The Role of Wealth in the Start-up Decision of New Self-employed: Evidence from a Pension Policy Reform*

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Abstract

We use administrative micro panel data from the Netherlands to study the wealth effect on the transitions of workers from wage-employment to self-employment. To isolate the causal effect of wealth, we use a pension system reform in 2006 as a quasi-natural experiment. With the onset of the reform, wage-employees born on or after 1 January 1950 faced a substantial reduction of their pension wealth. Our empirical results are robust to the checks on the anticipation effects and the placebo effects, and show that the (pension) wealth change has a significant positive causal effect on the transition into self-employment.

JEL codes: J26, J62, L26, C36

Keywords: self-employment, pension policy reform, exogenous wealth shock

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1 Introduction

In recent decades, self-employed have become a non-negligible fraction in the labour market, comprising about 10.5%[1], 12%[2] and 10% to 14%[3] of the labour force in the United States (US), the United Kingdom (UK) and the Netherlands, respectively. In many countries, a self-employed can qualify for a number of tax facilities and subsidies that are aiming at promoting entrepreneurship, while at the same time, saving into a pension can be more difficult for self-employed, either because of the lack of employer's contributions to the old age state pension (e.g. in Canada), or because they are excluded from the occupational (collective) pension schemes of wage-employees (e.g. in the UK and the Netherlands). The self-employed may need to compensate the lack of collective pensions by accumulating private wealth. Therefore, a fiscal treatment that is similar to the pension schemes of wage-employees is offered to the voluntary (private) pension savings for the self-employed in these countries. Descriptive evidence suggests that at present self-employed workers accumulate substantial private wealth. For example, Gentry and Hubbard (2004) indicate that entrepreneurs comprise under 9% of households in the US, but hold about 40% of total net wealth. Policy makers may thus not be concerned about the retirement provisions of the self-employed if they believe that this group is inherently wealthier. This lack of concern can be exacerbated if policy makers believe that there is a wealth effect in the start-up decision, namely that only the wealthy individuals become self-employed, rather than the self-employed becoming wealthy thanks to their entrepreneurship. Therefore, understanding whether or not the one-way causal effect of a wealth change on self-employment decisions actually exists is significant and meaningful, and thus is the focus of our study.

In this paper, we argue that we can use a pension reform that brings about an exogenous variation in wealth to examine whether there is a causal relation of wealth changes on the transition from wage-employment into self-employment. To see the issue more clearly,

[1]Household data from the Current Population Survey (CPS) (Bureau of Labor Statistics, 2002).

[2]Small and Medium Sized Enterprise (SME) Statistics (European Commission Enterprise and Industry, 2007).

[3]Statistics Annual Report, (Statistics Netherlands, 2011).

consider that a positive correlation between self-employment and wealth may come about from two separate channels. In the first, self-employment may enable one to become wealthier, meaning that hard working entrepreneurs could earn more during their working lives and be able to accumulate more wealth. In the second, richer individuals are more likely to become self-employed. For instance, due to investment requirements and capital market imperfections.[4] The potential wealth effects on the transition into self-employment have been most intensively documented. A sizable amount of studies interpret the wealth effect as evidence that liquidity constraints hinder people from starting an own business (Evans and Jovanovic, 1989; Fairlie, 1999; Quadrini, 1999; Gentry and Hubbard, 2004). The liquidity constraints hypothesis justifies the view that favorable policies, such as low-interest loans by governments and banks, should be easily accessed by small business starters. However, this hypothesis is questioned by Dunn and Holtz-Eakin (2000), who find a positive but small effect of financial wealth on the transition into self-employment, and Hurst and Lusardi (2004), who suggest that only for extremely wealthy households there is a positive correlation between household wealth and the business entry rate, thus credit constraints are not a main determinant to the formation of small business. Notice that according to the above studies, due to the potential endogeneity in wealth, it is not possible to elicit the casual relation from wealth to transition into self-employment. To address the concerns about the endogeneity, several researchers utilize exogenous wealth shocks, such as winning a lottery (Lindh and Ohlsson, 1996; Imbens et al., 2001; Taylor, 2001) or receiving an unexpected bequest (Brown et al., 2010). These studies conclude that, possibly due to credit constraints, windfall gains increase the start-up probability.

In order to solve the issue of the potential endogeneity of wealth changes and find a way to elicit a wealth effect on the transition into self-employment, instead of considering financial wealth or household wealth as the majority of the literature does, we resort to the study of pension wealth variations during a recent pension system reform in the Netherlands. With the onset of the reform, wage-employees born after a certain date faced

[4]As collateral is typically requested with a loan application, only rich individuals with high collateral are able to get their business plan financed.

a substantial reduction of their pension wealth while wage-employees born before that date did not see any modification in their entitlements. Although pension wealth is illiquid and one cannot borrow against it, there exists a documented link between pension wealth and private wealth: the literature concerned with crowding-out effects shows that, to a large extent, employees reduce their private savings in the presence of compulsory savings.[5] Also, pension wealth effects have been documented in the decision to work at old ages.[6] Therefore, it is legitimate to use an exogenous variation in pension wealth to elicit a wealth effect and study the labour supply decision. Yet, relatively little research has explicitly addressed the issues of pension wealth changes and labour supply in self-employment. To the best of our knowledge, this is the first study to fill this gap.

In our study, the wealth variation due to the reform is negative. We find that the reduction in the pension wealth has a significant causal effect on decreasing the transition into self-employment. This finding is robust to the checks on the anticipation effects and the placebo effects, and remains consistent when we narrowing the cohorts selections. The positive wealth effects on self-employment found in the literature above would imply a drop in self-employment. We have argued that private wealth and pension wealth are connected through the crowding-out mechanism, and risk aversion also strengthens this link. The self-employed face greater future income risk than the wage-employed. While the self-employed are risk averse, they have a higher risk tolerance than wage-employed (Ekelund et al., 2005; Colombier et al., 2008). The assumption of decreasing absolute risk aversion (DARA) leads to the prediction that wealthier individuals are more likely to transition into self-employment. Risk averse individuals who are going to transition into self-employment,

[5]As estimated in Alessie et al. (2013), the lower bound of crowding-out effect of pension wealth on private wealth is significant and it ranges between 17% and 30%. Hurst et al. (2010) point out that the lack of pension wealth is a potential reason for the difference in the size of precautionary saving motive between business owners and wage-employees.

[6]Previous studies show this for the relation between pension and social security benefits or the (early) retirement choice among old cohorts. Anderson and Burkhauser (1984) and Krueger and Pischke (1992) conclude that when the amount of social security and pension wealth which workers expect to receive becomes lower, labour supply of older workers declines. Also, Anderson et al. (1986) and Baker and Benjamin (1999) find that unanticipated increases in social security wealth induce earlier retirement, and the reduction of retirement earnings leads old individuals to continue working, who would otherwise have retired.

would implicitly accept an additional future income reduction that is equal to the income risk premium. Because of their risk aversion, they may want to avoid the situation in which they have to decide whether to pay this additional price and make the transition into self-employment, once they have also paid the cost of the reduction in pension wealth due to the reform. The reform thus discourages potential self-employed, and establishes a positive relation between pension wealth reduction and self-employment entry (since they both drop). If individuals were risk seeking or if they would anticipate future additional pension cuts, the reform could actually induce a wealth effect in the opposite direction. However, we find no support of this hypothesis in our results.

The paper is organized as follows. In the next section we sketch the institutional frame of the Dutch pension system and the main aspects of the reform. In Section 3, we introduce the data and present descriptive statistics. In Section 4, we discuss the main estimation results, and Section 5 concludes.

2 Quasi-natural Experiment for Self-employment transition

To isolate the causal effect of the pension wealth change on the transition into self-employment, we use the Dutch pension system reform in 2006 as a quasi-natural experiment. In this section, we briefly sketch the institutional framework of the Dutch pension system and the main aspects of the reform.

2.1 The Dutch Pension System

The Dutch pension system is a three-pillar system. In the first pillar, all residents are entitled to receive a pay-as-you-go basic old age state pension as of age 65. In comparison with other EU countries, the basic old age state pension only represents a limited proportion of the total old age pension income. The second pillar, which is affected by the pension reform in 2006, is supplementary to the state pension and covers the vast

majority (about 90%) of wage-employees. This is a collective and funded system, typically of the defined benefit type, and organized around private sector-specific, occupational or company-specific pension funds. The benefit of a second-pillar pension scheme depends on (past) wages, tenure in the pension scheme and whether one has been working full-time or part-time.[7] Participation is mandatory for all employees that are associated with a covered company/sector or occupation. For self-employed the situation is very different. With a few exceptions, self-employed workers are not covered by sectoral or occupational second-pillar pension arrangements. Before 2006, many of the second-pillar arrangements allowed for generous early retirement possibilities; the age of labour force withdrawal within such schemes averaged to about 60 years. Specific features of the Dutch pension legislation make it disadvantageous to become self-employed later in one's career. Pension funds must apply an average premium and accrual computation, where each contribution is assigned the same average return, even though those of the youth will produce a higher return in the future. The average premium and accrual computation also leads the average return to be higher than the market return for older workers. Therefore, it is less profitable to exit wage-employment at later ages, when higher returns could be enjoyed. This should be kept in mind when studying transitions into self-employment (thus out of the second pillar) at later ages. In the third pillar, individuals can build up tax-favored voluntary pension savings through contracts with insurers, banks or investment companies. However, due to the fact that the second pillar supplementary pension is exempted and that tax facilities are limited, not many wage-employees buy a third pillar pension product, as only a small part of it would typically be tax-deductible (Mastrogiacomo and Alessie, 2015).

2.2 Changes in the Dutch Pension System

The reform of the Dutch pension system in 2006 provides a basis for a quasi-natural experiment to examine the causal effect of an exogenous pension wealth change on the transition from wage-employment into self-employment. With the aim to increase the

[7] A part-time employee acquires pension benefit in proportion to his/her total number of working hours.

labour force participation rate of older workers, on 5 July 2005, the Dutch government abolished the preferential tax treatment of early retirement in the second pillar pension schemes for all wage-employees born on 1 January 1950 or later in both the public and the private sector, and announced that the new pension scheme would be launched on 1 January 2006. The wage-employees born until 31 December 1949 are still entitled to the old, more generous pension system, if they have been continuously working since 1 April 1997. However, employees born on 1 January 1950 or later, or those born before that date and who did not work continuously in the last 10 years, are subject to the less generous new pension rules. The most important feature of the reform is a reduction in pension benefits. On average, the retirement replacement rate of wage-employees born on 1 January 1950 or later drops by around 2.4 percentage point due to the reform. For example, consider a wage-employee in the public sector born in 1950 with labour market entry in 1975 and continuous participation, with current earnings of 60,000 euro per year, the retirement replacement rate drops from 69% to 66% due to the pension system reform, which equals a reduction of 1800 euro in terms of retirement annuity assuming that his/her wage remains constant.

In one respect, one may think that the reform of the Dutch pension system in 2006 is not totally unexpected, since there had been public debate by then that a legislative change in the pension system would be necessary due to the demographic changes. However, not only the short length of time between the announcement and the implementation of the pension system reform, but also the strong distinct treatment between wage-employees born until 31 December 1949 and from 1 January 1950 onwards came as a surprise to the public. Therefore, after 2006 a treatment group can be easily identified (wage-employees born on 1 January 1950 or later) as well as a control group (wage-employees born until 31 December 1949). With the exception of the reform of the Dutch pension system in the year 2006, there are no other significant changes in the Dutch pension system between 1996 and 2011 affecting workers directly, as most changes took place in the sphere of pension funds governance.

For our research, it is also important that wage-employees understand the reduction

of the pension benefit caused by the pension system reform. In order to make all participants acquainted with the new pension system, in the second half of 2005, there was an introduction campaign launched by all pension funds to explain the new pension system. A variety of methods, like special news bulletins, letters sent by employers, and electronic service packages were used to explain the difference between the old and the new pension system. Therefore, it is reasonable to believe that on 1 January 2006, wage-employees born on 1 January 1950 or later, in both the public and the private sector, were aware of the reduction of their pension wealth caused by the pension system reform.[8]

2.3 Approximation of the Reduction in Retirement Replacement Rate

The pension benefit is the sum of old-age pension benefits plus the (early retirement) occupational pensions. We calculate the approximate retirement replacement rate at age 65 before and after the pension system reform according to the calculation rules provided by ABP (the public sector pension fund).[9] As we do not observe the amount of working hours retrospectively, we assume that all wage-employees are always full-time workers. In reality, most parameters used in the pension benefits' computation are scaled down proportionally in order to adapt to the labour supply of a part-time employee such that a part-time employee acquires pension benefit proportionally to the hours worked. In this study though, we focus on the heads of the household,[10] who are more likely to be full-time wage-employees.[11] The individual's retirement replacement rate crucially depends on the employee's birth year, tenure in the pension scheme, and income from wage-employment. In our dataset, we cannot observe the individual's tenure in the pension scheme, so we

[8] This also has been verified empirically, see Grip et al. (2012).

[9] Although ABP is the pension administrator for the public sector, in the private sector the wage-employees born on 1 January 1950 or later face similar pension benefit drops due to the reform. Therefore, we use the rules of ABP to calculate the retirement replacement rate of wage-employees in both public sector and private sector.

[10] The definition of the heads of households is documented in the following Section 3.1.

[11] According to the data, 67% of the heads of household who are wage-employed are full-time in year 2011, and 74% of the heads of household who are wage-employed work with above 90% full time equivalent (fte).

need to reconstruct it on the basis of information available from other panel datasets. In order to mimic the average wage system, we take the average income from employment in the last five years as a proxy for the relevant labour income.[12] We multiply the difference between the calculated retirement replacement rate before and after the reform with the predicted income at age 65 to estimate the annual pension wealth reduction after age 65. In order to obtain the reduction in expected total pension wealth due to the reform, we compute the actuarial discounted sum of all these annual reductions between age 65 and 100. Refer to the Appendix A and B for more details about this computation. Pension wealth and yearly income are deflated to year 2011 using the Consumer Price Index.

3 Data and Descriptive Statistics

3.1 The Dutch Income Panel Study

We use the Dutch Income Panel Study (Inkomens Panel Onderzoek in Dutch, hereafter IPO) from 2003 to 2011. IPO is a panel dataset containing yearly administrative records obtained from various government registers (prominently based on the data from the Dutch tax authorities and customs administration) on around 250,000 individuals and 100,000 households, or approximately 1.5% of the entire Dutch population. In this dataset, randomly selected "key persons", supplemented with the cohabiting family, are drawn from the Dutch population. The "key persons" are tracked over time, although the household composition can change. The advantage of this dataset is that the attrition rate is quite low: it is only caused by death and emigration of the key person. In each wave, new key persons are also included in the dataset from immigrants to the Netherlands and newborns. The administrative nature implies that the dataset has low measurement error for the financial and demographic variables of each observed individual. The IPO dataset

[12]The calculation rules that ABP provided us do not take into account the wage-employees whose yearly income from employment is less than or equal to 27,000 euro. We drop those whose proxy for the current income is less than 27,000 euro, which represents around of 20% of wage-employees in the age range 31 to 65 in our dataset.

contains detailed and highly accurate information on personal income, augmented with various background variables, such as gender, age, marital status, household composition, country of birth, municipality of residence, home ownership, labour market status, self-employment status and so on. However, it lacks education and health status as two of the potentially relevant background variables. When constructing the sample, we adopt the following procedure. To eliminate those who have not yet entered the labour market or are approaching retirement, we concentrate on age groups that are typically of working age from 31 to 65 (those were born from 1938 to 1980). We further restrict the sample to the household head (the oldest male in a household, or oldest female in a household if a household does not contain any males). This procedure ensures that we focus on the individuals who are likely to work full-time.

Despite the fact that there exists a sizable number of studies that focus on analyzing the relation between wealth holding and self-employment, there is no agreement on the definition of "self-employed". The vast majority of studies is based on survey data, some authors identify self-employed utilizing self-reported employment status from survey questions (see Hochguertel (2015), Mastrogiacomo and Alessie (2015)), while other authors identify "business owners" by choosing a minimum value of business equity (See Quadrini (1999), Gentry and Hubbard (2004) and Hurst and Lusardi (2004)). In our study, based on administrative data from the tax office, we define an individual as self-employed if he/she has non-zero income from his/her company. According to whether one also has income from wage-employment, we further define two types of self-employment status: we define an individual to be self-employed if one has non-zero income from his/her own company (Type 1); with a stricter criterion, we define an individual to be full-time self-employed if one only has non-zero income from his/her own company and has zero income from wage-employment (Type 2). Panel A in Table 1 reports the total number of observations for Type 1 self-employed, Type 2 self-employed and wage-employed in the period 2003 to 2011 in the IPO dataset: there are around 8,000 to 10,000 counted as Type 1 self-employed, 5,500 to 7,500 counted as Type 2 self-employed, and 47,000 to 53,000 counted as wage-employed in

each wave.[13] As mentioned in Section 2.3, individual's tenure is not directly observed in the IPO dataset. Therefore, we reconstruct it on the basis of information from the dataset that contains job information (Baankenmerkenbus 2003 to 2011) and the dataset that contains pension benefit information (Pensioenaanspraken 2003 to 2011).[14] As reported in Panel B in Table 1, after excluding the wage-employees whose yearly income from employment is less than or equal to 27,000 euro, there are around 30,000 wage-employees in each wave that can be merged with either of the two datasets.

3.2 Descriptive Statistics

We define the dependent variable, the transition indicator $y_{it} = 1$ if an individual is wage-employed (WE) in year $t-1$ and self-employed (SE) in year t; otherwise, $y_{it} = 0$ if an individual is wage-employed in both year $t-1$ and t. As we only examine the transition from wage-employment into self-employment, we discard the observations that are not relevant to describe this hazard, for instance, those who are always self-employed. If an individual transitions from wage-employment into other states (e.g. transition into directors/large shareholders of a company, unemployment, or pension recipients), we keep this individual in the sample until the time point that the transition into other states takes place.[15] Panel C in Table 1 shows that the final sample contains around 22,000 to 23,000 wage-employed in each wave. Figure 1 plots the relationship between age and Type 1 self-employment transition rate for the year 2003 through 2011. The overall pattern is that the rate of transition into self-employment decreases with age. This is because the general job to job transition rate declines with age, and the average premium and average accrual system

[13]The rest contains those who are directors or large shareholders of a company, unemployed, pension recipients, social benefit recipients, without income, disabled etc.

[14]Baankenmerkenbus contains information on the employee's tenure of current job, and Pensioenaanspraken contains the observed number of years of pension accumulation. We select the largest value of an individual's tenure on the current job and the observed number of years of pension accumulation as the proxy for one's tenure in the pension scheme.

[15]As discussed previously, since the calculation rules that ABP provided us do not take into account wage-employees whose yearly income from employment is less or equal to 27,000 euro, based on the observations in Panel B in Table 1, we first drop those whose proxy for the current income is less than 27,000 euro, which leads to 219,252 observations left. This procedure further drops 11,582 out of 219,252 observations.

makes it less profitable to exit wage-employment at later ages. One may also conclude that the self-employment transition rates differ markedly over the years. Compared with other years, the self-employment transition rate is higher for young wage-employees in 2008.

We assume that the treatment group (wage-employees born on 1 January 1950 or later) and the control group (wage-employees born until 31 December 1949) have experienced the common trend before the pension reform started in 2006. Figure 2 plots the self-employment transition rates for the period 2003 to 2011. From Figure 2, one can see that the trends of self-employment transition rates of the treatment and control groups are roughly similar before the pension reform year 2006, suggesting that the common trend assumption is satisfied. Since the average age of the treatment group is lower than that of the control group, the self-employment transition rate of the treatment group is higher than that of the control group. After the reform, it is noticeable that not only is there a downward trend in terms of the difference of the transition rates between the treatment group and the full sample (the vertical difference of the dark shaded area), but also the difference of the transition rates between the treatment group and the control group (the vertical difference of the dark shaded area plus the light shaded area) decreases evidently after 2008. One may infer from this figure that those in the treatment group may be less likely to transition into self-employment in comparison with the situation when they are not treated and the situation of the control group.

For the selected years 2005 (before the reform) and 2006 (after the reform), Table 2 presents basic descriptive statistics for the treatment group and the control group separately. The table shows that the self-employment transition rate of the control group doubles from 0.0015 to 0.0035, while for the treatment group it increases from 0.0047 to 0.0071. Because of the pension system reform, on average, the retirement replacement rate of the treatment group drops by 0.024 percentage points in year 2006, and expected total pension wealth decreases by around 21,000 euro. We also find that the lagged income from wage-employment in 2006 is significantly higher than that of 2005 for the treatment group. The t-test for equal means indicates that there is no significant difference within the treatment group between 2005 and 2006 when it comes to other control variables that

are not directly affected by the pension reform. Similar evidence also holds for the control group, except that there are small significant changes in household size and number of income earners between 2005 and 2006.

4 Estimation Results

4.1 Analysis

Let $DropPW_{it}^k$ denote the negative changes in pension wealth, as $DropPW_{it}^k > 0$ if individual i faces a drop in his/her pension wealth, namely that individual i belongs to a birth cohort younger than or equal to 1950 and year t is larger than or equals to 2006; $DropPW_{it}^k = 0$ otherwise. The superscript k corresponds to different specifications to measure the negative changes in pension wealth. This is the main variable of interest in following regression equation:

$$y_{it} = \alpha_i + \beta_1 \cdot DropPW_{it}^k + \beta_2 \cdot DC_{(\text{cohort} \leq 1949)} + \beta_3 \cdot DT_{(\text{year} \geq 2006)} + \boldsymbol{\gamma} \cdot \boldsymbol{X}_{it} + u_{it}, \qquad (1)$$

where $t = 2003, \cdots, 2011$. y_{it} is the indicator for the transition into self-employment from wage-employment defined in Section 3.2. $DC_{(\text{cohort} \leq 1949)}$ and $DT_{(\text{year} \geq 2006)}$ are the dummy variables for the control group and the dummy for the treatment year 2006 and beyond, respectively. $\boldsymbol{X}_{it}$ contains other explanatory variables, such as age splines, tenure, lagged income from wage-employment, personal and household characteristics, cohort dummies and GDP growth rate to capture time effects.[16]

We use three different variables to measure the negative changes in pension wealth $DropPW_{it}^k$, respectively. First, we use the dummy for treatment ($DropPW_{it}^1$), which is equal to one if individual i both belongs to a birth cohort younger than or equal to 1950

[16] We also use time dummies instead of GDP growth rate, which do not lead to significant change in the estimation results. We include neither the level value nor the lagged value of household wealth in any regression, since the household wealth may be endogenous to the transition into self-employment as discussed in Section 1. Moreover, the information about household wealth is not observed in year 2003 and 2004.

and year t is larger than or equals to 2006; otherwise it is equal to zero. We apply pooled ordinary least squares (OLS) and individual fixed-effects (FE) estimation to Equation (1) under this specification. Second, we measure the negative changes in pension wealth using the reduction in the retirement replacement rate ($DropPW_{it}^2$, the variable in the fourth line in Table 2). Third, we use the reduction in the expected total pension wealth ($DropPW_{it}^3$, the variable in the fifth line in Table 2) as the explanatory variable. Under the second and third specification, we employ the OLS and the instrumental variable (IV) estimation to Equation (1).

4.2 Results

Column (1) - (2) and Column (3) - (4) in Table 3 apply pooled OLS and FE estimation to Equation (1) with the dummy for treatment as the measure for the negative changes in pension wealth. After we condition on the rest of the available information, the estimated coefficient β_1 of the dummy for treatment shows that the exogenous reduction in pension wealth has a significant effect on the individual's decision to shift into self-employment: according to the FE estimation results, the pension reform in 2006 decreases the probability of entering Type 1 and Type 2 self-employment by 0.24 and 0.11 percentage points respectively. Given the Type 1 and Type 2 self-employment transition rates of the treatment group in year 2006 are 0.0071 and 0.0011 respectively (as reported in Table 2), the coefficients imply that the treatment group experienced a 25%[17] and a 50%[18] decrease in the transition into Type 1 and Type 2 self-employment respectively in year 2006. Noticeably, although we use two different definitions of self-employment, our estimation results reveal a consistency of the significant effect of pension wealth on the transition into two types of self-employment. Additionally, as seen from Table 3, the coefficient of lagged income from wage-employment suggests that those with higher income are more likely to become self-employed. Transition into self-employment is less likely to be associated with longer tenure in wage-employment in general. There is weak evidence that household size is pos-

[17]Calculation: 0.25=0.0024/(0.0071+0.0024).
[18]Calculation: 0.50=0.0011/(0.0011+0.0011).

itively correlated with the self-employment transition rate. Immigrants are less likely to become self-employed than native-born, although the estimates are not significant at conventional levels. Marital status has effects on becoming self-employed: married, unmarried and widowed individuals are less likely to become self-employed than divorced individuals.

Next, instead of using the dummy for treatment, Column (1) - (2) in Table 4 repeats the same pooled OLS analysis as Table 3 while using the approximated reduction in retirement replacement rate due to the pension reform as the explanatory variable. Similar to Column (1) - (2) in Table 3, we find that the exogenous reduction in the retirement replacement rate has a significant effect on the self-employment transition. One may argue that the approximated reduction in retirement replacement rate contains non-negligible measurement error. Indeed, the approximation of individual job tenure may lead to biased estimates of the reduction in retirement replacement rates. Therefore, we use the dummy for treatment as an instrument for the approximated reduction in retirement replacement rate because of its strong predictive power.[19] Column (3) - (4) in Table 4 performs IV estimation, in which the reduction in retirement replacement rate is instrumented with the dummy for treatment. As expected, the dummy for treatment is highly positively correlated with the reduction in retirement replacement rate in the first-stage regression.[20] After instrumenting the reduction in retirement replacement rate, we find that the exogenous reduction in the retirement replacement rate still has a significant effect on the individual's decision to transition into self-employment: according to the IV estimation results, a 0.01 unit reduction in the retirement replacement rate decreases the probability of transition into Type 1 and Type 2 self-employment by 0.083 and 0.041 percentage points.

To quantify the extent of pension wealth effect on self-employment transition, Table 5 repeats the same analyses of Table 4 using the reduction in the expected total pension wealth due to the reform as the measure for the negative changes in pension wealth in Equation (1).[21] Although the OLS estimation results (reported in Column (1) - (2) in

[19]Dummy for treatment as instrumental variable has been applied in a number of studies, for example Kopczuk (2012) and Aoki (2014).

[20]The F-statistic for the relevance of the instrument is 81776.43, indicating the instrument is relevant.

[21]Notice that the independent variable, the reduction in the expected total pension wealth, is a generated

Table 5) are not significant, similar findings are confirmed again by the estimation results of IV (reported in Column (3) - (4) in Table 5). The empirical results imply that the exogenous reduction in the expected total pension wealth has a significant causal effect on one's decision to transition into self-employment. One possible explanation is that when pension wealth drops, one tends to reserve a higher amount of liquid private wealth for the retirement motive and the precautionary saving motive, and therefore, less of liquid financial wealth will be used to start new businesses and bear the risk of self-employment. Consequently, wage-employed tend to stay somewhat longer in wage-employment, and the transition into self-employment decreases upon a reduction in pension wealth. Our empirical results are in line with the findings of Anderson et al. (1986), Baker and Benjamin (1999), who find that a reduction of pension earnings induces old wage-employees to continue working for wage.[22]

Based on the IV estimation results in Column (3) - (4) in Table 5, a 10,000 euro reduction in the expected total pension wealth decreases the Type 1 self-employment transition rates by 0.096 percentage points. Since for the treatment group the average reduction in the expected total pension wealth is around 21,000 euro in 2006 (as shown in Table 2), this implies that the Type 1 self-employment transition rate decreases by 22%,[23] which are very close to the findings under the specification of using the dummy for treatment as explanatory variable (which is 25%). The magnitude of this estimated effect is larger than that found in other literature: Jensen et al. (2014) investigate the effect of an exogenous increased access to credit due to a mortgage reform on the transition into entrepreneurship,[24] and find that a 30,000 US dollar (which is roughly equal to 23,000 euro according to the exchange rate in year 2006 and correcting for inflation) increase in credit availability led to around 12% increase in the transition into entrepreneurship. One possible explanation

independent variable (as stated in Section 3.2). So we also perform the sensitivity analysis using different values of this variable which are generated under different specifications (e.g. using a different discount rate). The empirical results do not change significantly.

[22]These studies use data of old wage-employees, while our data contains wage-employees aging between 31 to 65.

[23]Calculation: 0.22=0.00096*2.1/(0.0071+0.00096*2.1).

[24]Definition of entrepreneur in their study: individuals who are employers (self-employed with at least one employee.)

for the large magnitude of our estimated effect is that we focus on the experienced wage-employees, whose work attachment could be easily triggered by a pension reform beyond the possibly limited impact of the reform. This is often observed in countries where labor market rigidities increase with age, like in the Netherlands where labor market attachment of the elderly is very high. Meanwhile, the estimated wealth-effect due to the reform could pick-up an additional effect that is impossible to be separately disentangled. It could be the case that the reform was considered as the initial step of a long series of further reforms, and wage-employed would anticipate larger future changes of their pension wealth. Finally the psychological effect of the reform might have amplified the economic outcomes.[25]

4.3 Robustness Checks

Table 6 presents the results of some robustness tests for our estimates. The table is divided into five panels, and the underlined numbers mean that those estimates do not show support for robustness. Primarily, Panel A is related to the possibility that anticipation effects are present if wage-employed were expecting the reform ahead of the implementation. To test the anticipation effect, we assume that the pension reform would not take place in 2006 but in any other years, and repeat the same analysis. We find that only in year 2005 there exists weak evidence for the anticipation effects, this is not surprising since the reform was announced in July 2005. Secondly, Panel B tests the placebo effect. We analyse the placebo effect based on the assumption that those who were born in 1950 to 1959, 1960 to 1969 and 1970 to 1979 would not be treated, respectively. The estimates become not significant under these assumptions, although accompanied by a few exceptions.

In Panel C, in order to get a balanced sample between the control and treatment group, we select a specific sample of cohorts 1938 to 1955 and replicate the analyses again.[26] We find that, with fewer observations in the treatment group, the reduction in pension wealth still makes wage-employed less likely to transition into self-employment. In comparison

[25]For instance, the effect on depressions and anxiety documented by Grip et al. (2012).

[26]Since the sample size of each cohort of the control group is less than that of the treatment group, the selected sample contains all 12 cohorts (cohort 1938 to 1949) of the control group and 6 cohorts (cohort 1950 to 1955) of the treatment group.

with the baseline estimates, for both Type 1 and Type 2 self-employment transition rates, the absolute values of the estimates of the dummy for treatment increase, while the absolute values of the estimates of the two independent variables that measure reduction in pension benefit decrease, respectively. In Panel D, we re-define and re-select the treatment group by using propensity score matching methods. We only compare the control group with those whose characteristics (except age, cohort and tenure) are similar to those in the control group, and still find significant results.[27] Similar to Panel C, when comparing the estimates of Panel D with the baseline estimates, we find there is an increase in the absolute values of the estimates of the dummy for treatment and decrease in absolute values of the estimates of two independent variables that measure reduction in pension benefit. Overall, the results of robustness test provide support to the validity of our quasi-natural experiment set-up and estimates.

5 Conclusions

In this paper, we identify the causal effect of pension wealth on the transition from wage-employment into self-employment. To solve the issue of potential endogeneity of wealth changes, we utilize the Dutch pension system reform of the year 2006 as a quasi-natural experiment to study the causal relation between wealth change and self-employment transition.

Our empirical results are robust to several specifications and tests, and provide support for the one-way causal effect interpretation: exogenous reduction in pension wealth significantly decreases the transition from wage-employment into self-employment. When pension wealth drops, the wage-employed tend to reserve a higher amount of liquid private wealth for retirement and precautionary saving, and less liquid financial wealth will be used to start new business and bear the risk of self-employment. There are a number of papers that put financial market imperfections (liquidity constraints) at the heart of the

[27]The results are based on nearest neighbor matching method. Radius matching and kernel matching give similar results.

explanation of the cross-sectional correlation between self-employment and wealth. Our paper therefore underlines the importance of isolating exogenous changes in wealth, and suggests that as a type of non-disposable wealth before retirement, the role of pension wealth should not be neglected when studying self-employment transitions.

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Appendix A: calculate the predicted income

For each individual, the predicted income at age 65 is extrapolated by the wage equation

$$w_{i,t} = \alpha_i + \beta_1 \cdot w_{i,t-1} + \beta_2 \cdot w_{i,t-2} + \beta_3 \cdot gdp_t + \beta_4 \cdot age_{i,t} + \beta_5 \cdot cohort_i + \boldsymbol{\gamma} \cdot \boldsymbol{X}_{i,t} + u_{i,t},$$

where $w_{i,t}$ is the income from employment of individual i in year t, gdp_t is the GDP growth rate that captures time effects, and it is assumed to be constant at 1.5% for extrapolation, $age_{i,t}$ represents the age polynomial, $cohort_i$ are dummies for each year of birth, and $\boldsymbol{X}_{i,t}$ represents additional controls. We use a random effect model to estimate this equation.

Appendix B: calculate the reduction in expected total pension wealth

In this part, we present the way to calculate the reduction in expected total pension wealth. Let ${}_kp_{65}$ denote the probability that an individual of age 65 survives at least k years. Let w_t indicate the predicted income from wage-employment at age 65 in year t. Let rrr_t indicate the approximated reduction in retirement replacement rate in year t, $rrr_t = 0$ if $t < 2006$. r is the discount rate, which is assumed to be constant at 2%. x_t is one's age in year t. Then the reduction in expected total pension wealth (rpw_t) in year t is calculated by

$$rpw_t = \sum_{k=0}^{35} w_t \cdot rrr_t \cdot (1+r)^{-(65+k-x_t)} \cdot {}_kp_{65},$$

where in calculation we replace ${}_kp_{65}$ according to the prediction of Statistics Netherlands.[28]

[28]We do not use cohort specific ${}_kp_{65}$, because this prediction has not been updated for all younger cohorts by Statistics Netherlands.

Appendix C: Tables and Figures

	Panel A IPO dataset				Panel B Merge IPO with tenure information[b]	Panel C Final sample
Year	Type 1 self-employed	Type 2 self-employed	Wage-employed	All[a]	Wage-employed	Wage-employed
2003	8082 (10.8%)	5697 (7.6%)	47303 (63.3%)	74673	30610	23610
2004	8412 (11.0%)	5723 (7.5%)	47883 (62.8%)	76214	30458	23458
2005	8677 (11.2%)	6001 (7.7%)	48574 (62.7%)	77516	30398	23398
2006	8831 (11.2%)	6039 (7.7%)	49743 (63.2%)	78660	30165	23165
2007	9225 (11.6%)	6256 (7.8%)	51106 (64.1%)	79749	30291	23291
2008	9888 (12.2%)	6716 (8.3%)	52132 (64.3%)	81041	30016	23016
2009	9746 (11.8%)	7102 (8.6%)	53071 (64.2%)	82607	29723	22523
2010	10069 (12.1%)	7289 (8.7%)	53079 (63.7%)	83366	29864	22064
2011	10482 (12.4%)	7566 (9.0%)	53627 (63.6%)	84319	29156	22145

Note: a. Except for self-employed household and wage-employed household, the rest contains those who are directors/large shareholders of a company, unemployed, pension recipients, social benefits recipients, without income, disabled, etc. b. IPO is merged with the Baankenmerkenbus dataset and the Pensioenaanspraken dataset to obtain tenure information.

Table 1: Total number of observations of Type 1 and Type 2 self-employed households and wage-employed households

	Treatment group (cohort≥ 1950)			Control group (cohort≤ 1949)		
	2006 Mean	2005 Mean	P-value	2006 Mean	2005 Mean	P-value
Self-employment transition rate						
Type 1 self-employment transition rate	0.0071	0.0047	0.132	0.0035	0.0015	0.071
Type 2 self-employment transition rate	0.0011	0.0018	0.136	0.0020	0.0007	0.164
Pension benefit						
Retirement replacement rate	0.633	0.658	0.000	0.657	0.657	0.984
Reduction in retirement replacement rate	0.024	0.000	0.000	0.000	0.000	/
Reduction in total pension wealth/10^5	0.206	0.000	0.000	0.000	0.000	/
Job characteristics						
Lagged income from wage-employment	55317.0	54436.8	0.000	58499.4	58123.7	0.575
Tenure	16.7	15.7	0.000	27.6	27.2	0.055
Personal characteristics						
Age	44.8	43.9	0.000	59.0	58.3	0.000
Household size	3.541	3.558	0.267	2.339	2.394	0.035
Number of income earners in household	2.109	2.108	0.891	1.954	2.000	0.059
Indicator for relocation	0.049	0.051	0.347	0.028	0.031	0.448
Indicator for urbanization	0.139	0.139	0.917	0.137	0.135	0.818
Indicator for immigrant	0.126	0.126	0.957	0.123	0.120	0.755
Indicator for unmarried	0.150	0.151	0.743	0.041	0.043	0.807
Indicator for married	0.777	0.779	0.544	0.849	0.856	0.469
Indicator for widowed	0.005	0.004	0.680	0.010	0.014	0.257
Indicator for divorced	0.068	0.065	0.171	0.100	0.087	0.139
Number of observations	19813	19866		2415	2945	

Table 2: Means of variables and mean-comparison tests for the treatment group and the control group for year 2005 (before the reform) and year 2006 (after the reform)

	(1)	(2)	(3)	(4)
	OLS		FE	
	Trans. into SE	Trans. into full-time SE	Trans. into SE	Trans. into full-time SE
Dummy for treatment ($DropPW_{it}^{1}$)	-0.0018*	-0.0010**	-0.0024*	-0.0011**
	(0.0011)	(0.0005)	(0.0014)	(0.0005)
Dummy for cohort≤1949	-0.0049**	0.0001	/	/
	(0.0023)	(0.0008)	/	/
Dummy for year≥2006	0.0053***	0.0015***	0.0016	0.0007
	(0.0009)	(0.0004)	(0.0013)	(0.0005)
Lagged income from wage-employment	0.0082***	0.0020***	0.0095**	0.0004
	(0.0013)	(0.0006)	(0.0039)	(0.0015)
Tenure	-0.0003***	-0.00006	0.0012***	0.0003***
	(0.00003)	(0.00001)	(0.0002)	(0.0001)
Age (31-36)	-0.0030***	-0.0008**	-0.0007	-0.00002
	(0.0007)	0.0003	0.0010	(0.00041)
Age (36-41)	0.0005*	0.0003**	-0.0019**	-0.00007
	(0.0003)	(0.0001)	(0.0009)	(0.00037)
Age (41-46)	0.0003	0.00003	-0.0015	-0.00005
	(0.0002)	(0.00009)	(0.0009)	(0.0004)
Age (46-51)	0.0003	0.00008	-0.0022**	-0.0002
	(0.0002)	(0.00008)	(0.0009)	(0.0004)
Age (51-56)	-0.00002	0.00013	-0.0029***	-0.0001
	(0.00001)	(0.00009)	(0.0009)	(0.0004)
Age (56-61)	0.0005**	0.0001	-0.0033***	-0.0003
	(0.0002)	(0.0001)	(0.0010)	(0.0004)
Age (61-65)	0.0025**	0.0003	-0.0027***	-0.0003
	(0.0011)	(0.0005)	(0.0009)	(0.0004)
Household size	0.0005**	0.00004	0.0005	0.0002
	(0.0002)	(0.00008)	(0.0004)	(0.0002)
Number of income earners in household	-0.0001	0.00003	-0.0007*	-0.0001
	(0.0003)	(0.00009)	(0.0004)	(0.0002)
Indicator for relocation	0.0010	-0.0003	-0.0003	-0.00010
	(0.0011)	(0.0004)	(0.0009)	(0.0004)
Indicator for urbanization	-0.0008	-0.0003	-0.0006	-0.0002
	(0.0005)	(0.0002)	(0.0018)	(0.0007)
Indicator for immigrant	-0.00004	-0.00002	/	/
	(0.0006)	(0.0002)	/	/
Indicator for unmarried	-0.0029***	-0.0002	-0.0043	-0.0004
	(0.0010)	(0.0004)	(0.0027)	(0.0010)
Indicator for married	-0.0039***	-0.0007**	-0.0050***	-0.0005
	(0.0009)	(0.0004)	(0.0017)	(0.0007)
Indicator for widowed	-0.0050***	-0.0013***	-0.0068	-0.0010
	(0.0017)	(0.0003)	(0.0047)	(0.0018)
GDP growth rate	-0.0007***	-0.00001	0.0007***	0.0003***
	(0.0002)	(0.00007)	(0.0002)	(0.0001)
Constant	0.0188***	0.0040***	-0.0365***	-0.0056***
	(0.0029)	(0.0015)	(0.0037)	(0.0014)

Note: The total number of observation is 207670. Cohort dummies are also included in the regression. The robust standard errors are in parentheses. *,**,*** denote the significance level at the 10%, 5% and 1% respectively.

Table 3: Estimation results of self-employment transition rate. Explanatory variable: dummy for treatment ($DropPW_{it}^{1}$)

	(1)	(2)	(3)	(4)
	OLS		IV	
	Trans. into SE	Trans. into full-time SE	Trans. into SE	Trans. into full-time
Reduction in retirement replacement rate ($DropPW_{it}^2$)	-0.046*	-0.0265**	-0.0827*	-0.0414**
	(0.0272)	(0.0133)	(0.0502)	(0.0194)
Dummy for cohort≤1949	-0.0012	0.0016**	-0.0026	0.0011
	(0.0021)	(0.0007)	(0.0021)	(0.0008)
Dummy for year≥2006	0.0028***	0.0004	0.0053***	0.0014***
	(0.0008)	(0.0003)	(0.0011)	(0.0004)
Lagged income from wage-employment	0.0092***	0.0025***	0.0119***	0.0035***
	(0.0015)	(0.0007)	(0.0014)	(0.0005)
Tenure	-0.00025***	-0.00005***	-0.0002***	-0.00005***
	(0.00003)	(0.00001)	(0.00003)	(0.00001)
Age (31-36)	-0.0031***	-0.0009***	-0.0032***	-0.0010***
	(0.0007)	(0.0003)	(0.0005)	(0.0002)
Age (36-41)	0.0004	0.0002**	0.0004	0.0002
	(0.0003)	(0.0001)	(0.0003)	0.0001
Age (41-46)	0.0003	-0.00001	0.0003	(0.00002)
	(0.0002)	(0.00001)	(0.0002)	(0.00009)
Age (46-51)	0.0002	0.00006	0.0003	0.0001
	(0.0002)	(0.00008)	(0.0002)	(0.0001)
Age (51-56)	-0.0001	0.0001	0.0002	0.0003*
	(0.0002)	(0.0001)	(0.0003)	(0.0001)
Age (56-61)	0.0007***	0.0003***	0.0006*	0.0002
	(0.0002)	(0.0001)	(0.0003)	(0.0001)
Age (61-65)	0.0028**	0.0003**	0.0024***	0.0003
	(0.0011)	(0.0001)	(0.0009)	(0.0003)
Household size	0.0005**	0.00004	0.0005**	0.00004
	(0.0002)	(0.00008)	(0.0002)	(0.00007)
Number of income earners in household	-0.0002	0.00003	-0.0002	0.00002
	(0.0003)	(0.00009)	(0.0003)	(0.00010)
Indicator for relocation	0.0009	-0.0003	0.0010	-0.0003
	(0.0011)	(0.0004)	(0.0010)	(0.0004)
Indicator for urbanization	-0.0008	-0.0003	-0.0008	-0.0002
	(0.0005)	(0.0002)	(0.0005)	(0.0002)
Indicator for immigrant	-0.00004	0.0002	-0.00006	0.0002
	(0.00056)	(0.0002)	(0.0006)	(0.0002)
Indicator for unmarried	-0.0029***	-0.0002	-0.0029***	-0.0002
	(0.0009)	(0.0004)	(0.0008)	(0.0003)
Indicator for married	-0.0039***	-0.0007**	-0.0039***	-0.0007**
	(0.0009)	(0.0004)	(0.0007)	(0.0003)
Indicator for widowed	-0.0049***	-0.0013***	-0.0049**	-0.0013
	(0.0017)	(0.0003)	(0.0023)	(0.0009)
GDP growth rate	-0.0007***	-0.00001	-0.0007***	-0.00002
	(0.0002)	(0.00008)	(0.0002)	(0.00008)
Constant	0.0182***	0.0038**	0.0167***	0.0032***
	(0.0029)	(0.0015)	(0.0019)	(0.0008)

Note: The total number of observation is 207670. Cohort dummies are also included in the regression. The reduction in retirement replacemen is instrumented by dummy for treatment, the F-statistic for the relevance of the instrument is 81776.4. The robust standard errors are in parent *,**,*** denote the significance level at the 10%, 5% and 1% respectively.

Table 4: Estimation results of self-employment transition rate. Explanatory variable: reduction in retirement replacement rate ($DropPW_{it}^2$, instrumented by dummy for treatment)

	(1)	(2)	(3)	(4)
	OLS		IV	
	Trans. into SE	Trans. into full-time SE	Trans. into SE	Trans. into full-time SE
Reduction in total pension wealth / 10^5	-0.0017	-0.0016	-0.0096*	-0.0048**
	(0.0026)	(0.0013)	(0.0058)	(0.0023)
Dummy for cohort≤1949	-0.0009	0.0017**	-0.0028	0.0010
	(0.0021)	(0.0007)	(0.0021)	(0.0008)
Dummy for year≥2006	0.0021***	0.0003	0.0052***	0.0014***
	(0.0007)	(0.0003)	(0.0011)	(0.0004)
Lagged income from wage-employment	0.0092***	0.0027***	0.0170***	0.0056***
	(0.0018)	(0.0009)	(0.0026)	(0.0010)
Tenure	-0.00034***	-0.00005***	-0.0002***	-0.00005***
	(0.00003)	(0.00001)	(0.00003)	(0.00001)
Age (31-36)	-0.0030***	-0.0009	-0.1312*	-0.0887***
	(0.0007)	(0.0003	(0.0068)	(0.0273)
Age (36-41)	0.0004	0.0002	-0.0071**	-0.0019
	(0.0003)	(0.0001)	(0.0031)	(0.0012)
Age (41-46)	0.0003	-0.00001	0.0023*	0.0009*
	(0.0003)	(0.00008)	(0.0013)	(0.0005)
Age (46-51)	0.0002	0.00005	-0.0032	-0.0010
	(0.0002)	(0.00008)	(0.0005)	(0.0002)
Age (51-56)	-0.00016	0.00007	0.0004	0.0002*
	(0.0002)	(0.00009)	(0.0003)	(0.0001)
Age (56-61)	0.0008***	0.0003**	0.0003	0.00002
	(0.0002)	(0.0001)	(0.0002)	(0.00009)
Age (61-65)	0.0028	0.0005	0.0023***	0.0003
	(0.0011)	(0.0005)	(0.0009)	(0.0003)
Household size	0.0005**	0.00004	0.0004**	0.00003
	(0.0002)	(0.00008)	(0.0002)	(0.00007)
Number of income earners in household	-0.0002	0.00003	-0.0002	0.00003
	(0.0003)	(0.00009)	(0.0002)	(0.00010)
Indicator for relocation	0.0009	-0.0003	0.0009	-0.0003
	(0.0011)	(0.0004)	(0.0010)	(0.0004)
Indicator for urbanization	-0.0008	-0.0003	-0.0007	-0.0002
	(0.0005)	(0.0002)	(0.0005)	(0.0002)
Indicator for immigrant	-0.00003	0.0002	-0.00005	0.0002
	(0.00056)	(0.0002)	(0.0006)	(0.0002)
Indicator for unmarried	-0.0029***	-0.0002	-0.0029***	-0.0002
	(0.0009)	(0.0004)	(0.0008)	(0.0003)
Indicator for married	-0.0039***	-0.0007**	-0.0039***	-0.0008***
	(0.0009)	(0.0004)	(0.0007)	(0.0003)
Indicator for widowed	-0.0050***	-0.0013***	-0.0049**	-0.0013
	(0.0017)	(0.0003)	(0.0023)	(0.0009)
GDP growth rate	-0.0007***	-0.00002	-0.0007***	-0.0003
	(0.00020)	(0.00007)	(0.0002)	(0.0001)
Constant	0.0183***	0.0037**	0.0144***	0.0023**
	(0.0030)	(0.0016)	(0.0022)	(0.0009)

Note: The total number of observation is 207670. Cohort dummies are also included in the regression. The reduction in expected total pension wealth is instrumented by dummy for treatment, the F-statistic for the relevance of the instrument is 17865.3. The robust standard errors are in parentheses. *,**,*** denote the significance level at the 10%, 5% and 1% respectively. For sensitivity analysis, we use different values of the reduction in the total pension wealth which are generated under different specifications, the empirical results do not change significantly.

Table 5: Estimation results of self-employment transition rate. Explanatory variable: reduction in expected total pension wealth ($DropPW_{it}^3$, instrumented by dummy for treatment)

	transition into self-employment (Type 1)			transition into full-time self-employment (Type 2)		
	Treat. dummy, FE	Reduc. in rrr[a], IV	Reduc. in tpw[a], IV	Treat. dummy, FE	Reduc. in rrr[a], IV	Reduc. in tpw[a], IV
Base line estimation	-0.0024*	-0.0827*	-0.0096*	-0.0011**	-0.0414**	-0.0048**
Panel A: test anticipation effect						
If the reform would take place in 2004	0.0011	-0.0802	-0.0082	0.0001	-0.0400**[b]	-0.0039
If the reform would take place in 2005	-0.0004	-0.0983**	-0.0112**	-0.0004	-0.0436**	-0.0050**
If the reform would take place in 2007	-0.0020	-0.0962**	-0.0107**	-0.0005	-0.0178	-0.0020
If the reform would take place in 2008	-0.0022	-0.0791	-0.0079	0.0000	0.0025	0.0003
If the reform would take place in 2009	-0.0018	-0.0061	-0.0125**	-0.0008	-0.0179	-0.0019
If the reform would take place in 2010	-0.0035**	-0.1251	-0.0101	-0.0004	0.0026	0.0003
If the reform would take place in 2011	-0.0016	-0.0071	-0.0091	0.0009	0.0380	0.0044
Panel B: test placebo effect						
If cohort 1950-1959 would not be treated	0.0002	-0.0565	-0.0063	-0.0004	-0.0371**	-0.0044**
If cohort 1960-1969 would not be treated	0.0001	-0.0310	-0.0037	0.0006	0.0126	0.0015
If cohort 1970-1979 would not be treated	-0.0011	-0.0540	-0.0056	0.0002	-0.0031	-0.0003
Panel C: narrowing cohorts selection						
Only keep cohort 1938 to 1955[c]	-0.0025*	-0.0683**	-0.0089**	-0.0019**	-0.0338*	-0.0036*
Panel D: balance size of contr. and treat. group						
Sample based on matching method	-0.0030**	-0.0697*	-0.0091*	-0.0018**	-0.0303*	-0.0032*

Note: a. rrr: retirement replacement rate, tpw: total pension wealth. b. Underlined numbers mean that those estimates do not show support for robustness. c. Since the sample size of each cohort of the control group is less than that of the treatment group, the selected sample contains all 12 cohorts (cohort 1938 to 1949) of the control group and 6 cohorts (cohort 1950 to 1955) of the treatment group.

Table 6: Robustness check under different specifications

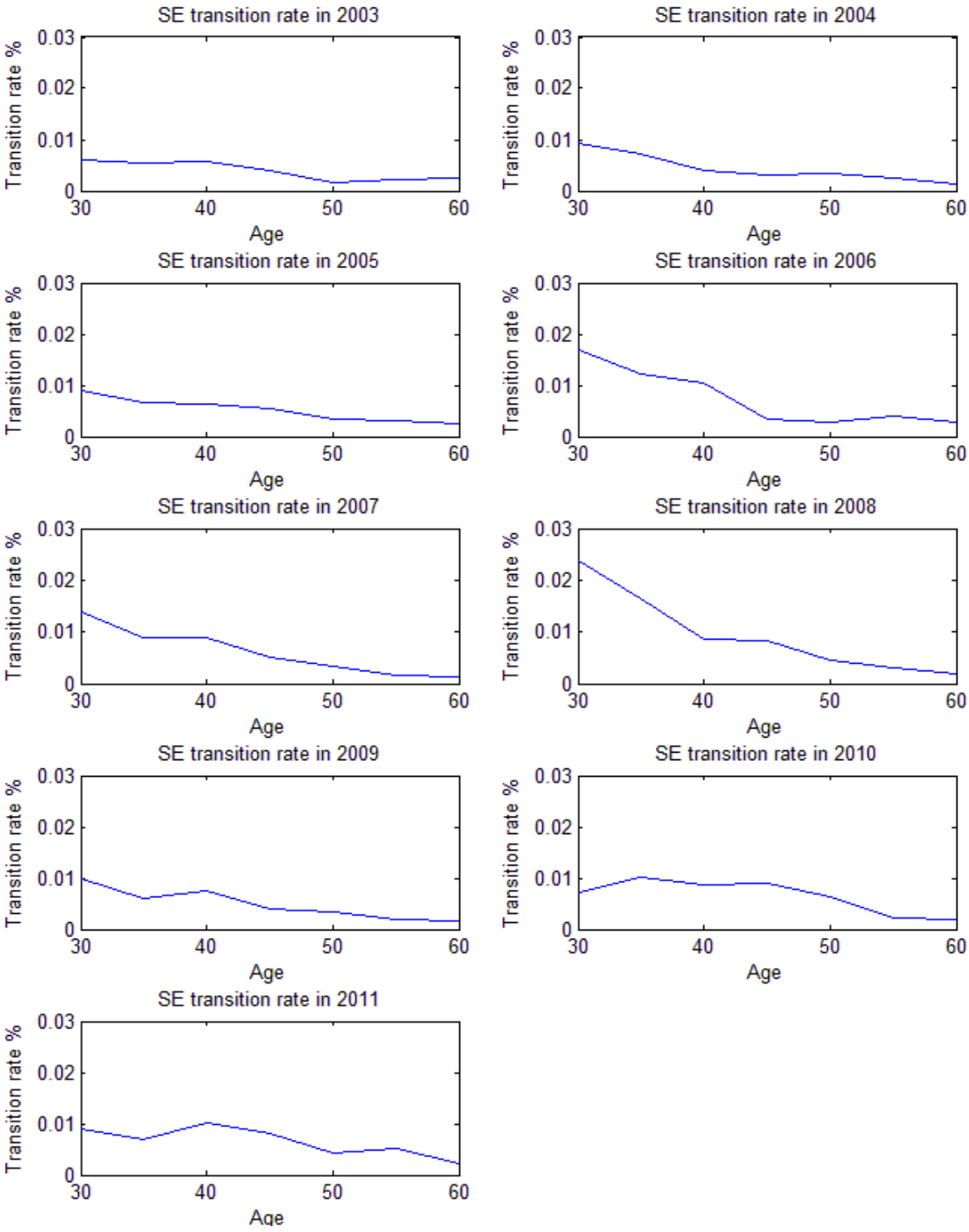

Figure 1: Type 1 Self-employment transition rates by age and year

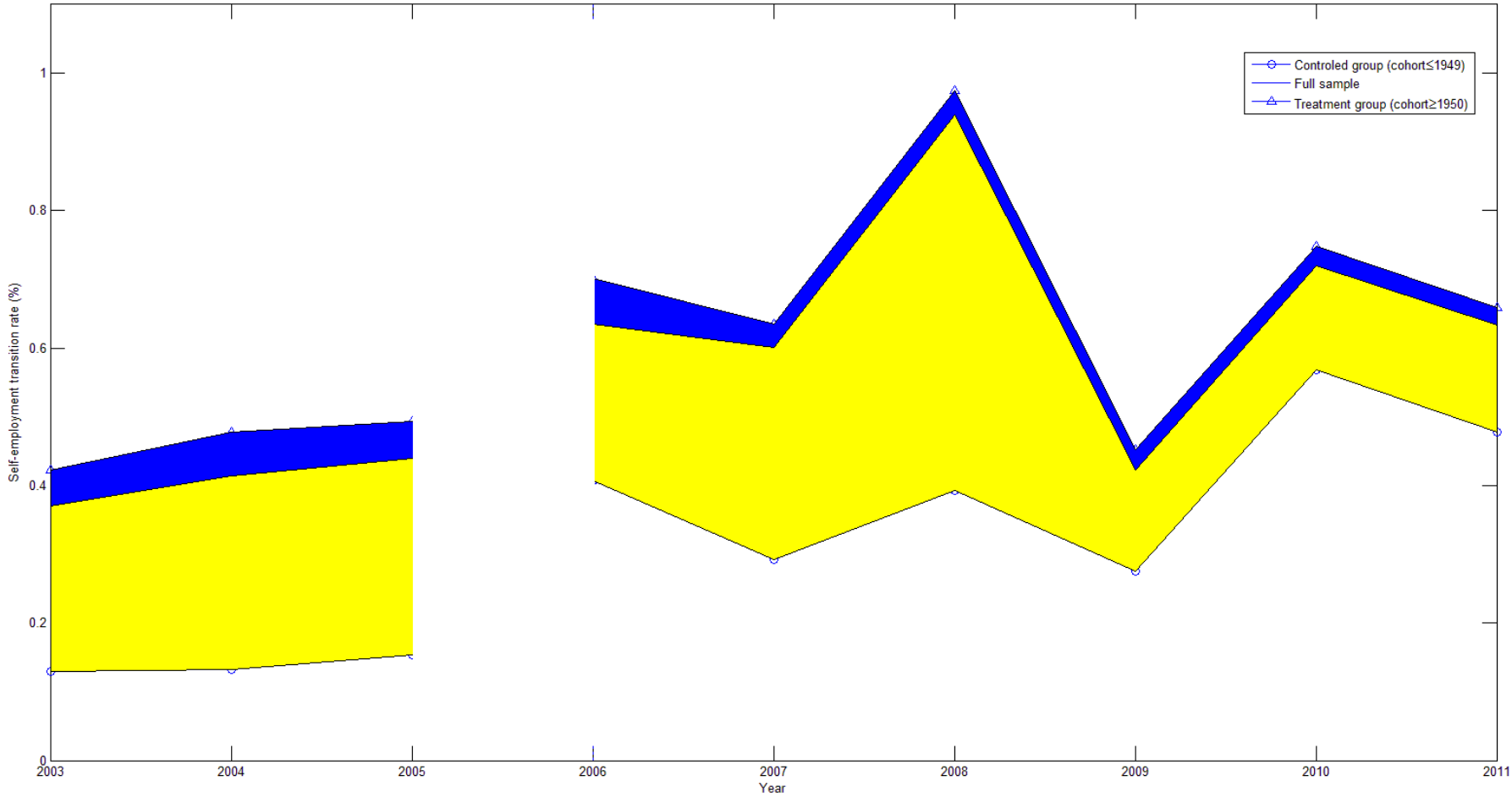

Figure 2: Type 1 Self-employment transition rates of the treatment group and the control group