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#629

Imprint

Ruhr Economic Papers

Published by

Ruhr-Universität Bochum (RUB), Department of Economics
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences
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Editors

Editorial Office

Ruhr Economic Papers #629

Responsible Editor: Volker Clausen

ISSN 1864-4872 (online) – ISBN 978-3-86788-731-1

Ruhr Economic Papers #629

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Bibliografische Informationen der Deutschen Nationalbibliothek

Die Deutsche Bibliothek verzeichnet diese Publikation in der deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über: *http://dnb.d-nb.de* abrufbar.

http://dx.doi.org/10.4419/86788731
ISSN 1864-4872 (online)
ISBN 978-3-86788-731-1

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Abstract

This paper estimates the effects of cohort size on wages, employment and work time for workers in Germany. The empirical findings suggest that male workers with medium and high degrees of occupational specialization who were born at the peak of the baby boom earn at least 5.3% lower wages than comparable workers born during the subsequent baby bust. Highly specialized females born into large cohorts earn 2.5% lower wages than their counterparts from small cohorts. Employment effects are detected only for highly specialized males. The effects on work time are mixed and invariably larger when actual work time is considered rather than contractual work time. It is argued that the restrictive labor market institutions in place are key in shaping the response pattern across the different economic outcomes.

JEL Classification: J21, J31, J11

Keywords: Population aging; cohort size; labor market effects; labor market institutions

August 2016

1 Sarah Okoampah, RGS Econ and UDE. *– I am grateful for valuable suggestions by Mathias Sinning, Klaus Zimmermann, participants of the RES 2014 Postgraduate Presentation Meetings, the IZA Summer School in Labor Economics 2013, annual meetings of the ESPE 2013, the EALE 2012 and the SOEP conference 2012. Financial support by the Ruhr Graduate School in Economics is gratefully acknowledged.* *– All correspondence to: Sarah Okoampah, University of Duisburg-Essen, Chair of Health Economics, Weststadttürme, Berliner Platz 6-8, 45127 Essen, Germany, e-mail: sarah.okoampah@uni-due.de.*

1 Introduction

Most regions of the planet experience rapidly rising numbers of elderly both in absolute and relative terms (United Nations, 2013a). Various studies investigate the consequences of this development for labor markets (e.g., Börsch-Supan, 2003, 2008; Feyrer, 2007, 2011) and social security systems (e.g., Börsch-Supan, 2000, 2005; Hirazawa et al., 2010). Several papers focus on shifts in the age structure of the workforce and estimate effects of relative cohort size on economic outcomes such as wages (e.g., Macunovich, 1999; Card and Lemieux, 2001; Araki et al., 2013) and employment (e.g., Korenman and Neumark, 2000; Macunovich, 2012). The rationale behind this approach emanates from the theoretical concepts of factor substitutability and competitive pricing: To the degree workers of different age are imperfect substitutes on the labor market, the number of rivals individuals face in job competition is reflected by the number of individuals of similar age. Because the degree of competition influences outcomes, cohort sizes are expected to have a negative impact on economic success.

This paper analyzes wage, employment and work time responses to shifts in the relative labor supplies of workers of different age. The empirical analysis is based on individual-level data and age-specific population numbers for Germany. The results are interpreted in the context of discussing the response pattern across different labor market outcomes and occupation types, first, because the effects of cohort sizes on different outcomes are likely dependent, and second, because Germany's restrictive labor market institutions may shape this pattern in a certain way by imposing rigidities upon some economic outcomes and some types of workers but not upon others.

The paper contributes to the literature in several respects. First, the German labor market is examined. The existing evidence on Germany lacks comprehensive insights on the topic to date because relatively few studies estimate cohort size effects on labor market outcomes using German data. While some papers provide evidence for employment effects (Zimmermann, 1991; Schmidt, 1993; Jimeno and Rodriguez-Palenzuela, 2002; Fertig and Schmidt, 2004; Biagi and Lucifora, 2008; Garloff et al., 2013), only one study (to the best of my knowledge) examines cohort size effects on wages using cross-country data including Germany (Brunello, 2010). Although wages and employment may be rigid as a result of restrictive labor market institutions, only Garloff et al. (2013) investigate work time as an alternative response variable. This lack of evidence for the German case is surprising, firstly, because Germany has the largest labor force in the European Union (World Bank, 2015), and secondly, because demographic change is particularly marked in Germany. In 2013, the German population happened to be the second oldest in the world in terms of median age (45.5), closely behind the Japanese population (45.9; United Nations, 2013b).

A second contribution of this study is the usage of a measure of actual job content rather than educational attainment to account for different degrees of worker substitutability. Plausibly, the substitutability of workers within and across birth cohorts determines how strong economic outcomes respond to cohort size changes. To account for the expected effect heterogeneity, former studies proxied worker substitutability by educational level. As will be argued below, the educational level is a poor indicator of worker substitutability for a range of occupations, such as emergency physicians or low-educated workers in experience-based positions. In the present study, worker substitutability is proxied by the physical demandingness of occupations measured on a ten-point scale, an indicator that is arguably superior to the educational level.

Finally, the present study generates empirical evidence on the interplay of the effects on different labor market outcomes in the presence of restrictive labor market institutions. For instance, the dismissal of a worker may be difficult under dismissal protection legislation, in which case an employer might instead lower the worker's wage. On the other hand, collective bargaining agreements may impede wage and work time adaptions, which incentivizes employers to adapt employment instead. Hence, rigidities in one outcome may be responsible for a relatively strong response in another outcome due to a rerouting of the effect. In contrast to previous studies, which mostly focus on a single economic outcome, the approach chosen here accounts for institution-induced ridigities in outcomes and the possibility of diverted effects across outcomes.

The empirical results reveal a robust response pattern across the different labor market outcomes. Large cohort sizes are found to depress economic success in terms of wages for male and female workers with medium and high degrees of occupational specialization. Specifically, a medium (highly) specialized man born at the peak of the baby boom earns on average 5.8% (5.3%) lower wages than a comparable man born during the subsequent baby bust. Highly specialized females born into large cohorts earn 2.5% lower wages than their counterparts from small cohorts. In addition, the employment probabilities of highly specialized males born at peak fertility are 0.3 percentage points lower than those of comparable workers born into later-born, small cohorts. For males with a medium degree of occupational specialization, weekly work time rises in response to an increase in cohort size, while it decreases for highly specialized males and females. The estimated effects on actual work times are stronger than those on contractual work times.

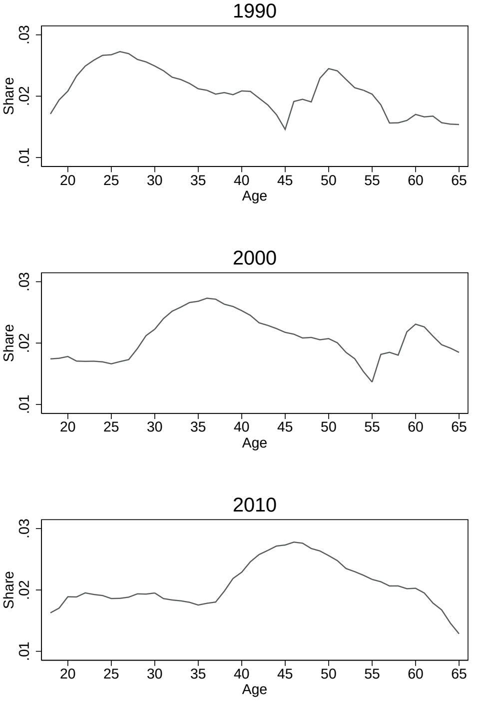
These results are broadly in line with the theoretical considerations. Germany's restrictive dismissal protection legislation covering all occupational specialization groups equally (while excepting workers in small establishments) lowers the probability of employment adaptations in general, which may explain why medium and highly specialized males and females respond in terms of wages and work times but only highly specialized males are slightly affected in terms of employment. The positive cohort size effect on work time measured for medium specialized males may result from an increased pressure to succeed on the individual worker when faced with intensified competition or from a worsening of working conditions enforced by employers as a reaction to increased labor supply. In contrast, the negative effects on work time for highly specialized males and females may indicate that in this group increased labor supply leads to a relief of the individual worker because a given amount of work is allocated among a larger number of workers.

The paper is organized as follows. Section 2 briefly illustrates the demographic trends in the German workforce and infers expectations regarding its effects on labor market outcomes. Section 3 details the empirical identification strategy. Section 4 describes the data. The empirical findings are presented in Section 5. Section 6 concludes.

2 Workforce Aging and Competitive Labor Market Outcomes

Over the past century, the German population was subject to substantial demographic transformation resulting from a permanent decline in fertility and a steady growth of life expectancy. The changes, which entail a rapid aging of the population, are ongoing and will continue in the future. The German population share of 20 to 65 year-olds is predicted to decline from 61% in 2008 to 50% in 2060 (Federal Statistical Office, 2009), which indicates that by 2060 an average worker will have to provide for herself as well as for at least one non-working person. However, the labor force population is not only shrinking relatively to the rest, it also ages in itself. Figure 1 illustrates the relative labor force shares by age group over time and reveals considerable shifts in the age structure of the workforce with the labor supply of younger workers declining relatively to the supply of older workers. In particular, high shares of people in their 20s observed in 1990 shift to people in their 30s in 2000, and finally to people in their 40s in 2010.

Figure 1: Labor Force Shares by Age over Time



Population by age as share of working-age population (18-65 year-olds) 1990, 2000 and 2010. Own calculations based on population numbers from the Federal Statistical Office.

How do wages, employment and working time respond to these shifts? The size of a cohort may influence individuals' labor market outcomes through various channels as it ages. School outcomes, educational track, occupational choice and further training may be subject to competition among individuals of similar age, all of which may affect later-life economic outcomes, before workers in the same occupational tracks compete for the same jobs on the labor market. In particular, the larger a cohort and the more restricted the educational capacities for popular professions, the more individuals will be forced into another than their desired occupation, which might decrease the quality of occupational matches and in turn affect later-life outcomes. At the same time, the quality within popular occupations should rise, since only the best matches prevail.[1] Regarding competition for jobs on the labor market, the size of a cohort may affect outcomes because an increase in labor supply will either lower equilibrium wages, increase unemployment, or both.

Both the direct competition effects and the indirect mechanisms via education and occupational sorting establish a theoretical impact of cohort size-related competition on economic outcomes and are therefore arguably part of the impact this study aims to measure. Besides competition, networking may play a role because a large cohort size may foster the formation and size of social networks. Networks may affect economic outcomes e.g. by enhancing information sharing during education or because jobs are found through friends rather than by undergoing regular application procedures. The literature suggests mixed network effects on economic success (e.g., Beaman, 2012; Anderberg and Andersson, 2007). Social networks may therefore enforce or counteract the negative cohort size effect on economic success induced by competition.

As for wages and employment, the expected cohort size effect on work time is ambiguous. High competition levels may incentivize workers to invest more effort by working more hours. In addition, it strengthens employers' bargaining positions, which may lead to an increase in working hours. On the other hand, in a situation with high labor supply employers may prefer to allocate a fix amount of work among more employees, possibly because a reduction in total work time per worker increases individual productivity per hour or a more diverse pool of skills is created and the potential for innovative ideas is enhanced. Furthermore, in large cohorts more workers may get actively involved in unions and hereby strengthen the bargaining power of unions which indicates a negative effect on work time.

The strength of the measured cohort size effect will not only depend on the competition-sensitivity of individual outcomes and variations in the propensity to formate networks but also on the potential of the utilized cohort size measure to reflect the number of relevant competitors. Age cohort sizes reflect the competitors well when workers are easily substitutable within but not between age cohorts. This would be the case in a situation where workers pass through different stages throughout their working careers (labor market entry, promotions) at which they compete for jobs mainly with individuals of similar experience levels (Welch, 1979). Employers on the German labor market tend to rely relatively strongly on signals in

[1] Fertig et al. (2009), basing their study on SOEP data and actual population numbers, find that an increase in the relative cohort size of 1 percentage point is associated with a reduction in the probability of receiving a high schooling degree of at least 1.5 percentage points. In the present study, the sample utilized in the data description (Section 4) exhibits a correlation between the number of live births in the birth year and occupational prestige (magnitude-prestige-scale), which is negative and significant at 1%.

terms of vocational and diploma degrees which underlines the importance of career phases in the context of the present study (Bol and van de Werfhorst, 2011; Spence, 1973). In addition, changing job content within occupations over time may reduce the substitutability between age cohorts even further.[2]

Probably most occupations are characterized by career phases and changing job content (Biemann et al., 2012), which indicates that the size of a cohort indeed reflects the number of relevant competitors. However, these factors are presumably of lesser relevance if the ability to execute job tasks is rather independent of age. This might be the case for a range of low-skilled occupations that can be carried out without experience-based knowledge.[3] Also, cohort size does not reflect competition levels well when workers are not even replaceable by individuals of similar age because their job duties require deep, position-specific knowledge. Autor and Dorn (2013) argue that the creative, problem-solving, and coordination tasks performed by highly educated workers such as professionals and managers can not as easily be automated as the routine, codifiable job tasks executed by many lower educated workers. In the most extreme, less specialized workers compete with individuals from all age groups, while highly specialized workers compete with nobody. If it is true that cohort sizes reflect the number of relevant competitors best for medium degrees of occupational specialization, the measured cohort size effect is likely to be strongest for this group.

The degree of substitutability between workers also depends on market flexibility. The German labor market is characterized by a rather restrictive employment protection legislation[4] as well as a system of unionized wage and work time bargaining.[5] Dismissal protection, on the one hand, lowers the probability of employment

[2]Spitz-Oener (2006) shows that the complexity of skills within occupations rose since 1979 and that the changes in skill requirements have been most pronounced in rapidly computerizing occupations.

[3]Low-skilled occupations often exhibit physically demanding job duties which indicates a negative relationship between age and the ability to execute job tasks because work-related health impairments likely accumulate over time and human physical capacity declines naturally with increasing age. Giesecke and Okoampah (2014) discuss occupational differences in the labor market behavior of older workers in detail and conclude that among 55–65 year-olds non-manual workers have a 20% lower risk of exiting the labor market than manual workers. Occupational differences in employment probabilities arising from a limited ability to execute physically demanding tasks are presumably less prevalent among younger age groups. Therefore, since the present analysis focuses on individuals aged 26–55, the argument that high physical job demands reduce the substitutability of workers across age cohorts might be negligible.

[4]According to a comparison of 34 OECD countries regarding the OECD Indicators of Employment Protection, which measure the protection of permanent workers against dismissal, Germany is ranked 4th in terms of individual dismissal and shares rank 5 with Hungary and Switzerland in terms of collective dismissal. After summarizing the two indicators, Germany ranks 1st (OECD, 2013).

[5]The share of unionized employees amounted to 30% in 1985, to 27% in 1993 and declined to

responses and suggests wages and work times to react instead. Collective bargaining agreements, on the other hand, cause rigidities in wages and work times promoting employment responses. Dismissal protection covers all dependent employees in establishments with at least a certain number of full-time equivalent employees equally.[6] In contrast, collective labor agreements are most likely more effective for less specialized workers, firstly, because they are more often organized in unions, and secondly, because universally binding collective agreements cover mostly physically demanding occupations.[7] Fitzenberger and Kohn (2005) show that strong unions are associated with a lower wage level as well as a compression of the lower part of the wage distribution. According to Franz and Pfeiffer (2006), German firms regard labor union contracts and implicit contracts as important reasons for the wage rigidity of the less skilled, while considering specific human capital and negative signals for new hires as responsible for wage stickiness of the highly skilled.

As soon as having chosen an occupation and entered the labor market, it is plausible that individuals compete for jobs mostly with individuals in the same occupational track, which indicates that the number of relevant competitors is not given by the overall size of an age cohort but rather by the number of individuals of similar age in the same occupational track, i.e. the occupation-cohort size. All above-mentioned arguments should therefore be thought of to apply within occupational tracks.

In summary, cohort size effects are expected to be strongest for medium specialization degrees because the size of the own age cohort should reflect the number of relevant competitors of this group best. Medium and highly specialized occupations can be expected to respond in terms of wages and work times rather than employment due to dismissal protection, while employment effects may be rerouted provoking accordingly higher responses in the other outcomes. In comparison, less specialized workers tend to have more rigid wages and work times due to collective agreements, which establishes a higher pressure on employment to respond. In such

20% in 2003 (Fitzenberger et al., 2011).

[6]The exemption threshold from dismissal protection was lifted from five to ten full-time equivalent employees in 1996, which was returned to five employees in 1999. Bauer et al. (2007) do not find effects of these law changes on employment dynamics. In 2004, the threshold was lifted again to its current value of ten employees.

[7]The Federal Ministry of Labour and Social Affairs (2013) declared 506 collective agreements as universally binding (July 1, 2013), i.e. applicable even if neither the employee nor the employer belongs to the bargaining parties. Less than 1.5% of these agreements cover occupations in science and journalism. The remaining agreements refer to occupations in agriculture and forestry, cement and lime/ceramics, mining, metal and electrical trades, wood craft, leather and footwear, textile and clothing, food and beverage, construction, trade, transport, hotels and restaurants, cleansing and body care, and other public and private services (care sector, security services).

a situation, dismissal protection might be circumvented by employment adaptations via hiring or non-hiring at initial labor market entries in the first place. Finally, competition intensity should be better reflected by occupation-cohort sizes rather than by overall cohort sizes.

3 Estimation Strategy and Identification

To study the response of individual economic success to changes in the cohort size, individual economic outcomes are assumed to be a function of the population of similar age in the same occupational track, which is used as an approximation of an individual's number of competitors for job positions. Accordingly, the regression equation is formulated as follows:

$$Y = \beta_0 + \beta_1 \mathrm{OCS} + \mathbf{X}'\boldsymbol{\beta_2} + \varepsilon \,, \tag{1}$$

where Y denotes the economic outcome, i.e. wage, employment status, or working hours, respectively. $\mathbf{X}$ represents a vector of covariates, such as education and labor market experience, which are likely to affect economic outcomes. ε is an error term for which $E(\varepsilon) = 0$ is assumed. OCS denotes the population number in an individual's occupation-age cell, the occupation-cohort size, which proxies the number of relevant competitors. Its coefficient β_1 reflects the effect of competition in the labor market on economic outcomes. This is the parameter of interest which this study aims to identify.

Equation (1) gives reason for an endogeneity concern. If workers migrate to locations with comparably favorable expected outcomes, economic outcomes influence the occupation-cohort size at different locations rather than the other way around. The mechanism at work is one of demand and supply: If, on the one hand, labor supply rises due to an increase in the occupation-cohort size, this depresses economic outcomes (which can be thought of as the price for labor) and raises labor demand. If, on the other hand, demand for labor rises (for whatever reasons), expected labor outcomes become more favorable, and in turn attract economic migration which increases the occupation-cohort size (reverse causality). Hence, OCS and Y are simultaneously determined by the movement of labor supply and demand into an equilibrium.

If internal migration is sizeable, this simultaneity is potentially confounding an OLS estimate of β_1. According to data from the Federal Statistical Office (2004, 2014), a yearly average of 1.1 million moves across Germany's internal borders was observed between 1991 and 2012 with a spike of close to 1.2 million moves in 2001.

These numbers are equivalent to a situation with about 1.4% of all German residents moving across federal state borders once a year, a number which may matter for the validity of an OLS estimate of β_1. Figure A1 illustrates the total number of moves by year, while Figure A2 reveals considerable state and time variation in the net influx rates. Apparently, some federal states are more attractive destinations than others and attractiveness, at least of some states, changes over time. These migration patterns are possibly determined by regional and temporal variation in expected economic outcomes.

To address the potential bias caused by internal migration empirically, Equation (1) is estimated employing 2SLS regressions.[8] Overall cohort size and educational capacities should be strong predictors of the number of individuals of similar age in the same occupation.[9] I instrument OCS with proxies of both measures, namely, the number live births in the birth year as well as the nationwide share of workers in the own occupation at age 15. The original number of children born in the birth year should be strongly correlated with overall age cohort size throughout the life cycle. Current overall occupation shares reflect past educational capacities, which I assume to be correlated with current educational capacities.[10] Both of these measures capture competition intensity in the occupational sorting process: Given fixed educational capacities, a larger cohort size intensifies competition. Given fixed cohort sizes, tightening educational capacities intensifies competition as well. I argue that both these variables are exogenous to individuals in the occupational sorting process but relevant to the final realization of occupation-cohort sizes. I assume that their influence via OCS is their only link to later-life economic outcomes. Both variables are determined long before later-life individual labor market outcomes are realized, eliminating the reverse causality concern.

Finally, the age-period-cohort identification problem needs to be addressed. In order to identify the effect of occupation-cohort size on economic outcomes β_1, age and time effects have to be controlled for to eliminate e.g. age-specific productivity differences and business cycle effects. Methods to effectively isolate cohort effects from age and period effects are a frequently debated topic in cohort analyses (e.g.

[8] In the empirical analysis, regressions are estimated applying the Stata command `ivreg2` (Baum et al., 2010).

[9] Section 5.1 below presents correlations of indicators for overall cohort size and educational capacities with the realized degree of occupational specialization. The results suggest that educational capacities are more important for occupational sorting than overall cohort size.

[10] Besides, individual occupational choice is influenced by many further factors including personal talents, preferences regarding e.g. risk (Grazier and Sloane, 2008) and intended effort (Demiralp, 2011), individual knowledge of occupational task content (Bonin et al., 2007; Saniter and Siedler, 2014), social networks and peer groups (Bentolila et al., 2010; Drost, 2002) as well as parental occupation and wealth (Nicolaou and Shane, 2010; Mookherjee and Ray, 2010).

Fukuda, 2006; Luo, 2013), as the three variables are connected in a perfectly multicollinear relationship (birth year + age = period). The strategy chosen here to address this issue is to avoid an overlap of the intervals of age, period, and cohort (following Kaushal and Kaestner, 2013). I define age fixed effects to comprise three consecutive age cohorts (26-28, 29-31, ... , 50-52, 53-55) and year fixed effects to vary by year. The measure for cohort size OCS is constructed to additionally vary by occupation and federal state.

As the effect of cohort size likely depends on the substitutability of workers within and between age cohorts (see Section 2), I estimate Equation (1) separately for three degrees of professional specialization. Furthermore, three different specifications are defined. In the baseline specification, vector $\mathbf{X}$ solely comprises age, year, occupation and region fixed effects. Occupation (region) fixed effects are included to isolate all constant occupation-specific (region-specific) differences in the outcome variables. Additional specifications are defined by gradually adding further control variables.

4 Data and Descriptive Analysis

4.1 Data Sources and Sample Restrictions

The empirical analysis of this paper uses data from the German Socio-Economic Panel (SOEP). The SOEP is a representative longitudinal study, which started in 1984. It annually collects household information from about 12,000 households since 2000 as well as individual data from all household members above age 15.[11]

The present analysis uses a range of socioeconomic characteristics provided by the SOEP. The utilized sample is restricted to individuals in prime labor force age, i.e. ages 26 to 55, to exclude age cohorts with large shares in education or already retired. The data is further restricted to West German residents observed between 1990 and 2012 to eliminate potential distortions due to different labor market situations in the Eastern states or before the reunification, respectively.[12] These restrictions leave the birth cohorts 1935 to 1986 for empirical investigation. Furthermore, civil servants, soldiers and self-employed persons are excluded as their wage and employment determinations should function differently from those of the salaried workforce in the private sector. In addition, individuals in vocational training, marginal irregular part-time employment or in a sheltered workshop are removed

[11]For documentations of the SOEP database, see Kroh (2011) or Haisken-DeNew and Frick (2005).

[12]Due to east-west heterogeneity, also an exploitation of the German reunification as an exogenous shock to occupation-cohort size might be unsuitable.

from the sample. Finally, observations with missing values on relevant variables are excluded.

Population and birth numbers by birth cohort and federal state as well as population numbers by occupation are provided by the German Federal Statistical Office. As the latter information is available for a limited number of years,[13] only data for the birth cohorts 1955 to 1976 are exploited in the regression analysis.

Taken together, three samples are being used in the empirical analysis. The descriptive statistics presented in the present section are based on 43131 records from 9266 individuals (Sample 1). The employment analysis uses 28985 records from 5803 individuals (Sample 2). The analysis of occupational sorting is also based on Sample 2 but uses time-constant variables only. The wage and work time analysis, which is restricted to employees, includes 28277 records from 5272 individuals (Sample 3).

4.2 Variable Definitions

4.2.1 Economic Outcomes

The SOEP questionnaire asks individuals for their current employment status and, in case they are employed, for their exact gross amount of labor income, their contractual working hours excluding overtime, as well as their actual working hours including overtime. From this information, the following four outcomes are generated and used as dependent variables in the regression analysis: (a) the natural logarithm of real hourly gross wages, (b) a binary variable indicating employment status, (c) the number of contractual working hours per week, and (d) the number of actual working hours per week.

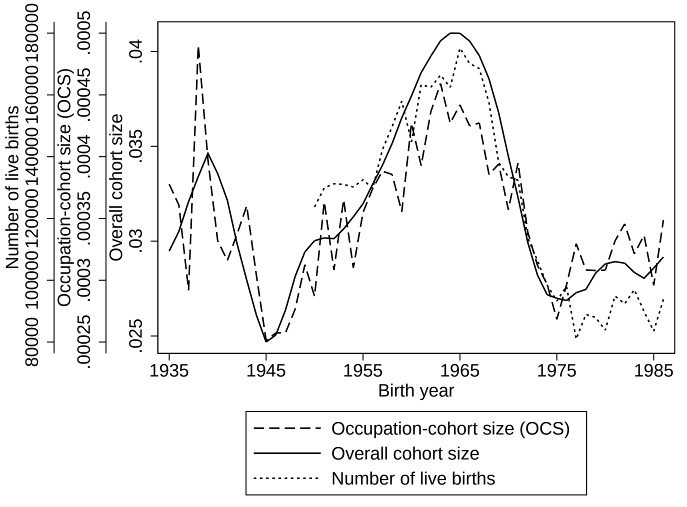
4.2.2 Occupation-Cohort Size

As job competition in the labor market should take place mainly among individuals of similar age in the same occupational track, I attempt to measure competition intensity by the population numbers within occupation-age cells, i.e. the occupation-cohort size. Because these population numbers appear to be unavailable, I estimate them by weighting actual overall cohort sizes with occupation shares estimated from my sample using weights provided by the SOEP. The SOEP reports the detailed

[13] In particular, population numbers by occupation are available only for the years 1970, 1973, 1976, 1978, 1980, 1982, 1984, 1985, 1989 and 1991. Numbers for the years in between are imputed based on the available numbers. The data are at KldB 2 digits level. KldB ("Klassifizierung der Berufe") denotes the German classification of occupations of the Federal Employment Agency.

current occupation and the first occupation ever worked in according to the International Standard Classification of Occupations (ISCO-88; 4 digits level).

Figure 2: Cohort Size Measures by Birth Cohort



The relevant competitors of an individual are unlikely to be sharply concentrated within a single age cohort. Rather, they are probably spread to some extent over the surrounding cohorts (Welch, 1979). In addition, the most relevant competitors often reside geographically close. In order to account for all these aspects, occupation-cohort size is calculated as a weighted moving average of the sizes of the own and the surrounding age cohorts where cohort sizes are given by age-specific population numbers at federal state level. Finally, to also account for changes in the size of the labor force over time, the measure is normalized by the number of individuals in core workforce age (26–55).

To formalize, occupation-cohort size (OCS) is calculated in each year (1990–2012) for each age cohort j as a weighted moving average of population numbers N by federal state s, multiplied by the estimated national share of workers ws in occupation o, and divided by the total size of the labor force at federal state level N_s:

$$\text{OCS}_{jso} = \frac{\left(\frac{1}{9}N_{(j-2)s} + \frac{2}{9}N_{(j-1)s} + \frac{3}{9}N_{js} + \frac{2}{9}N_{(j+1)s} + \frac{1}{9}N_{(j+2)s}\right) \times ws_o}{N_s} \quad (2)$$

Figure 2 illustrates occupation-cohort size (OCS), overall cohort size,[14] and the number of live births by birth year. All three measures rise during the baby boom of the 1950s and 1960s and decrease in the subsequent baby bust of the 1970s. Due to the sample restrictions, OCS is more noisy for relatively old and relatively young birth cohorts, because observation numbers drop at the tails of the distribution over birth years. Moreover, the representativeness of OCS and overall cohort size for the original cohort size at birth deteriorates with decreasing birth year because the share of cohort members who already died increases.

The values taken by OCS are rather small in size. For the sake of an easy interpretation of a one unit change in the regression analysis, I rescale OCS by dividing it by factor 0.00015, which roughly equals the average difference in OCS between birth cohorts born at the peak of the baby boom (around 1964) and cohorts born in the subsequent bust (around 1975), to obtain a rescaled occupation-cohort size measure (OCS*). As a consequence, a one unit change in OCS* refers to the average difference between baby boomers and baby busters.

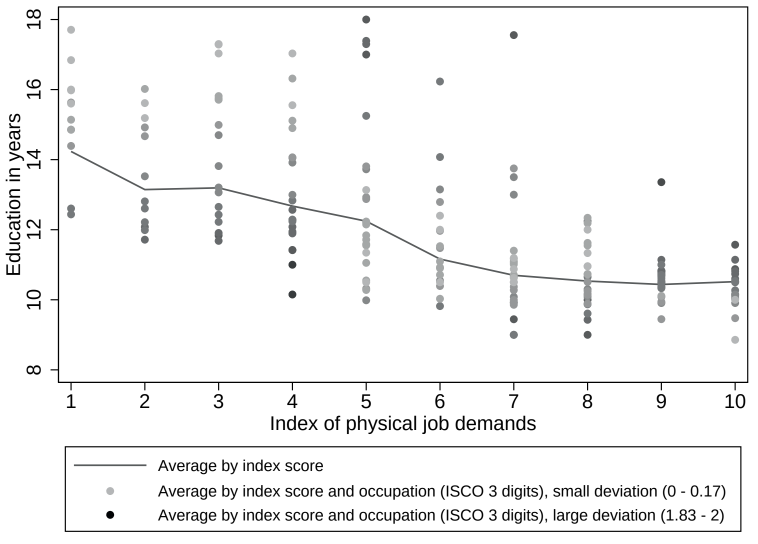
4.2.3 Occupational Specialization

Economic theory implies that the effect of cohort size varies by degree of professional specialization (see Section 2). In order to account for this heterogeneity, previous studies divided their samples based on educational attainment, assuming occupational specialization to be increasing in education (e.g., Freeman, 1979; Brunello, 2010). Although education should be positively correlated with the degree of specialization, it is probably not a perfect measure of substitutability. For example, an emergency physician exhibits a high level of education but may be easily replaceable by any other physician of the same expertise since her daily job content consists of a series of practical routine tasks. In contrast, a less educated clerk who executes planning and organizing works may be indispensable in her position if she strongly relies on experience and position-specific knowledge in her daily work.

A more accurate measure of specialization would reflect the actual content of occupational duties. Rather than education, I utilize a 1-10 ordinal scale for physical job demands developed by Kroll (2011) to categorize my sample. The index was constructed based on a large-scale representative survey for Germany collected in 2006 which focused on workplace characteristics (i.e., job requirements, main tasks, working conditions and job demands). I hypothesize the relevance of experience and position-specific knowledge for the execution of everyday job tasks to be decreasing in physical job demands. To the extent physical job demands are superior in reflect-

[14] Overall cohort size is calculated as OCS with ws_o equal to 1.

Figure 3: Education by Degree of Occupational Specialization



ing workers' substitutability to a measure of educational attainment, the present study categorizes specialization groups more precisely than former studies did.

Figure 3 illustrates the relationship between the number of years in education and the index of physical job demands, based on Sample I. While the overall relationship may be negative, there is high variation at the occupational level.

To illustrate the extent to which a categorization based on the index of physical job demands differs from an assignment based on education, I define groups of occupational specialization using each of the two measures and compare the deviations in group assignment. In particular, using the index, I divide the sample into low (index values 8-10), medium (index values 4-7), and high specialization (index values 1-3). Using education, I define individuals with 7-10 years of education as less specialized, 10.5-13 years as medium specialized and 13.5-18 years as highly specialized. Only 47.1% of all observations in Sample 1 are assigned to the same specialization group by both measures. 3.3% of the observations even exhibit a deviation of two, i.e. they are assigned the lowest specialization degree by one measure and the highest degree by the other measure.[15] The deviations are also illustrated in Figure 3, where

[15]Examples with a deviation of two for low education and low physical job demands (ISCO-88 classification in parantheses): directors and chief executives (121), architects, engineers and

a darker dot color indicates a larger average deviation in group assignment.

4.3 Correlations

Table 1 reports correlations of occupation-cohort size as defined by Equation (2) with the economic outcome variables. As discussed in Section 2, both positive and negative relationships are plausible. An increase in occupation-cohort size intensifies competition for jobs, which may depress wages and employment probabilities. On the other hand, a larger occupation-cohort may be associated with higher social interaction which may foster knowledge sharing and networking with potentially positive wage and employment effects. According to Table 1, a negative correlation with wage and employment is found for medium and highly specialized males. In contrast, the coefficients for less specialized males are positive. For females, a negative relationship is measured only for wages of medium and highly specialized workers, while employment status is positively correlated with occupation-cohort size for less and medium specialized females. The remaining correlations with females' wages and employment status are insignificant.

Table 1: Correlations with Occupation-Cohort Size

	Degree of Occupational Specialization		
	Low	Medium	High
Males:			
Real hourly gross wage	0.066***	-0.181***	-0.096***
Employed	0.030***	-0.038***	-0.014
Contractual work time	-0.107***	0.015	-0.009
Actual work time	-0.022**	0.053***	-0.043***
Females:			
Real hourly gross wage	-0.061	-0.089***	-0.146***
Employed	0.046*	0.023**	-0.003
Contractual work time	-0.398***	-0.166***	-0.137***
Actual work time	-0.403***	-0.164***	-0.154***

Correlation coefficients. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

related professionals (214), physical and enginieering science technicians (311), finance and sales associate professionals (341), secretaries and keyboard-operating clerks (411), client information clerks (422). Examples for high education and high physical job demands: travel attendants and related workers (511), building finishers and related trades workers (713), blacksmiths, tool-makers and related trades workers (722), machinery mechanics and fitters (723), wood treaters, cabinet-makers and related trades workers (742).

Considering working hours, intensified competition may incentivize workers to invest more effort by working more hours, inducing a positive relationship with occupation-cohort size. On the other hand, the distribution of a fixed amount of work among a larger number of workers may be associated with potential productivity gains due to reduced individual work loads or enhanced innovation potential due to a more diverse pool of workers, which would suggest a negative relationship with occupation-cohort size. According to Table 1, all correlations are negative for females. For males, the picture is more mixed. While the coefficients are mostly negative for low and high specialization degrees, the correlation between actual work time and occupation-cohort size exhibits a positive sign for medium specialized workers.

5 Results

This section presents the estimation results for cohort size effects on occupational sorting, wage, employment and work time. To test the results for robustness, all regressions were also estimated releasing the sample restrictions described in Section 4 by including civil servants, soldiers and self-employed into the sample. As this changes the size of the estimated coefficients slightly, but not the quality of conclusions, these results are not reported here.[16]

5.1 Occupational Sorting

Table 2 shows the effects of the instruments, i.e. the number of live births in an individual's birth year and educational capacities as measured by the share of workers in the own occupation at age 15, on occupational sorting. The dependent variables are categorical variables reflecting the degree of occupational specialization, inferred from the index of physical job demands described in Section 4.2.3 and differing only by categorical depth. The estimated effects of the number of live births indicate that belonging to a larger cohort decreases the probability for an occupation with a higher as compared to a lower specialization level. However, the estimated coefficients and odds ratios are insignificant for both genders. In contrast, educational capacities have significant positive effects in all regressions. In particular, considering the binary regressions, the OLS coefficient for males (females) indicates that a one percentage point increase in the occupation share at age 15 increases the probability for an occupation with a high specialization as compared to

[16] Results are available upon request.

a low specialization by 6.2% (4.8%). Focusing on three categories of specialization (ordered logit I), a one percentage point increase in the occupation share raises the odds for males (females) to end up in a higher specialization category than the considered one or a lower category by factor 1.57 (1.41). When subdividing occupations into ten categories of specialization (ordered logit II), the odds ratios for males (females) decrease to 1.22 (1.18) but remain larger than one and highly significant.

Table 2: Occupational Sorting

	Males			Females		
	OLS	Ordered logit		OLS	Ordered logit	
		I	II		I	II
Live births in birth year / 10^5	-0.006	0.957	0.961	-0.007	0.964	0.981
	(0.010)	(0.042)	(0.038)	(0.011)	(0.050)	(0.041)
Occupation share at age 15 (%)	0.062***	1.569***	1.219***	0.048***	1.413***	1.183***
	(0.003)	(0.045)	(0.014)	(0.002)	(0.025)	(0.009)
Observations	3116	3116	3116	2687	2687	2687

Dependent variables (DV) measure degree of occupational specialization. OLS: DV has 2 categories; coefficients reported. Ordered logit I: DV has 3 categories; odds ratios reported. Ordered logit II: DV has 10 categories; odds ratios reported. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Assuming that a higher degree of occupational specialization is associated with higher economic success, the findings seem to indicate that restricted educational capacities force individuals into less prestigious occupations. Although the effects of the overall size of a cohort exhibit the expected signs, they are not significant. Instead, educational capacities seem to be the more important predictor of occupational choice.

5.2 Wage

Table 3 presents the estimates of occupation-cohort size effects on wages. In all regressions, the Kleibergen-Paap F statistic exceeds the Staiger and Stock (1997) rule-of-thumb threshold of 10, indicating that the models are identified (Baum et al., 2007; Dickson, 2013). Because two instruments are exploited in the regressions, overidentification tests are reported. The p-values of the Hansen J statistics exceed 0.05 in all regressions, indicating that the null hypothesis that the instruments are valid cannot be rejected. The test results do therefore not raise overidentification concerns.

Table 3: Occupation-Cohort Size Effects on Wage

Males									
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	0.020	-0.064***	-0.085***	0.012	-0.058***	-0.056***	0.009	-0.058***	-0.053***
	(0.013)	(0.020)	(0.015)	(0.012)	(0.019)	(0.013)	(0.013)	(0.019)	(0.013)
Education				0.021***	0.049***	0.052***	0.019***	0.046***	0.050***
				(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.007)
Labor market experience				0.006	0.027***	0.030***	0.005	0.023***	0.027***
				(0.010)	(0.006)	(0.010)	(0.010)	(0.006)	(0.010)
Labor market experience$^2/10^2$				0.000	-0.000*	-0.001**	0.000	-0.000	-0.000**
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
Kleibergen-Paap F statistic	25.98	30.50	17.20	26.62	32.00	16.42	27.07	32.29	16.38
Hansen J statistic	0.64	0.01	1.51	0.76	0.20	1.26	0.46	0.15	1.17
p-value	0.423	0.943	0.219	0.385	0.655	0.262	0.497	0.698	0.279

Females									
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	0.039	-0.091**	-0.047***	0.038	-0.062*	-0.026***	0.032	-0.062*	-0.025***
	(0.034)	(0.036)	(0.011)	(0.033)	(0.035)	(0.009)	(0.032)	(0.035)	(0.009)
Education				0.017	0.040***	0.052***	0.021*	0.040***	0.052***
				(0.012)	(0.007)	(0.005)	(0.011)	(0.007)	(0.005)
Labor market experience				0.012*	0.012**	0.029***	0.010	0.011**	0.028***
				(0.007)	(0.005)	(0.006)	(0.008)	(0.005)	(0.007)
Labor market experience$^2/10^2$				-0.000	-0.000	-0.000**	-0.000	-0.000	-0.000**
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339
Kleibergen-Paap F statistic	20.62	21.53	18.08	21.01	20.05	18.45	22.83	20.20	18.43
Hansen J statistic	1.22	0.00	0.36	1.15	0.12	0.14	1.21	0.13	0.16
p-value	0.269	0.955	0.551	0.284	0.733	0.708	0.271	0.718	0.687

2SLS. Dependent variable: logarithm of real hourly gross wage (ln). Age, year, occupation and state fixed effects are included in all regressions. Instruments: number of live births in birth year, occupation share in own occupation at age 15. Additional covariates: full-time employment, household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

As Table 3 shows, the coefficients of occupation-cohort size (OCS*) are negative and significant for medium and high specialization degrees, indicating that a larger number of competitors on the job market depresses wages. In particular, considering the specification with additional covariates, males in medium (highly) specialized occupations who were born at the peak of the baby boom are estimated to earn 5.8% (5.3%) less than their counterparts born during the subsequent baby bust. The coefficients are insignificant for males in less specialized occupations.

The picture is similar for females, although the negative effect for medium specialized women is significant at the 10% level only. In particular, medium (highly) specialized women born at the peak of the baby boom are estimated to earn 6.2% (2.5%) lower wages than comparable women born during the baby bust.

These findings are largely in line with the theoretical expectations developed in Section 2. Less specialized workers are unlikely to respond in terms of wages, first, because they are probably more easily replaceable by workers of different age groups, and second, because their wages are more often subject to unionized wage-bargaining which causes rigidities in wages.[17] In contrast, considering medium specialized workers, the size of the own age cohort might reflect the number of relevant competitors well, because according to the career-phase model workers are easily substitutable within but not between age cohorts. Finally, for highly specialized occupations, the potential of the size of a cohort to reflect the number of relevant competitors may be lower, because these workers might not even be substitutable with other workers of similar age. This argumentation provides a plausible explanation for the finding of smaller cohort size effects for highly than for medium specialized workers (although the difference is small for males).

The corresponding first stage results are reported in Table A2 in the Appendix. As expected, the number of live births in the birth year is positively associated with occupation-cohort size in all regressions and, except for medium specialized males and less specialized females, its effects are also significant. The effects of the occupation share at age 15 are even positive and significant in all regressions.

Reduced form results are given in Table A5. Surprisingly, the effects of the number of live births in the birth year do not exhibit the expected negative sign but are insignificant instead. In contrast, the occupation share at age 15 has a negative effect for medium and high degrees of occupational specialization. In particular, a one percentage point increase in the occupation share at age 15 decreases the wage level by 3.1% (1.3%). Following the argumentation throughout this study,

[17]Figure A3 in the Appendix shows union membership shares by degree of specialization based on the SOEP data used here.

the mechanism behind these effects may be that a larger occupation share reflects larger educational capacities which in turn increase the occupation-cohort size. A larger occupation-cohort size is associated with intensified competition for jobs on the labor market and a depression of the wage level.

5.3 Employment

Table 4 presents the estimation results from the employment regressions. The findings are to be interpreted with caution because, as a consequence of restricting the sample to individuals in core labor force age, the shares of unemployed individuals are quite low in all subsamples.

As for the wage regressions, the Kleibergen-Paap F statistic exceeds a value of ten in all regressions. With the exception of medium specialized males, none of the overidentification tests is rejected. Hence, there are nearly no concerns of model overidentification. The second stage results for medium specialized males will not be interpreted in the following.

The estimation results presented in Table 4 suggest a significantly negative effect of occupation-cohort size on employment for highly specialized males. Specifically, males in occupations with high degrees of occupational specialization who were born at the peak of the baby boom are predicted to have a 0.3 percentage points lower employment probability than comparable males born during the subsequent baby bust. While the coefficient for less specialized males exhibits a negative sign too, the effect is not significant. Considering females, there is no evidence for significant employment effects at all.

These findings are partly in line with the expectations inferred in Section 2. Employment responses are unlikely in general due to Germany's restrictive dismissal protection legislation, which comprehensively applies to workers from all specialization groups equally. However, employment may adapt to variations in occupation-cohort size via hiring or non-hiring at initial labor market entry in the first place. As low-skilled workers are often additionally covered by universally binding collective agreements which prevent their wages and work times from responding, the pressure on employment to respond should be comparably higher for this group. Nevertheless, highly specialized males are the only group which is estimated to respond.

The first stage results reported in Table A3 in the Appendix are very similar to the first stage results for the wage regressions presented in the previous section. Again, the number of live births in the birth year has a positive effect on occupation-cohort size in most of the regressions, while educational capacities have a positive impact in all regressions.

Table 4: Occupation-Cohort Size Effects on Employment

Males									
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	0.000	0.003	-0.002**	-0.002	-0.000	-0.002**	-0.001	0.000	-0.003**
	(0.004)	(0.004)	(0.001)	(0.004)	(0.003)	(0.001)	(0.004)	(0.003)	(0.001)
Education				0.005**	0.005***	0.001**	0.006***	0.005***	0.001**
				(0.002)	(0.002)	(0.000)	(0.002)	(0.002)	(0.000)
Labor market experience				0.006	0.008***	0.000	0.007	0.008***	0.000
				(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
Labor market experience$^2/10^2$				0.000	-0.000	0.000	0.000	-0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	6695	5260	6222	6695	5260	6222	6695	5260	6222
Kleibergen-Paap F statistic	26.35	31.14	17.26	26.98	32.63	16.49	27.49	32.74	16.54
Hansen J statistic	0.90	1.98	0.01	0.78	4.86	0.04	0.66	4.81	0.15
p-value	0.342	0.159	0.907	0.376	0.027	0.850	0.417	0.028	0.702
Females									
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	0.008	0.001	-0.003	0.005	0.005	-0.002	0.004	0.004	-0.002
	(0.023)	(0.009)	(0.002)	(0.023)	(0.010)	(0.002)	(0.024)	(0.010)	(0.002)
Education				-0.002	0.005*	0.002*	-0.001	0.004	0.001
				(0.006)	(0.003)	(0.001)	(0.006)	(0.003)	(0.001)
Labor market experience				0.009***	0.002	0.003*	0.009***	0.001	0.001
				(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Labor market experience$^2/10^2$				-0.000*	0.000	0.000	-0.000*	0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	1143	4107	5558	1143	4107	5558	1143	4107	5558
Kleibergen-Paap F statistic	20.81	22.05	18.07	21.12	20.54	18.59	22.24	20.56	18.62
Hansen J statistic	0.20	0.26	0.06	0.23	0.69	0.60	0.21	0.83	1.03
p-value	0.653	0.613	0.802	0.633	0.408	0.440	0.648	0.362	0.309

2SLS. Dependent variable: binary indicator for employment status. Age, year, occupation and state fixed effects are included in all regressions. Instruments: number of live births in birth year, occupation share in own occupation at age 15. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A6 presents the reduced form regressions for employment. The estimated results reveal that the negative effect on employment measured in the second stage regression for highly specialized males is driven by the occupation share at age 15. Specifically, a one percentage point increase in the occupation share at age 15 decreases the employment probability for males in high specialization occupations by 0.1 percentage points. Additionally, the reduced form regressions suggest that the live births in the birth year have a positive employment effect for medium specialized males. In particular, increasing the number of live births by 100,000 increases the probability for this group to be in employment by 0.7 percentage points. This may support the networking hypothesis described in Section 2 which suggests that a larger cohort may be associated with higher social interaction which may in turn have positive effects on education as well as on the probability to be employed. The remaining effects of the instruments on employment are insignificant.

5.4 Work Time

Tables 5 and 6 present the results from regressions of individual work time, whereby Table 5 refers to weekly work time agreed upon with employers and Table 6 refers to actual work time per week. As for wages and employment, the Kleibergen-Paap F statistics pass the rule-of-thumb threshold of ten for all reported regressions. With the exception of medium specialized females, the overidentification test is never rejected. In the regressions for medium specialized females, the p-values of the Hansen J statistics are slightly below the threshold of 0.05, leading to a rejection of the null hypothesis that the instruments are valid and inducing overidentification concerns. These regressions will not be interpreted in the following.

According to Table 5, males in medium specialized occupations exhibit higher contractual work times when they belong to a large occupation-cohort, possibly indicating that intensified competition either incentivizes them to invest more effort by working longer hours or demotivates employers to offer favorable working conditions in the form of short working hours. Specifically, males in medium specialized occupations born at the peak of the baby boom work 0.8 hours more than comparable males born during the bust. In contrast, the work times of highly specialized males decline as a result of larger occupation-cohort sizes, suggesting that as labor supply increases a fixed amount of work is distributed among a larger number of workers. In particular, when a highly specialized worker was born at fertility peak instead of its low, he works on average 0.2 weekly hours less. The work time effect for less specialized males is not statistically significant. For females, there is a negative effect on contractual working hours for less specialized workers, which is, while large

Table 5: Occupation-Cohort Size Effects on Contractual Work Time

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	-0.186	0.958***	-0.180**	-0.185	0.831***	-0.192**	-0.186	0.829***	-0.190**
	(0.129)	(0.329)	(0.090)	(0.129)	(0.308)	(0.090)	(0.124)	(0.310)	(0.091)
Education				0.001	0.238**	0.101***	-0.002	0.230**	0.101***
				(0.055)	(0.100)	(0.030)	(0.057)	(0.098)	(0.031)
Labor market experience				0.031	0.708***	0.231***	0.028	0.712***	0.230***
				(0.058)	(0.125)	(0.064)	(0.059)	(0.124)	(0.064)
Labor market experience$^2/10^2$				-0.001	-0.013***	-0.004**	-0.001	-0.013***	-0.004**
				(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Additional covariates							✓	✓	✓
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
Kleibergen-Paap F statistic	25.98	30.50	17.20	26.62	32.00	16.42	27.18	32.09	16.45
Hansen J statistic	0.92	0.04	0.01	0.91	0.68	0.00	0.67	0.70	0.01
p-value	0.336	0.847	0.904	0.340	0.411	0.946	0.413	0.403	0.938
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	-0.532	-1.348	-0.370*	-1.165	-1.059	-0.190	-1.570*	-0.997	-0.152
	(1.040)	(0.863)	(0.225)	(0.837)	(0.833)	(0.168)	(0.861)	(0.815)	(0.153)
Education				-1.057***	0.007	0.462***	-1.147***	-0.078	0.322***
				(0.302)	(0.192)	(0.117)	(0.315)	(0.186)	(0.086)
Labor market experience				0.918***	1.144***	1.150***	0.688***	0.931***	0.875***
				(0.214)	(0.091)	(0.104)	(0.212)	(0.093)	(0.115)
Labor market experience$^2/10^2$				-0.015**	-0.017***	-0.016***	-0.010	-0.014***	-0.014***
				(0.007)	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)
Additional covariates							✓	✓	✓
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339
Kleibergen-Paap F statistic	20.62	21.53	18.08	21.01	20.05	18.45	22.58	20.01	18.43
Hansen J statistic	1.29	7.17	3.52	1.41	7.62	0.85	0.84	3.95	0.94
p-value	0.256	0.007	0.061	0.235	0.006	0.357	0.360	0.047	0.333

2SLS. Dependent variable: contractual working hours per week. Age, year, occupation and state fixed effects are included in all regressions. Instruments: number of live births in birth year, occupation share in own occupation at age 15. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6: Occupation-Cohort Size Effects on Actual Work Time

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	-0.018	1.856**	-1.049***	-0.119	1.843**	-0.931***	-0.292	1.842**	-0.935***
	(0.315)	(0.759)	(0.218)	(0.322)	(0.720)	(0.219)	(0.306)	(0.724)	(0.219)
Education				0.306***	0.800***	0.413***	0.208*	0.730***	0.406***
				(0.112)	(0.190)	(0.086)	(0.112)	(0.185)	(0.086)
Labor market experience				0.139*	0.987***	0.380***	0.110	0.996***	0.380***
				(0.074)	(0.166)	(0.121)	(0.082)	(0.167)	(0.122)
Labor market experience$^2/10^2$				-0.005**	-0.017***	-0.004	-0.005**	-0.018***	-0.004
				(0.002)	(0.004)	(0.003)	(0.002)	(0.005)	(0.003)
Additional covariates							√	√	√
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
Kleibergen-Paap F statistic	25.98	30.50	17.20	26.62	32.00	16.42	27.18	32.09	16.45
Hansen J statistic	0.03	0.00	0.15	0.02	0.22	0.20	0.08	0.25	0.23
p-value	0.869	0.967	0.702	0.876	0.637	0.656	0.772	0.617	0.628
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Occupation-cohort size (OCS*)	-0.822	-1.748*	-0.807***	-1.413	-1.310	-0.492**	-1.695*	-1.279	-0.448**
	(1.156)	(0.946)	(0.313)	(0.997)	(0.946)	(0.238)	(1.010)	(0.942)	(0.215)
Education				-0.822**	0.199	0.789***	-0.973***	0.068	0.624***
				(0.344)	(0.214)	(0.147)	(0.354)	(0.209)	(0.115)
Labor market experience				1.099***	1.269***	1.283***	0.817***	1.015***	0.958***
				(0.255)	(0.108)	(0.118)	(0.246)	(0.112)	(0.127)
Labor market experience$^2/10^2$				-0.019**	-0.019***	-0.016***	-0.013*	-0.016***	-0.014***
				(0.008)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)
Additional covariates							√	√	√
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339
Kleibergen-Paap F statistic	20.62	21.53	18.08	21.01	20.05	18.45	22.58	20.01	18.43
Hansen J statistic	3.29	7.08	4.22	3.32	7.38	1.83	1.99	4.09	2.04
p-value	0.070	0.008	0.040	0.069	0.007	0.176	0.159	0.043	0.153

2SLS. Dependent variable: actual working hours per week. Age, year, occupation and state fixed effects are included in all regressions. Instruments: number of live births in birth year, occupation share in own occupation at age 15. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

in size, significant at the 10% level only. It suggests that less specialized females born during the baby boom work 1.6 hours per week less compared to females born during the baby bust. The remaining coefficients for females are insignificant.

Considering actual work time as an outcome variable instead of contractual work time (Table 6) barely changes the quality of results. However, the coefficients increase considerably in size. Medium specialized males born at the peak of the baby boom are predicted to work 1.8 weekly hours more than comparable males born during the subsequent bust, while highly skilled males in large occupation-cohorts work 0.9 hours less. Also the negative effect for less specialized female workers increases slightly from 1.6 to 1.7. In addition, the coefficient for highly specialized women, which was insignificant for contractual work time, becomes significant at the 10% level. It suggests that highly specialized women born at fertility high work 0.4 weekly hours less than comparable women born at fertility low. The overall finding of stronger effects on actual work time than on contractual work time may reflect that actual work hours are generally more flexibly adaptable since they are not subject to contractual agreements.

The corresponding first stage regression results on effects of the instruments on occupation-cohort size (Appendix Table A4) again barely differ from those for wage and employment discussed above. The reduced form regressions reported in Tables A7 and A8 reveal that the estimated second stage effects on contractual work time are driven by the occupation share in the own occupation at age 15. For example, a one percentage point increase in the occupation share at age 15 increases contractual weekly work time of medium specialized males by 0.4 hours. In contrast, Table A8 shows that the negative second stage effect on actual work time for highly specialized females is driven by the number of live births in the birth year. While the second stage estimates for medium specialized females could not be interpreted due to rejection of the overidentification tests, the reduced form estimates reveal a negative work time effect of overall cohort size for this group. In particular, increasing the number of live births in the birth year by 100,000 reduces the weekly contractual work time of medium specialized females by 1.0 hour. The corresponding effect on actual work time is a decrease of 1.2 weekly hours.

6 Conclusion

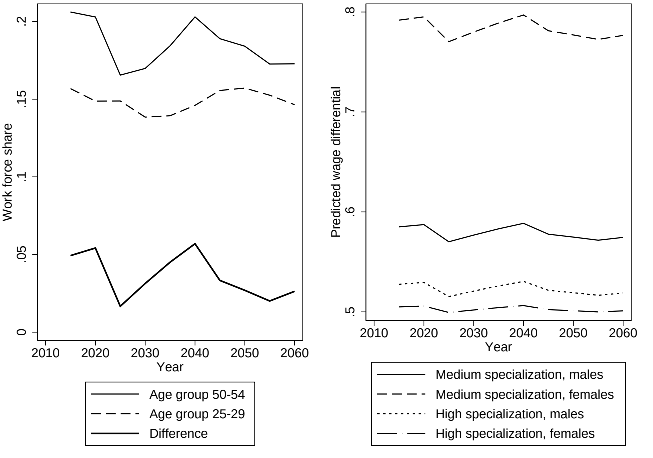
In this paper, I present new evidence on cohort size effects on wages, employment and work time. The German labor market is considered as a case study because the existing evidence for this country lacks comprehensive insights on labor market effects based on recent data, although the German population ages particularly rapidly in international comparison. In contrast to previous studies, professional specialization levels are measured by an index reflecting actual job content rather than by educational attainment.

The empirical results indicate that belonging to a large cohort depresses economic success. In particular, male and female workers in medium and highly specialized occupations respond with wage reductions. Specifically, all other things equal, a medium (highly) specialized man born at the peak of the baby boom earns on average 5.8% (5.3%) lower wages than a comparable man born during the subsequent baby bust. Highly specialized females from the largest cohorts have 2.5% lower wages than their counterparts from small cohorts. Highly specialized male workers additionally adapt in terms of employment. Employment probabilities of highly specialized males born at peak fertility are estimated to be 0.3 percentage points lower than those of comparable workers belonging to later-born, smaller cohorts. Weekly work time is estimated to rise in response to an increase in cohort size for males with medium occupational specialization, which is reversed for highly specialized males. These findings are confirmed for both contractual and actual work times, while the effects on the latter outcome are stronger. In particular, medium (highly) specialized males born into boom cohorts work 0.8 (0.2) contractual working hours and 1.8 (0.9) actual working hours longer (shorter) than comparable males born into low-fertility cohorts. Highly specialized females work 0.4 weekly hours less when born into large instead of small cohorts.

The estimated response pattern in the considered labor market outcomes is well in line with the expected role of Germany's restrictive labor market institutions. Institution-induced rigidities in one outcome might be responsible for a relatively strong response in another outcome due to a rerouting of the effect. In particular, the German dismissal protection legislation may hinder employment to adapt but instead foster wage and work time responses. However, further research is needed to supplement the findings presented in this article and to disclose the exact mechanisms at work.

How does demographic change affect labor market outcomes? A satisfactory answer to this question is clearly beyond the scope of this article as shifts in the age structure of the workforce remain a single mediator out of a range of potential mechanisms through which population aging might influence labor markets. However, the estimated effects happen to be robust with some of them being relatively large in size. Since population aging implies the supply of older workers to rise relatively to the supply of younger workers (at least for the initial period of demographic transition), the results of the present analysis suggest that younger workers benefit in terms of wages and employment probabilities at the cost of older workers.

Figure 4: Predicted Young/Old Wage Differentials until 2060



Own calculations based on population projections from the c. Left panel: percentages aged 25–29 and 50–54 of population in core workforce age (25–54). Right panel: predicted young/old wage differentials (age groups 25–29 vs. 50–54) by gender and occupational specialization. Wages were predicted by entering projected cohort sizes, estimation coefficients presented in Table 3 and variable group averages from Sample 3 into Equation (1).

Figure 4 presents projections of future relative cohort sizes and predicted wage differentials for the age groups 25 to 29 and 50 to 54. As the left panel shows, the supply of older workers exceeds the supply of younger workers already in 2015, which points at the shifts in the age structure that have taken place during the past decades. Furthermore, the projected workforce share of older workers remains larger throughout the whole period from 2015 until 2060. This indicates that when small young cohorts today age into small old cohorts tomorrow, tomorrow's young cohorts will be even smaller. Hence, the labor force as a whole will continue to decline since coming generations will be smaller and smaller. As the left panel of Figure 4 reveals, the relative supply of older and younger workers will not remain constant over the coming decades. In particular, while the difference in relative cohort size amounts to about 5 percentage points in 2015 and 2020, it drops to about 2 percentage points in 2025. Thereafter, it rises to 5 percentage points in 2040 again before declining to below 3 percentage points in 2060.

The right panel of Figure 4 presents predicted wage differentials for the two age groups over time, calculated by entering projected cohort sizes from the Federal Statistical Office (2015), estimation coefficients presented in Table 3 and variable group averages from Sample 3 into Equation (1). Medium specialized females are predicted to have the largest wage differential of all considered groups amounting to nearly 0.8, which indicates a very moderate wage growth throughout their working careers. Highly specialized females, in contrast, exhibit the lowest differential close to 0.5, suggesting that they experience the strongest wage growth over time among the considered groups.

The comparison of the left and right panels of Figure 4 suggests a positive relationship between the difference in cohort size and the wage differentials between the two age groups. For example, the rise in the cohort size difference of about 3 percentage points from 2025 to 2040 is associated with a rise in the wage differential for medium specialized males (females) of about 1.7 (2.5) percentage points. Regarding highly specialized males (females), the increase amounts to 1.4 (0.6) percentage points.

These results suggest that increasing the workforce share of older relative to younger workers benefits younger workers in terms of wages at the cost of older workers. Especially in the past, at the onset of workforce aging when initially balanced workforce shares have shifted to become more and more unbalanced (compare Figure 1), younger workers may have profited at the disadvantage of older workers. This might be interpreted as an inequitable redistribution of economic success between generations (Harper, 2014).

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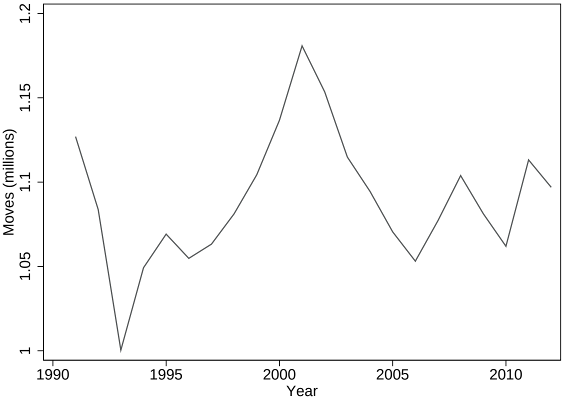
Appendix

Table A1: Means and Standard Deviations

	Degree of occupational specialization					
	Low		Medium		High	
Variable	Mean	SD	Mean	SD	Mean	SD
Males, Sample 2:						
Age	37.88	7.04	38.82	6.97	38.44	6.70
Education	10.75	1.39	11.10	1.87	13.97	2.80
Labor market experience	16.44	7.78	16.52	7.96	13.87	7.88
Employed†	0.98	0.15	0.99	0.12	1.00	0.07
German native†	0.72	0.45	0.79	0.41	0.92	0.27
Household size	3.15	1.38	3.05	1.33	2.82	1.34
Observations	6695		5260		6222	
Males, Sample 3:						
Real hourly gross wage	15.02	4.45	15.14	5.78	21.10	7.69
Full-time employed†	0.99	0.08	0.96	0.19	0.98	0.14
Contractual work time	38.42	3.07	38.46	5.26	38.44	3.23
Actual work time	42.16	6.18	42.81	8.35	44.64	6.90
Observations	6574		5193		6199	
Females, Sample 2:						
Age	39.14	7.25	39.02	7.22	37.98	7.06
Education	10.10	1.54	11.35	2.17	12.95	2.58
Labor market experience	10.08	7.69	10.41	7.62	10.70	7.16
Employed†	0.94	0.23	0.94	0.24	0.96	0.21
German native†	0.56	0.50	0.77	0.42	0.91	0.29
Household size	3.12	1.28	2.89	1.26	2.61	1.15
Observations	1143		4107		5558	
Females, Sample3:						
Real hourly gross wage	10.54	5.14	11.96	5.68	15.76	7.05
Full-time employed†	0.54	0.50	0.53	0.50	0.60	0.49
Contractual work time	27.93	12.05	30.15	10.01	31.51	9.39
Actual work time	29.80	13.14	32.67	11.50	34.78	11.34
Observations	1086		3886		5339	

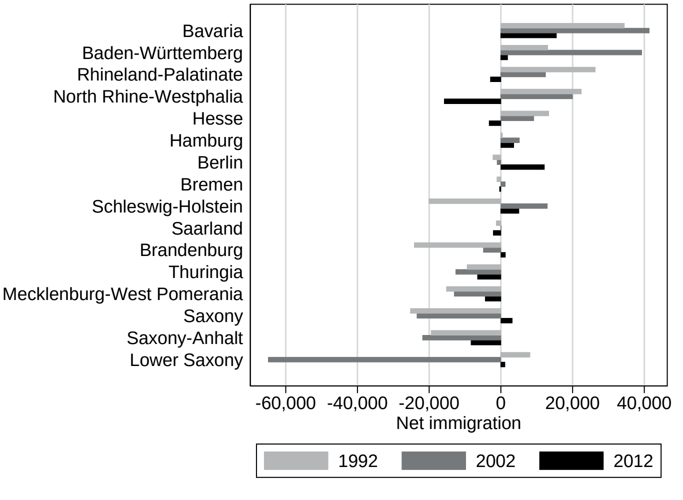
SD: standard deviation. † binary indicator variable. Weights provided by the SOEP are used.

Figure A1: Internal Migration over Time



Moves within Germany across federal state borders. Graph based on data from the Federal Statistical Office (2004, 2014).

Figure A2: Net Migration Influx by State



Moves within Germany across federal state borders. Graph based on data from the Federal Statistical Office (2004, 2014).

Figure A3: Union Membership by Degree of Specialization

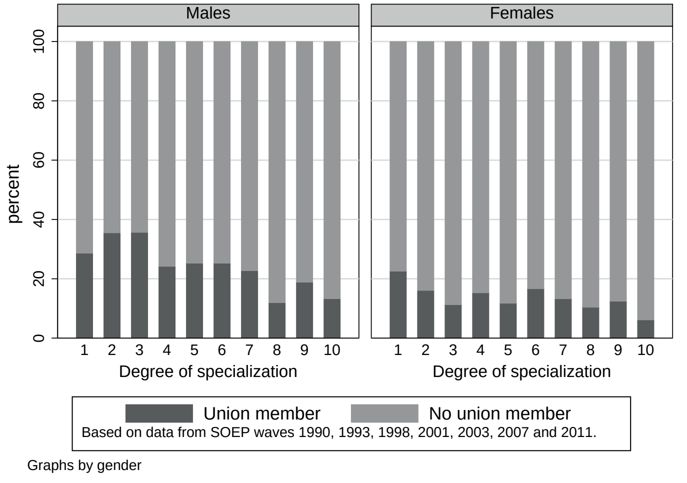


Table A2: First Stage, Wage

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.120***	0.036	0.204***	0.121***	0.026	0.201***	0.123***	0.030	0.199***
	(0.034)	(0.063)	(0.071)	(0.034)	(0.063)	(0.071)	(0.033)	(0.062)	(0.071)
Occupation share at age 15 (%)	0.532***	0.521***	0.237***	0.529***	0.523***	0.233***	0.525***	0.524***	0.231***
	(0.031)	(0.061)	(0.024)	(0.031)	(0.061)	(0.024)	(0.030)	(0.061)	(0.024)
Education				0.015	-0.041**	-0.020	0.011	-0.031	-0.017
				(0.016)	(0.020)	(0.020)	(0.016)	(0.020)	(0.020)
Labor market experience				-0.014	0.024	-0.005	-0.015	0.043**	0.002
				(0.012)	(0.019)	(0.027)	(0.012)	(0.018)	(0.028)
Labor market experience^2/10^2				0.000	-0.001**	0.000	0.000	-0.002***	0.000
				(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Additional covariates							√	√	√
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.036	0.317***	0.374***	0.035	0.278**	0.350***	0.042	0.271**	0.344***
	(0.072)	(0.110)	(0.100)	(0.073)	(0.109)	(0.098)	(0.074)	(0.109)	(0.101)
Occupation share at age 15 (%)	0.765***	0.274***	0.269***	0.756***	0.254***	0.259***	0.755***	0.256***	0.259***
	(0.100)	(0.068)	(0.017)	(0.097)	(0.066)	(0.018)	(0.095)	(0.066)	(0.018)
Education				-0.047	-0.129***	-0.095***	-0.050	-0.126***	-0.085***
				(0.031)	(0.026)	(0.024)	(0.032)	(0.026)	(0.024)
Labor market experience				-0.009	0.016	-0.005	0.002	0.026*	0.013
				(0.019)	(0.013)	(0.026)	(0.019)	(0.015)	(0.026)
Labor market experience^2/10^2				0.000	-0.001*	-0.001	-0.000	-0.001*	-0.001
				(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Additional covariates							√	√	√
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339

OLS. Dependent variable: occupation-cohort size (OCS*). Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: full-time employment, household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A3: First Stage, Employment

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.117***	0.040	0.201***	0.117***	0.032	0.198***	0.120***	0.033	0.198***
	(0.033)	(0.062)	(0.071)	(0.032)	(0.062)	(0.071)	(0.032)	(0.062)	(0.071)
Occupation share at age 15 (%)	0.533***	0.521***	0.238***	0.531***	0.522***	0.233***	0.527***	0.521***	0.232***
	(0.030)	(0.060)	(0.024)	(0.030)	(0.060)	(0.024)	(0.029)	(0.060)	(0.024)
Education				0.012	-0.037*	-0.020	0.008	-0.033	-0.020
				(0.015)	(0.020)	(0.020)	(0.015)	(0.020)	(0.020)
Labor market experience				-0.012	0.028	-0.007	-0.013	0.031*	-0.003
				(0.011)	(0.018)	(0.027)	(0.011)	(0.018)	(0.028)
Labor market experience$^2/10^2$				0.000	-0.002***	0.000	0.000	-0.002***	0.000
				(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Additional covariates							√	√	√
Observations	6695	5260	6222	6695	5260	6222	6695	5260	6222
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.043	0.322***	0.354***	0.041	0.287***	0.330***	0.047	0.283***	0.328***
	(0.069)	(0.106)	(0.097)	(0.069)	(0.105)	(0.095)	(0.070)	(0.105)	(0.095)
Occupation share at age 15 (%)	0.735***	0.276***	0.269***	0.731***	0.255***	0.259***	0.733***	0.256***	0.259***
	(0.095)	(0.067)	(0.016)	(0.093)	(0.065)	(0.017)	(0.093)	(0.065)	(0.017)
Education				-0.034	-0.126***	-0.094***	-0.032	-0.124***	-0.088***
				(0.031)	(0.025)	(0.023)	(0.030)	(0.025)	(0.023)
Labor market experience				-0.010	0.016	-0.006	-0.006	0.020	0.006
				(0.018)	(0.012)	(0.025)	(0.018)	(0.014)	(0.026)
Labor market experience$^2/10^2$				0.000	-0.001*	-0.001	-0.000	-0.001*	-0.001
				(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Additional covariates							√	√	√
Observations	1143	4107	5558	1143	4107	5558	1143	4107	5558

OLS. Dependent variable: occupation-cohort size (OCS*). Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A4: First Stage, Work Time

Males									
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.120***	0.036	0.204***	0.121***	0.026	0.201***	0.123***	0.028	0.202***
	(0.034)	(0.063)	(0.071)	(0.034)	(0.063)	(0.071)	(0.033)	(0.063)	(0.071)
Occupation share at age 15 (%)	0.532***	0.521***	0.237***	0.529***	0.523***	0.233***	0.525***	0.521***	0.231***
	(0.031)	(0.061)	(0.024)	(0.031)	(0.061)	(0.024)	(0.030)	(0.060)	(0.024)
Education				0.015	-0.041**	-0.020	0.011	-0.036*	-0.019
				(0.016)	(0.020)	(0.020)	(0.016)	(0.021)	(0.020)
Labor market experience				-0.014	0.024	-0.005	-0.015	0.028	-0.001
				(0.012)	(0.019)	(0.027)	(0.012)	(0.019)	(0.028)
Labor market experience^2/10^2				0.000	-0.001**	0.000	0.000	-0.002***	0.000
				(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Additional covariates							√	√	√
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
Females									
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.036	0.317***	0.374***	0.035	0.278**	0.350***	0.041	0.274**	0.347***
	(0.072)	(0.110)	(0.100)	(0.073)	(0.109)	(0.098)	(0.074)	(0.109)	(0.098)
Occupation share at age 15 (%)	0.765***	0.274***	0.269***	0.756***	0.254***	0.259***	0.764***	0.255***	0.259***
	(0.100)	(0.068)	(0.017)	(0.097)	(0.066)	(0.018)	(0.096)	(0.066)	(0.018)
Education				-0.047	-0.129***	-0.095***	-0.045	-0.127***	-0.088***
				(0.031)	(0.026)	(0.024)	(0.031)	(0.026)	(0.024)
Labor market experience				-0.009	0.016	-0.005	-0.004	0.020	0.007
				(0.019)	(0.013)	(0.026)	(0.019)	(0.014)	(0.027)
Labor market experience^2/10^2				0.000	-0.001*	-0.001	-0.000	-0.001*	-0.001
				(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Additional covariates							√	√	√
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339

OLS. Dependent variable: occupation-cohort size (OCS*). Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A5: Reduced Form, Wage

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.014	-0.004	0.007	0.014	0.006	0.011	0.010	0.005	0.011
	(0.015)	(0.017)	(0.018)	(0.014)	(0.017)	(0.018)	(0.014)	(0.017)	(0.018)
Occupation share at age 15 (%)	0.010	-0.033***	-0.021***	0.006	-0.031***	-0.014***	0.004	-0.031***	-0.013***
	(0.007)	(0.012)	(0.003)	(0.006)	(0.011)	(0.003)	(0.007)	(0.011)	(0.003)
Education				0.021***	0.051***	0.053***	0.019***	0.048***	0.051***
				(0.005)	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)
Labor market experience				0.006	0.026***	0.030***	0.005	0.020***	0.027**
				(0.010)	(0.006)	(0.010)	(0.010)	(0.006)	(0.010)
Labor market experience^2/10^2				0.000	-0.000	-0.001**	0.000	-0.000	-0.001**
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	-0.044	-0.030	-0.030	-0.043	-0.012	-0.015	-0.043	-0.011	-0.016
	(0.036)	(0.023)	(0.022)	(0.037)	(0.021)	(0.018)	(0.036)	(0.021)	(0.018)
Occupation share at age 15 (%)	0.030	-0.025**	-0.012***	0.029	-0.017*	-0.006***	0.025	-0.017*	-0.006***
	(0.027)	(0.011)	(0.003)	(0.026)	(0.010)	(0.002)	(0.025)	(0.010)	(0.002)
Education				0.015	0.048***	0.055***	0.019*	0.048***	0.054***
				(0.011)	(0.006)	(0.005)	(0.011)	(0.006)	(0.005)
Labor market experience				0.012*	0.011**	0.029***	0.010	0.009*	0.028***
				(0.007)	(0.005)	(0.006)	(0.008)	(0.005)	(0.007)
Labor market experience^2/10^2				-0.000	-0.000	-0.000**	-0.000	-0.000	-0.000**
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339

OLS. Dependent variable: logarithm of real hourly gross wage (ln). Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: full-time employment, household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A6: Reduced Form, Employment

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.004	0.004	-0.001	0.003	0.007**	-0.001	0.003	0.007**	-0.001
	(0.004)	(0.003)	(0.001)	(0.004)	(0.003)	(0.001)	(0.004)	(0.003)	(0.001)
Occupation share at age 15 (%)	-0.000	0.001	-0.001**	-0.001	-0.000	-0.001**	-0.001	-0.000	-0.001**
	(0.002)	(0.002)	(0.000)	(0.002)	(0.002)	(0.000)	(0.002)	(0.002)	(0.000)
Education				0.005**	0.005***	0.001**	0.006***	0.005***	0.001**
				(0.002)	(0.002)	(0.000)	(0.002)	(0.002)	(0.000)
Labor market experience				0.006	0.008***	0.000	0.007	0.008***	0.000
				(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)
Labor market experience^2/10^2				0.000	-0.000	0.000	0.000	-0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	6695	5260	6222	6695	5260	6222	6695	5260	6222
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.006	0.003	-0.000	0.006	0.006	0.002	0.006	0.007	0.003
	(0.013)	(0.008)	(0.004)	(0.013)	(0.008)	(0.004)	(0.013)	(0.008)	(0.003)
Occupation share at age 15 (%)	0.006	-0.001	-0.001	0.004	-0.000	-0.001	0.003	-0.000	-0.001
	(0.017)	(0.003)	(0.000)	(0.017)	(0.003)	(0.001)	(0.018)	(0.003)	(0.001)
Education				-0.002	0.004*	0.002**	-0.002	0.004	0.001
				(0.006)	(0.002)	(0.001)	(0.006)	(0.002)	(0.001)
Labor market experience				0.009***	0.002	0.003	0.009***	0.001	0.001
				(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Labor market experience^2/10^2				-0.000*	0.000	0.000	-0.000*	0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Additional covariates							√	√	√
Observations	1143	4107	5558	1143	4107	5558	1143	4107	5558

OLS. Dependent variable: binary indicator for employment status. Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A7: Reduced Form, Contractual Work Time

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	0.120	0.084	-0.024	0.119	0.220	-0.031	0.099	0.225	-0.029
	(0.144)	(0.245)	(0.106)	(0.144)	(0.230)	(0.111)	(0.146)	(0.230)	(0.111)
Occupation share at age 15 (%)	-0.109	0.498***	-0.043*	-0.108	0.429***	-0.045**	-0.107	0.426***	-0.044**
	(0.071)	(0.162)	(0.022)	(0.071)	(0.155)	(0.021)	(0.068)	(0.156)	(0.022)
Education				-0.002	0.206**	0.104***	-0.004	0.202**	0.105***
				(0.055)	(0.094)	(0.031)	(0.057)	(0.094)	(0.031)
Labor market experience				0.032	0.730***	0.232***	0.030	0.738***	0.231***
				(0.057)	(0.123)	(0.065)	(0.059)	(0.122)	(0.064)
Labor market experience$^2/10^2$				-0.001	-0.015***	-0.004**	-0.001	-0.015***	-0.004**
				(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Additional covariates							✓	✓	✓
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	1.150	-1.779***	-0.832**	1.122	-1.315***	-0.415	0.833	-0.999**	-0.348
	(1.122)	(0.516)	(0.406)	(1.071)	(0.390)	(0.402)	(1.064)	(0.387)	(0.322)
Occupation share at age 15 (%)	-0.405	0.003	-0.081	-0.879	-0.004	-0.040	-1.209*	-0.069	-0.032
	(0.837)	(0.288)	(0.060)	(0.665)	(0.231)	(0.043)	(0.706)	(0.228)	(0.040)
Education				-1.002***	0.136	0.480***	-1.071***	0.044	0.336***
				(0.289)	(0.128)	(0.115)	(0.297)	(0.125)	(0.086)
Labor market experience				0.925***	1.132***	1.153***	0.696***	0.919***	0.876***
				(0.222)	(0.090)	(0.104)	(0.222)	(0.092)	(0.115)
Labor market experience$^2/10^2$				-0.015**	-0.016***	-0.016***	-0.010	-0.013***	-0.014***
				(0.007)	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)
Additional covariates							✓	✓	✓
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339

OLS. Dependent variable: contractual working hours per week.. Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A8: Reduced Form, Actual Work Time

	Males								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	-0.059	0.048	-0.336	-0.069	0.252	-0.333	-0.135	0.267	-0.348
	(0.330)	(0.468)	(0.312)	(0.336)	(0.438)	(0.323)	(0.326)	(0.435)	(0.324)
Occupation share at age 15 (%)	-0.006	0.967***	-0.245***	-0.059	0.958***	-0.212***	-0.146	0.954***	-0.211***
	(0.179)	(0.346)	(0.048)	(0.182)	(0.329)	(0.050)	(0.174)	(0.330)	(0.050)
Education				0.304***	0.727***	0.433***	0.204*	0.665***	0.424***
				(0.112)	(0.168)	(0.086)	(0.112)	(0.164)	(0.086)
Labor market experience				0.141*	1.034***	0.384***	0.115	1.050***	0.381***
				(0.074)	(0.159)	(0.119)	(0.080)	(0.159)	(0.120)
Labor market experience^2/10^2				-0.005**	-0.020***	-0.004	-0.005**	-0.021***	-0.004
				(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.003)
Additional covariates							√	√	√
Observations	6574	5193	6199	6574	5193	6199	6574	5193	6199
	Females								
	Degree of Occupational Specialization								
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Live births in birth year / 10^5	1.647	-2.118***	-1.392**	1.613	-1.578***	-0.862	1.238	-1.240***	-0.781*
	(1.007)	(0.617)	(0.589)	(0.986)	(0.471)	(0.542)	(1.001)	(0.462)	(0.461)
Occupation share at age 15 (%)	-0.626	-0.049	-0.188**	-1.066	-0.017	-0.109*	-1.309	-0.099	-0.100*
	(0.937)	(0.314)	(0.078)	(0.793)	(0.266)	(0.058)	(0.824)	(0.266)	(0.052)
Education				-0.755**	0.358**	0.836***	-0.889***	0.224*	0.664***
				(0.318)	(0.139)	(0.148)	(0.325)	(0.135)	(0.116)
Labor market experience				1.107***	1.253***	1.289***	0.826***	0.999***	0.958***
				(0.268)	(0.107)	(0.117)	(0.262)	(0.111)	(0.125)
Labor market experience^2/10^2				-0.019**	-0.019***	-0.016***	-0.013	-0.015***	-0.014***
				(0.008)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)
Additional covariates							√	√	√
Observations	1086	3886	5339	1086	3886	5339	1086	3886	5339

OLS. Dependent variable: actual working hours per week. Age, year, occupation and state fixed effects are included in all regressions. Additional covariates: household size, immigration status. Robust standard errors in parentheses are clustered at occupation and birth year level. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.