Analysing public administrative data from two different organisations: A historical analyses of mothers' pension credits in Germany

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Abstract:

Debates on gender equality in the pension system are ongoing. In Germany, recent pension reforms mainly address mothers and aim at improving the recognition of child rearing. Also a more equal recognition of child-rearing leave of mothers with children born before and after 1992 was in the focus of the latest reform. In our study, we ask whether the reform provide an equal subsidy to mothers with employment interruptions due to child rearing, independently from the timing of their child births.

However, first we have to examine the differences between mothers before and after 1992 and how they differ from each other with regard to their pension entitlements. Controlling for these differences we ask whether the reform provides substitution for potential loss in pension entitlements.

Therefore, we aim at testing whether social differences on the macro level of society can be moderated by providing support on the individual level and how ex-post chances regarding the pension entitlements contribute to future pension levels.

This paper discusses methodological problems of the data available. It particularly gives an overview on advantages and disadvantages of linking data from two different administrative processes in purpose of historical analysis.

Key words: Process-Oriented Methodology, Longitudinal Analysis, Linked Administrative Data

1. Introduction

Debates on gender (in)equality in statutory pension systems are ongoing. It has been argued that gender employment gaps lead to a continuing gender pension gap in most European welfare states (Frericks, Knijn, & Maier, 2009; Frericks, Maier, & De Graaf, 2007). Furthermore, Möhring (2014) shows that there is also a particular mother pension gap with regard to individual public pension incomes in many European countries. Most of the difference between mothers and childless women can be explained by higher labour market participation rates of childless women. However, for Spain, Belgium and West-Germany statistically significant differences between mothers and childless women remain even after controlling for different occupational biographies.

In Germany, recent pension reforms attempt continuing to reduce the mother pension gap and increased pension entitlements granted for child rearing: Since the reform of 1992, mothers were compensated for child care with partial pension entitlements for three insurance years per child born later than 1992. At the same time, the child-rearing leave was extended from one two three years.

Mothers of children born earlier than January 1st 1992 gained only one insurance year of recognition for child care. The reform of 2014 retroactively granted two (instead of one) years for these mother to close the gap between both groups of mothers. These compensation for child rearing is commonly referred to as mothers' pension.

It has already been shown that the implementation of mothers' pension had almost no effect for the reduction of gender inequality in the past (Möhring, 2014). A gender equal distribution of old-age income is rather reached in basic pension schemes or by increasing mothers' labour market participation. However, after a comprehensive literature review we found no further studies concerning the effect of mothers' pension allowance on mothers' pension gaps.

We conducted the present study to address this gap in the literature and attempt three main research questions:

Q1: Which individual characteristics increase the likelihood to benefit from mothers' pension?

Q2: Which individual characteristics explain the level of pension credits within the cohorts under study?

Q3: Which differences with regard to pension credits occur between mothers with children before and after the reform and does mothers' pension allowance compensate potential income deficits of women with children before or after the reform?

It is of special interest how mothers with children before and after the implementation of the reform differ from each other and to what extend older cohorts are disadvantaged with regard to pension entitlements.

Comparisons of pension entitlements of different birth cohorts already reveal, that German baby boomer cohorts on average gained significantly lower pension entitlements than older birth cohorts. These differences can mostly be explained by instable employment patterns, increasing part-time employment and employment trajectories with lower labour force participation across the life course (Simonson, Romeu Gordo, & Titova, 2011; Tophoven & Tisch, 2016). Our analysis also comprises most birth cohorts of the German baby boom (women born in 1957 and 1967), because these birth cohorts are most likely

to have children before and after 1992. Therefore, in comparison to older women, the mothers considered are disadvantaged with regard to their old-age provision and old-age income is strongly depended on labour market participation. However, we ask whether mothers' pension allowances reduce differences between West-German women with different employment patterns within the baby boomer cohorts. We only consider West-German mothers, because gender differences in East Germany tend to be much smaller since the socialist system promoted high rates of employment of men and women equally (Rosenfeld, Trappe, & Gornick, 2004; Trappe, Pollmann-Schult, & Schmitt, 2015).

In our study, we ask whether the reform provide an equal subsidy to western mothers with employment interruptions due to child rearing, dependent from the timing of their child births before or later of the latest reform. We aim at testing whether an ex-post institutional intervention on the macro level of society influences differences on the micro level of individuals.

This paper discusses methodological challenges of our analyses. It particularly gives an overview on advantages and disadvantages of linking data from two different administrative processes and of using administrative data to analyse historical events and their implications for the future.

2. Institutional settings

2.1. The architecture of the German pension system

The German pension system is an "income security system" most similar to the pension systems in other conservative and southern European welfare regimes (in particular Austria, Belgium, Luxembourg, France, Italy, Greece, Italy, Portugal and Spain). Within this system income from statutory pension insurance is the main source of income in old-age and contributions as well as pensions are strongly earnings-related and conditioned by the length of the insurance biography (Tophoven & Tisch, 2016). In contrast, the pension system of liberal welfare stets (UK and Ireland) are classified as "residual models" with only a minimum pension, whereas the Scandinavian countries (and the Netherlands) are classified as "basic security models" with a basic pension which is not earnings-related (Ginn & Arber, 1992; Leitner, 2001). The pension system in Germany consists of three pillars: The first pillar, the national pension insurance system is the most essential one since it covers the vast majority of the resident population: Almost 91 percent of men in West and 99 percent of men in East Germany as well as 82 percent of women in West and 99 percent of women in East Germany receive an old age income from the German National Pension Insurance (Bäcker, Naegele, Bispinck, Hofemann, & Neubauer, 2010: 464f). The public pension system mostly covers employees subject to social security contribution. Civil servants' old-age provision is provided by a different state-funded system (Funke & Walther, 2010) and the majority of the self-employed rely on private pension schemes (Ziegelmeyer, 2010).[1] Particular among women, the second pillar of company-based or occupational pension systems is much less relevant regarding income in old age. The third pillar in the pension scheme is voluntary and based on

[1] Many self-employed have their own professional pension organisations, e.g. self-employed physicians or lawyers (Schulze Buschoff, 2006). Only a very small number of self-employed are compulsorily insured in the statutory pension scheme (e.g. midwives). However, self-employed are allowed to voluntarily contribute to the public pension system, but only very few make use of this possibility.

private investment, partly subsidised by the state, but mostly irrelevant for the birth cohorts considered in our analyses (Tophoven & Tisch, 2016).

Initiated by Bismarck in 1889, the German national pension system is the oldest formal pension system in the world. In 1957, the formerly capital funded system was transferred to a pay-as-you-go system (Börsch-Supan & Schnabel, 1998) in which current pension payments are financed by current contributions. Employers and employees subject to social security contributions equally contribute to the pension fund and individual statutory pension entitlements reflect individual income from employment. Pension payments are proportional to lifetime earnings and directly reflect individual earnings during working life. Therefore, the German system contributes to the maintenance of income differences also in the retirement age (Fasang, 2012; Willert, 2012). However, some further pension entitlements are granted during times of child care, elder care, military/civilian service, and during times of benefit receipt from social insurances, e.g. unemployment benefits or sickness benefits.

2.2. Pension credits as earning related entitlements for future income in old age

In Germany, pension credits reflect the relative income position of a person contributing to social security systems. A person with an annual wage reflecting the exact average wage of all contributors receives one pension credit (particularly referred to as 'earning point'). Accordingly, earnings half of the average wage results in 0.5 pension credits. Therefore, the yearly pension credits reflect the relation between the individual income and the average income of all employees in Germany. A maximum of pension credits is determined by the contribution assessment ceiling, which amounted to 71,400 Euros for West Germany in 2014.

To calculate the gross monthly pension income, the sum of personal pension credits is multiplied by the current pension value[2], the factor for type of pension[3] and the age factor[4] (Deutsche Rentenversicherung Bund, 2013a, 2013b).

Formula 1: Pension formula

$$Gross\ monthly\ pension = Sum\ of\ pension\ credits * current\ pension\ value * factor\ for\ type\ of\ pension * age\ factor$$

In sum, individual pension income depends on lifetime earnings, timing of pension entrance (age factor and type of pension), and the actual value of pension (set by government following the development of average incomes according to the act on pension adjustments).

Deviations from the norm of a long employment biography with steady full-time employment in well-paid jobs lead to disadvantages in later pension income: Part-time or low-paid jobs cause pension entitlements below the average. Although periods of unemployment, maternity leave, elder care or

[2] The current pension value links employees' earnings and pensioners' benefits. For the second half of 2014, the current pension value was 28.61 Euros for West Germany and 26.39 Euros for East Germany (Deutsche Rentenversicherung Bund, 2013c).
[3] The factor for regular old-age pension equals 1. Other forms of pensions, such as disability pensions, have reduced factors.
[4] The age factor allows discounts for earlier and awards for postponed entrances.

unpaid work are compensated by the national pension insurance to a certain degree, they end in below-average entitlements in the long-run. Since unemployment is unequally distributed among the German labour force and child care duties are most often fulfilled by women, disadvantages can be explained by specific social characteristics.

3. The creeping death of the male-breadwinner model

3.1. Ageing calls: Recent pension reforms

Against the background of the challenges of an ageing society, in the last decades major reforms in almost all western society took place. In Germany, we find a shift from promoting early retirement to the paradigm of the retention of working life up to a standard age of retirement of 67 years. In addition, to finance the pay-as-you-go system, pension reforms of the past decades led to an actual decrease in pension levels: Credited periods for education have been abolished and contributions for the long-term unemployed were substantially shortened (Flecken, 2014). Furthermore, government-funded private forms of old-age provisions were introduced in order to compensate for lower public pension benefits (Frommert & Strauß, 2012). However, especially among older cohorts as well as among low-income earners private pension schemes are not very common (Motel-Klingebiel, Simonson, & Romeu Gordo, 2011; TNS Infratest Sozialforschung, 2012). On the contrary, child care and informal care giving gained recognition in the national pension entitlements.

3.2. The recognition of motherhood

Since 1986 child rearing periods are recognized in the calculation of public pensions in Germany. Mothers (or upon request fathers) born in 1921 or after got granted for one insurance year per child (the so-called 'child rearing period') with an amount of 75 percent of the national annual average wage. Further reforms lead to a stepwise increase to the full amount of 100 percent of the annual average wage. Since 2000, the recognition of child care is equivalent to paid work. After a judgement of the highest court in Germany in 1996, granted insurance years are additional to other compulsory contribution periods in the national insurance pension system.

The pension reform of 1992 increased the child rearing period to three years for children born in 1992 and after. Additionally, women gained the right to return to a comparable but not similar job within three years after child birth. Furthermore, child care facilities were broadened. However, women often remain to re-enter into the labour market only as part-time workers and mini-jobbers. Kreyenfeld and Hank (2000) found that the availability for child care is more important for female employment than opportunity costs.

The most recent pension reform of 2014 retroactively recognized a child rearing period of two years for children born before 1.1.1992. For each child rearing year a maximum of one earning point is granted (Frericks et al., 2009). However, earning points of child rearing are added to regular earning points from employment and are only granted up to the contribution assessment ceiling.

To justify the retroactive recognition two arguments are stated: Firstly, the recognition of child rearing as a common good and secondly, the intention to compensate mothers for their opportunity cost due to child rearing (Möhring, 2014). It has been argued that in the 1980s and at the beginning of the 1990s almost no public child care facilities were available and mothers had no choice but to interrupt their

employment careers to raise their children. When child caring facilities became available during the 1990s, full-time child rearing became are a more to a voluntary decision (Allmendinger, 2010; Kreyenfeld & Hank, 2000).

4. Methods and data: The evaluation of retroactive policy changes with historical data

4.1. Historical analysis as a method for policy evaluation

For the evaluation of policy reforms often difference-in-difference designs are applied, in which the differential effect of a reform on a 'treatment group' versus a 'control group' is examined. It can be assumed that the implementation of a reform randomly splits a population in a treated and a control group. In difference-and-different designs, then the effect of a treatment (e.g. the implementation of a reform) on an outcome (e.g. total pension credits) is calculated by comparing the average change of the outcome between a treated and a non-treated (control) group. In order to apply a difference-in-difference design longitudinal data is necessary, comprising measurements before and after the implementation of the reform. The reform under study in this article was implemented retroactively and no evaluation design could have been implemented to accompany its implementation. However, the availability of administrative data allows us to analyse the implementation retrospectively and examine its impact on future pension incomes. Therefore, we make use of historical data in order to analyse the future effects of a most recent reform.

Usually, policy evaluations measure how individuals adjust to legislative changes. In this sense, e.g. the implementation of a more generous parental leave in 1992 could have encouraged mothers to postpone births. However, the reform under examination in this study was implemented retroactively and individuals had no chance to adjust their behaviour. Therefore, births could not be timed in accordance with pension credits allowance. Rather, the reforms was legitimized by the argument, that women in the 1980s had smaller access to institutional child care facilities than mothers in the 1990s and are hence doubly disadvantaged with regard to pension credits: by gaining a smaller amount of credits per child and by having lower chances to compensate the lost credits by earlier return to employment.

In fact, in this article we are interested, whether the retroactive allowance of pension credits leads to a more equal distribution of pension credits among mothers in Germany. Different methods are applied: First, we analyse the chances of having a child before or after the reform applying logistical regression models. Second, we are interested in the actual amount of pension credits of mothers with children before and after the reform date. Third, we want compare the average amount of pension credits of mothers with children before and after the reform. We apply propensity score matching, controlling for the likelihood of having a child before or after. On average, mothers after the reform should have exact two extra pension credits.

4.2. BASiD – a combination of historical data of selected social insurance agencies in Germany

We employ data from the administrative historical dataset BASiD (Biographical Data of Selected Social Insurance Agencies in Germany) which brings together individual data of the German Pension Insurance (GPI) and of the Federal Employment Agency (FEA). BASiD is a unique dataset which contains individual information from the reporting process of social security contribution and additional information resulting from the administrative procedures of the GPI and the FEA. The linkage of both

data sources allows for a gapless picture of individual employment trajectories subject to social insurance.

The sample of BASiD comprises a one per cent sample of the insurance accounts of the GPI in 2007 and is available as Scientific Use Files (SUF) at the Institute for Employment Research as well as at the Research Data Centre of the GPI[5]. The SUF already includes the integrated employment histories of both social insurances and indicates for each information were it is originally sourced. Furthermore, cross-sectional information is available for each individual included in the data with reference date 31st December 2007. The cross sectional data e.g. covers information on one-time additional earning points which are not included in the longitudinal employment histories.

The employment histories cover periods of employment (administrative employment declarations of both, the GPI and the FEA), unemployment and benefit receipt (held by the FEA) as well as periods of illness, care giving and child rearing (held by the GPI). Furthermore, demographic, socio-economic and regional characteristics are available.

BASiD is restricted to individuals with employment episodes subject to social security (Lange, Schumilow, & Stegmann, 2012), civil servants or self-employed are not included in the data. However, the public pension covers over 80% of the currently employed population and approximately 90% have been employed subject to social security distribution at any time during their employment career (Bäcker et al., 2010).

The BASiD data originally covers 568.468 individuals and 39,916,818 individual spells. The earliest information available is from 1951 and the oldest included persons were born in 1940 (for further details see (Hochfellner, Müller, & Wurdack, 2011, 2012). For the sample used in the study, only spells of West-German mothers of three birth cohorts (1957-59, 1961-63, 1965-67) were retained. Furthermore, already retired women and those who receive disability pensions where excluded from the study. Hence, our sample amounted to 20.578 women. We follow these women from their labour market entry until the age of 40.

4.3. Variables

Nationality: Caused by the oversampling of migrants in the data provided by the GPI, we observe about 30% of women with another nationality than German. Compared to women with a German nationality those mothers tend to have more often 4 and more children. On the contrary, these women also seems to remain childless more often. However, this might reflect that women gave birth before the came to Germany. In this case, births are not included in the data.

Number of children and average age of first birth: Almost half of the sample is childless (47%). 24% gave birth to their children before 1.1.1992, 18% after the effective date, and 11% had children before as well as after the 1992. On average, mothers of birth cohorts1957-59 in our sample gave first birth at

[5] The data basis of this article is the weakly anonymized version of the "Biographical data of selected social insurance agencies in Germany" (Version 1951-2009). Data is available on a daily basis. The data access was guaranteed by the Research data center (FDZ) of the German Federal Employment Agency at the Institute for Employment Research (IAB). For further information please visit: http://fdz.iab.de/en/FDZ_Individual_Data/basid.aspx.

the age of 24.7, while the average age among the cohorts of 1965-67 has increased to 26.7. In 1991, the average age of mothers when they gave birth to their first child was 27.9 (Federal Statistical Office, 2016). Furthermore, childlessness increased from 43.3% women of the 1950s birth cohort to 50.7% among the youngest cohorts. Mothers of the 1957-59 cohorts on average had 2.06 children, mothers born in 1965-67 only had 1.82 children until the age of 40. Both results are in line with the state of research regarding a decreasing total fertility rate and an ascending age of first birth.

Education: The educational level is important to explain the individual biographical decisions of women in family planning as well as regarding their employment biographies: Higher educated women not only postpone first birth due to longer periods of education, but also face higher opportunity costs since their income is expected to be higher. Subsequently, they more often give birth later in life and also remain childless more often (Blossfeld & Jaenichen, 1992). Therefore, pension credits should vary across educational levels. One disadvantage of administrative data is the lack of information that is not necessary for reporting. The BASiD data offers the unique possibility to have time variant information on education. Additionally, it combines two sources of administrative data. However, remaining high rates of missing data in both data sources made complex imputation necessary. In the first step, we combined both data sources to create a common variable on educational on the spell level. Imputations in both directions, filling back and forward under the assumption of consistency per person allows us to reduce the missing data significantly. However, about 14% of missing information on the highest education remains. Therefore, the level of education is indicated in four categories: Secondary school leaving certificate without vocational education, secondary school leaving certificate with vocational training and university degree. Additionally, no information is added as a category. This category comprises individuals with very low education, but also those with an unspecified educational level.

Labour market status before birth of first child: We combine information gained for the GPI and the FEA in order to distinguish between the following statuses. Those who gave birth during or shortly after vocational training, part-time employed women and full-time employed women. Furthermore, the category ‘no participation in social security systems’ comprises women who already before motherhood quit the labour market. Another category ‘other’ comprises women which other status (e.g. care giving or illness) before motherhood. Finally a category ‘other employment (VSKT)’ indicates that the employment episode was only found in the GPI data. The distinction between full- and part-time is only available in the FEA data though. It is rather unclear which types of employment are summarized in this category, but most likely the deviations in both data sets can be ascribed to missing data in the FDA data. It is documented that missing occur for example within two years after the German reunification as well as for some professions such as doctors in the 1980s.

Income: Furthermore, we control for the income before women’s first birth. We distinguish five group according to the relative income quantile in the total study population. The income is available in the FEA data for episodes of employment as well as for benefit receipt. However, we can only rely on individual incomes and are not able to control for household incomes.

Pension credits: For our variable of interest, we made use of the information from the data of the GPI. The pension credits are based on the original earning points accumulated by employment, benefit

receipt, care giving and child rearing. Each earning point is checked for plausibility and we removed duplicates from different sources if a parallel recognition took place. We extract daily pension credits from each spell available and sum up the earning points depending on their origin: We distinguish between the total sum, the sum of earning points by employment, and those that were granted for child rearing (see Table 1). At the age of 40, women in our sample on average gained 8.82 earning points. Two third of the average of earning points omits to pension credits by employment, one third is the result of the recognition of child rearing. Younger cohorts of women gained less pension entitlements than their older counterparts. Also differences occur with regard to vocational education and timing of first birth.

Table 1: Sum of earning points at the age of 40

		1. Cohort (1957-1959)			2. Cohort (1961-1962)			3. Cohort (1965-1967)		
	Education	pension credits (total)	pension credits (employ-ment)	pension credits (maternity leave)	pension credits (total)	pension credits (employ-ment)	pension credits (maternity leave)	pension credits (total)	pension credits (employ-ment)	pension credits (maternity leave)
Childless women	No vocational training	7,28	7,01		6,83	6,57		6,93	6,70	
	Vocational training	6,45	6,12		5,65	5,26		5,84	5,48	
	University	5,68	5,42		5,43	5,14		5,80	5,59	
her before 1.1.1992	No vocational training	13,92	6,75	6,92	12,44	5,97	6,24	10,48	5,04	5,26
	Vocational training	13,15	6,97	5,94	11,20	6,20	4,78	10,23	5,36	4,65
	University	6,56	4,23	2,22	7,10	4,71	2,26	8,82	6,75	1,59
Mother after 1.1.1992	No vocational training	10,67	8,38	2,20	11,62	7,72	4,00	11,41	6,80	4,75
	Vocational training	11,13	8,49	2,37	10,34	6,83	3,58	10,01	5,98	4,16
	University	11,72	8,69	2,27	10,65	7,87	2,78	9,32	6,27	2,96
Total		9,67	6,24	3,53	8,80	5,65	3,13	8,31	5,52	2,68

Source: Author's calculations (BASiD v1, 1951-2009)

Surprisingly and without the extra pension credits of the latest reform, descriptive results show higher average earning points for maternity leave among mothers with children born before rather than after 1.1.1992 (see Table 2). This is true, even though the reform of 1992 led to an improvement for mothers with children born after the reform of 1992.

Table 2: Average amount of mothers' pension credits by number of children

Number of children	before 1.1.1992	after 1.1.1992	before and after
1	3,43	2,42	*
2	6,65	5,81	7,10
3	8,85	7,29	9,24
4 and more	12,51	9,16	10,39

Source: Author's calculations (BASiD v1, 1951-2009)

5. Results

5.1. The differences we didn't make: Differences without treatment effects

In contrast to other policy evaluations, our treatment group is not really treated: A behavioural adaption to the legislative change was impossible since the reform was implemented at least 23 years after the children were born. However, the reform was legitimized with disadvantages mothers had regarding their choice of being employed, part-time working or child caring at that time.

Against the background of the retroactive reform, we are especially interested to compare mothers that gain profits by the latest reform, independently of behavioural adjustments. In our analysis we consider women who are most likely to give birth to children around the reform year 1991. Therefore we emphasize on women of birth cohorts 1957 to 1967.

First result of logistical regression models show differences in the characteristics of mothers that are retroactively treated by the mother's pension reform (see Table 3). In this analysis we distinguish between mothers with children born before the reform (model 1), mothers with children born after the reform (model 2) and mothers having a child born as well before and after January, 1st. 1992 (model 3). The reference group of each logistical regression comprises the other two groups of mothers.

Obviously, women of older cohorts are more likely to have children before 1991, while women of younger cohorts are more likely to have given birth after the reform date. Therefore, we control for cohort affiliation in all models conducted. Furthermore, we control for the mothers' age at first birth, the number of children and mothers' nationalities.

Mothers with a higher educational level are older at their first birth (not displayed) and have a higher probability of being a mother after the implementation of the reform dating back to 1992 (see Table 3). Mothers who gave birth to children before the reform are less likely to have university degree.

Furthermore, the status of labour market participation before the birth of the first child can be related to the timing of births. Compared to full-time employed women, those in part-time employment, vocational education or those who are not employed were more likely to become a mother before 1992, while mothers with children after the reform date were more often full-time employed before they gave birth to their first child. The retroactive reform addressing mothers of children being born earlier, grants profits for those mothers who are not fully employed before child birth. This can be interpreted as a signal that the reform really "treats" these women who had worse options on full-time work.

Finally, a higher income before the first child increases the likelihood of having a child after 1992 and decreases the likelihood of being mother to children born before 1992.

In sum, the results show that mothers with children before the reform date differ from mothers with children after 1992, even after controlling for individual characteristics such as their birth cohort or the timing of the first birth. On average, women with children after the reform are more likely to have higher education resulting in higher income and potentially in higher pension credits. Therefore the retroactive reform should contribute to a more equal old age provision among mothers.

Table 3: Likelihood of mothers' pension receipt (logistic regression analysis)

	Model 1: Children in 1991 and before		Model 2: Children after 1991		Model 3: Children before and after 1991	
Birth cohort						
1957-59			*ref*			
1961-63	-2.074***	(0.0522)	2.985***	(0.0924)	1.019***	(0.0531)
1965-67	-4.042***	(0.0638)	6.824***	(0.145)	1.096***	(0.0542)
Socio-demographic characteristics						
EU citizen	-0.0497	(0.0854)	0.306***	(0.109)	-0.222**	(0.0934)
German			*ref*			
Other	0.0766	(0.0647)	0.0294	(0.0836)	-0.156**	(0.0685)
Number of children	-1.182***	(0.0254)	-0.504***	(0.0307)	1.238***	(0.0239)
Age at first child:						
28 years of age and younger	4.279***	(0.0656)	-6.484***	(0.132)	1.127***	(0.0595)
28 years of age and older			*ref*			
Educational level						
No information	-0.303***	(0.0759)	0.138	(0.0976)	0.227***	(0.0774)
Secondary school without vocational education			*ref*			
Secondary school with vocational training	-0.114	(0.0540)	0.150**	(0.0682)	-0.00857	(0.0553)
University	-0.787**	(0.146)	0.695***	(0.162)	0.196	(0.131)
Labour market status before birth of first child						
vocational training	0.345***	(0.0748)	-0.905***	(0.101)	0.306***	(0.0719)
Full-time employment			*ref*			
Part-time employment	0.132**	(0.0583)	-0.131*	(0.0722)	-0.0433	(0.0592)
Other employment (VSKT)	0.926***	(0.0929)	-1.214***	(0.158)	-0.490***	(0.0908)
Other	0.0564	(0.0822)	-0.281***	(0.0973)	0.232***	(0.0819)
No participation in social security systems	0.571***	(0.0624)	-0.520***	(0.0787)	-0.239***	(0.0665)
Economical status						
Income (1st quantil)	-0.0356	(0.0860)	1.161	(0.109)	-0-067	(0.0921)
Income (2nd quantil)	0.201***	(0.0673)	-0.360***	(0.0840)	0.0549	(0.0729)
Income (3rd quantil)	-0.144**	(0.0642)	-0.0759	(0.0772)	0.330***	(0.0685)
Income (4th quantil)	-0.121*	(0.0663)	0.0503	(0.0782)	0.232***	(0.0709)
Income (5th quantil)				*ref*		
Constant	0.956***	(0.0774)	0.323***	(0.089)	-5.890***	(0.101)
Number of observations	22,578		22,578		22,578	

Source: Author's calculations (BASiD v1, 1951-2009)

5.2. The quantitative dimension of the recognition of child care: mothers pension credits

In a second set of analysis we apply linear regression models on the actual pension credits at the age of 40. Our models compare the earnings points mothers gained over their prior working lives and differentiated between pension entitlements gained from employment and those granted for child rearing. The extra earning points allowed by the latest reform are not included in the models. The models allows us to observe the quantitative effect of being more or less involved in the labour market: The strongly earning related German national pension system honours women who work full-time and with incomes above the average. These are for instance high qualified women and those without employment interruptions. However, the recognition of child care and generous benefits for parenthood compensated for opportunity costs of child rearing. That is also true regarding the pension credits (see Table 4).

We find, compared to the oldest cohort that later born mothers significantly gained less pension entitlements. That is true for pension entitlements from employment as well as from child care.

Regarding the probability of mothers from older birth cohorts to give birth before 1992 this results surprises. It seems as if mother that already have a higher probability to be granted for three instead of one year of insurance in the amount of an average wage still gain lower pension entitlements than their older counterparts. Comparing models with and without considering the timing of first birth reveals that the timing of first birth can explain part of the relationship between cohort affiliation and pension entitlements. However, the trend of decreasing entitlements over cohorts remains.

The number of children decreases the amount of pension entitlements gained from employment and women who gave birth before their 29th birthday show lower entitlements than those after. However, the number of children increases the number of entitlements gained from child care. Furthermore, women with more children on average have a higher amount of entitlements at the age 40.

In contrast to our expectations of higher pension entitlements for the higher educated mothers, we find significant relations in the other direction: Controlling for other covariates as the previous labour market status, the number of children, and the age of first birth, an ascending educational level means lower pension entitlements for mothers. The counterintuitive educational outcome in lifetime pension entitlements can be explained by the descending effect in the recognition of child care with mothers of a lower educational level having higher profits of child care regarding the sum of earning points. Furthermore, higher educated women enter the labour market later and until the age of 40 might not be able to collect as many entitlements as lower educated women with earlier labour market entries.

Considering previous employment status reveals the expected effects of an earnings related pension scheme: full-time employment before first child birth seems to pay off. Mothers in full-time employment have higher total earning points than mothers with all other previous statuses. Obviously, this can be related to higher entitlements gained from employment. Furthermore, higher income is related to higher pension entitlements. Considering only entitlements from child care, the entitlements are higher among women not working full-time and of lower income categories.

Our primary dependent variable of the logistic models, the timing of birth before or later of the latest reform shows that those with children in 1992 and after, have lower total pension entitlement from employment than those with children before 1992. However, they indeed gained profits from the additional earning points and show higher average pension entitlements. Also women with children before and after the effective date seem to profit from pension entitlements gained from child rearing.

In general, we can conclude that we found differences in the social characteristics of mothers benefiting from the latest chances in the recognition of child care. It reduces the social inequality within the group of mothers and redistributes resources towards those mothers with a weaker connection to the labour market. However, it seems that younger cohorts remain to be disadvantaged with regard to their future pension income and it remains to be observed whether or not they are able to compensate the loss of pension entitlements of their early career later in their employment trajectories.

Further models should compare most similar mothers with regard to their labour market participation and examine whether or not the reform contribute to a more equal recognition of child rearing.

Table 4: Linear regression analysis on pension credits (of mothers)

	Sum of earning points (total)		Sum of earning points (employment)		Sum of earning points (child care)		Sum of earning points (total)		Sum of earning points (employment)		Sum of earning points (child care)	
Birth cohort												
1957-59			*ref*				*ref*		*ref*		*ref*	
1961-63	-1,158***	(0,12)	-0,873***	(0,08)	-0,270**	(0,08)	-0,916***	(0,09)	-0,782***	(0,04)	-0,208*	(0,08)
1965-67	-1,912***	(0,13)	-1,601***	(0,09)	-0,310**	(0,10)	-1,418***	(0,10)	-1,343***	(0,04)	-0,277**	(0,10)
Socio-demographic characteristics												
EU citizen	-2,733***	(0,19)	-1,531***	(0,14)	-0,819***	(0,14)	-0,616***	(0,14)	0,192***	(0,06)	-0,787***	(0,14)
German			*ref*					*ref*	*ref*		*ref*	
Other	-3,255***	(0,14)	-2,329***	(0,10)	-0,588***	(0,11)	-0,228*	(0,11)	-0,086	(0,05)	-0,512***	(0,12)
Number of children	1,412***	(0,05)	-0,749***	(0,04)	2,053***	(0,04)	2,068***	(0,04)	-0,119***	(0,02)	1,984***	(0,04)
Age at first child <29	1,003***	(0,14)	-0,984***	(0,10)	1,967***	(0,11)	1,604***	(0,10)	-0,337***	(0,04)	1,928***	(0,10)
Age at first child >28			*ref*				*ref*		*ref*		*ref*	
Educational level												
No information	-5,118***	(0,16)	-3,416***	(0,11)	-1,434***	(0,12)	-1,206***	(0,13)	-0,369***	(0,05)	-1,254***	(0,13)
Secondary school without vocational education			*ref*					*ref*				
Secondary school with vocational training	-0,956***	(0,12)	-0,195*	(0,08)	-0,734***	(0,09)	-0,690***	(0,09)	0,022	(0,04)	-0,730***	(0,09)
University	-3,085***	(0,28)	-0,728***	(0,20)	-2,540***	(0,21)	-2,617***	(0,21)	-0,537***	(0,09)	-2,229***	(0,21)
Labour market status before birth of first child												
vocational training							-2,592***	(0,13)	-1,237***	(0,05)	-1,203***	(0,13)
Full-time employment							*ref*		*ref*		*ref*	
Part-time employment							-0,515***	(0,10)	-0,866***	(0,04)	0,109	(0,09)
Other employment (VSKT)							-0,211	(0,15)	-1,192***	(0,06)	1,345***	(0,14)
Other							-0,210	(0,14)	-0,685***	(0,06)	0,062	(0,13)
No participation in social security systems							-1,924***	(0,11)	-1,089***	(0,04)	0,900***	(0,13)
Economical status												
Income (1st quantil)							-14,277***	(0,15)	-13,247***	(0,06)	-0,270	(0,15)
Income (2nd quantil)							-12,319***	(0,11)	-12,198***	(0,05)	0,530***	(0,11)
Income (3rd quantil)							-8,972***	(0,11)	-9,465***	(0,04)	0,700***	(0,10)
Income (4th quantil)							-5,422***	(0,11)	-5,971***	(0,04)	0,530***	(0,10)
Income (5th quantil)							*ref*		*ref*		*ref*	
Timing of births												
Children in 1991 and before							*ref*		*ref*		*ref*	
Children before and after 1991	1,023***	(0,14)	0,081	(0,10)	0,903***	(0,10)	0,986***	(0,10)	0,062	(0,04)	0,988***	(0,10)
Children after 1991	0,570***	(0,16)	0,482***	(0,11)	0,239*	(0,12)	-0,122	(0,12)	-0,120*	(0,05)	0,346**	(0,12)
Constant	10,450***	(0,17)	9,382***	(0,12)	0,880***	(0,13)	16,639***	(0,14)	15,875***	(0,06)	0,429**	(0,14)
Number of observations	22566				22566				20811			
R^2	0,168				0,163				0,247			

Source: Author's calculations (BASiD v1, 1951-2009)

6. Conclusion

This working paper emphasizes on the advantages and disadvantages of longitudinal administrative data of two different organisations, the German Pension Insurance (GPI) and the Federal Employment Agency (FEA) within one set of data (BASiD). It documents the methodological challenges researchers have to meet when analysing historical events with effects for current and future outcomes. In particular, we attempt to evaluation a retroactive pension reform. In Germany since 2014, mothers with children born before 1992 have retroactively been allowed pension credits for an additional year of child rearing. It has been argued that mothers with children born before 1992 have been doubly disadvantaged, by not having the opportunity of institutional child care and a shorted period of child rearing allowances. However, even after the reform they get a lower allowance than mothers with children born after 1992. In the following conclusion we discuss methodological advantages and disadvantages we met during data preparation and first analysis.

6.1. Advantages for historical analysis

An great advantage of administrative data over survey data is that it is usually available for a longer time period, can be regarded as representative for the study population and lacks bias due to drop out and non-response. Therefore, it is especially valuable for the analysis of historical events. The data analysed covers complete employment histories up to the age of at least 40 for all birth cohorts under study (1957-1967). We are able to observe periods of employment, unemployment, benefit receipt as well as child care, elderly care and illness. Combining the data of two social security institutions result in a representative picture of almost gapless employment trajectories of the individuals under study.

The combination of data sources offers the further opportunity to expand the information available for analysis. Both institutions are only allowed to collect and hold data necessary for their administrative processes as well as a set of statistical references. Accordingly, while a distinction between full-time and part-time work is only possible on basis of data held by the FEA, dates of births of children are only available in the GPI data. The data linkage allows us to consider both information. Also the long histories covered by the data allows reasonable imputation of information across time. This is especially true for time-invariant information, but also for some varying variables such as for example educational attainment. One can assume that educational achievements gained at one point in the live course, are not expiring over time.

Finally, the long time periods available allows us to analyse a current reform witch depends on events of the past. In evaluation research it is often difficult to gather information from before the implementation of a reform. This is especially true, when the reform was implemented retroactively. The detailed information available in BASiD gives the unique opportunity for retroactive analysis.

6.2. Disadvantages for historical analysis

However, the analysis of administrative data of two different social security institutions reveals also some disadvantages. First of all, the linkage on the individual level is not always unambiguous. Although many periods of e.g. employment or unemployment can be found in both data sources, some are only available in one of the original data sets. It remains unclear which of the two data sources provides the true or updated information.

Furthermore, administrative data only provides information necessary for administrative processes. Therefore, some relevant information (such as e.g. information on the household) is missing as well as there are many missing or even inaccurate values on variables only collected for statistical purposes (such as e.g. education).

Also, although we can follow many cohorts over a comparably long time period, the sample is restricted with regard to time. For example, the sample is right censored in 2007. When comparing our cohorts of interest we can only follow them until the age of 40. However, one might assume that especially the years after the age of 40 are most relevant for future pension entitlements.

Finally, some disadvantages with regard to the sample design of BASiD have to be mentioned. The sample was drawn disproportional and stratified by agency, gender, nationality and year of birth. It comprises persons between the age of 15 and 67 with a dn account at the GPI on 31st of December 2007. Therefore the data corresponds to all persons who contribute to the pension insurance in 2007. Representative analysis over time are only difficult to undertake, especially because the weighting factors for the disproportionately stratified sample are only available for 2007. A particular challenge of the sample design for our analysis lies in the oversampling of foreigners. Since foreigners are sometimes in Germany only for a short time period and children of foreigners might not be known be the GPI, they might distort some effects of the analysis.

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