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Phasing out: routine tasks and retirement

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Abstract
Population ageing poses new challenges to the sustainability of the pension system and possibly to economic growth in advanced economies. In such context, calls are made to increase participation of workers close to their retirement age. Ageing occurs in a period where technological progress has changed the patterns of labor demand, away from physically demanding tasks (opportunity) and into more cognitive-interpersonal type of tasks (challenge). To understand the net effect, we analyze the relation between automation and labor supply of older workers. We explore whether exposure to technological change, measured by the task content of jobs, was connected to labor supply of older workers in Germany and Great Britain. Using panel data, we show that the adjustment in the number of hours of workers in occupations exposed to automation was small, and only negative for a subset of workers. The exposure to automation is related to somehow earlier retirement, but the size of the relation is small.

Keywords:
task content, routinization, retirement, labor supply, automation

JEL Classification
J24, J26

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1 Introduction

According to a report by the OECD (2006), if the current trends in fertility and longevity are sustained, the share of people over 65 in total population will double in the course of the next 50 years, resulting in a considerable fall in the pensions and the quality of life. Slowly, a consensus on how to deal with this development is being formed around the idea of increasing the participation of workers with a low labor market attachment, such as women and workers who might be eligible for early retirement schemes (Bloom et al. 2010) as well as to increase the retirement age. The title of the OECD report mentioned above neatly summarizes this approach: "Live longer, work longer". Similar conclusions can be drawn from European Commission report on ageing (2009).

Ageing does not occur in the vacuum. The last 25 years observed levels of technological progress unparalleled since the industrial revolution. Such changes create opportunities and challenges. On one hand, new machines allow to automate tasks that were associated to earlier retirement, such as physically demanding or repetitive tasks (Filer and Petri 1988, Lund and Villadsen 2005, Dal Bianco et al. 2015). Since these tasks can be performed by machines (Autor et al. 2003, Acemoglu and Autor 2011), current jobs might be better suited to keep workers on the market. On the other hand, by automating part of the production process, machines also make human labor redundant. Given the positive correlation between average age of workers in an occupation and how susceptible an occupation is to automation (Autor and Dorn 2009), one would expect that potential mismatch between supply and demand of tasks might be larger among older workers. Facing a falling demand and increasing competition with machines, older workers might experience longer and more frequent unemployment spells. Moreover, given low re-entry rates,[1] unemployment spells for workers over 50 years old are more likely to end in a transition to retirement than to a new employment.

This research focuses on the challenges that technological progress created for older workers. In particular, we test whether *workers in jobs more exposed to automation reduced labor supply more than workers in other occupations.* We hypothesize that changes in the demand for workers (as documented in Autor et al. 2003, Michaels et al. 2014) affected workers decision to participate in the labor market at two different levels: intensive, or the number of hours work; and extensive, or whether to work at all. We perform the analysis using panel data from West Germany and Great Britain.[2] Analyzing these two countries allows evaluating whether the relationship between labor supply among workers close to retirement and task content of jobs varies across institutional settings. In spite of recent policy change, Germany still provides relatively generous early retirement schemes and unemployment benefits. The availability of such schemes allows workers to retire before the official retirement age (Dietz and Walwei 2011, Inderbitzin et al. 2016). One could expect that workers in occupations more exposed to competition with machines might find the early retirement option more appealing. Since similar early retirement provisions are not in place in Great Britain, workers with different levels of exposure to automation might behave in a similar fashion.

Our research contributes to two strands of the literature: the participation of older workers in the labor market and the task content of jobs. In relation to the literature on ageing and labor market participation, our analysis relates to the understanding of factors that drive the decision to retire. Previous literature describes the existence of *push* and *pull* factors (Blöndal and

[1] Dietz and Walwei (2011) estimate that among German workers over 55 years old, the probability to find a new (unsubsidized) job lies below 4 %.

[2] East Germany is excluded from the analysis, as research demonstrates that the legacy of socialist period still matters for labor market outcomes (e.g. Fuchs-Schündeln and Masella 2016, Steiner 2017).

Scarpetta 1999, Gruber and Wise 2004, Schils 2008, van Oorschot and Jensen 2009, Engelhardt 2012). Pull factors correspond to financial incentives and, in particular, to the generosity of early retirement schemes, and unemployment benefits; while push factors are associated with elements driving workers out of the labor markets. Compulsory retirement age in place in some occupations or discriminatory practices in hiring are examples of push factors. As part of the analysis of push factors, job characteristics play a significant role. In particular, there is a growing research on how tasks performed by workers affected the decision (or the intention) to retire before the official retirement age. Filer and Petri (1988), and Lund and Villadsen (2005) find that workers are more likely to prefer early retirement when their jobs are physically demanding. Similarly, Dal Bianco et al. (2015) finds that workers tend to favour early retirement in jobs with repetitive, monotonous tasks. Not only the type of tasks matter for early retirement intentions, the possibility to choose among those tasks is also relevant. Blekesaune and Solem (2005) indicates that workers who lack discretion to choose among several tasks favour earlier retirement. Finally, boredom at work, a measure that combines features of monotony, low demand and low ability to decide, has also been shown to be related to early retirement intentions (Harju et al. 2014). Unlike previous literature, our approach to tasks does not focus on internal motivation, but on the potential mismatch between the tasks supplied by older workers and the demand in the labor market.

In relation to the literature on the task content of jobs, the contribution is two-fold. First, we focus on individual level data, whereas the analysis presented in previous empirical literature (Autor and Dorn 2009) focus on aggregate data on synthetic cohorts. Thus, while Autor and Dorn (2009) attempt to tackle changes for older workers, most of their analysis highlights differences across cohorts. Moreover, to some extent the use of long time differences might include other confounding factors, such as migration across commuting zones. Second, Autor and Dorn (2009) focus on working populations, and as such the literature emphasizes the role of transitions between occupations, without considering how task content might affect retirement decisions, which lies at the core of our analysis. To some extent, our analysis is closer to Friedberg (2003). Her research finds that workers who do lack computer skills might have a harder time finding new employment opportunities and might retire sooner as a result. Our research differs from Friedberg (2003) in that the focus is set on the nature of tasks performed by workers, and not on the skiklls. Workers who use computers to perform routine tasks, such as bookkeeping, might be as exposed to automation as assembly-line workers (Autor et al. 2003).

Our empirical analysis demonstrates that workers in routine occupations worked on average fewer hours than workers in non-routine occupations, a result that is consistent with the aggregate trends in labor supply discussed in Goos et al. (2014). Notwithstanding, the relation defies a simple characterization. In models with no control for selection into employment, we find no difference between older and younger workers response to automation, the fall in hours was similar. After controlling for selection, the relation between hours worked and routine content becomes age/country specific. Shifting the focus to the extensive margin, we find some weak evidence of workers in routine occupations leaving the labor market sooner. Moreover, we argue that given the positive relation between the measure of routine content and other job characteristics related to early retirement (e.g. boredom, lack of discretion), the estimates are likely to represent lower bounds on the effect.

Taken together the lack of strong links between occupation and labor supply of older workers in a context of rapid changes in demand of labor linked to technological processes (Goos et al. 2014) asks to reconsider theoretical models and also the policy interventions. When it comes to theoretical models of technological change and unemployment (e.g. Jaimovich and Siu 2012), the lack of significant correlation suggests that a focus on jobs might be better suited than on occupations. The latter allows having match-based productivity gains, and not occupation-based gains.[3] As such, these models could bring theoretical predictions closer to empirical results. Second, and from a policy perspective, the results suggest that retraining workers might have only a moderated impact on their labor market attachment.

2 Technological change and early retirement

The routine biased technological change hypothesis provides an explanation of the changes experienced in developed economies over the last decades. Proponents of this view (e.g. Autor et al. 2003, Goos and Manning 2007, Acemoglu and Autor 2011) indicate that new technologies allowed to automate part of the production process, the so called "routine" tasks. The distinctive feature of these tasks is that they are sufficiently well understood that it is possible to instruct a machine to execute them, i.e. it is possible to write a "routine". Moreover, these tasks are performed in a controlled environment, where there is no need to adjust to unexpected changes. An example of a routine task is spellchecking. The complement of these tasks are non-routine tasks, which cannot be coded as a simple set of rules and which require workers to adjust to the environment. Negotiating with a potential business party is an example of a non-routine task.[4]

Autor and Dorn (2009) provide a first attempt to bring an age dimension to the task content of occupations. Borrowing from human capital arguments, they hypothesize that older workers are less likely to switch towards jobs with different task content. The argument is twofold. First, and aligned with the optimal choice of education, workers learn new skills for a job to the point that the cost of learning equals the discounted stream of income from working in that job. Having shorter time horizons, the incentives to increase their human capital are lower among older workers than among younger workers. A similar argument can be found in Jaimovich and Siu (2012) and in Carrillo-Tudela and Visschers (2013), who produced models of occupational changes within a search and matching framework. Carrillo-Tudela and Visschers (2013) would additionally indicate workers with more experience in a given occupation would likely have accumulated more job- or occupation-specific human capital, which they might be reluctant to treat as sunk costs. These insights were confirmed by empirical analysis, which show that older workers are less likely to participate in trainings (e.g. Taylor and Urwin 2001, Lindsay et al. 2013).

The human capital approach can also be assessed from employers' perspective. Employers might be reluctant to offer training opportunities for older workers, as they also expect them to retire sooner, which again reduces the returns on investment. Moreover, if employers' perceive older workers to be less able to learn new skills, as shown by Van Dalen et al. (2010), investing in older workers might be relatively more costly. Empirically, this argument has received some confirmation. Taylor and Urwin (2001) and Lazazzara et al. (2013) provide evidence that older workers are less likely to be offered training opportunities.

Baert et al. (2016) further confirm the difficulty of switching occupations at the heart of Jaimovich and Siu (2012) model. Baert et al. (2016) conduct a correspondence study in Belgium and find that 50 years-old workers were less likely to be called back for interviews than 6 and 12 year younger workers.[5] The call-back rate was even smaller among older workers seeking

[3] Caballero and Hammour (1996) for an early example of match based productivity.

[4] Literature discusses a second categorization, which is based on the type of skills required: manual, cognitive and interpersonal. This second dimension is important to understand wage effects, but plays a secondary role in the analysis of labor demand.

[5] This result was confirmed also by Neumark et al. (2015), though the authors suggest a much smaller effect once the characteristics of the correspondence study are taken into consideration.

for a job different from the one they held previously. Moreover, Marmora and Ritter (2015) finds that dismissed workers are more likely to retire following an unemployment spell (see also Dietz and Walwei 2011). Taken together these findings suggest that workers over 50 in routine jobs might be at a disadvantage with respect to non-routine workers, not only because the falling demand for tasks makes unemployment more likely, but also because of the difficulties in obtaining employment in new sectors.

Institutional settings could also affect employers' and workers' incentives. Early retirement schemes might reinforce the effects of changes in the demand for tasks in driving older workers in routine occupations to retirement for two reasons. First, early retirement schemes might be more appealing to workers with worse economic prospects, such as workers in routine jobs, who not only face a lower demand for routine tasks, but also a fall in wages. For workers in non-routine jobs, whose wages are raising, retiring early has a higher opportunity cost. Not only early retirement schemes "pull" workers into retirement, they can also act as "push" factors. Employers seeking to restructure their firms could reduce dismissal costs by inciting older workers to use early retirement schemes. Evidence on the use of early retirement by employers as a tool to restructure the firm is mixed: Buchholz et al. (2013) show that early retirement schemes were more common in industries subject to restructuring pressures, whereas Dorn and Sousa-Poza (2010) interpret the fact that areas with greater unemployment have also a larger share of early retirees as evidence of the use of these schemes to reduce staff. On the other hand, in the sample of managers surveyed by Henkens (2000), the author could not corroborate the hypothesis that middle managers suggested early retirement to achieve grand organizational goals, such as employment reduction. Rather, suggestions to retire were made based on workers' characteristics. Regardless of the relative importance of "pull" and "push" components of early retirement, it is possible that in the face of routine biased technological change, these schemes disproportionately affected workers' incentives in routine jobs.

This discussion puts into question the need of an additional analysis, as routine workers are consistently portrayed as having worse opportunities to keep working. However, these insights are based on a stylized description of jobs in at least two dimensions. First, technological progress increases productivity in all jobs in non-routine occupations. Second, occupations are assumed to have a stable task content, i.e. routine occupations cannot change the task content to become non-routine occupations. Both assumptions are critical to the results presented in the theoretical literature (Jaimovich and Siu 2012, Carrillo-Tudela and Visschers 2013). If instead productivity is match specific and growing over time, which means that only recent matches benefit from new technologies (e.g. Caballero and Hammour 1996), then outcomes might change as well. New non-routine jobs will be more productive than routine, but also than earlier non-routine jobs, encouraging firms to destroy non-routine jobs when the productivity gap to the technological frontier is large enough. As a consequence, the difference in job destruction between routine and non-routine jobs might be smaller than predicted by the model in Jaimovich and Siu (2012). This smaller difference implies that the probability of becoming unemployed across different workers should also be similar. Moreover, if productivity growth is linked to changes in the use of new technologies, then workers switching between non-routine jobs might also be required to update their skill set.

Finally, one should also consider how tasks *per se* could affect workers' motivations. In fact, jobs with a larger share routine tasks might also be more monotonous. Workers in routine intensive jobs have less discretionary power to decide on both the pace and the order of tasks. In fact, whether the pace is determined by machines is an indicator of how routine an occupation is (see Autor et al. 2003, Acemoglu and Autor 2011). Moreover, monotonous jobs also involve short, repetitive tasks in a predictable environment. These tasks are also more prone to automation.[6] A reduction of monotony at the workplace, e.g. due to automation of routine tasks, could then lead to postponement of retirement decision Harju et al. (2014).

Similarly, the increasing demand for cognitive and interpersonal tasks, which do not require physical strength, could also help to increase labor market attachment among older workers (Filer and Petri 1988, Lund and Villadsen 2005), especially if these changes in the demand occur in "routine" and "non-routine" occupations alike. Spitz-Oener (2006) provides some indication that this might be the case. Her analysis of changes in the task demands in Germany indicates that changes within occupations were larger than changes between occupations. Thus, technological change poses both challenges (workers need to learn new skills) and opportunities (new jobs are better suited to workers' needs) to extend the engagement in labor market.

In the next sections, we proceed to test the extent to which exposure to technological change, measured by the proportion of routine tasks performed in a given occupations, was associated to early retirement and decreases in the number of working hours.

3 Data and descriptive statistics

3.1 Data and the task content of jobs

In order to analyze the relation between workers' decision to leave the labor market and their exposure to technological progress, we require long panel data. Such data should allow both to capture the exact timing of transition, and also to have a record of the positions held by respondent while active. In Europe, the German Socioeconomic Panel (GSOEP) and the British Household Panel Survey (BHPS) offer the longest running panels, which also stand out for the richness of variables collected. The GSOEP is collected in West Germany since 1984[7]and it is still released on yearly basis. The BHPS was collected between 1991 and 2008, when the collection was discontinued.[8] To keep results from both countries comparable, the analysis focuses on the period in which GSOEP and BHPS overlap.

The focus is set on workers aged 50 to 65, which corresponds to the minimum age for workers to be eligible to early retirement schemes and the official retirement age at the time of the survey in both Germany and Great Britain. Our sample covers men and women, even though in Great Britain law establishes a lower retirement age for women, 60 years old.[9]

In addition to data on retirement decisions, the analysis also requires information on the task content of jobs, particularly on how routine these jobs were. Such information, however, is not available on either of the panels, so we relied on external sources. Following Acemoglu and Autor (2011), we employ Occupation Network (O*NET) database to recover the task content. This database is collected and published by the US Department of Labor since 2003. It contains information on the tasks performed by US workers aggregated within narrowly defined occupations.[10] For the purposes of our analysis, we employ the 2008 release of the O*NET database, which matches the latest observable date on the national panels.

The construction of the task variables follows the procedure outlined in Acemoglu and

[6] The overlap between monotonous and routine tasks is not complete, though. Some tasks, such as driving trucks or patrolling border are non-routine, but probably monotonous.

[7] Former territories of East Germany joined the sample in 1991

[8] In 2009, a new survey was launched in Britain to replace the BHPS under the name "Understanding Society", where former respondents of BHPS were asked to participate. Given changes in the sample design, these waves were not included in the analysis.

[9] One should bear in mind that before 2006, these retirement ages were mandatory in Great Britain. Eventually, the European Commission condemned this institution as discriminatory (Banks and Smith 2006).

[10] Given the length of the questionnaire, respondents are asked to fill only a part of it. Thus, individual responses are incomplete and not released.

Autor (2011). We first recover the importance of five types of tasks: routine manual (e.g. tasks performed by assembly workers), routine non-manual (fixing a household appliance), routine cognitive (bookkeeping), non-routine cognitive (e.g. writing research proposals), and non-routine interpersonal (negotiating). Each indicator is obtained by combining several variables from the O*NET.[11] Given the differences in scales between these variables, they are standardized before their combination. Having constructed these indicators, we proceed to create the Routine Task Intensity (RTI) of an occupation. Similar to Autor and Dorn (2009, 2013), the RTI index is defined as the sum of routine tasks minus the sum of non-routine tasks. The RTI index is then standardized at the country level to facilitate interpretation.

The use of task data from the US has several advantages over available databases from each country. First, surveys conducted in Germany and Great Britain differ on the description of tasks and on the number of occupations included. Using US data on task content effectively eliminates the noise that might arise from different collection mechanisms. Second, sample size in the O*NET is much larger, which means that aggregated data at the occupation level are more reliable, particularly for relatively small occupations. Finally, our research is not the first to employ US data as a proxy for task content of occupations in Europe. Goos and Manning (2007) and Goos et al. (2014) already explore demand polarization in Great Britain and the EU -15 respectively combining American and European data. On the other hand, an analysis of task content in the US and some European countries reveals that American data are a good proxy for task content in Europe (Cedefop, 2013).

A potential downside of employing O*NET for the analysis of European data is the lack of a perfect match between the classification of occupations on both databases. Whereas panels employ ISCO-88 codes, O*NET has its own classification system, which needs to be converted to the standard classification system before matching to the ISCO-88. To minimize potential errors, we followed two rules when assigning task values to occupations:

1. When one O*NET code corresponds to more than one ISCO-88 code, each of the ISCO-88 codes received the same value on the task content.

2. When more than one O*NET code corresponds to one ISCO-88 code, the mean value of the tasks at O*NET is obtained and then assigned to the ISCO-88 code.

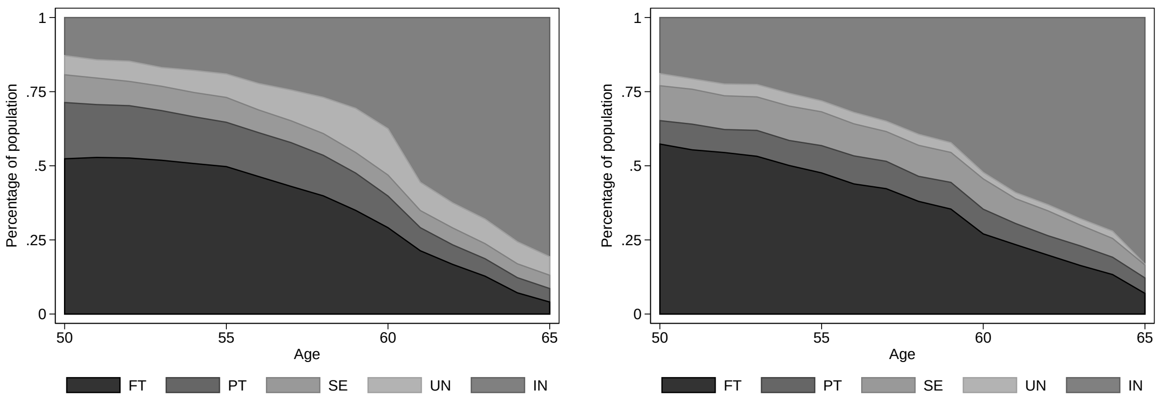
3.2 Descriptive statistics

An initial description of retirement patterns is provided in Figures 1 and 2, which explore changes at the extensive and the intensive margin, respectively. Figure 1 distinguishes between five possible states: working full and part time, working as a self-employed, unemployed, and inactive. The last category, in turn, groups people that for some reason are not actively looking for employment. It comprises individuals in early retirement, discouraged workers, individuals with long-term disabilities and housewives/househusbands. The heterogeneity of this group reflects the existence of diverse pathways to retirement, as explored by van Oorschot and Jensen (2009) and OECD (2006).

Even though Germany and Great Britain share the same official retirement age for men, Germany presented a lower effective age of retirement over the entire sample period, for men and women alike. Dorn and Sousa-Poza (2010) attribute this difference both to the generosity of the early retirement scheme in the country, and the stringent German employment protection. According to an OECD report (2006), the gap in effective retirement age shrank in the almost

[11] The list of variables used in the construction of each indicator is available in Table 4 in the appendix

Figure 1: Labor market status of workers close to retirement age



(a) Germany (West)

(b) United Kingdom

Notes: Frequency of labor market status in each year. Own calculations based on data from GSOEP and BHPS. FT stands for Full Time employment, PT for Part Time employment, SE for Self Employment, UN for unemployed and IN for inactive.

two decades under analysis, yet Figure 1 suggests that patterns towards retirement varied across countries.

Focusing on full time workers reveals that in Germany the participation is rather constant until the age of 55, when a steep decline follows. By the age of 60, the proportion working full time shrinks by half, while by the time individuals celebrate their 65$^{\text{th}}$ birthday, less than a quarter of them are still active in the labor market. Several factors might stand behind the fall in full time employment around the age of 55, such as the relaxation of the conditions for receiving unemployment benefits in Germany, i.e. searching for a job is no longer required (Buchholz et al. 2013); but also the strict employment protection legislation, which prevents firing workers close to retirement age and, consequently, hinders job creation among this group.[12] The fall in full time employment in Great Britain does not present such abrupt changes as in Germany. The fact that women might retire at a younger age is reflected as a minor fall just below 60, not comparable to the changes visible in Germany. Figure 1 reveals that even though effective retirement age is over 60, part of these exits occur much earlier.

Instead of analyzing retirement as discrete changes, one could also consider retirement patterns as a progressive decrease in the number of hours worked, as these countries facilitated more flexible employment contracts for older workers. Since the frequency of flexible work arrangements increased over time, a simple look at the mean hours worked would confuse time and age effects. Moreover, one could also suspect that variation across cohorts would matter, for instance due to the labor market conditions at the time of entry or simply due to the size of the cohort. In order to separate the effect of age on the number of hours worked, we then proceed to employ the decomposition method described in Deaton (1997). This decomposition allows isolating cohort, age and period effects by assuming that the latter are orthogonal to a time trend, and that the sum of all effects equals zero. The procedure requires a simple transformation of time fixed effects to avoid the well-known perfect collinearity problem. Newly created fixed effects are of the form:

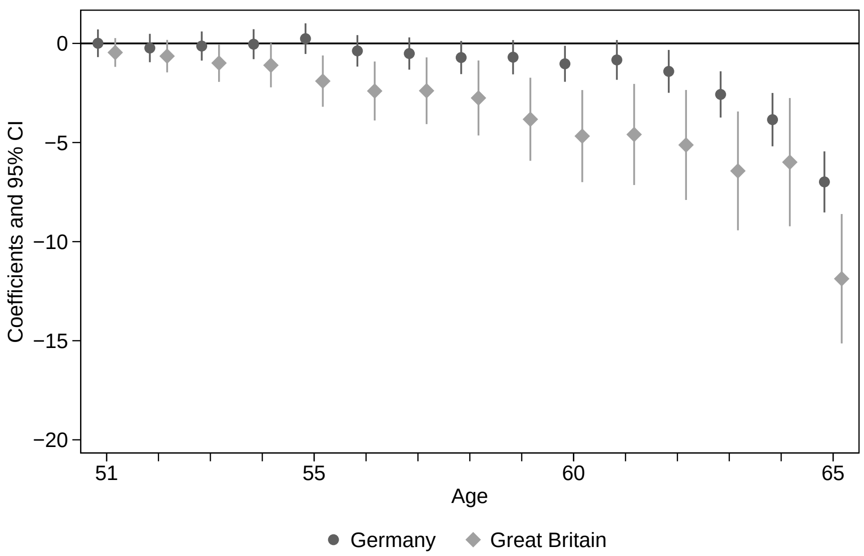
[12] See Blöndal and Scarpetta (1999) for a better description of changes in policy towards active ageing and their impact on retirement decisions.

$$y_t = \begin{cases} 1, & \text{if } year = t \\ (\delta_t - 2) * y_{base} - (\delta_t - 1) * y_{base+1}, & \text{otherwise} \end{cases}$$

, where δ_t indicates the difference between year t and the base year and y_{base} is a dummy variable that takes the value of one when the year equals base year. The dummy variables corresponding to the first two years, as well as the first age and cohort fixed effects are not included in the regression.

Age coefficients from the Deaton decomposition are presented in Figure 2.[13] Since Deaton decomposition does not allow the inclusion of additional covariates, coefficients in Figure 2 correspond to separate regressions, one for each country. Coefficients in the decomposition have the same interpretations as any other dummy variable, where the reference level are workers aged 50 in each country. As an example, conditional on being employed, respondents aged 65 in Germany tended to work almost 10 hours less than their colleagues 15 years younger.

Figure 2: Deaton decomposition: hours worked



Notes: Age coefficients from a Deaton decomposition of hours worked. Sample includes wage-employed individuals age 50 to 65 with at least one hour of work. Coefficients from regressions are available in Table 5 and 6 in the Appendix.

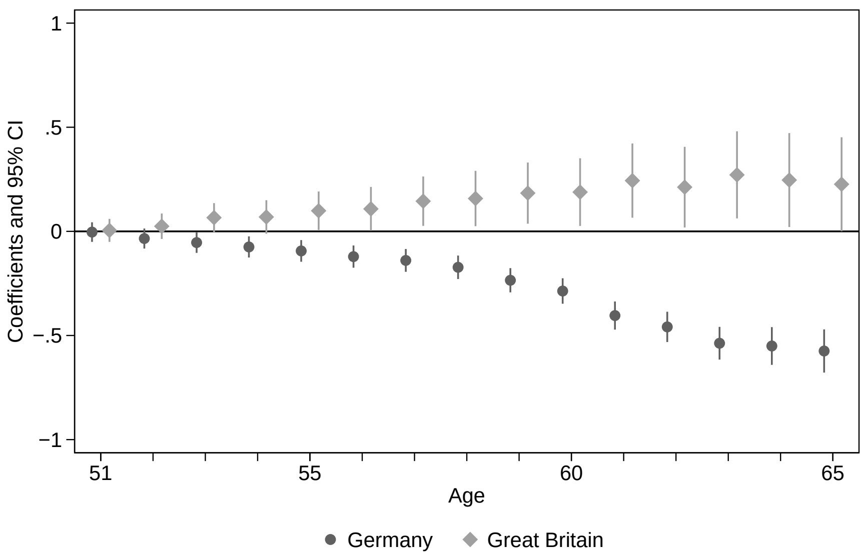
As in the case of labor market status, the reduction in the number of hours worked appears to be more pronounced when workers turn 60. Yet, this is not necessarily the beginning of the process. Coefficients in Great Britain are already significant at the age of 55, whereas for Germany the first significant differences appear two years later. These coefficients are upward boundaries to the differences in average working hours: the inclusion of inactive respondents as workers with zero hours would increase (in absolute values) the coefficients. This proposition follows from the increase in inactivity observed in Figure 1.

Up to this point, we provide a description of retirement patterns, either as changes in status or as a progressive reduction on the number of hours. The analysis now focuses on the task content of jobs held by people within the ages 50 to 65. Figure 3 presents a first approximation to the phenomenon. The figure reports coefficients from a similar Deaton decomposition where

[13] A full list of results can be made available upon request.

the dependent variable is the RTI index.

Figure 3: Deaton decomposition: RTI



Notes: Age coefficients from a Deaton decomposition of RTI. Sample includes wage-employed individuals age 50 to 65. Coefficients are available in Tables 5 and 6 in the Appendix.

Differences across countries are clearly portrayed in Figure 3. In Germany, the average value of RTI index decreases when workers age. This pattern appears to be present in different cohorts, as illustrated in Figure 4 in the Appendix. In Great Britain, by contrast, the evolution of RTI index of jobs in older cohorts presents a clear positive trend. Older workers in Great Britain more often occupy routine intensive positions. Figure 4 suggests that cohorts born after 1950 are driving the result, as the number of observations for these cohorts is larger. The large standard errors for workers aged over 60 years old reflect falling sample sizes, as less people are active in the labor market.

Figure 3 informs on the age at which RTI begins to change. In Germany already at the ages of 54-55 differences are statistically significant, which, *grosso modo*, coincides with the fall in participation rates. In Great Britain, point estimates show increases in RTI from the early 50's; however, standard errors are large and coefficient are not statistically significant at the 1% level.

An analysis of the different elements of RTI helps to understand better the differences across countries. In Tables 5 and 6, we present additional decompositions, where the dependent variables are the individual measures of task content. The coefficients suggest that the last years of workers are quite different across countries. In Germany, workers appear to progressively gravitate towards more non-routine, non-manual jobs, a result that is consistent with Spitz-Oener (2006); whereas in Great Britain, the exact opposite occurred. Workers tended to perform more routine manual tasks, at the expense of other non-routine tasks. These opposing trends in task adoption suggest that British workers suffered downward mobility at later stages of their careers, taking jobs at the lower end of the wage distribution, where jobs present greater manual (routine and non-routine) content. According to this view, workers over 50 in Great Britain experienced the same process described in Lewandowski et al. (2015) for Poland or in Cortes (2016) for prime age men in the United States. A combination of a more stringent EPL, seniority rules and early retirement schemes in effect in Germany might have prevented such polarization of jobs among older workers.

Notice also that the results differ from the descriptive statistics presented in De la Rica and Gortazar (2016), who found that older workers tend to perform more routine tasks than younger ones. Two reasons might explain the contrasting results. First, De la Rica and Gortazar (2016) employ PIAAC data for their calculations, which is subject to shortcomings in terms of representativeness. Moreover, in PIAAC, employees inform directly on the tasks performed.[14] This feature could bias the results if younger employees overemphasize the importance of certain tasks. Secondly, their results combine countries at various stages of development, and with diverse average levels of RTI. It is difficult then to ascertain to what extent results reflect age differences and to what extent is the result due to changes in sample composition. Finally, PIAAC captures better differences in non-routine cognitive and interpersonal content, but it is not well-equipped to recover manual content of jobs.

Independently of differences across countries, the shifts in tasks documented in Figure 3 (and Tables 5 and 6) result from a combination of two mechanisms. In the case of Germany, for instance, it might be that workers in more routine jobs can successfully transition to more non-routine jobs. Alternatively, workers in routine jobs might also decide to retire earlier, possibly as they are made redundant from their job, lowering the average RTI of those who stay. The similar timing of the fall in RTI and changes in the labor market status and the reduction in the number of working hours suggests that there might be a relation between the two. We explore this issue in the next section.

4 Results: labor supply and task content of jobs

Descriptions from the previous section show that countries presented similar patterns of adjustment in hours and employment decisions. Yet, workers in these countries differed in terms of how did they adapt to technological change. In Germany, there seems to be a trend towards more non-routine positions as people age, whereas in Great Britain results run in opposite direction. The fact that in Germany the fall in RTI coincides with the decline in the number of hours appears to give ground to model assumptions; however, insights from the previous sections are limited, as there might be additional confounding factors. A shortcoming of the Deaton decomposition is that it cannot be estimated with additional covariates to control for such characteristics. This could affect the comparison if countries presented different workforce composition. Two factors that could bias the comparison are educational level and industrial structure. If older workers are better educated in Germany, then one could expect that they will be able to obtain non-routine jobs more easily than British peers, and that they will remain longer in the labor market. Industrial structure might determine how prone to routinization jobs were (Autor et al. 2003). In this sense, as services, particularly high skill services, represent a larger share of British economy, one could expect them to be less exposed to technological competition. In this section, we proceed to analyze individual level data controlling for additional worker characteristics.

4.1 Intensive margin

Results of Goos et al. (2014) indicate that on aggregate there was a fall in the routine content of occupations over the period 1992-2009. This fall is reflected both in terms of the number of employees and the number of hours worked. Hence, we can expect a fall in RTI for young

[14] O*NET, by contrast, is validated by occupational experts, a feature that was inherited from the earlier Dictionary of Occupational Titles.

and old cohorts alike. Yet, we hypothesize that given that older workers might be less likely to adapt to new requirements, or they might be considering a reduction in hours as a pathway towards retirement, the fall in the number of hours for these workers should be larger. In order to test this hypothesis, we estimate the following model:

$$hours = \alpha + \beta_1 RTI + \beta_2 (Age \geq a) + \beta_3 RTI * (Age \geq a) + D\gamma' + X\psi' + \epsilon ,$$

where $(Age \geq a)$ represents a dummy variable that takes the value of 1 whenever a worker is older than a cutoff age a. β's are the coefficients of interest. β_1 indicates the relation between RTI content and the number of hours worked for population under the cutoff age; β_2 indicates whether workers older than a worked, on average, less hours than those younger; and β_3 indicates whether workers over a are more sensitive to changes in RTI. D is a set of dummy variables that control for household characteristics, marital status, industry, occupations (ISCO 2 digit codes) and education level. X includes additional characteristics, such as age and its square, years of experience, and a time trend. We also include additional characteristics of the occupation, such as the median wage and the satisfaction of the worker in the job[15]. These last two variables are meant to control for "push" factors: low median wages and low satisfaction with employment might lead to earlier retirement. Moreover, we expect those variables to be related to task content of occupation. All estimations include individual fixed effects to control for unobserved characteristics that might drive both RTI and retirement decisions.

Table 1 displays results from these regressions.[16] Different columns test for the effects of different cutoff ages, where the header indicates the cutoff selected. Results do not provide much support for our initial hypothesis. Older workers in routine occupations appear to work less hours, but not necessarily less than younger workers. In both countries, interaction coefficients are either not statistically significant or show the "wrong" sign. In such cases, older workers would work more hours than younger workers in similarly routine occupations.[17]

The relation between task content and hours is aligned with the results of Goos et al. (2014). Workers in routine intensive jobs tend to work fewer hours. The magnitude of the effect, however, is small. An increase in one standard deviation of RTI, corresponding to moving from an office clerk to a cab driver, is associated with half an hour less of work per week in West Germany and one hour less in Great Britain.

Since models of labor reallocation emphasized the effect of crisis as triggers of job destruction in low productivity matches (Caballero and Hammour 1996, Jaimovich and Siu 2012), it might be that the reduction of hours is only visible during economic crises. We explore this possibility in the right panel of Table 1, we include an additional dummy for whether the country experienced negative real GDP growth in a given year or in the previous year. The additional year aims to capture the period of jobless recoveries. This newly created dummy is interacted with our main variable of interest ($RTI * (Age \geq a)$). The inclusion of additional controls for years of crisis does not seem to affect the results significantly. Given data availability, the crisis variable does not cover the period of the Great Recession. Its inclusion might affect the conclusions substantially.

[15]Definition of satisfaction varies across survey. In BHPS, it is coded from 1 to 7, whereas in Germany from 1 to 10. In order to make results comparable, we convert these scales into dummy variables that take the value of 1 whenever job satisfaction is above the middle of the scales, i.e. 3 in Great Britain, 5 in Germany.

[16]For the sake of brevity, only coefficients of interest and R^2 are reported in Table 1. Full set of results can be made available upon request.

[17]Coefficients on age dummy cannot be interpreted as age effects as the model includes a quadratic term on age as well.

Table 1: Task content and hours worked

	Germany				
	$(a = 50)$	$(a = 55)$	$(a = 60)$	$(a = 50)$	$(a = 60)$
RTI	-0.47**	-0.43**	-0.41**	-0.48**	-0.41**
	(0.19)	(0.19)	(0.19)	(0.20)	(0.01)
$(Age \geq a)$	0.54***	0.04	-2.24***	0.45**	-2.32***
	(0.19)	(0.20)	(0.27)	(0.20)	(0.29)
RTI *$(Age \geq a)$	0.26	0.16	0.23	0.30*	0.32
	(0.18)	(0.23)	(0.29)	(0.18)	(0.32)
RTI *$(Age \geq a)$*Crisis				-0.16	-0.45
				(0.15)	(0.43)
R^2	0.78	0.78	0.78	0.78	0.78
N	90,411	90,411	90,411	90,411	90,411

	Great Britain				
	$(a = 50)$	$(a = 55)$	$(a = 60)$	$(a = 50)$	$(a = 60)$
RTI	-1.09***	-1.10***	-1.07***	-1.00***	-0.96***
	(0.37)	(0.37)	(0.37)	(0.36)	(0.37)
$(Age \geq a)$	0.53**	-1.52***	-2.34***	0.35*	-2.46***
	(0.20)	(0.28)	(0.41)	(0.19)	(0.42)
RTI *$(Age \geq a)$	0.17	0.42*	-0.11	0.15	-0.15
	(0.16)	(0.23)	(0.33)	(0.18)	(0.35)
RTI *$(Age \geq a)$*Crisis				-0.08	0.00
				(0.22)	(0.43)
R^2	0.75	0.75	0.75	0.75	0.75
N	52,920	52,920	52,920	52,920	52,920

Notes: Table shows relation between hours worked and task content of occupations. $(Age \geq a)$ is a binary variable that takes the value of 1 when the respondent is a years old or older. Values of a are defined in the column header. Controls for age and its square, gender, marital status, education level, years of experience, industry and occupations are also included in the regressions. Standard errors clustered at the occupation level, ISCO 88 three digits, showed in parenthesis. *,**,*** denote significance at the 10%, 5% and 1%.

Workers in routine occupations work less hours, independently of their age. The relation, however, is not causal. It might be the case that workers chose to perform routine tasks due to their lower work hours. If this self-selection mechanism is stronger in the case of younger workers than in the case of older, we might observe no differences across the two groups, even though the reasons for working fewer hours differ across them. Both the BHPS and the GSOEP present information that could proxy for individuals' preferences over the number of working hours. In particular, surveys ask whether respondents would like work more or less hours than they currently do.[18] In Table 7, we estimate linear probability models where the dependent variable is not the number of hours, but whether the individual likes to work more or less hours.[19] In none of the models, RTI appears as significant, nor the interactions.

Another concern with our initial specifications is self-selection into working. Particularly, one can only observe the number of hours worked for those who had a job. Since selection is not random, coefficients might be biased. A popular solution to this problem is to use a two-stage Heckman correction model. Compared to alternative models, such as the Tobit, the two-step Heckman model offers greater flexibility in modelling the selection process, as it could be affected by a different set of variables than the main variable (i.e. hours). Within this context, this advantage is significant as some of the variables are only observed for workers, e.g. task content of the job or controls as the mean wage in the occupation. These variables are only kept in the second stage of the estimation. We include two variables as exclusion restrictions: an interaction between marital status and gender, and household size. The rationale behind these variables is that married women might be less likely to work, e.g. due to specialization inside the household or to the availability of a second income.

Table 2 displays coefficients from introducing the Heckman correction into our main specification. The results are consistent with those shown in Table 1 in the case of Great Britain. The relation between hours worked and RTI does not seem to be affected by the age of the workers for this country. However, in the case of Germany the pattern is more complex. Among relatively younger workers (aged 50 to 60), the task content does not appear to be related to the number of hours worked. By contrast, among workers over 60, the relation between hours worked and the routine content of the job is even more negative than for younger workers. Yet, one must be cautious when interpreting these results, as selection into employment after the age of 60 might be more significant than at other age groups.

4.2 Extensive margin

In this section, we study retirement decisions as a discrete choice of the individuals. While this can be analyzed with a standard probit where the dependent variable is whether the individual has retired or not, this approach fails to recognize that retirement is, more often than not, an absorbing state. To take this into consideration, in our model the dependent variable takes the value of zero for all periods before retirement, one when the individual retires and it is missing thereafter.

In principle, several indicators can be used to determine when an individual retires. First, one could analyze whether respondents perceive themselves as retirees. Second, and more objective, we could use whether individuals receive retirement benefits as a proxy for retire-

[18] The wording of the question differs in BHPS and GSOEP. In BHPS, individuals are asked whether they would like to have more or less hours, keeping hourly wages constant. In GSOEP, individuals are asked about their preferred number of hours. By comparing their stated preferences to the actual number of hours worked, it is possible to obtain a measure that is roughly comparable to that from the BHPS.

[19] We estimate this model as two separate linear regressions instead of a multinomial logit to include individual fixed effects.

Table 2: Task content and hours work: Heckman correction

	Germany			Great Britain		
	(a=50)	(a=55)	(a=60)	(a=50)	(a=55)	(a=60)
RTI	-0.50***	-0.43***	-0.37***	-1.30***	-1.29***	-1.24***
	(0.13)	(0.13)	(0.12)	(0.15)	(0.15)	(0.15)
(Age>a)	2.10***	-0.25	-4.54***	1.09***	-1.60***	-3.49***
	(0.20)	(0.24)	(0.28)	(0.22)	(0.26)	(0.31)
RTI *(Age>a)	0.37***	0.30**	-0.49**	0.13	0.14	-0.29
	(0.12)	(0.14)	(0.21)	(0.12)	(0.15)	(0.24)
N	128,753	128,753	128,753	88,519	88,519	88,519

Notes: Table presents models on the number of hours that consider a first stage selection into employment. Specifications control for age and its square, gender, marital status, education level, years of experience, industry and occupations. The selection equation does not include variables related to current position (industry and occupation) and includes an interaction between marital status and gender, and household size as exclusion restrictions. Robust standard errors in parentheses. *,**,*** indicate significance at the 10%, 5% and 1% level.

ment. Given institutional constraints precluding work after retirement, receiving benefits could serve as a measure of retirement. Third, one can consider that people retire when they stop working, which is a less restrictive definition. To be sure, each measure has weaknesses. The first two measures might fail to reflect the variety of retirement paths. Individuals receiving unemployment benefits or disability pensions might not be classified as retirees according to the first two definitions until they receive pensions, which might occur several years after the *de facto* retirement. These definitions then tend to overestimate the working life of individuals. The third option, last year of work, incurs in the opposite mistake, as some unemployment spells might be censored in the data. In a context where older people have difficulties in finding new employment after dismissal (Marmora and Ritter 2015), the bias introduced by this definition is smaller than what might be expected from using alternative indicators. The sample includes only active individuals, i.e. those who worked in at least one survey year between the ages of 50 and 65.

Results are presented in Table 3. In column 1, we introduce our base specification, estimated with the help of a fixed effects model. By looking at variation at the individual level, this specification avoids problems related with the varying time spans across individuals, while it allows including a variety of controls. In columns 2, 3 and 4, we explore heterogeneity effects across age groups. If RTI coefficients are larger among younger groups, one can conclude that task content affects early retirement. Given the limitations of linear fixed effect models, we complement these estimations with two more that are obtained using random effects logit models.[20]. The main independent variable distinguishes these two models. In the first, the RTI is included; while in the second we employ a constant RTI measure, the first RTI we observe for the worker after her 50^{th} birthday. This alternative specification intends to cover cases where workers decide to remain active in the labor market as a result of a promotion, which would usually involve a fall in RTI.

Table 3 suggests that evidence supporting the hypothesis of workers moving earlier to retirement is weak. While most coefficients have the “right” sign: a higher value of RTI is positively related to retiring; standard errors are quite large. Effect appears to be smaller in the case of fixed effects models, which reflects the fact that identification comes from within

[20]The use of fixed effect logit is discouraged as censored observations, that is individuals who do not retire, are excluded from the analysis.

Table 3: Participation decision and task content

	Fixed effects				Panel Logit	
	Base	Age 50-54	Age 55-59	Age 60-65	RTI changes	RTI const.
Germany	0.002	0.001	0.001	0.009	0.020	0.026*
	(0.002)	(0.002)	(0.004)	(0.008)	(0.013)	(0.013)
Great Britain	0.001	0.002	0.002	0.010	0.041**	0.029
	(0.002)	(0.002)	(0.004)	(0.009)	(0.021)	(0.020)

Notes: Estimates of the relation between RTI and retirement decisions. Estimations in columns 1 to 4 obtained with linear probability models and fixed effects, whereas columns 5 and 6 presents results with Random effect models. Individual level cluster standard errors presented in parentheses. *,**,*** indicate significance at the 10%, 5% and 1% level.

individual changes, that is only from those who retire. Workers who either leave the panel while still working or remain active over the age of 65 do not contribute to the identification. The use of logit coupled with appropriate controls for the span observed, leads to significant results. In both Germany and Great Britain, we can reject the null that the coefficient is zero against a one-sided alternative that it is larger.

5 Discussion and conclusions

The increase in the retirement age and a promotion of higher employment rates among older people are two of the measures proposed to prevent the collapse of the pension system in ageing societies. These proposals, however, might be hard to implement if the demand for labor moves away from the tasks performed by older workers, i.e. routine tasks (see Autor and Dorn 2009). Models of technological progress such as (e.g. Jaimovich and Siu 2012, Carrillo-Tudela and Visschers 2013) would lend us to expect greater job destruction in routine jobs, as all non-routine jobs benefit from a growing productivity trend. Workers displaced from routine jobs would then go through a costly process of re-skilling before obtaining a new position, or remain inactive. At the same time, new technologies, by reducing the share of physically demanding and repetitive tasks might create an environment that promotes labour market attachment among workers close to the retirement age.

The results of our empirical analysis are mixed. Descriptive statistics show that at the age of 55, when workers could employ early retirement schemes, there is a fall in the percentage employed and in number of hours worked, even after controlling for cohort and year effects. Moreover, we observed that in Germany the importance of routine content falls with age, which appears to be consistent with older workers leaving earlier routine intensive jobs. In Great Britain, however, results were closer to those obtain in Central and Eastern Europe by Autor and Dorn (2009): workers close to the retirement age are, on average, more likely to perform routine tasks.[21]

Yet, the fact that workers over the age of 50 reduced their hours and their task content might be related to overall trends in the economy (as documented in Goos et al. 2014) and not with age *per se*. We test whether the reduction in the number of hours among workers in routine occupations was stronger among older workers. Results from several specifications indicate that in general workers in routine occupations worked around an hour less per week than workers in non-routine occupations. However, and except for the subgroup of workers over 60 in Germany, the difference in the number of hours worked in older and younger workers is

[21] Similar results were reported for transition countries in Lewandowski et al. (2015).

comparable. If anything, after we control for selection, it appears that workers aged 50 to 60 year old are less sensitive to changes in the demand for tasks than their younger counterparts.

The relation between employment decisions and previous task content also appears to be rather weak. Point estimates suggest that workers from routine occupations tend to retire somehow sooner; however, the effect appears to be economically small and in many cases it is not statistically significant. The lack of a stronger effect is surprising and stands in stark contrast with our expectations from human capital considerations. Workers in routine occupations might retire sooner, but not in the proportions required to make retirement an important component of the change in the supply of tasks.

The task content might affect decisions to retire through other channels that are not related to the demand for labour. Previous research also emphasizes the role of working conditions on different labor market outcomes, from job satisfaction to absenteeism Melamed et al. (1995), Kass et al. (2001) and early retirement decisions (Dal Bianco et al. 2015). These works focused on monotony of the job. A job is defined as objectively monotonous when it involves performing short and repetitive tasks in a defined schedule and when workers lack autonomy to make decisions.[22] Similarities between objectively monotonous jobs and routine jobs are evident, even though there is no perfect equivalence. Loukidou et al. (2009), for example, includes truck drivers as monotonous jobs, whereas it would still be categorize as non-routine according to Autor et al. (2003) typology. If monotony is a determinant of employment decisions, then the estimates of task content from our main specifications are biased, as no additional controls for monotony were included. In particular, the bias means that point estimates overstate the negative effects of exposure to technological change. Controlling for this job characteristic could even result in routine occupations being associated with longer employment spells, *ceteris paribus*, and longer working hours. Unfortunately, the GSOEP and the BHPS only present a measure of satisfaction with employment, which captures too many features of the job to be a good proxy for monotony at work.[23]

Even if concerns over other characteristics of occupations could be addressed in the data, our estimates would still fail to indicate causal effects of technological progress on labor supply decisions. While the fact that task content was obtained from US data assures certain level of exogeneity, it does not uniquely identify the effect of task content. Other factors, such as offshoring of tasks discussed in Blinder (2009) correlate well with the RTI and can potentially stand behind fall in employment.

Three possible avenues could be followed to build on these results; each of them corresponds to valid, interesting research questions. First, one could analyze differences across industries in order to observe if jobs in industries that faced greater competition from China were more likely to retire sooner. In this way, one could isolate the effects of offshoring and routinization. A failure to find any significant relation would make our results more trustworthy. Alternatively, one could construct commuting zones, such as those presented in Autor and Dorn (2013), and analyze the relation between task content and retirement decisions within them, using macro level data. Finally, due to the comparative nature of the analysis, we omitted the period of

[22] Monotony at work is likely a combination of objective and subjective factors, as workers might perceive differently the same job description or may have different levels of tolerance to boredom. Since the analysis of subjective boredom requires specialized data, such as collected in Harju et al. (2014), we restrict comparisons to objective measures of boredom.

[23] Using the 2005 edition of the ISSP survey, we provide a short view on the relation between task content and other job characteristics. While no question in ISSP specifically addresses whether a job is monotonous, workers were asked whether they considered their jobs interesting, which if the sale is reversed, might be a proxy for monotony. Similarly, workers also provided information on whether jobs are performed on dangerous conditions. We plot the relation between monotony and RTI and between hazard and RTI in Figure 5

the Great Recession for which British data were not comparable. Given the higher levels of job destruction in those years, it might be interesting to repeat the analysis for that subperiod. If such analysis fails to find any significant relation between RTI and retirement decisions, then it would provide additional confirmation of our study. If on the contrary, it reveals a relation, it might be suggestive of the size of crisis needed to trigger early retirement.

Policy implications of our research should be taken with a grain of salt. Delivering active labor market policies to retrain workers close to retirement in the skills required in non-routine jobs might not be sufficient to increase employment rate among older workers, nor to delay early retirement.

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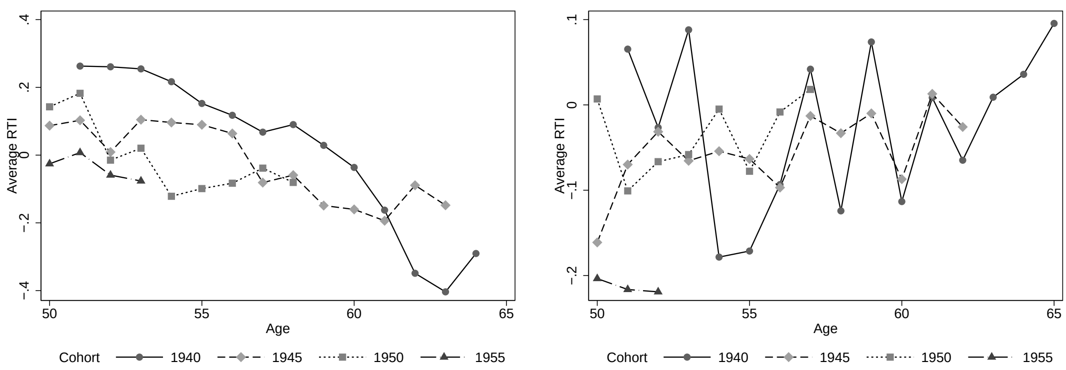
6 Appendix: additional tables

Table 4: Task variables in O*NET (following Acemoglu and Autor (2011))

	Non-routine	Routine
Cognitive	Analyzing data/information (A) Thinking creatively (A) Interpreting information for others (A)	Importance of repeating the same tasks (C) Importance of being exact or accurate (C) Structured v. Unstructured work (reverse) (C)
Interpersonal	Establishing and maintaining personal relationship (A)s Guiding, directing and motivating subordinates (A) Coaching/developing others (A)	
Manual	Operating vehicles, mechanized devices, or equipment (A) Spend time using hands to handle, control or feel objects, tools or controls (C) Manual dexterity (Ab) Spatial orientation (Ab)	Pace determined by speed of equipment (C) Controlling machines and processes (A) Spend time making repetitive motions (C)

Notes: This table replicates information contained in the Appendix of Acemoglu and Autor (2011). Letters in parentheses in parentheses indicate from which part of the O*NET survey variables are recovered. (A) corresponds to work activities, (Ab) to worker abilities and (C) to Work context.

Figure 4: Age and RTI patterns across cohorts



West Germany

Great Britain

Notes: Figures shows evolution of the task content of jobs for several cohorts as they aged.

Table 5: Deaton decomposition of RTI and Hours: Germany

	RTI	NR-cog	NR. Pers.	NR. Man.	R. Cog.	R. Man.	Hours
Age							
51	-0.01	0.00	0.01	-0.01	-0.02	-0.02	-0.07
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.34)
52	-0.09	0.04	0.05*	-0.02	-0.05*	-0.06**	-0.21
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.35)
53	-0.14*	0.06*	0.07**	-0.01	-0.08***	-0.09***	-0.14
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.36)
54	-0.23***	0.09***	0.11***	-0.03	-0.13***	-0.12***	0.08
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.37)
55	-0.28***	0.10***	0.13***	-0.05*	-0.16***	-0.16***	0.21
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.38)
56	-0.39***	0.15***	0.16***	-0.07**	-0.20***	-0.19***	-0.28
	(0.09)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.39)
57	-0.43***	0.15***	0.17***	-0.08***	-0.23***	-0.21***	-0.64
	(0.09)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.40)
58	-0.55***	0.19***	0.21***	-0.12***	-0.29***	-0.25***	-0.69*
	(0.09)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.41)
59	-0.72***	0.26***	0.27***	-0.15***	-0.34***	-0.31***	-1.00**
	(0.09)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.43)
60	-0.90***	0.32***	0.33***	-0.20***	-0.43***	-0.39***	-1.03**
	(0.10)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.45)
61	-1.23***	0.43***	0.42***	-0.30***	-0.49***	-0.41***	-1.10**
	(0.11)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.50)
62	-1.41***	0.49***	0.49***	-0.32***	-0.56***	-0.45***	-1.89***
	(0.11)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.55)
63	-1.70***	0.58***	0.56***	-0.43***	-0.63***	-0.50***	-3.05***
	(0.12)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.60)
64	-1.76***	0.61***	0.56***	-0.47***	-0.65***	-0.53***	-5.35***
	(0.14)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.71)
65	-1.87***	0.64***	0.60***	-0.50***	-0.75***	-0.62***	-9.87***
	(0.16)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.84)
N	32,074	32,074	32,074	32,074	32,074	32,074	26,732
R^2	0.03	0.03	0.04	0.02	0.05	0.04	0.02

Notes: Table presents age coefficients from a Deaton decomposition of the average RTI at each cohort-year cell. Other controls include cohort and year specific fixed effects. Details on the Deaton decomposition in the main text. Standard errors are presented in parentheses. *,**,*** indicate significance at the 10 %, 5% and 1% level.

Table 6: Deaton decomposition of RTI and Hours: Great Britain

	RTI	NR-cog	NR. Pers.	NR. Man.	R. Cog.	R. Man.	Hours
Age							
51	-0.04	0.02	0.02	0.00	0.00	0.01	-0.11
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.36)
52	-0.03	0.01	0.04	0.03	0.00	0.01	-0.07
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.37)
53	0.05	-0.02	-0.01	0.02	0.03	0.03	-0.20
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.38)
54	0.03	-0.02	0.00	0.02	0.01	0.01	-0.21
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.39)
55	0.05	-0.05	-0.02	0.01	0.03	0.05*	-0.69*
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.40)
56	0.06	-0.04	-0.03	0.00	0.00	0.03	-1.08***
	(0.08)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.41)
57	0.13	-0.09***	-0.06**	0.00	0.03	0.06*	-0.81*
	(0.09)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.42)
58	0.09	-0.08**	-0.07**	-0.02	0.04	0.07**	-1.05**
	(0.09)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.44)
59	0.16*	-0.11***	-0.08**	0.01	0.05	0.09**	-1.71***
	(0.09)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.45)
60	0.09	-0.13***	-0.09***	-0.04	0.05	0.14***	-2.55***
	(0.10)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.49)
61	0.19*	-0.17***	-0.14***	-0.00	0.05	0.15***	-2.31***
	(0.11)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.53)
62	0.02	-0.13***	-0.11***	-0.08*	0.02	0.14***	-2.23***
	(0.11)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.57)
63	0.11	-0.18***	-0.15***	-0.07	0.05	0.20***	-3.46***
	(0.12)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.60)
64	-0.01	-0.12***	-0.12**	-0.12**	0.08	0.21***	-2.97***
	(0.13)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.67)
65	-0.17	-0.06	-0.08	-0.19***	-0.05	0.07	-8.84***
	(0.16)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.84)
N	27,688	27,688	27,688	27,688	27,688	27,688	22,172
R^2	0.01	0.01	0.01	0.01	0.01	0.01	0.02

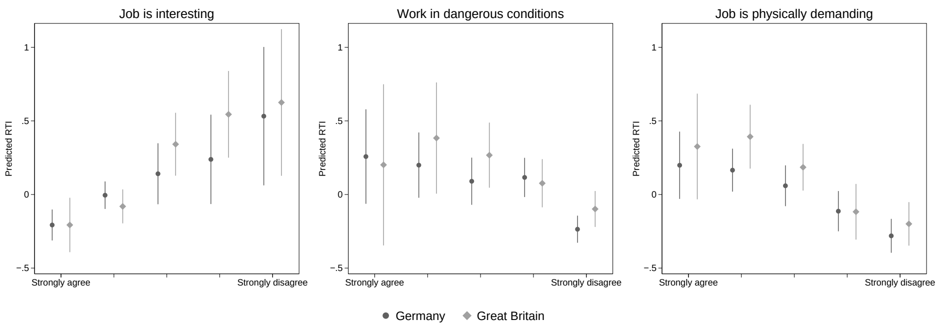
Notes: Table presents age coefficients from a Deaton decomposition of the average RTI at each cohort-year cell. Other controls include cohort and year specific fixed effects. Details on the Deaton decomposition in the main text. Standard errors are presented in parentheses. *,**,*** indicate significance at the 10 %, 5% and 1% level.

Table 7: Desired hours of work and task content

	Germany		Great Britain	
	Less	More	Less	More
RTI	-0.02**	0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.00)
(Age>50)	0.01	0.00	0.02*	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
RTI *(Age>50)	-0.01***	-0.00	-0.00	-0.01**
	(0.01)	(0.00)	(0.01)	(0.00)
R^2	0.40	0.41	0.43	0.30
N	93,869	93,869	54,029	54,029

Notes: Table presents linear probability models where the dependent variable indicates whether individuals want to work less or more hours than currently. Standard errors clustered at the occupation (ISCO three digits) level presented in parentheses. Controls for age and its square, gender, marital status, education level, years of experience, industry and occupations are also included in the regressions. *,**,*** indicate significance at the 10%, 5% and 1% level.

Figure 5: Task content and other job characteristics



Notes: Figures shows the relation between people's perception of a job and its task content. It presents predicted values from a regression where the dependent variable is RTI and that also includes controls for age, gender, marital status and firm ownership status.