Peer Effects and Retirement Decisions: Evidence from Pension Reform in Germany

Mary K. Hamman[*], Daniela Hochfellner[†], John M. Nunley[‡], and Christopher Ruhm[§]

October 31, 2016

Abstract

Although there is an extensive literature studying the effects of individual incentives on retirement decisions, research on the influence of workplace peers is scant. It is important to determine whether individuals respond to own pension incentives and the behavior of their peers, as peer effects may enhance or detract from the intended effects of policy. Our research examines peer effects in the context of retirement using a custom extract from the German administrative pension system data for all individuals working in medium and large private establishments. We exploit changes in pensionable ages to identify the effects of peer retirements on individual retirement timing.

JEL Categories: J26, H55, C31

Key words: retirement, peer effects, public pensions, pension reform

[*]Assistant Professor, Department of Economics, University of Wisconsin–La Crosse, La Crosse, WI 54601, email: mhamman@uwlax.edu, phone: 608-785-6860.

[†]Senior Research Scientist, Center for Urban Science and Progress, New York University, New York, NY 10012, email: daniela.hochfellner@nyu.edu, phone: 646-997-0549.

[‡]Associate Professor, Department of Economics, University of Wisconsin–La Crosse, La Crosse, WI 54601, email: jnunley@uwlax.edu, phone: 608-785-5145.

[§]Professor of Public Policy and Economics, University of Virginia, Charlottesville, VA 22901, email: ruhm@virginia.edu, phone: 336-254-6307.

1 Introduction

The majority of developed countries are facing a demographic transition that threatens the solvency of their social security programs (Gruber and Wise 2008). Private pension plans are under similar pressure as employers manage an aging workforce and combat legacy costs. As policymakers and employers consider options to address these changes, it is important to understand how individuals make retirement decisions. A substantial literature in economics examines individual worker responses to changes in own pension incentives.[1] Much less is known about the possible relationship between an individual's decision to retire and the retirement decisions of their peers.

Our study contributes to existing literature in two ways. First, we produce the first estimates of peer effects using a large-scale source of data that is representative of all medium- to large-sized establishments in a national economy. Two prior studies in the economics literature have estimated peer effects using smaller regional samples of public-sector workers (Brown and Laschever 2012; Chalmers, Johnson and Reuter 2008).[2] Both studies find that individual-retirement decisions are positively affected by peer retirements, but it is impossible to know whether their findings extend to the broader economy or the private sector. Second, using an established empirical strategy to estimate the causal effect of peer retirements on individual retirement timing, we are able to test the sensitivity of our estimates to more disagregated peer-group definitions, whereas prior research has defined peer groups as all employees working within the same organization. In the retirement context, Chalmers, Johnson and Reuter (2008) define the relevant peer group as all employees of the same employer who are eligible to retire in the same month, while Brown and Laschever (2012) define the relevant peer group as all teachers aged 55 years and older who are working at the same school. Similar to Brown and Laschever (2012), our peer group is composed of workers aged 50 and older,[3] and we define the peer group as all workers in the same establishment. Both Brown and Laschever (2012) and Chalmers, Johnson and Reuter (2008) define their peer groups at levels that are analogous to the establishment level. However, our data also provide the ability to define peer groups as all workers in the same occupation within establishments. This allows us to examine sensitivity of estimated peer effects at a more granular level, while still analyzing a broad cross section of industries.

There are three main challenges associated with estimating peer effects: simultaneity, correlated unobservables, and endogenous group membership. To convincingly address these issues in an observational study, an instrument that is strongly correlated with endogenous group outcome and uncorrelated with unobservable determinants of retirement timing is required. However, as pointed out by Brock and Durlauf (2001), more is needed to identify

[1] Lumsdaine and Mitchell (1999) provide a comprehensive but highly technical review of empirical strategies for modeling individual retirement behavior; Leonesio (1996) provides a nontechnical summary of the findings from the literature; and Gruber and Wise (2008) compare individual retirement incentives in public pension schemes across countries.

[2] There are also a few studies that estimate peer effects on retirement plan choice and/or savings behavior, but these studies do not address the timing of retirement (Duflo and Saez 2002, 2003; Hastings and Tejeda-Ashton 2008; Rege, Telle and Votruba ; Beshears et al. 2011).

[3] We include workers age 50 to 54 in our sample because the modal retirement age in Germany was 60 in 2002 and many workers exited the labor force prior to retirement and claimed unemployment. So, this range should include nearly all of the left tail of the retirement distribution.

the causal effect of peer behavior on individual outcomes: the instrument must also differentially affect members of the peer group. In the peer effects and retirement literature, these instruments are referred to as Differential Population Interventions (DPI) (See Brown and Laschever 2012).[4] We use stepwise changes in pensionable ages across old age, disability, long service, and unemployment pension streams in Germany as a DPI. These reforms created exogenous variation in ages of pension eligibility across adjacent birth cohorts and within birth cohorts by gender and years of service. Using the DPI to identify the first-stage equation, we assume that it is valid to exclude our DPI from the structural model. We contend the assumption to omit the DPI from the structural equation is justifiable, as the only effect of our DPI on individual retirement should be through peer behavior after age and gender composition of the peer group is held constant.

Our data are drawn from establishment- and employee-level administrative records of the German pension system. We create a custom extract from the Establishment History Panel (BHP) matched to Integrated Employment Biographies (IAB) for all workers within each firm. We use a custom extract to ensure adequate statistical power to test detailed peer-group definitions. Our data include employment histories for all workers within each establishment, necessary information to determine the pensionable age for each individual, and important covariates that relate to retirement decision including detailed work histories, earnings, work hours, educational attainment, occupation and industry. Having data for all workers within an establishment is crucial for studying peer effects, which has resulted in previous studies using smaller samples that must rely on ad-hoc peer-group definitions (Halliday and Kwak 2012).

Overall, we find precisely estimated peer effects that are postitive but near zero. The estimated peer effects are slightly larger when measured at the occupation level, but the economic impact remains small. Our largest estimates indicate that one additional peer retirement increases an individual's retirement hazard rate by 0.06 percentage points. The average retirement hazard rate for our sample is approximately 10 percent. As a result, the margine effect implies a 0.6 percent change in the retirement hazard rate. Thus far, we have used the same specifications as in prior work with more homogeneous organizations and peer-group sizes. The establishments and peer groups in our sample vary considerably in size. The largest establishments in our sample may experience as many as 1,000 retirements in a year. By contrast, the smaller establishments could experience as few as six retirements in a year. To better account for the heterogeneity in establishment size, our ongoing work will incorporate more detailed peer-group definitions, produce separate estimates for medium and large establishments, and estimate peer effects in response to the share of peers retiring instead of the count. Additionally, the most policy-relevant questions may be better addressed by modeling the individual response to a change in the share of peers who continue working beyond a given target age, such 62 years-old in the US context. Our ongoing work will examine this possibility.

Studying peer effects and retirement in Germany allows us to use this especially rich data set and the policy identification needed to estimate peer effects, but there are other reasons to study retirement in Germany. It is the largest economy in Europe and has been regarded as the first and most significant test of the effects of population aging on the solvency of

[4] These variables are also referred to as Partial Population Interventions (PPI) by Moffitt (2001).

social security systems (Daley and Kulish 2013). The same demographic trends exist in the U.S. and other developed countries, and there is much to be learned from the ways in which Germany navigates population aging. Furthermore, the German pension accrual formula was relatively simple and private pension savings was negligible during our study period, which allows us to more convincingly isolate relationships of interest than may be infeasible in countries with more complex public and private pension institutions.

2 Pension Reform in Germany

Like most European countries, Germany has a pay-as-you-go pension system. The system covers approximately 80 percent of the German population.[5] Private retirement savings is uncommon in Germany. In the 1990s, public pension benefits accounted for approximately 80 percent of income among households headed by persons age 65 or older and, as of 2005 estimates suggests less than 5 percent of households headed by older workers had private pensions despite incentives for private savings introduced in the 2001 Riester Reform (Börsch-Supan 2000; Börsch-Supan, Reil-Held, and Schunk 2007).[6] Public pension accrual is a simple function of one's own wages, years of service, age, and countrywide average wages and benefits in each year. Benefits are based only on one's own work history. There are no spousal benefits, only survivor benefits.

Germany's pension system contains many "pathways" to claiming old-age pension benefits. Like in the U.S., Germans can retire before reaching "normal pensionable age" and receive actuarily adjusted old-age pension benefits. At the start of our sample period, early dispersements of old-age pensions were lower because individuals retiring early had fewer years of contributions, but they were not otherwise actuarily adjusted (Berkel and Börsch-Supan 2004). Additionally, Germans who claimed unemployment or disability benefits could also drawn down old-age pension benefits. Germans with long service histories, defined as 35 years of work or more, could claim old-age pension benfits early, too. Also, women could claim old-age pension benefits earlier than men. In 1992, Germany introduced reforms that gradually eliminated pathways to retirement that pay full benefits (without actuarial adjustment) prior to age 65. The reforms increased ages of pension eligibility in each pathway gradually by birth cohort.

Table 1 reports the earliest age at which benefits (actuarily adjusted and unadjusted) are available by birth year for each pension pathway. The missing entries for actuarally adjusted pension pathways reflect the fact that there was no actuarial adjustment prior to this reform. These changes began to bind in 1998, but the schedule of increases was made public in 1992. For example, men born in 1940 knew at age 52 that they could not obtain full old-age pension benefits through the unemployment pathway at age 60 as previous cohorts had. They could either receive a reduced benefit at age 60 or wait until age 60.5. The actuarial adjustment factor for claiming at age 60 was 0.3 percent per month. The reform also provided an

[5]Self employed workeres, civil servants and marginal workers are excluded. Marginal workers are workers who earn less than 15 percent of the average gross monthly wage. During our study period, self employed and marginal workers accounted for approximately 9 and 6 percent of the overall labor force respectively (Börsch-Supan and Schnabel 1999).

[6]The Riester Reform was associated with increases in private savings among younger workers.

actuarial increase of 0.5 percent per month for retirements after age 65. Previous research finds the early effects of these reforms on elderly labor supply were dramatic, especially for men. Berkel and Börsch-Supan (2004) estimate the reforms were associated with a two-year increase in the average retirement age among men and a nine month increase among women.

3 Data

Our data are based on custom extract from the German administrative pension system data, which is from the Institute for Employment Research (Nuremberg, Germany). The basis file used to construct the analysis sample is the Establishment History Panel (BHP). The BHP is generated by the aggregation of all the workers' notifications to social security for each establishment and composed of cross sectional datasets since 1975 for West-Germany. Each cross section includes all establishments in the country as of June 30th with at least one employee liable to social security. Since 1999, establishments with no employees liable to social security but with at least one marginal part-time employee are included (Spengler 2008). Information on the branch of industry and the location and size of the establishments can be obtained from the BHP. Furthermore, workforce characteristics are available, including total number of workers, age, sex, occupational status, qualifications, and nationality. Quartiles of ages and wages are also given, both for full-time employees only and for all employees. Two extension files, which contain information on detailed worker flows between establishments and a classification of establishment entries and exits, are available on request.

From the BHP population, we first select all establishments that are recorded at least once within the years of 1990 and 2010. Within the outlined observation period, we only include establishments that employ at least 100 workers at any point in time. In addition, we restrict the sample to establishments that are located in West Germany over the observation period. After these restrictions are imposed, our data set includes between 11,342 and 12,525 establishments per year. The majority of observed establishments belong to the mining and manufacturing sectors, followed by trade and food services, finance and real estate.

We then select every individual born to the 1925 through 1950 cohorts that has worked in the sampled establishments in a job liable to social security at least one day in between 1990 and 2010. Our sample is composed of 4,186,978 workers and 60,072,136 employment-spell observations. Currently, data are organized at the person-year level.

Finally, we sample the daily employment histories of the outlined workers from 1975 to 2011. These are obtained from the notification process of the social security system and the internal procedures of the Federal Employment Agency. The individual data contain exact information on the daily employment and unemployment history of the individuals. In addition, the data contain a rich set of variables describing employment or benefit receipt in more detail. For example, the data include precise information on daily wages and income from benefits like unemployment. Moreover, spatial information and a rich set of demographic variables, including information on education, and occupation is available. We use these employment histories to determine workforce exit for every employee.

In terms of peer-group definitions, our primary peer variables are aggregated to the establishment level, which is analogous to the definitions used by other researchers (e.g., Brown and Laschever 2012). But we are able to rely on more narrow definitions. In particular, we are able to aggregate the peer variables to the occupation level *within* establishments. The age cutoffs for the peer variables is 50-years-old and older. In future modeling exercises, we will alter the age restrictions placed on the peer group by increasing the minimum age to 55 and 60 as well as limit the sample of include only workers between the ages of 60 and 64.

Table 3 will present descriptive statistics for individuals as well as the establishment peer grous.

4 Identification Strategy

The 1992 reforms created stepwise increases in several pension pathways. Individuals born in adjacent years could have different pensionable ages for each of the four pension types, and men and women born in the same year may have different pensionable ages as well. Pensionable ages increased by three to five years depending on the pension type. Importantly, after pensionable ages rose for unemployment and disability pensions individuals could still retire at age 60 but benefits would be actuarily adjusted. Thus, employees in adjacent birth cohorts who choose to retire in the same year may receive very different pension benefits. The changes in pensionable ages created by the 1992 reform satisfy the requirements for a valid DPI provided there is gender or age variation within each peer group and across peer groups. Using the DPI to identify the first-stage equation, we assume that it is valid to exclude our DPI from the structural model. We argue this is plausible because after age and gender composition of the peer group is held constant, the only effect of our DPI on individual retirement should be through peer behavior.[7]

To estimate peer effects, we must jointly model individual and peer behavior. The equation that models individual-retirement behavior is

$$\begin{aligned} y_{i,g,t} = \gamma_0 + \gamma_1 \vec{y}_{-i,g,t-1} \\ + \beta_1 \mathbf{X}_{i,g,t} + \beta_2 \mathbf{Z}_{g,t-1} \\ + \phi_g + \phi_t + \epsilon_{i,g,t}, \end{aligned} \tag{1}$$

while the equation that represents group-retirement behavior is

$$\begin{aligned} \vec{y}_{g,t-1} = \delta_0 + \delta_1 \mathbf{P}_{g,t-1} + \delta_2 \mathbf{Z}_{g,t-1} \\ + \phi_g + \phi_{t-1} + \epsilon_{g,t-1}. \end{aligned} \tag{2}$$

The dependent variable, y, in equation 1 is a binary variable that equals zero when the individual is working, one when the individual retires and missing thereafter. Such a specification is known in the retirement literature as a "discrete time hazard model", and the coefficient estimates can be interpreted as changes in the retirement hazard rate.[8] Peer behavior enters

[7]Pensionable ages are exogenously assigned as a function of age and gender and thus cannot be manipulated by individuals. Although it is possible individuals could sort into peer groups based on the retirement intentions of their peers, given the rigidities of the German labor market, we believe this is unlikely.

[8]This interpretation applies if Equation 1 is estimated using OLS. Because the dependent variable is binary, it is appropriate to consider estimation using the probit or logit functional forms. In that case, the marginal effects after estimation would be interpreted as changes in the retirement hazard rate. The convention in the literature is to report the estimates based on OLS because of the straightforward interpretation, provided the estimates are not materially different from the probit or logit estimates. We adhere to this convention.

equation 1 through the variable $\vec{y}$, which is a count of retirements in the individual's peer group in the previous year (indicated by $t-1$).[9] As a result, the parameter of interest is γ_1, and it can be interpreted as the estimated change in the retirement hazard rate when one additional peer retired in the previous year. The remaining variables in Equation 1 account for individual characteristics ($\mathbf{X}$), the characteristics of the peer group ($\mathbf{Z}$ and ϕ_g), and year-specific effects (ϕ_t).

The dependent variable, $\vec{y}$, in equation 2 is the same count-of-peer-retirements variable that appears in Equation 1. The dependent variable $\vec{y}$ in Equation 2 is measured at the peer-group level (g) in the previous year ($t-1$). All other variables are (a) measured at the peer-group level or (b) represent the characteristics of the establishment as a whole. Each peer-group/establishment variables is measured in the previous year. Our DPI is $\mathbf{P}$, which is a vector of variables measuring the number of individuals in the peer group eligible to retire under each pension scheme in year $t-1$. The method used to estimate the system of equations depicted in equations 1 and 2 is two stage least squares (2SLS).

While our data allow us to examine various definitions of peer groups, the baseline estimates are based on the establishment-level peer definition, as such a peer-group definition is analogous to those used in prior studies. For example, the peer group analyzed by Brown and Laschever (2012) is teachers in public schools in Los Angeles, CA, while the peer group used by Chalmers, Johnson and Reuter 2008 is non-federal public-sector workers in Oregon. Thus, testing for establishment-level peer effects is a natural starting point for our analysis. However, we test the sensitivity of the peer effect estimates to narrower peer-group definitions (i.e. occupation level within establishments). The ability of our data to analyze a variety of peer-group definitions is an important advantage of our study, as it is likely that peer effects would be stronger when the peer group is defined more narrowly relative to a broader definition.

As explained above, we need a valid DPI to obtain an unbiased estimate for the effect of peer-retirement behavior on individual-retirement timing, which is γ_1 in equation 1. If the assumptions are met, the exclusion restriction assumption required for 2SLS is also satisfied. Specifically, we must assume the only way in which our DPI, $\mathbf{P}$, influences individual-retirement decisions is through its effect on peer behavior. But there are two additional assumptions required for our 2SLS estimation strategy to produce an unbiased estimate of γ_1. First, $\mathbf{P}$ must be correlated with peer retirement decisions, $\vec{y}$. If this correlation is weak, our estimate of γ_1 will be biased (Bound, Jaeger and Baker 1995).[10] Second, $\mathbf{P}$ must have differential effects within and between peer groups; that is, $\mathbf{P}$ must affect peer-group members differently. If this were not the case, we would have insufficient variation in $\mathbf{P}$ to identify the effect of peer retirements on individual retirement timing (Table).[11]

[9]In future work, we will examine other peer definitions. In particular, we will measure peer retirements by replacing the count version of the variable with the share of peer retirements in the previous year.

[10]From previous work, it is known that $\mathbf{P}$ is strongly correlated with individual retirement timing, and it follows that it will be strongly correlated with group retirement timing as well (Berg, Hamman, Piszschek and Ruhm 2013). We return to this issues in the next section.

[11]These results are currently being processed through data disclosure and should be ready for release in November. The last information we have been authorized to release examined the shares of peers eligible for each pension type by year using our occupation level peer group definitio. We found in approximately 10% of peer group-year observations some but not all peers were eligible for normal retirement, and in 25% to 50% (depending on pension type) of peer group-year observations some but not all peers were eligible for other

5 Results and Extensions

The first-stage estimates for establishment-level peer groups are reported in Table 5. The dependent variables are counts of persons in each peer group who are exiting or retiring, and the independent variables presented are the counts of peers eligible for each pension stream. Each estimated coefficient should have a positive sign. However, we find negative and statistically significant estimates for both normal retirement pension and early long service pension. This is likely because for men, the normal retirement age remained 65-years-old, but very few people actually worked to age 65 because they would be foregoing several options to retire earlier through other streams. A peer group with relatively more persons eligible to retire at normal retirement age may be one in which individuals retire later in general. Similarly, to be eligible to retire early with actuarily adjusted benefits from a long service pension, individuals had to be age 63 or older and would be foregoing the early unemployment and disability pension streams available at age 60 with lenient criteria for qualifying. Although these first-stage regressions control for peer group age composition using the median and interquartile range ages, these pension eligibility variables may still be capturing some age composition effects and retirement norms.[12] The first-stage regressions also control for peer group size, the share of female, low skilled, high skilled, part-time, under age 30, over age 50 and foreign workers in the peer group, the shares of workers in each of 12 occupational groups and 10 industries, year, average tenure with the establishment and in total, and average wage.

The estimates for the second-stage models are reported in Table 6 alongside OLS estimates. The peer effect is an estimate of the percentage point change in retirement or exit likelihood associated with one additional peer retiring or exiting in the prior year. Point estimates are all very close to zero but precisely estimated. Because in these specifications peer groups are defined at the establishment level, the apparently small point estimates may actually reflect important peer effects. For example, in an establishment with 250 workers in total, assuming 25 percent of workers are age 50 to 65 as is the case in the German labor force as a whole, the peer group would consist of approximately 63 workers. Approximately 10 percent of workers in this age range retire each year so our estimates imply the peer effect in this group would be 0.06 percentage points. However, the largest establishments in our sample have over 40,000 employees. Using the same calculation implies a peer effect as large as 10 percentage points, which would be a 100 percent increase.

Given the heterogeneity in peer group sizes in our sample, it is unreasonable to expect the effect of one peer's retirement or exit from the establishment to be the same across all establishments. To better address the likely heterogeneous responses, we first redefine peer groups as all workers within the same occupation within establishments. Estimates from the first-stage regressions using this peer group definition are presented in Table 7. At this level of aggregation, the coefficients on the count of peers eligible for normal retirement in both the exits and retirements models have the expected positive signs. Coefficient signs for long

pension types. The lower variance in normal retirement age implied by these calculations is expected. Men's retirement age remained 65 throughout the entire study period and the modal retirement age remained well below 65 despite the gradual increases in pensionable ages for other pension types.

[12]For the next round of estimates, we will incorporate more precise age composition measures and hold constant peer-group modal retirement age.

service pensions, both early and regular, are, however, still negative.

Table 8 reports the estimated peer effects when the peer group is defined at the occupation-within-establishments level. All estimates are generally larger when the more narrow peer-group definition is used, peer groups. This implies peer effects are stronger when we define peer groups at the less aggregated level. However, the point estimates are still close to zero.

In the next iteration of different estimation approaches, we will depart from prior research and estimate peer effects using shares rather than counts of peers retiring and exiting their establishments and produce separate estimates for the medium and large establishments in our sample. We will also estimate the effects of an increase in the share of peers working past target ages in the German pension system (e.g., 60 for women and 63 for men) using the same identification strategy. These latter estimates will be especially relevant for policy-makers interested in the peer effects of reforms designed to encourage later retirements.

References

[1] Berg, Peter, Mary K. Hamman, Matthew Piszczek, and Christopher J. Ruhm 2015. "Can Policy Facilitate Gradual Retirement? Evidence from Germany." *Unpublished Manuscript.*

[2] Berkel, Barbara and Axel Börsch-Supan 2004. "Pension Reform in Germany: The Impact on Retirement Decisions." *Public Finance Analysis*, 60(3): 393-421.

[3] Beshears, John, James J. Choi, David Laibson, Bridgette C. Madrian, and Katherine L. Milkman. 2011. "The Effect of Providing Peer Information on Retirement Savings Decisions." *NBER Working Paper Series No. 1734.*

[4] Bound, John, David A. Jaeger, and Regina M. Baker. 1995. "Problems with Instrumental Variables Estimation when the Correlation Between the Instruments and the Endogenous Explanatory Variable is Weak." *Journal of the American Statistical Association*, 90(430): 443-450.

[5] Brown, Kristine M. and Ron A. Laschever. 2012. "When They're Sixty-Four: Peer Effects and the Timing of Retirement Timing." *American Economic Journal: Applied Economics*, 4(3): 90-115.

[6] Chalmers, John M.R., Woodrow T. Johnson, and Jonathan Reuter. 2008. "Who Determines When You Retire? Peer Effects and Retirement." *NBER Papers on Retirement Research Center Projects NB08-13*.

[7] Daley, Suzanne and Nicholas Kulish. "Germany Fights Population Drop," *The New York Times* 14 August 2013: A1. Print.

[8] Duflo, Esther and Emmanuel Saez. 2002. "Participation and Investment Decisions in a Retirement Plan: The Influence of Colleagues' Choices." *Journal of Public Economics*, 85(1): 121-148.

[9] Duflo, Esther and Emmanuel Saez. 2003. "The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment." *Quarterly Journal of Economics*, 118(3): 815-842.

[10] Gruber, Jonathan and David Wise. 2008. *Social Security Programs and Retirement Around the World: Micro-Estimation*. University of Chicago Press: Chicago, IL.

[11] Halliday, Timothy J. and Sally Kwak. 2012. "What is a Peer? The Role of Network Definitions in Estimation of Endogenous Peer Effects." *Applied Economics*, 44(xx): 289-302.

[12] Hastings, Justine S. and Lydia Tejeda-Ashton. 2008. "Financial Literacy, Information, and Demand Elasticity: Survey and Experimental Evidence from Mexico." *NBER Working Papers Series No. 14538*.

[13] Leonesio, Michael V. 1996. "The Economics of Retirement: A Nontechnical Guide." *Social Security Bulletin*. 59(4): 29-50.

[14] Lumsdaine, Robin L. and Olivia S. Mitchell. 1999. "New Developments in the Economic Analysis of Retirement." *Handbook of Labor Economics*. 3: 3261-3307.

[15] Moffitt, Robert A. 2001. "Policy Interventions, Low-Level Equilibria, and Social Interactions." In *Social Dynamics*, eds. Steven N. Durlauf and H. Peyton Young, pp. 45-82, Brookings Institution Press: Washington, D.C.

[16] Rege, Mari, Kjetil Telle, and Mark Votruba. 2012. "Social International Effects in Disability Pension Participation: Evidence from Plant Downsizing." *Scandinavian Journal of Economics*. 114(4): 1208-1239.

Table 1 Changes in Pensionable Age by Birth Cohort and Pension Type

Birth Cohort	Normal Retirement Age for Men	Normal Retirement Age for Women	Unemployment	Disability	Long Service
1937	65	60	60	60	63
1938	65	60	60.5	60	63.5
1939	65	60	61.5	60	64.5
1940	65	60	62.5	60	65
1941	65	60.5	63.5	60	65
1942	65	61.5	64.5	60.5	65
1943	65	62.5	65	61.5	65
1944	65	63.5	65	62.5	65
1945	65	64.5	65	63	65
1946	65	65	65	63	65

NOTE: FOR TABLE 2, 3 AND 4, DESCRIPTIVES ARE STILL UNDERGOING DISCLOSURE REVIEW. THESE TABLES WILL BE POPULATED WHEN RESULTS ARE RELEASED.

Table 2 Distribution of New Retirees by Pension Type, Selected Calendar Years

Calendar Year	Normal Retirement Age for Men	Normal Retirement Age for Women	Unemployment	Disability	Long Service
1990					
1995					
2000					
2005					
2010					

Table 3 Descriptive Statistics at the Individual and Peer Group Level

	Individual	Establishment-Level Peer Group
Retirement Age		
Exit Age		
Age		
Female		
Low Skilled		
High Skilled		
Part Time		
Years of Experience		
Daily Wage		
Modal Retirement Age	N/A	
Total Employment	N/A	

Table 4 Coefficients of Variation in Instruments within and Across Peer Groups

	Normal Retirement Age	Unemployment Pension	Long Service Pension	Disability Pension	Early Long Service Pension	Early Unemployment Pension
Across						
Within:						
Average						
25^{th} Pct.						
50^{th} Pct.						
75^{th} Pct.						

Notes: Coefficients of variation in pensionable age for each pension type across peer groups are computed as:

$$CV_{Across} = \frac{\sum_{j=1}^{N} \overline{a_J}/N}{\sqrt{\frac{\left(\bar{a}_j - \sum_{j=1}^{N} \overline{a_J}/N\right)^2}{N-1}}} \qquad CV_{Within} = \frac{\overline{a_J}}{\sqrt{\frac{\left(a_{ij} - \overline{a_J}\right)^2}{n_j - 1}}}$$

Where $\overline{a_J}$ is the average pensionable age within establishment j, n_j is the number of individuals, i, employed in establishment j in total over the study period, a_{ij} is individual i's pensionable age, and N is the total number of establishments in the analysis sample.

Table 5 First Stage IV Results with Establishment Level Peer Groups

	Exits	Retirements
Count of Peers Eligible for:		
Normal Retirement Pension	-0.163**	-0.187**
	(0.016)	(0.011)
Unemployment Pension	0.195**	-0.006
	(0.014)	(0.010)
Long Service Pension	0.182**	0.189**
	(0.029)	(0.020)
Disability Pension	0.267**	0.196**
	(0.010)	(0.007)
Early Long Service Pension	-0.539**	-0.392**
	(0.020)	(0.014)
Early Unemployment Pension	0.228**	0.247**
	(0.007)	(0.005)
N	134,990	136,480
R^2	0.604	0.685

** $p < 0.01$, * $p < 0.05$

Table 6 OLS and IV Results with Establishment Level Peer Groups

	OLS		IV	
	Exit	Retirement	Exit	Retirement
Men				
Peer Effect	0.0002**	0.0002**	0.0001^{+}	0.0001**
95% CI	[0.0001, 0.0002]	[0.0001, 0.0002]	[-0.0000, 0.0002]	[0.0000, 0.0002]
N	6,745,855	7,379,116	6,746,030	7,379,116
Women				
Peer Effect	0.0002**	0.0002**	0.0001	0.0000
95% CI	[0.0001, 0.0003]	[0.0001, 0.0003]	[-0.0000, 0.0002]	[-0.0001, 0.0001]
N	3,410,661	3,698,397	3,698,397	3,410,852

** $p < 0.01$, * $p < 0.05$, $^{+}$ $p < 0.10$

Table 7 First Stage IV Results with Occupation (within Establishment) Level Peer Groups

	Exits	Retirements
Count of Peers Eligible for:		
Normal Retirement Pension	0.181**	0.038**
	(0.004)	(0.004)
Unemployment Pension	0.223**	0.061**
	(0.005)	(0.004)
Long Service Pension	-0.144**	-0.075**
	(0.009)	(0.007)
Disability Pension	0.151**	0.097**
	(0.004)	(0.003)
Early Long Service Pension	-0.605**	-0.399**
	(0.006)	(0.005)
Early Unemployment Pension	0.342**	0.061**
	(0.002)	(0.004)
N	848,710	885,763
R^2	0.510	0.497

** $p < 0.01$, * $p < 0.05$

Table 8 OLS and IV Results with Occupation (within Establishment) Level Peer Groups

	OLS		IV	
	Exit	Retirement	Exit	Retirement
Men				
Peer Effect	0.0004**	0.0004**	0.0004*	0.0004**
95% CI	[0.0003, 0.0006]	[0.0003, 0.0005]	[0.0002, 0.0005]	[0.0002, 0.0006]
N	6,720,854	7,352,365	6,722,709	7,352,365
Women				
Peer Effect	0.0006**	0.0006**	0.0001	-0.0000
95% CI	[0.0004, 0.0008]	[0.0003, 0.0008]	[-0.0002, 0.0004]	[-0.0004, 0.0003]
N	3,399,359	3,686,556	3,400,155	3,686,556

** $p < 0.01$, * $p < 0.05$, $^{+}$ $p < 0.10$