Job Demand and Early Retirement in Manufacturing Workers

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Abstract

Policy initiatives such as increases to the full retirement age implicitly reduce benefits for early retirement. Yet research suggest that those in physically demanding jobs may be particularly adversely affected by such policies. We examine to what extent physical job demand relates to the early retirement decisions in a population of aging manufacturing workers. We follow a cohort of approximately 2001 stably employed male Alcoa employees aged 51-58 in 2000 followed forward to 2008 and examine whether externally rated physical job demand at middle age is related to early retirement. Next, we use variation in pension eligibility and generosity to determine whether there are any effects on retirement age for those with more physically demanding jobs while considering underlying health, and 401K accumulation. We find evidence of health worker biases in our naïve estimates, where workers working in jobs with higher physical demand delay their age at retirement. However, once we control for basic demographics this association disappears. Nonetheless in our preliminary results the relationship between job physical demand and retirement age is sensitive to specification and sample selection.

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Description of research question

As a means of addressing the large national debt, the Obama debt committee has suggested raising the full retirement age (FRA) from 67 to 69.[1] This change seems benign *prima facie* in light of the higher overall increases in longevity, but careful inspection of the longevity data shows drastic differences in life expectancy by social and occupational class (Cullen et al., 2010; Meara et al., 2008; Waldron, 2007). While the life expectancy by social class has been studied, the longevity differentials by occupational class have received less attention and can be even larger. According to the Society of Actuaries, "Blue-collar workers show significantly higher mortality rates than white-collar workers… At age 65, blue-collar men score a mortality rate 42 percent higher than white-collar men…job status has a greater impact on mortality than gender; the mortality difference between 65-year-old men and women is only 29 percent."[2]

In addition to the longevity differentials, there are strikingly few studies that account for work-related factors that "push" workers into early retirement.[3] One work-related factor often discussed is physical demand. The high physical demands of certain occupations, such as firefighters and air traffic controllers, have compelled the government to establish legal retirement ages for these select occupations (Bureau of Labor Statistics Website, www.bls.gov). However, the high work demands of other occupations in the private sector have been largely ignored in the policy debate. Recent policy initiatives, such as the one in France to raise the FRA from 60 to 62, have included exemptions for physically demanding jobs, and thus have spotlighted this issue.

We propose to examine the issue of physical job demand and retirement using an extraordinary array of administrative available for a universally insured, geographically, socially and economically diverse cohort of about 2000 men working for a large aluminum company, Alcoa. We intend to examine whether and how physical job demand relates to the early retirement decisions while considering underlying health, and wealth accumulation in this population of aging manufacturing workers.

Previous Literature

While there have been many studies on how physically demanding jobs affect the retirement decision, they have some noteworthy limitations. First, studies show that physical job demand is related to disability retirement (Karpansalo et al., 2002), but not necessarily to non-disability early retirement (Blekesaune & Solem, 2005). Second, many studies of job demand depend on occupational-level codes and thus cannot account for heterogeneity within job class. As a consequence, these studies inadvertently compare workers in remarkably different work environments. For example, an engineer within a manufacturing setting may have different physical work demands and exposures than an engineer in a university setting. Even when studies have examined job demand directly at

[1] National Commission on Fiscal Responsibility and Reform. New York Times Topics http://topics.nytimes.com/top/reference/timestopics/organizations/n/national_commission_on_fiscal_responsibility_and_reform/index.html

[2] The self-selection process into blue collar jobs based on personal and health characteristics is likely to explain some of these differences, but unlikely to account for them all. In addition, these differences in longevity may influence subjective survival probabilities, and in turn also affect the perceived total value of Social Security benefits claimed at older ages.

[3] We focus on early retirement ages because they are quite common. In fact only 25% of workers wait until after reaching the FRA to retire and claim SS benefits (Behaghel and Blau, 2010).

the individual-level, they have used self-reported measures of job demand, which may be biased. Ideally, externally rated job demand within similar contexts would capture the construct of interest best. Third, many studies have examined more educated populations such as Finish health workers (Elovainio et al., 2005), British Civil Servants, and high school graduates in Wisconsin (Kubicek et al., 2010). Fewer studies of construction, manufacturing, and lower level service workers have been done. This is important because this is the sector that is still at the highest risk for early retirement (Blöndal & Scarpetta, 1999).

We propose to use the Alcoa setting to assess whether and the extent to which physical job demand drives early retirement decisions. The rich administrative data allow us to follow a cohort of approximately 2000 male employees in birth cohorts 1941-1949 forward from 1996 to the present. We intend to 1) descriptively examine whether and to what extent externally rated physical job demand at middle age is related to early retirement, 2) examine if pension eligibility and generosity had any effect on retirement age for those with higher physical demand jobs while accounting for health, experience and 401K wealth accumulation. With the exception of HRS, few datasets have details on retirement age, health, and wealth; thus our work would serve as an important complement.

Data

Our study relies on the extraordinarily rich administrative data sources from a large multi-site aluminum-manufacturing employer, Alcoa. For this Alcoa population, we have access to personnel, physical job demand, pension, health, and wage data (some variables will be assessed in future analyses).

The personnel data set has detailed records for each employee with records for each job change starting in 1985. This data set includes basic demographic variables (sex, race, age), job category (hourly or salary), job title (linked to physical job demand), plant information (location and union status), employment status (active), date of entry or leave, and disability leave and date of re-entry.

The job demand survey data includes externally rated measures of physical and psychosocial work for the bulk of hourly Alcoa workers. A single expert rater at each plant rated the job demand by department and determined the job demand score. The raters were safety and health mangers that received training on the criteria to rate each job prior to the data collection. The physical demand required for each job was classified as sedentary, light, medium, heavy, or very heavy. While the survey was done in 2003, the standardized titles allow us to assign workers job demand scores going both forward and back in time as the nature of work of hourly has not changed drastically.

The potential pension eligibility and benefits for these workers were based on location, tenure, job grade, and years of service for each employee. The union negotiates these benefits every few years. While they differ across each plant, there are two rounds of pension negotiations in our observation window (2001, 2006). We will calculate the monthly potential pension benefit for each worker in each year on the worker's birthday.

We also have health claims data for all medical encounters beginning in 1996. Nearly 97% of the Alcoa workforce is covered in these data. In addition we have detailed information on 401K accumulations by year starting 2003. This information allows us to consider health profiles and wealth accumulation.

While the administrative data allow us to follow a cohort of approximately 4,000 male employees aged 47-55 (birth cohorts 1941-1949) forward from 1996 to the present,[4] data considerations, such as missing data on reason for leaving Alcoa, match rates on older job titles, and other data consideration force us to both left and right censor the data beginning 1/1/2000 and ending in 1/1/2008. This makes us drop about 50 % of our observations and our actual sample size is 2300.

Methods

We will begin with descriptive survival analysis comparing the labor force survival rates for those in high demand jobs. After examining these descriptive patterns, we use cox proportional hazard models to control for confounding by underlying health, and 401K accumulations. The preliminary results presented here control for basic demographic characteristics, the pension eligibility and generosity, and 401K accumulations. The first set of cox models does not have time varying pension eligibility included, but the second set does. Likewise the 401K analyses are only possible for a subset of the workers.

Preliminary Results

Sample

Of the 3785 male hourly workers active on Jan 1, 1996 95% job titles could be matched to a specific job demand. However, only 25% of the sample had their job demand matched going back before the year 2000. In addition, the reason for leaving Alcoa was only coded in between 2000-2007 and 401K accumulation data is only available after 2003. For the bulk of the other observation the reason for leaving Alcoa was missing. In order to deal with these specific data constrains, our analyses considers both right (1/1/2008) and left censoring (1/1/2001) in the data. Our final analytic sample had 2369 workers. In this smaller sample, 65% of the sample retires during the observation window.

Table 1 presents the summary statistics for the sample. The median age of the sample at the beginning of the observation window is 54 years old. The median age of retirement is 59 years (less than 2% of the sample workers continue to work at Alcoa to FRA). The average tenure at Alcoa is 30 years and most workers work in jobs with medium physical demand, especially at this point in their careers. Approximately 33% of workers were in jobs categorized as 'heavy' or 'very heavy' and 21% were in jobs categorized as 'sedentary or light'.

Figure 1 presents the distribution of age of retirement for the sample. Most of the sample retires well before the FRA. There is a small but notable jump at age 55 and striking jump at age 62. Alcoa's normal pension eligibility requires either 5 years of service & reaching

[4]Labor force participation rates for men aged under 55 has been stable between 86-90% for the entire economy (http://www.bls.gov/emp/ep_table_303.htm) thus we think there is only minor selection in our sample at these ages.

age 65, 10 years of service and reaching the age 62, or 30 years of services.[5] While the eligibility criteria are consistent for normal retirement, the monthly pension amount varies by years of service, job grade, time of retirement, and work location.

Figure 2 provides the raw differences in rates of retirement by job demand. This figure suggests that job demand does matter, but in the opposite direction as hypothesized—that those in high demand jobs actually work longer. However, we have reason to believe that this naïve relationship is confounded by selection into these jobs by health leading to healthy worker selection bias.

Table 2 presents our preliminary findings using cox-proportional hazards models. In the first specification, we find that those in the heaviest jobs work longer than those in the medium heavy job, and the estimate is very significant. However, once we account for basic demographic and health this association becomes insignificant.[6] We also add controls for health and find that are those with higher health risk scores are more likely to retire early and the risk scores behave in a monotonic fashion as is expected. Nonetheless they do not appreciable change the relationship between job demand and retirement age.

In Table 3 we take advantage of the time varying information in the data and present our results using time–varying cox methods. Here we divide each time period into a one-year interval defined by each workers birthday. If the find that job demand is not significantly associated with early retirement, but the coefficient becomes larger but is not statistically significance. We also find that eligibility for the defined benefit pension is strongly associated with earlier age of retirement. In contrast, the actual monthly pension benefit amount is associated with later retirement. This is not unexpected since higher monthly pension benefits are determined largely by years of service.

Table 4 presents a sub analyses where we can include defined contribution benefits, namely participation and 401K accumulations. In these analyses our sample changes considerably because the data are further right censored because retirements that happen before 1/1/2003 are not considered in the sample. For this sample of employees working in a job with high physical demand is associated with a higher hazard ratio and earlier retirement. There continues to be a strong association between defined benefits eligibility and earlier age of retirement. There was no association between 401K participation or accumulation and age at retirement.

Future Analyses:
Overall, our descriptive analyses highlight the difficulty in understanding the relationship between physical job demand and retirement age due to health worker selection even in a cohort of stably employed workers. In these preliminary analyses, we show that the

[5] There is a also eligibility for those that have 10 years of service and are 60 years old but the benefits are reduced. We do not consider these individuals as eligible because we do not know the rules for the reduced benefits.
[6] All regressions must account for birth cohort because of the varying ages of the men included in the sample.

relationship between job physical demand and retirement age is sensitive to specification and sample selection.

Future work will attempt to further clarify this relationship by undertaking several additional analyses. First, we will add several important covariates to examine their effect on the outcome. We will add information on the wages, hours worked, workers' injury experience, disability events, and overall risk aversion. Second, we will try to examine an inception cohort where all the workers will enter the analysis at a specific age. While this will limit our sample size considerably, it will allow us to compare like aged individuals in the time varying analysis (above and beyond birth cohort controls which we included in these preliminary analyses). Third, we will examine the interaction of job demand and all the various pension schemes. The current analyses does not account for social security wealth and this third form of pension may be an important factor to consider.

Tables

Table 1: Sample Description & Summary Statistics

	Mean	SD
Age of sample at entry	54.86	2.23
Age at retirement	59.03	2.77
Percent of sample with observed retirement	65.50%	
Job Demand		
Sedentary/ Light	21%	
Medium	47%	
Heavy/Very Heavy	31%	
Tenure at entry		
0-15 years	9%	
15-20	12%	
20-25	25%	
25-30	35%	
30-35	19%	
35-40	0%	
Married		
Ever Married	88%	
Race		
White	88%	
Health		
Health Score 2000 Q1	17%	
Health Score 2000 Q2	25%	
Health Score 2000 Q3	24%	
Health Score 2000 Q4	20%	
Health Score 2000 Q5	15%	
Defined Benefits Pension		
Eligibility at time of entry	47%	
Monthly Pension at entry for eligible	$1,316.91	$104.54
Monthly Pension at entry	$614.90	$660.56
Defined Contributions Pension Accumulation		
401K Participation	86%	
401K Accumulation 2003 if participate	$95,593.38	$65,734.00
401K Accumulation 2003	$83,901.00	$72,573.90
N	2369	

Table 2: Proportional Hazard Cox Regression with no time varying variables

Time to Retirement (after 1/1/2001)	Hazards Ratio and 95% CI			
Job Demand (omitted JD=3, Medium)				
Sedentary/Light (JD=1 or 2)	1.04	1.032	1.031	1.037
	(0.927 - 1.167)	(0.918 - 1.161)	(0.916 - 1.160)	(0.922 - 1.167)
Heavy/Very Heavy (JD=4 or 5)	0.845***	1.012	1.005	1.024
	(0.764 - 0.936)	(0.894 - 1.145)	(0.887 - 1.138)	(0.903 - 1.160)
Race				
White	1.227***	1.027	1.017	1.028
	(1.065 - 1.413)	(0.882 - 1.197)	(0.872 - 1.186)	(0.881 - 1.199)
Married				
Ever Married			0.967	0.95
			(0.841 - 1.111)	(0.827 - 1.091)
Health (omitted Q1)				
Health Score 2000 Q2				1.007
				(0.869 - 1.167)
Health Score 2000 Q3				1.158*
				(0.997 - 1.344)
Health Score 2000 Q4				1.184**
				(1.013 - 1.383)
Health Score 2000 Q5				1.465***
				(1.245 - 1.725)
Observations	2369	2369	2369	2369
Birth Cohort FE	NO	YES	YES	YES
Location FE	NO	YES	YES	YES
Tenure FE	NO	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1 Note: Data is both right and left censored.

Table 3: Proportional Hazard Cox Regression with time varying variable.

Time to Retirement (after 1/1/2001)	Hazards Ratio and 95% CI					
Job Demand (omitted JD=3, Medium)						
Sedentary/Light (JD=1 or 2)	1.036 (0.907 - 1.182)	1.039 (0.911 - 1.186)	1.04 (0.911 - 1.188)	1.045 (0.915 - 1.193)	1.043 (0.913 - 1.191)	1.025 (0.897 - 1.172)
Heavy/Very Heavy (JD=4 or 5)	0.989 (0.859 - 1.138)	1.071 (0.930 - 1.235)	1.072 (0.930 - 1.235)	1.093 (0.948 - 1.261)	1.09 (0.945 - 1.257)	1.109 (0.962 - 1.279)
Race						
White	1.152 (0.965 - 1.374)	1.062 (0.889 - 1.270)	1.064 (0.890 - 1.273)	1.079 (0.901 - 1.291)	1.083 (0.904 - 1.296)	1.096 (0.916 - 1.313)
Married			0.98 (0.837 - 1.147)	0.96 (0.820 - 1.124)	0.952 (0.813 - 1.115)	0.952 (0.813 - 1.115)
Ever Married						
Health						
Health Score 2000 Q2				1.037 (0.869 - 1.239)	1.029 (0.862 - 1.229)	1.029 (0.861 - 1.228)
Health Score 2000 Q3				1.244** (1.044 - 1.484)	1.236** (1.037 - 1.474)	1.234** (1.035 - 1.472)
Health Score 2000 Q4				1.277*** (1.064 - 1.533)	1.268** (1.057 - 1.522)	1.263** (1.053 - 1.515)
Health Score 2000 Q5				1.609*** (1.332 - 1.943)	1.605*** (1.328 - 1.938)	1.599*** (1.324 - 1.932)

Pension (time-varying)						
Pension Eligible					1.591*** (1.291 - 1.960)	3.000*** (1.897 - 4.745)
Monthly Pension (100$)						0.948*** (0.916 - 0.981)
Observations	13494	13494	13494	13494	13494	13494
Unique Workers	2368	2368	2368	2368	2368	2368
Birth Cohort FE	YES	YES	YES	YES	YES	YES
Location FE	YES	YES	YES	YES	YES	YES
Tenure FE	NO	YES	YES	YES	YES	YES
Time vary variables change on Birthday					YES	YES

*** p<0.01, ** p<0.05, * p<0.1 Data is both right and left censored

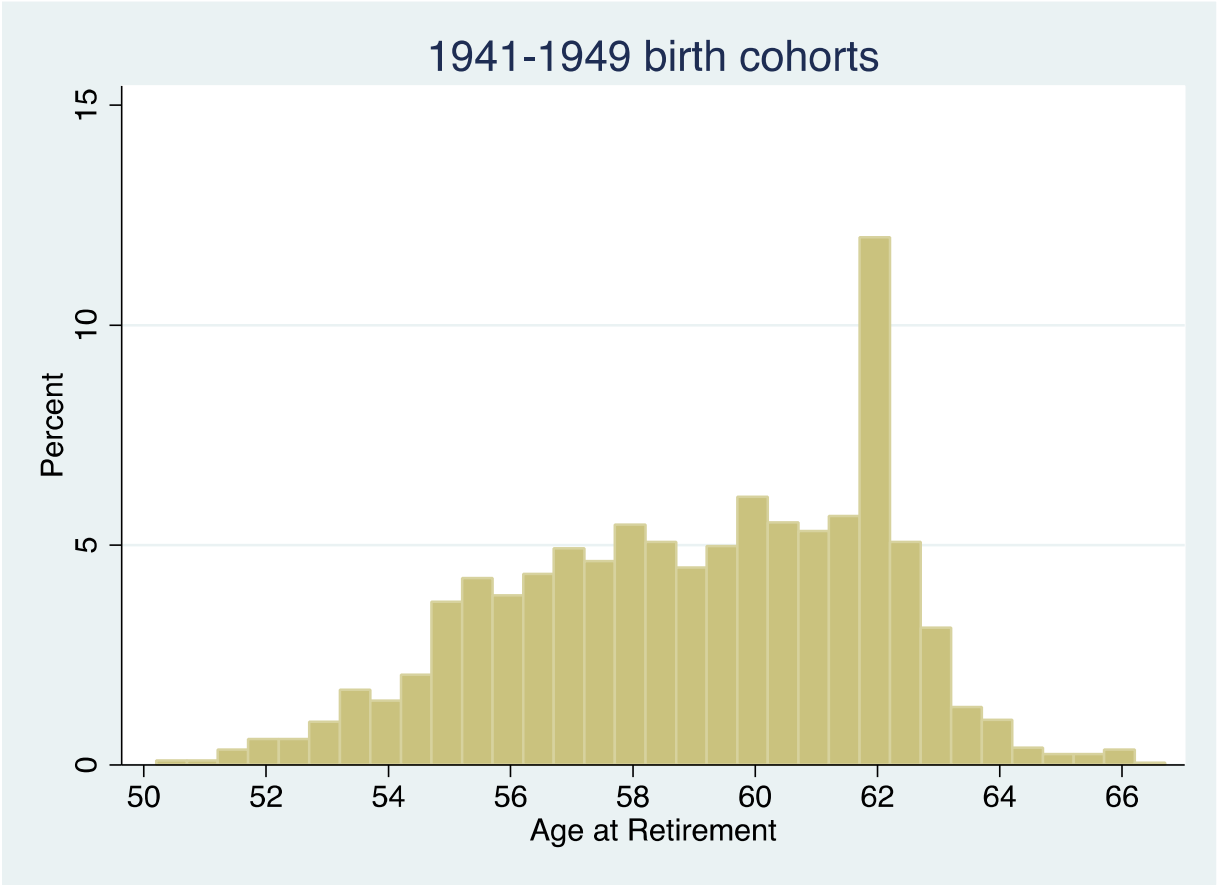
Table 4: Proportional Hazard Cox Regression with time varying variable. Sub-analyses.

Time to Retirement (after 1/1/2003)	Hazards Ratio and 95% CI		
Job Demand (omitted JD=3, Medium)			
Sedentary/Light (JD=1 or 2)	0.976 (0.823 - 1.157)	0.975 (0.823 - 1.156)	1.021 (0.854 - 1.221)
Heavy/Very Heavy (JD=4 or 5)	1.198** (1.004 - 1.430)	1.195** (1.001 - 1.426)	1.230** (1.019 - 1.485)
Race			
White	1.185 (0.954 - 1.472)	1.189 (0.957 - 1.477)	1.237* (0.979 - 1.563)
Married			
Ever Married	0.977 (0.798 - 1.196)	0.979 (0.800 - 1.199)	1.004 (0.809 - 1.245)
Health			
Health Score 2000 Q2	0.968 (0.785 - 1.193)	0.967 (0.785 - 1.193)	0.909 (0.728 - 1.134)
Health Score 2000 Q3	1.212* (0.984 - 1.493)	1.219* (0.990 - 1.501)	1.176 (0.944 - 1.464)
Health Score 2000 Q4	1.254** (1.011 - 1.556)	1.258** (1.014 - 1.560)	1.233* (0.984 - 1.546)
Health Score 2000 Q5	1.330** (1.051 - 1.683)	1.338** (1.057 - 1.693)	1.246* (0.971 - 1.600)
Pension (time-varying)			

Defined Benefits Pension			
Pension Eligible	3.107*** (1.642 - 5.882)	3.024*** (1.592 - 5.743)	2.481** (1.225 - 5.027)
Monthly Pension (100$)	0.927*** (0.885 - 0.970)	0.929*** (0.887 - 0.973)	0.936*** (0.890 - 0.984)
Defined Contributions Pension Accumulation			
401K Participation		0.896 (0.708 - 1.135)	0.857 (0.669 - 1.100)
401K Accumulation in (1000$) (time-varying)			0.999 (0.998 - 1.000)
Observations	6753	6753	6625
Unique Workers	1845	1845	1845
Birth Cohort FE	YES	YES	YES
Location FE	YES	YES	YES
Tenure FE	YES	YES	YES

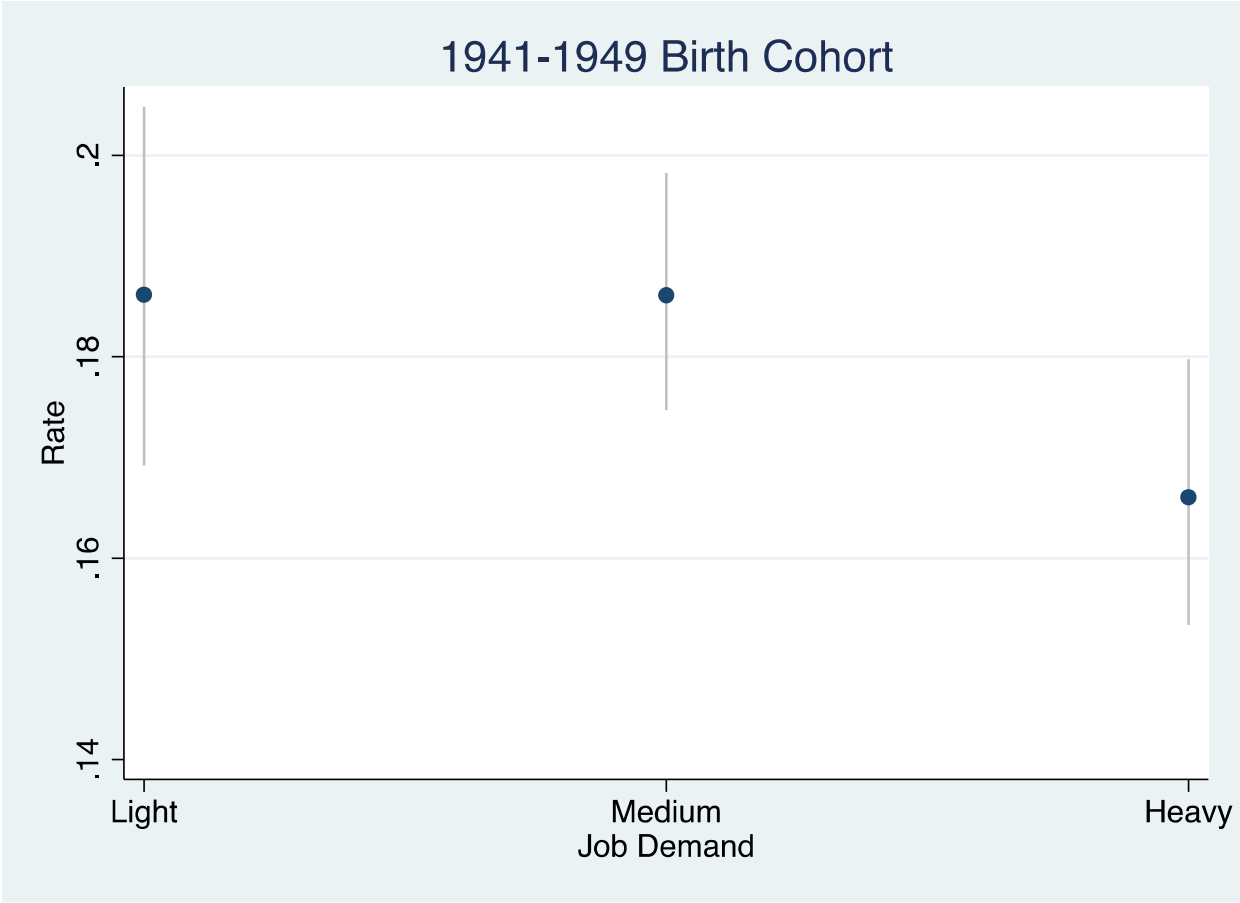
Figures

Figure 1: Histogram of age at retirement.



Includes birth cohorts 1941-1949 over a 7-year observation window.

Figure 2: Retirement rate by Job Demand.



Includes birth cohorts 1941-1949 over a 7-year observation window.

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