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Do small labor market entry cohorts reduce unemployment?

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Contents

Abstract

In this paper we study the effect of small labor market entry cohorts on (un)employment in Western Germany. From a theoretical point of view, decreasing cohort sizes may on the one hand reduce unemployment due to “inverse cohort crowding” or on the other hand increase unemployment if companies reduce jobs disproportionately. Consequently, the actual effect of cohort shrinking on (un)employment is an empirical question. We analyze the relationship between (un)employment and cohort sizes using a long panel of Western German labor market regions. In this context, we account for both the likely endogeneity of cohort size due to migration of the (young) workforce across regions using lagged births as instruments as well as for temporal and spatial autocorrelation. Our results provide good news for the (Western) German labor market: small entry cohorts are indeed likely to decrease the overall unemployment rate and thus to improve the situation of job seekers. Accordingly, with regard to the employment rate we find that it is positively affected by a decrease in the youth share.

Zusammenfassung

In diesem Beitrag untersuchen wir die Wirkung des Eintritts kleiner Arbeitsmarktkohorten auf Beschäftigung und Arbeitslosigkeit in Westdeutschland. Von einem theoretischen Standpunkt aus kann eine Abnahme der Kohortengröße einerseits – in Umkehrung des Kohortenverdrängungseffektes – zu einem Abbau der Arbeitslosigkeit führen. Andererseits kann der Eintritt kleiner Kohorten auch dazu führen, dass Firmen überproportional ihr Angebot an Arbeitsplätzen reduzieren, so dass die Arbeitslosigkeit ansteigt. Wegen dieser gegenläufigen Effekte ist die tatsächliche Wirkung eine empirische Frage. Vor diesem Hintergrund analysieren wir den Zusammenhang zwischen Arbeitslosigkeit bzw. Beschäftigung und der Kohortengrößen mit einem Paneldatensatz über die westdeutschen Arbeitsmarktregionen. Mit diesem können wir sowohl zeitlicher und räumlicher Autokorrelation Rechnung tragen als auch der wahrscheinlichen Endogenität der lokalen Kohortengröße aufgrund von Migration insbesondere der jungen Erwerbspersonen zwischen den Regionen, indem wir die zeitlich verzögerte relative Größe der Eintrittskohorte zum Zeitpunkt ihrer Geburt als Instrument verwenden. Unsere Ergebnisse zeigen, dass kleinere Eintrittskohorten sehr wahrscheinlich zu einer Abnahme der Arbeitslosigkeit führen und sich damit die Lage von Arbeitssuchenden verbessert. In Übereinstimmung hierzu finden wir auch, dass die Abnahme des Jugendanteils mit einem Anstieg der Beschäftigungsquote einhergeht.

JEL classification: C23, J21, J82, R23

Keywords: Demographic change; cohort size; labor market

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1 Introduction

In this paper we analyze the consequences of labor market entry cohort size on (un)employment in Western Germany. Germany experienced a sharp decline in birth rates since the beginning of the 1970s: the so-called baby boomer were followed by a baby bust generation and it will experience significant demographic changes in the decades ahead. Not only will the population – in a likely scenario – shrink by almost 17% until 2050 but there will also be a dramatic shift in the age distribution due to the low fertility rate and increased life expectation (Federal Statistical Office of Germany, 2009).

Paralleling the demographic development, unemployment rates in Germany have been decreasing in the last few years. Thus, the question whether the size and the age composition of the working population have been affecting unemployment and employment rates is of high interest. In order to study the impact of cohort size on (un)employment we use regional population data from the Federal Statistical Office of Germany, social security and unemployment data from the Federal Employment Agency and the IAB for the years 1978 to 2009. Thereby, we distinguish a direct from an indirect effect. The direct effect is a composition effect which follows from acknowledging that different age groups have different age-specific unemployment rates. The indirect effect follows from the possibility that the cohort size changes the age-specific unemployment rates.

As a main result, we find that a 10 percent decrease in the youth share (roughly equivalent to the decline from around 19.7 percentage points in 1990 to around 17.5 percentage points in 2008) results in a decrease in the unemployment rate between 2.8 and 4 percent (i.e. -0.24 to -0.35 percentage points; the average unemployment rate in this period was 8.7%) when not accounting for endogenous mobility. The direct effect of population ageing is slightly smaller; we find that the actual changes in the age structure between 1991 and 2009 account for only -0.22 percentage points change of the unemployment rate. The decline in unemployment due to population shrinking and changes in the age composition represents a robust finding for various econometric specifications. Accordingly, our preferred model suggests that the employment rate increases in reaction to the decrease in the youth share.

The remainder of this paper is organized as follows. In Section 2 we review the related literature on labor market effects of demographic change. In Section 3 we give an overview on international developments, present the used data sets and provide descriptive statistics on demographic change, unemployment and employment in Western Germany. In Section 4 we calculate the direct statistical composition effect of demographic change on unemployment indicating to what extent changes in the age structure and in the participation structure across age groups have affected the unemployment rate. In Section 5 we develop the identification strategy, present the empirical findings for the relationship between the youth share in the labor force and (un)employment (the combined effect) and provide several robustness checks of our results. Finally, Section 6 concludes the paper.

2 Related literature

The various consequences of demographic change have been studied intensively in the literature. To start with, there are numerous investigations that analyze the effect of relative cohort sizes on earnings (e.g. Berger, 1985; Katz/Murphy, 1992 Macunovich, 1999; Sapozhnikov/Triest, 2007). Other papers study population aging and the associated changes in the demand for goods (Lührmann, 2005) that eventually translate into employment effects across different sectors in the economy (e.g. Siliverstovs/Kholodilin/Thiessen, 2011). In another strand of the literature the relationship between the labor market entry of the baby boom generation and retirement behavior of the elderly is investigated (e.g. Macunovich, 2009a,b).

In our paper we are interested in the relationship between labor market entry cohort sizes and (un)employment. The associated literature can be grouped into two broad categories which either focus on a direct or an indirect impact of demographic change on unemployment. The direct effect is considered to be the result of pure changes in the composition of the workforce given that the actual unemployment rate can be decomposed into age-specific unemployment rates which are weighted by the share of the age-specific population. To compare with, a counterfactual unemployment rate is constructed by weighting the actual age-specific unemployment rates with the population weights of a base year. The difference between both rates is then labeled as the direct effect.

Perry (1970) as well as Flaim (1979, 1990) provide results for the direct effect for the United States. In particular, Flaim (1979) shows that the actual unemployment rate was almost 0.8 percentage points higher in the period 1957 to 1977 only due to changes in the population composition as well as in labor force participation. By distinguishing the compositional from the participation component, Flaim (1979) shows, that the latter effect only plays a minor role for changes in the aggregate unemployment rate.

Similarly, Shimer (1999) also calculates the direct effect for the United States, using age-sex-specific fractions of the workforce as weights. According to his calculations the unemployment rate has risen by 0.74 percentage points in the period 1954 to 1978 and has decreased by 0.73 percentage points from 1978 to 1997 due to the cohort structure. According to Shimer, this suggests that the aging of the baby boomers explains to a large extent the decline of the unemployment rate since 1979. Combining these pure age effects with changes in labor force participation (of women) shows that the overall impact is even somewhat higher, i.e. a 0.96 percentage point increase of the unemployment rate in the period from 1954 to 1978 and a decrease by 0.80 percentage points between 1978 and 1997.

The majority of the literature, however, has focused on the indirect effect of the demographic change on (un)employment, thus taking into account a reaction of labor demand. According to the cohort crowding hypothesis, linked to this strand of the literature, workers are supposed to perform worse (better) on the labor market if they belong to bigger (smaller) cohorts. Easterlin (1961) was among the first to note that the relative size of the birth cohort is negatively correlated to its labor market opportunities. The underlying idea

is that a bigger size of the entry cohort may entail an increase in unemployment due to higher competition among the workforce, for an amount of jobs that is assumed fixed, or at least less flexible. Korenman/Neumark (2000) provide a good overview on this literature and also perform a cross-national analysis on cohort crowding and youth labor markets. They use OECD data for fifteen countries for the years 1970 to 1994 and conduct their investigation on a national level. Overall, they find evidence of cohort crowding on youth unemployment but only a very small effect on youth employment. Methodologically, this literature identifies the effect of demographic change on the labor market by analyzing the partial correlation between demography and the labor market on country-level data over time, implying difficulties to single out the effect of other macroeconomic events on the labor market.

Whereas the argument of cohort crowding on unemployment seems straightforward at first glance this hypothesis has been challenged by recent empirical and theoretical works. Shimer (2001) uses state-level data for the United States from 1978 to 1996 to show that the labor market entry of large cohorts entails positive effects not only for the same birth cohorts but also for prime-aged workers (individuals aged between 25 and 54) , i.e. a decrease in unemployment and an increase in employment, respectively. As an explanation, Shimer (2001) provides a theoretical model, which demonstrates that companies have an incentive to create more jobs in regions with large youth entry cohorts. The reason is that in a matching model with three possible states for individuals (unmatched, mismatched or well matched) without on-the-job search, the probability to form good matches is higher in labor markets with many young individuals. Under reasonable parameter assumptions, this can lead to a sufficiently high number of newly created jobs such that the labor demand reaction overcompensates the initial labor supply shift. Thus, overall unemployment declines, when youth entry cohorts increase.[1] Foote (2007) augments the investigation conducted by Shimer (2001) by controlling for spatial autocorrelation in the state-level data and by extending the sample period until the year 2005. In contrast to Shimer (2001) but in line with the cohort crowding literature, Foote (2007) provides evidence that the youth share effect (cohort crowding) on unemployment is positive.

Given the rapid demographic change in Germany (cf. the next section) it comes as a surprise that the consequences on the labor market have been ignored in the economic literature for a long time.[2] A notable exception is Zimmermann (1991) who investigates cohort effects on unemployment in Western Germany using national data for the period 1967 to 1987. His results suggest that in the long-run young cohorts do not experience higher unemployment rates if their cohort size is relatively large. However, in the short-run Zimmermann (1991) finds a positive impact of relative cohort size on unemployment.

[1] Nordström-Skans (2005) performs a similar analysis as Shimer (2001) for the Swedish labor market. He finds that young workers benefit from belonging to a large cohort.

[2] In the sociological literature, there are studies that are concerned with the two hurdles from school to vocational training and from the vocational-training system into work. In part, these studies also discuss the effect of the cohort size on the transition probabilities from a microeconomic/micro-sociological point of view. For example, Hilmert (2001, 2004) concludes for the birth cohorts 1964 and 1971 that the cohort size does not play a crucial role in determining the transition probabilities. However, this literature focuses on the labor-market success within a certain entry cohort. Macro-effects on (un)employment rates and effects on other cohorts are not discussed.

Börsch-Supan (2003) shows that shifts in the age structure affect the demand for goods which eventually translates into employment effects. Ochsen (2009) uses regional data for 343 German districts controlling for spatial autocorrelation, however, only two years are considered in the time dimension (2000 and 2001). He shows that the aging of the workforce and a declining share of younger job seekers is related to increases in regional unemployment rates. In particular, unemployment increases due to decreasing shares of young job seekers in surrounding areas.

Our paper fills the research gap left by Zimmermann (1991) and Ochsen (2009) using both a long time series *and* a large cross section. We aim to identify both the (causal) pre-adjustment effect and the (non-causal) post-migration effect of the relative size of the entry cohort on aggregate employment and unemployment.[3]Our approach complements the studies of Zimmermann (1991) and Ochsen (2009) since we take simultaneously into account macroeconomic factors and the fact that demographic change has proceeded quite differently across the German regions. We exploit regional variation in the age structure of the (un)employed and regional differences in population development. Contrary to Ochsen (2009), we use functionally delineated labor market regions[4] instead of NUTS 3 regions and our study comprises the time period from 1993 to 2008.[5] We perform various econometric specifications such as ordinary least squares (OLS), instrumental variable (IV) techniques and regression models where spatial autocorrelation across districts are taken into consideration.

Thus, our empirical analysis adds to the literature by studying the effect of cohort size over a long time span, by analyzing separately a direct effect of ageing on unemployment, by singling out macroeconomic factors and using an appropriate unit of analysis. The long time horizon is important since the variation in cohort size has not been that large in recent years but it has been significant in the past when the baby boomer generation was followed by a baby bust generation.[6] In a second respect, our paper contributes to the literature because we analyze the effect of decreasing cohort sizes on the labor market outcome (and not increasing cohorts as in previous studies). This relationship could but need not to be symmetric across directions of population developments. Third, given that Germany as well as most other industrialized countries will experience significant declines in the labor force in the near future our results are highly relevant for the questions whether and to what extent the government should alter its migration, family and retirement policies in order to compensate for a shrinking working population.

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[3] One important reason, why the partial correlation between youth share and unemployment rate is not identical with the causal effect, is that young individuals might move in reaction to labor market differences. We discuss this point more intensively later in the paper.

[4] Eckey/Kosfeld/Türck (2006) describe the delineation of German labor market regions. These labor market regions consist of one or more administrative units (districts or “Kreise”) and fulfill the criterion of reasonable commuting, i.e. a maximum of 45 to 60 minutes in dependence of the attractiveness of the centre. The main advantage of using labor market regions instead of administrative units is - in our view - that the spatial spillovers are considerably smaller.

[5] The time window 1994-2008 is due to our instrument. For the OLS estimations we can use a longer window from 1978.

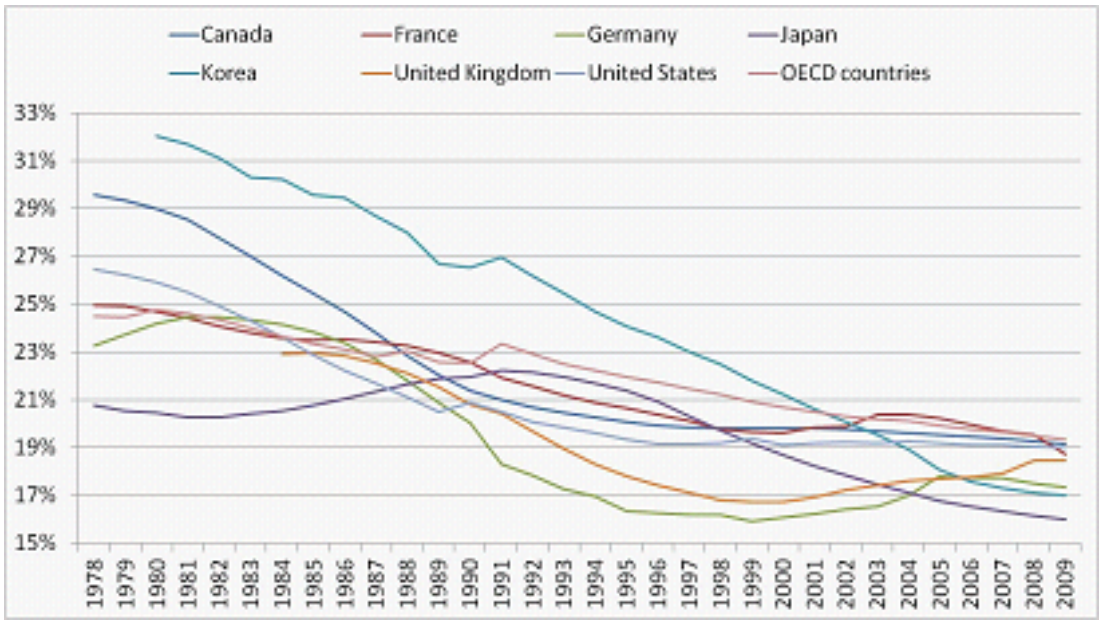
[6] In Germany the baby boomer generation is considered to be born during the mid 1950s until the mid 1960s implying that these individuals have entered the labor market (predominantly) during the mid 1970s until the mid 1980s. In the United States the baby boom has already started one decade ahead, i.e. from the mid 1940s until the mid 1960s.

3 International comparison and used data

In order to assess the magnitude and the speed of demographic change, we firstly compare Germany with other industrialized countries. For this purpose, we provide the development of youth shares, employment levels and unemployment levels in selected OECD countries. In a second step, we present descriptive statistics for the West German labor market regions.

3.1 Demographic change in international comparison

In Figure 1 we show the development of the youth shares, i.e. the population aged 15-24 divided by the population aged 15-64, in selected OECD countries as well as for the average of the industrialized countries. The youth share was much higher in Canada (1978: 30%) and in South Korea (1980: 32%) than in other industrialized countries (OECD average in 1978: 24%) and in particular in Germany (1978: 23%) in the late 1970s. However, due to the increasing birth deficit and the aging of the baby boomer generation the youth share has decreased in all industrialized countries, i.e. the OECD average was only 19% in 2009. The decline has been almost 11 percentage points in Canada, 15 percentage points in South Korea and 6 percentage points in Germany. However, currently Germany is together with Japan and South Korea among those industrialized countries that display the lowest youth shares among OECD member states.



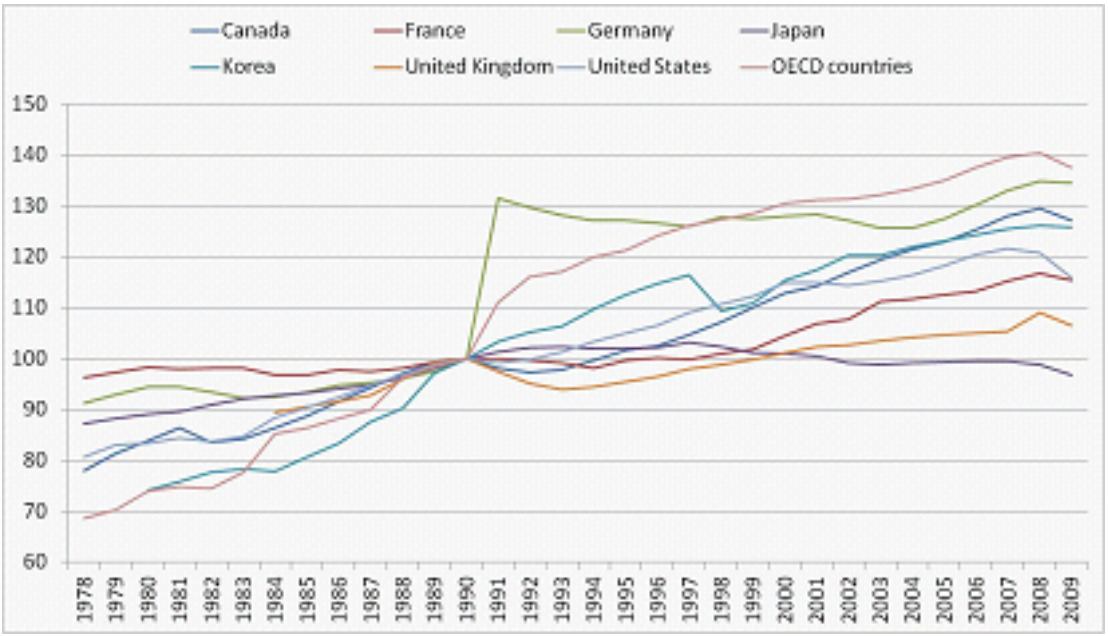
Source: OECD Statistics, own calculations

Figure 1: Development of the youth share (population aged 15-24 population aged 15-64) in selected OECD countries from 1978 to 2009

With regard to the employment situation we observe a significant increase in Germany from 1990 to 1991 due to the German unification[7] (see Figure 2). However, in subsequent years

[7] Before 1991, numbers refer to Western Germany; from 1991 onward, internationally comparable numbers are only available for reunified Germany.

there only have been small changes in the employment level. Similarly to Germany there have been only small changes in employment in Japan since the beginning of the 1990s. In contrast, countries such as Canada, France, South Korea, the United Kingdom and the United States of America have experienced significant increases from 1990 until 2009. Overall, the employment level has increased by 37% within the OECD member countries in this period.

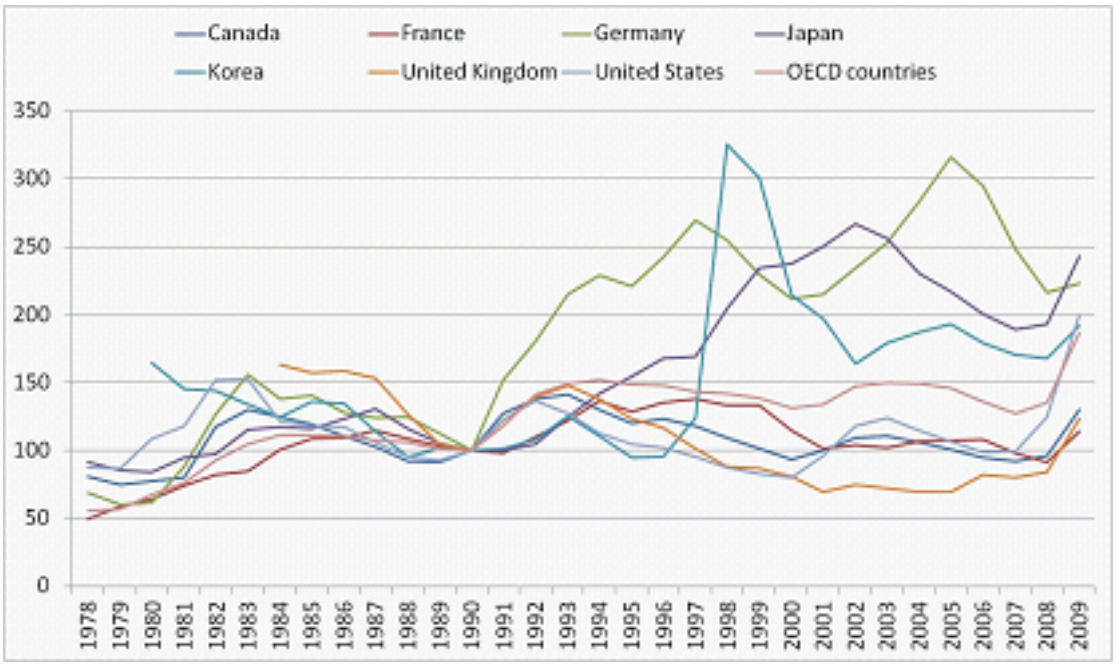


Source: OECD statistics, own calculations

Figure 2: Development of the total number of employed in selected OECD countries from 1978 to 2009 (1990=100)

In addition, there have also been differences across the OECD countries with respect to the development of unemployment levels (see Figure 3). Focusing on Korea and Japan, we observe an increase in unemployment by 92% for the former and by 143% for the latter country in the period 1990 to 2009. This development is particularly interesting given that there has been a relatively strong decline in the youth share in this period. Virtually the same development can be observed for Germany. In other countries such as Canada, France and the United Kingdom the youth share has almost remained constant while the unemployment level has decreased and the employment level has increased in the same time period (except for the year 2009). The United States represent a special case since a constant youth share corresponds to a constant unemployment level (except for the years 2008 and 2009) while there has been an increase in employment.

Summarizing the descriptive evidence on demographic change, employment and unemployment in OECD countries, we find that the youth shares have been decreasing in all industrialized countries, but that this development has been quite heterogeneous. In Germany (as well as in Japan and South Korea) the decline in the youth share was slow, though the youth share itself is small. The decline in the youth share corresponds to an increase in unemployment while employment (correcting for reunification) has almost remained the same. This evidence is suggestive and has been used in cross-country studies to test the cohort-crowing hypotheses (see Korenman/Neumark, 2000). Below, we follow a different



Source: OECD Statistics, own calculations

Figure 3: Development of the total number of unemployed in selected OECD countries from 1978 to 2009 (1990=100)

approach and try to identify a causal effect by using data on German labor market regions. By doing this, we exploit variation in regional population and labor market developments and are able to single out common macroeconomic events.

3.2 German labor market regions

For our empirical investigation we use different data sources. Since our unit of analysis is the regional level we use as cross-section observations all entirely Western German 108 functional labor market districts.[8] With regard to the population we have data from the Federal Statistical Office that enables us to distinguish between seven mutually exclusive age-groups over the complete time horizon, i.e. individuals aged 15-24, 25-29, 30-34, 35-39, 40-49, 50-59 and 60-64. The population data comprises the time period from 1978 to 2009. In Table 1 we provide descriptive statistics on the development of the alternative age groups of the population in order to demonstrate how demographic change in Germany affects the age composition and the total number of the labor force.

Overall, the population aged 15-64 has increased by over 4.1 million in the period 1978 to 2009, i.e. an increase by almost 10%. However, the development has been quite het-

[8] We only consider data for Western Germany because of data availability, i.e. we have access to a long time series from 1978 to 2008 and there only have been minor changes in the territorial delineations of the NUTS-3 regions in Western Germany, which we can uniquely track and which serve as a basis for the construction of functional labor markets (FLM). In contrast, there have been significant changes in the assignment of municipalities to NUTS-3 regions in Eastern Germany. Furthermore, regional population data for Eastern Germany at the NUTS-3 level are only available for the time after German reunification. There are 5 functional regions covering areas across the former inner-German border (Hof, Coburg, Göttingen, Wolfsburg/Helmstedt and Berlin). However, results reported here refer only to the 108 entirely western German functional regions.

erogeneous across age groups. From 1978 to 2009 the number of young individuals aged 15-24 has decreased by over 1.6 million persons (-21.8%), the baby bust, whereas we find a relatively small reduction in the age group 25-29 (-5.6%).

Table 1: Development of age-groups in Western Germany 1978-2009, in Millions

	15-24	**25-29**	**30-34**	**35-39**	**40-49**	**50-59**	**60-64**	**15-64**
1978	9.206	4.13	3.646	4.577	8.078	6.996	2.281	38.914
2009	7.556	3.910	3.772	4.256	11.148	8.949	3.456	43.048
2009-1978	-1.65	-0.22	0.126	-0.321	3.07	1.953	1.175	4.134
in %	-21.8	-5.6	3.3	-7.5	27.5	21.8	34.0	9.6

Source: Federal Statistical Office of Germany, own calculations

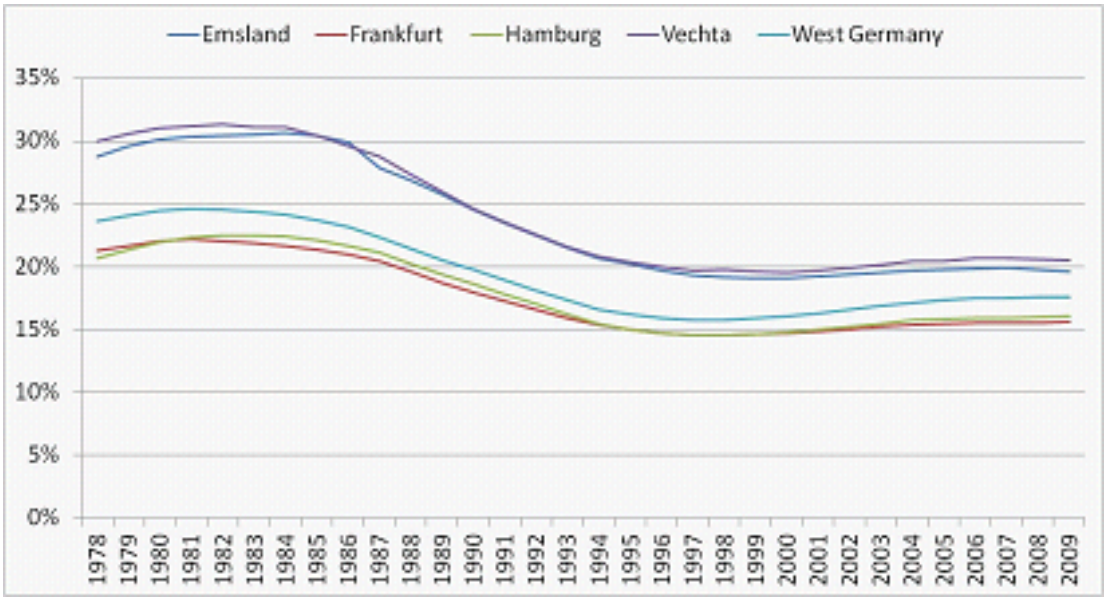
In 2009 the majority of the baby-boom generation is already older than 40 which in turn explains the strong increase of these age groups. For instance, there has been an increase by 27.5% in the group of individuals aged 40-49, i.e. in absolute numbers this class has gained 3.1 million individuals. In addition, the number of individuals in the age group 50-59 has risen by almost 22% which is also mainly due to the baby-boomer generation. The strongest (relative) increase can be observed in the age group 60-64 ($+34\%$). In contrast to the aforementioned age-groups this increase cannot be explained by the baby-boom generation since these individuals were born between the late 1940s and the mid 1950s. The explanation for this strong increase is rather the reduced size of the cohorts born during World War I and particularly affected by World War II, who were aged 60 to 64 in 1978. In addition, the former so-called guest workers, i.e. foreigners that have immigrated to Germany between 1955 and 1973, also belong to the age group 60-64.[9] Altogether, demographic change over the last three decades can be characterized by a relatively strong decline within the younger age groups, especially for the group aged 15-24, whereas there has been a strong increase in the elderly population.

However, demographic change did not proceed in the same fashion across the West-German regions. Some labor market regions have seen their youth share decline much faster than other parts due to differences in birth rates, life expectancy and migration. In order to illustrate these heterogeneities we use regions with the highest and lowest youth shares in 1978 as examples in Figure 4 (see also Figure 7 and 8 in the appendix). The light blue line indicates the share of the population aged 15-24 over the population aged 15-64 for Western Germany and thus represents the average development. Between 1978 and 2009 this share declined from 23.6% (over a peak at 24.8% in 1981 and a minimum at 16.1% in 1997) to 17.6%.

The green and red lines reflect that this share was much lower in Frankfurt and Hamburg at the beginning of our observation period. However, their youth shares have only declined

[9] Due to the perceived shortage of labor in the years of the so called Wirtschaftswunder (economic miracle) the government initiated a guest-worker program. Foreign employees were hired abroad in order to work in assigned jobs in the German industry. In 1955 the first bilateral contract was concluded with Italy. At the beginning of the 1960s recruitment agreements were signed with Spain, Greece and Turkey followed by other countries from the Mediterranean. In the aftermath of the first oil crisis the government established in 1973 a ban on recruitment of workers not originating from the European Union.

by around five percentage points from 21% to 16% until 2009. With regard to those labor market regions with the highest youth share in 1978 we find rural regions with a lower population density such as Emsland (29%) and Vechta (30%). But, these districts are more affected by demographic change, i.e. a decrease by almost nine percentage points in each region until 2009.



Source: Federal Statistical Office of Germany, own calculations

Figure 4: Population aged 15-24 over population aged 15-64 in selected Western German labor market region (1978-2009)

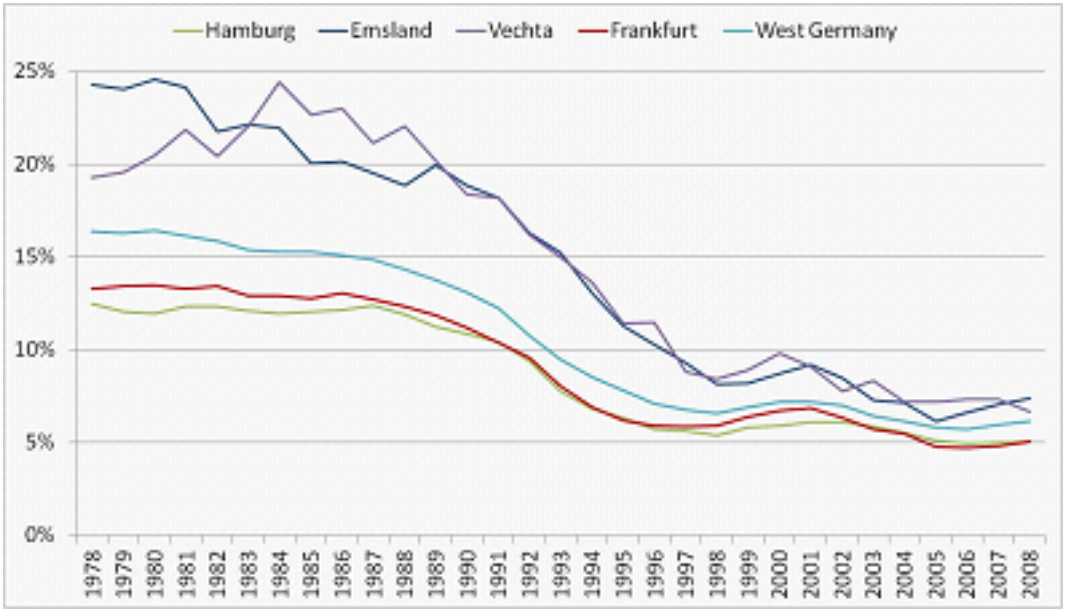
Due to the fact that demographic change does not only alter the composition of the population but also the age structure of the labor force we have depicted the share of the young workers (aged 15-24) over the total number of workers aged 15-64 in Figure 5 for the same labor market regions as in Figure 1.[10] Data Source is the IAB's Sample of Integrated Labor Market Biographies (SIAB), see Dorner et al. (2010), a 2% random sample of the individual register data collected by the Federal Employment Agency (FEA); the reported numbers refer to persons in regular employment at June 30th, the annual record day. Since the beginning of the 1980s we observe a downward trend, i.e. the share of the young workforce in Western Germany (light blue line) has declined from over 16% to around 6% in the year 2008. This observation corresponds to the strong decrease in cohort sizes at the end of the baby boomer generation.[11]

In addition, similar to the regional heterogeneity in population developments we also find these regional differences in the labor market developments. The share of the young workers has been slightly over 24% in the labor market region Emsland but under 13% in Hamburg in 1978. Over the last decades this share has decreased significantly in Emsland, i.e. by 17 percentage points, whereas the decline is less pronounced in Hamburg (-7

[10] Throughout the paper individuals are not counted as workers while participating in vocational training.

[11] Note that while the population share of the 15-24 years age group stabilizes after 1994, this is less so for the employment share. The reason for this lies in the participation of the young age group: while the participation of the 15-64 years age group remains roughly the same between 1994 and 2008, the participation of the age group 15-24 strongly decreases. The reasons for this are both rising shares of pupils and of university students.

percentage points). The situation in Frankfurt is quite similar to that in Hamburg whereas in Vechta the youth share has increased until the mid 1980s (to over 24% in 1984) and has experienced a strong decline by 18 percentage points in subsequent years.[12]



Source: Institute for Employment Research: SIAB (1975-2008), own calculations

Figure 5: Development of the employed aged 15-24 over the number of employed aged 15-64 at workplace in selected labor market regions from 1978-2008

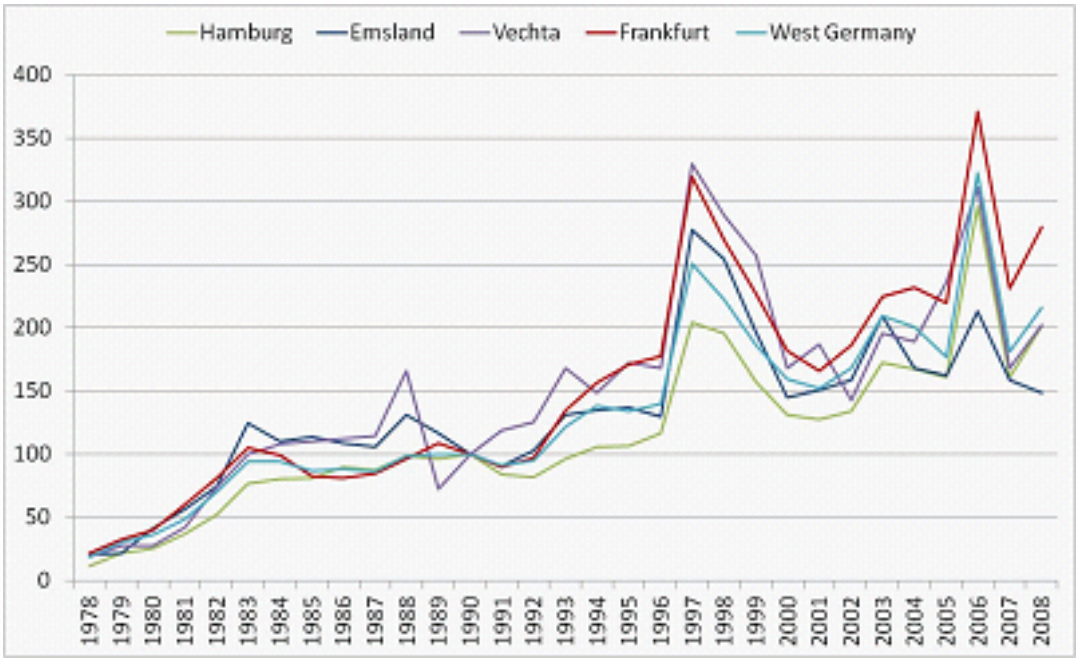
The number of unemployed persons has increased in Western Germany throughout the considered time period. Although, there are significant differences in the unemployment levels across the labor market regions the direction of the developments are quite similar. After the recession in the mid 1990s and the so-called Hartz reforms 2003 to 2005 the unemployment figures have increased strongly in most regions.[13]

Overall, if the descriptive evidence allowed for the interpretation that demographic change in Germany was associated with labor market developments, one would infer that smaller entry cohorts led to increasing unemployment. From 1978 to 2008 the number of the younger population (15-24) has decreased by 1.5 million persons, while unemployment increased by almost 2 millions.

Comparing the youth shares across selected labor market regions shows that demographic change and labor market developments proceed differently across the German districts. Overall, the share of employed persons aged 15 to 24 over the employed persons aged 15 to 64 has decreased until the end of the 1990s and has remained constant in subsequent years.

[12] The developments in population shares and employment shares differ because the relative employment (employment to population ratio) of the 15-24 year olds diminishes strongly over time (longer average education time), whereas the relative employment of the 15-64 year olds on average remains roughly unchanged, hiding of course heterogeneous developments over sexes and age groups. The relative employment of the age group 50-64 remains roughly unchanged, too, while the female employment in this age group increases strongly.

[13] Note that the increase in unemployment in 2005 is partly due to changes in the accounting of unemployment.



Source: Federal Employment Agency of Germany, own calculations

Figure 6: Development of the total number of unemployed in selected labor market regions from 1978-2008 (1990=100)

Clearly, the descriptive evidence does not permit to infer any causal relationship between declining birth cohorts and labor market developments. In order to identify a causal effect we exploit regional variation and the variation over time in the youth share as well as in the workforce and develop an identification strategy based on exclusion restrictions. However, before conducting the econometric analysis, in the next section, we calculate the compositional (direct) effect of changes in the age structure as well as in participation on the unemployment rate.

4 Direct effects of demographic changes on the unemployment rate

Transferring the ambiguous results from the cohort crowding literature to cohort shrinking implies, on the one hand, that the aggregate unemployment rate is expected to fall due to less competition among entrants on the labor market (Easterlin, 1961). On the other hand, theory also suggests that companies may create fewer jobs in regions with a low birth rate so that overall unemployment may increase (Shimer, 2001). Since the aggregate unemployment rate is the product of age-specific weights and age- specific unemployment rates, changes in the overall unemployment rate may stem from two sources. First, cohort sizes may increase or decrease, i.e. the age-specific weights may change (the direct effect), or second, age-specific unemployment rates may vary across years.

In what follows, we calculate the direct effect of the composition and participation across age groups on unemployment, applying the population weights of a base year to the actual age-specific participation and unemployment rates of each year to calculate a counterfac-

tual unemployment rate. The difference to the actual unemployment rate is then called direct effect (Flaim, 1979 and Shimer, 2001). In Section 2, we defined the direct effect of cohort size on unemployment as being simply the difference between the actual unemployment rate and a counterfactual unemployment rate, constructed by applying the population weights of a base year to actual age-specific unemployment rates. The underlying assumption is that age-specific unemployment rates are determined by other factors and thus that the composition shapes the aggregate unemployment rate.

Using the Flaim (1979) approach, we subdivide the compositional impact into a part resulting from changes in the age structure of the population and a part stemming from changes in the labor force participation rates of the various age groups. We apply the actual age-specific unemployment rates for each year over the available time period (1991-2009) to a labor force for which age components are held constant (here labor force weights from 1991). We then compute the difference between this counterfactual rate (Table 2, column B) and the actual rate (column A) which indicates the amount of change in the overall rate that stems from changes in the makeup of the labor force (column C). The results in column C in Table 2 indicate that since the year 2000 the counterfactual unemployment rate based on a constant distribution of the labor force would have been higher than the actual unemployment rate in the same year. Hence, due to demographic changes the unemployment rate is lower compared to the situation with no demographic changes. Put it differently, the unemployment rate would have been higher if there were no changes in the composition in the age structure.[14]

The effects of changes in labor force participation rates of the various age groups are represented in the next two columns of Table 2. In particular, values in column E are arrived at by subtracting from column A a counterfactual unemployment rate (column D) which is computed by allowing the age-specific unemployment rates and the population structure to change over time while holding the labor force participation rates of the various groups at their 1991 levels.

With respect to changes in participation rates we observe very low values in column E, indicating that in the considered period from 1991 to 2009 there have been no substantial changes in participation for the entire labor force. Consequently, the overall effect of population changes on the unemployment rate (column F) is very close to the effect of the compositional changes. The unemployment rate in 2009 would have been 0.22 percentage points higher compared to the actual unemployment rate if there were no changes in the age structure as well as in participation. Thus, demographic change in Germany (from 1991 to 2009) results in a low but still negative (direct) effect on the overall unemployment rate. To summarize, the direct effect shows that the unemployment rate would have been higher after 2000 if the entry cohort size had been as large as in 1991. Thus, this pure statistical exercise can be interpreted as first evidence for a positive relationship between declining cohort sizes and a lower unemployment rate.

[14] For the calculation of the direct effect, we use a different data source, namely the Mikrozensus. This is the only data source for Germany which allows the construction of age-specific unemployment rate over such a long time horizon.

Table 2: Effect of total compositional changes and of participation and population changes on the overall unemployment rate, based on 1991 weights

Year	Actual unemployment rate	Rate based on constant distribution of labor force	Effect of compositional changes (A - B)	Rate based on constant participation rates	Effect of participation changes (A - D)	Effect of population changes, the direct effect (C - E)
	A	B	C	D	E	F
1991	4.66	4.66	0.00	4.66	0.00	0.00
1992	5.95	5.95	0.01	5.96	-0.01	0.01
1993	7.41	7.40	0.01	7.42	-0.01	0.02
1994	8.35	8.33	0.02	8.35	0.01	0.01
1995	8.08	8.04	0.04	8.06	0.02	0.02
1996	8.80	8.76	0.04	8.77	0.03	0.01
1997	9.80	9.73	0.06	9.74	0.06	0.01
1998	9.69	9.61	0.08	9.62	0.07	0.01
1999	8.75	8.70	0.05	8.68	0.07	-0.02
2000	7.85	7.88	-0.03	7.81	0.04	-0.07
2001	7.87	7.92	-0.05	7.82	0.05	-0.10
2002	8.74	8.83	-0.10	8.70	0.03	-0.13
2003	10.07	10.22	-0.16	10.04	0.03	-0.19
2004	11.04	11.26	-0.22	11.03	0.01	-0.23
2005	11.26	11.58	-0.33	11.33	-0.07	-0.26
2006	10.36	10.61	-0.25	10.39	-0.04	-0.21
2007	8.72	8.95	-0.23	8.76	-0.04	-0.19
2008	7.61	7.82	-0.22	7.65	-0.05	-0.17
2009	7.82	8.12	-0.30	7.91	-0.08	-0.22
Source: Federal Statistical Office of Germany, own calculations.						

5 The effect of the youth share on the labor market

5.1 Econometric specifications

In order to analyze the total effect of cohort shrinking on (un)employment in Western Germany we check whether there is a statistically significant relationship between the population share of young residents (aged 15 to 24 years) in a particular region and the (un)employment rate in the same region. Thus, we measure the combined effect of demographic change on (un)employment, comprising the indirect effect plus the direct effect from above. The dependent variable, log$rate_{it}$, is either the natural log of the unemployment ratio over all age groups $\left(\frac{\#\text{unemployed}}{\text{population (15-64 years)}}\right)$ or the natural log of the employment ratio over all age groups $\left(\frac{\#\text{employed (at residence)}}{\text{population (15-64 years)}}\right)$. We conduct this analysis at a disaggregated regional scale for all Western German functional labor markets ($i = \{1, ..., 108\}$) and consider the period from 1993 to 2008 ($t = \{1993, \ldots, 2008\}$).[15] The coefficients α in equation (1) capture regional and the coefficients β time effects. The random disturbance term is represented by ε. The coefficient of interest γ – the elasticity of $rate_{it}$ with respect to the local youth share – indicates the sign and the size of the youth share effect on the unemployment or employment rate, respectively:

$$\log(rate)_{it} = \alpha_i + \beta_t + \gamma \log\left(\text{youth share}\right)_{it} + \varepsilon_{it} \tag{1}$$

with $\log\left(\text{youth share}\right)_{it} = \log\left(\frac{\text{population (15-24years)}}{\text{population (15-64years)}}\right)_{it}$

In matrix notation, we have

$$rate = A + B + YS\,\gamma + E \tag{2}$$

with $rate = (\log(rate)_{11}, ..., \log(rate)_{1T}, \log(rate)_{21}, ..., \log(rate)_{NT})'$, $A = (diag_{i=1}^{N}\alpha_i)\otimes I_T$, $B = I_N \otimes (diag_{t=1}^{T}\beta_t)$, $YS = (\log(\text{youth share})_{11}, ..., \log(\text{youth share})_{NT})'$ and $E = (\varepsilon_{11}, ..., \varepsilon_{NT})'$.

When estimating with OLS, identification of the coefficient γ as causal effect requires that the share of the youth population on the overall population does not depend on the unemployment rate. However, the youth share in specification (1) is likely to be endogenous since individuals relocate across regions due to disparities in labor market conditions (for Germany, see Arntz, 2007. In order to address this endogeneity, we instrument the local current cohort size by the cohort size of the same group 15 years ago (lagged birth cohort), i.e. when both the persons in the numerator and the denominator were 15 years younger. Since we consider the population aged 15 to 24 years as the entry cohort, we estimate

[15] The IV procedure (see below) constrains our sample to the time period from 1993 to 2008. We use the complete time period from 1978 to 2008 as a robustness check, but want to synchronize the time period used for the OLS and the IV results. There are five labor market regions spread across the former inner German border (Berlin, Coburg, Göttingen, Helmstedt and Hof) which are not included in the estimations presented here but in some robustness estimations.

equation (1) with IV, with the following equation (3) as first stage regression:

$$\log\left(\frac{\text{population (15-24years)}}{\text{population(15-64years)}}\right)_{it} = \delta_i + \varphi_t + \mu \log\left(\frac{\text{population (0-9years)}}{\text{population (0-49years)}}\right)_{i,t-15} + \psi_{it} \tag{3}$$

In Matrix form, this becomes

$$YS = D + \Phi + BS\,\mu + \Psi \tag{4}$$

where *YS* as defined above, $D = (diag_{i=1}^{N}\delta_i) \otimes I_T$, $\Phi = I_N \otimes (diag_{t=1}^{T}\varphi_t)$, $BS = (\log(\text{birth share})_{1,-14}, ..., \log(\text{birth share})_{N,T-15})'$ and $\Psi = (\psi_{11}, ..., \psi_{NT})'$. Note that $(\log(\text{birth share})_{i,t-15} = \log\left(\frac{\text{population (0-9years)}}{\text{population (0-49years)}}\right)_{i,t-15}$.

5.2 Empirical results

In Table 2 we present the results from our OLS and IV estimations where we regress the log (un)employment ratio on the log youth share (weighted by the population shares of the respective labor market region) as defined above, using the robust sandwich form for estimating the covariance matrix (White, 1980). Due to the log-log specification the coefficients can be interpreted as elasticities. Our OLS results indicate that a 10 percent decline in the youth share of the population – in 2009 a reduction of roughly 1.7 percentage points – is correlated with a 2.78 percent decline in the unemployment ratio (roughly equivalent to a shift of the unemployment rate from 7.3 % to 7.1%). With respect to the employment ratio we find a negative elasticity of -0.56, i.e. a 10 percent decline in the youth share corresponds with a 5.6 percent increase in the overall employment ratio. The estimate for unemployment is small in size and insignificant (which might be due to the sandwich variance-covariance estimate). Hence, the point estimates confirm the inversed cohort crowding hypothesis that smaller labor market entry cohorts do indeed improve the situation of the job seekers. This result is a combination of the direct and the indirect effect, i.e., both the age specific unemployment rates change and the age composition changes.

Table 3: Results – Basic specifications

Explanatory Variable: Log youth share	Log unemployment/population ratio, 1993-2008		Log employment/population ratio (residence, age 15-64), 1999-2008	
	OLS	IV	OLS	IV
Coefficient	0.2780 (0.1887)	1.0757 (0.2688)	-0.5581 (0.1314)	-0.6994 (0.2652)

Remarks: Estimation equations are saturated with region and year dummies. Observations are weighted with population shares to account for the different size of the regions. Standard errors are given in parentheses.

However, it is not possible to interpret these effects in a causal fashion, since the population (and in particular the young population) is likely to be mobile across the labor market regions, implying that the actual local cohort size is endogenous. In order to solve this

econometric problem, we need to filter the endogeneity out. In the IV specifications we use the relative size of the lagged births cohorts as an instrument for the relative size of the labor market entry cohort (see equation 2). The lagged birth rate in the first stage is highly significant with an estimated coefficient of 0.50, and the partial R-squared mounts to 0.4045 in the estimation over the period 1993-2008 and to 0.3009 over the period 1999-2008, respectively. It is plausibly exogenous in the second stage if parents do not relocate do to the anticipated labor market situation fifteen years later.

The estimated coefficient of the 2SLS model for the youth share effect on the unemployment rate is much larger when compared to the OLS specification. This is in line with our expectation, since labor mobility tends to equalize labor market differences, thus making the observed partial correlation smaller. The reported elasticity in Table 3 is roughly 1, indicating that a 10 percent decrease in the youth share translates into a 10 percent decline in the unemployment ratio. The estimated coefficient is statistically significant. With respect to employment the elasticity remains negative and becomes a bit larger in absolute value, indicating now that a 10 percent decrease in the youth share entails a 7 percent increase in the employment ratio.

Overall, our estimations show that there is a positive effect of the youth share on the unemployment rate and a negative effect of the youth share on the employment rate. Thus, our results support the cohort crowding hypothesis, namely that large (small) labor market entry cohorts positively (negatively) affect unemployment, i.e. an increase (decrease) in the unemployment rate. Consequently, since demographic change in (Western) Germany has been characterized by declining birth cohorts, these results suggest that a reduction in cohort size had a positive impact on the labor market in the sense that it lowered the unemployment rate and increased the employment rate. In addition, the differences between OLS and IV estimates are consistent with the view that individuals react to the local labor market situation of the region where they grow up by moving to regions with ex-ante lower unemployment. As a consequence, the post-mobility elasticities estimated by OLS adjust towards each other, i.e. they are both closer to zero.

5.3 Discussion and robustness checks

In order to assess whether our results are valid under alternative assumptions we perform several robustness checks. The estimates in specification (1) are likely to have serially and spatially correlated residuals – or to be determined by a serially and spatially lagged dependent variable – because of the persistence and the spatial distribution of the (un)employment rate in Germany.

Since ignoring serial correlation would provide inefficient estimates of our coefficient of interest γ as well as biased standard errors when not using a robust covariance estimate, we check for serial correlation in the error term. Put it differently, we account for the fact that changes in the (un)employment rate only gradually vanish over time. In order to gain efficiency and to account for autocorrelation in the error term, we use a feasible generalized least square (FGLS) estimator which can be implemented as Prais-Winsten (PW) and/or

Cochrane-Orcutt (CO) approach (Greene, 2008). Shimer (2001) uses the CO procedure to account only for serial correlation.

However, as our data is observed at a regional level it is likely that the estimations are also affected by spatial correlation, e.g. due to commuting or because of events commonly affecting neighbor regions. Then, observations cannot be considered independent and estimates may turn out to be, at best, inefficient or, at worst, biased. Foote (2007) shows that this alters the results for the US labor market considerably. To account for cross-sectional dependencies, we use a (row-standardized) first-order contiguity matrix (wherein the element w_{ij} contains the value 1 (or $\frac{1}{\sum_{j=1}^{N} w_{ij}}$ in the row-standardized) if regions i and j have a common border and 0 otherwise) as spatial link matrix W and estimate a model wherein the residual is assumed to follow a SAR(1) process.[16]

Then, the model with a serially correlated error term $\varepsilon_{it} = \phi\varepsilon_{i(t-1)} + u_{it}$ and L as the lag operator is given by

$$rate = A + B + YS\gamma + (I_N \otimes (I_T - \phi L))^{-1}U \tag{5}$$

and the model with a spatially correlated error term $\varepsilon_{it} = \lambda \sum_{j=1}^{N} w_{ij}\varepsilon_{jt} + u_{it}$ (for the detailed estimation routine see Kapoor/Kelejian/Prucha, 2007) is

$$rate = A + B + YS\gamma + ((I_N - \lambda W) \otimes I_T)^{-1}U. \tag{6}$$

When accounting for error correlation, we apply Cochrane-Orcutt and Prais-Winsten transformations on the data, respectively: We use the residuals of a first (inefficient) regression to estimate the parameters determining the error correlation, pre-multiply the matrices $rate$ and YS with $(I_N \otimes (I_T - \phi L))$ or $((I_N - \lambda W) \otimes I_T)$, respectively, and then get the final, (hopefully more) efficient estimation from the transformed variables.

CO and PW provide virtually the same results, so that we only indicate the results for the CO transformation in Table 4. Starting with serial dependence (the results of eq. (5)), the coefficients for unemployment are larger in size when compared to the non-GLS-transformed OLS and IV estimator. When accounting for serial correlation, the IV regression of the (log) unemployment ratio on the (log) youth share shows a (weakly) significant positive relationship. However, the IV results in Table 3 are in the confidence interval of

[16] A first-order contiguity spatially autoregressive process $u = (I - \lambda W)^{-1}\varepsilon$ is equivalent to an infinite order spatial moving average $u = \left(\sum_{p=0}^{\infty} \lambda^p W^p \varepsilon\right)$ where the weights used in computing the average decline geometrically with the number of neighbors between two regions (see e.g. LeSage/Pace, 2009, Ch.1). Hence, it is a fairly general way to model a cross-sectionally autocorrelated process where the degree of correlation decays with geographical distance. Contiguity does hardly reflect correlated shocks affecting all metropolitan areas and major cities but not the rural areas in between them. In addition, economic linkages e.g. due to mobility and input-output relations do not necessarily follow physical structures. However, previous research for Germany (see Schanne/Wapler/Weyh, 2010) found a high degree of similarity between contiguity-based weights and commuting-based weights which reflect economic connectivity between regions.

the FGLS-IV estimate. With regard to social security employment,[17] the FGLS-IV estimate of the effect of the youth share on the employment rate shows a virtually unchanged coefficient when compared to the basic IV specification. Both estimates of the employment elasticity are not significant at reasonable levels. In the GLS transformations of the OLS and IV estimations, the coefficient estimates hardly change compared to the results reported in Table 3. However, the standard error of the non-instrumented (post-mobility) unemployment elasticity estimate is now sufficiently small that significance can be established.

Overall, the estimations for the relationship between the youth share and unemployment are quite robust across the alternative specifications. Given that the IV specification provided a bigger elasticity in magnitude than the OLS estimation it seems that – as we expected – young workers do in fact react on labor market differences by moving to low unemployment regions and the significant elasticity estimates lend support to the (reverse) cohort-crowding hypothesis.[18]

Table 4: Feasible generalized least squares estimates

Explanatory Variable: Log youth share	Log unemployment/population ratio, 1993-2008		Log employment/population ratio (residence, age 15-64), 1999-2008	
	FGLS	FGLS-IV	FGLS	FGLS-IV
Serial correlation	0.7468 (0.3389)	3.3108 (1.7770)	-0.3810 (0.2207)	-0.3850 (0.8604)
Spatial correlation	0.2791 (0.1011)	1.0891 (0.3769)	-0.0820 (0.0726)	-1.1859 (0.3633)

Remarks: Estimation equations are saturated with region and year dummies. Observations are weighted with population shares to account for the different size of the regions. Standard errors are given in parentheses.

So far we used the ratio of unemployed to the working age population as the main unemployment measure, abstracting from the non-participants. This approach has the advantage that the employment and unemployment equations have the same denominator. As a consequence, the differences between the unemployment and employment equation can directly be interpreted as a participation decision in the labor market.[19] As a robustness check we use the official unemployment rate which takes into account the labor force

[17] The number of registered unemployed is clearly more easily subject to political manipulation than the number of employed.

[18] In a further robustness check, we account simultaneously for cross-sectional dependencies and serial correlation in the estimation of the covariance matrix using the estimator of Driscoll/Kraay (1998) and its implementation by Hoechle (2007). Compared to the basic OLS specification of Table 3, we get similar but not identical point estimates because the approach does not allow weights. Even more the estimate for employment becomes significant. Similar results are also obtained for the IV specification where the first stage is estimated by hand and where the projected value is used in the second stage. It suffers however from the fact, that standard errors are not estimated consistently in this case.

[19] To see this, imagine that there would be an increase in the working age population of 1 percent without change of the youth share. Then, we would know from the regressions that both the employment ratio and the unemployment ratio are unchanged. We can then infer that also the participation rate has remained unchanged, since we are using the same denominator.

participation effects in the denominator. Overall, these results are roughly comparable to those provided above (see Table 3).

In addition, as an alternative to the dependent variable 'employment ratio' where we used head counts we apply the volume measure full-time equivalents, i.e. we multiply the employment spells from micro data (the IABS) by their daily exact durations and taking into account their working time status.[20] The results provided in Table 4 are in line with our findings where we used the employment ratio in heads, although the elasticity is somewhat smaller. The strong reaction of the employment rate on the youth share is obviously partly compensated by reactions on working time.

Table 5: Robustness, variable definitions

Variable	OLS	IV
Official unemployment rate, 1993-2008	0.2405 (0.1768)	1.1646 (0.2590)
Full-time equivalent employment rate, 1999-2004	-0.2198 (0.0661)	-0.8909 (0.2105)

Remarks: Estimation equations are saturated with region and year dummies. Observations are weighted with population shares to account for the different size of the regions. GLS estimates (analogue to Table 4) do not significantly deviate from the OLS and IV results and are available from the authors. Standard errors are given in parentheses.

Additionally, we perform (whenever possible) estimations over a longer time series to check whether the results are stable for alternative lengths of time. We find that the post-adjustment OLS estimation for unemployment for the maximum data horizon (1985-2008) is much closer to the coefficient of the IV estimate. This result does not only hold for the OLS but also for both GLS estimations (with serial and spatial correlation) and points to some instability of the coefficient over time. However, this finding can be expected since the pre-1994 era in Germany is characterized by large immigration flows of ethnic Germans, i.e. individuals with German ancestors originating from Eastern Europe, whereas there has only been little immigration from abroad from 1994 onward.

As a final robustness check we use the 326 West German NUTS-3 regions (excluding West Berlin) instead of the 108 functional labor market districts as units of observation. The coefficients are given in Table 6 and are, with the exception of the OLS estimate for the unemployment ratio at NUTS-3 level, quite similar to those for the labor market regions.

At first glance the positive relationship between the youth share and the unemployment rate and the elasticity of around 1 on the one hand and the negative elasticity between the youth share and the employment ratio again of around 1 on the other hand seems intuitive. However, since the employment ratio is about factor ten the unemployment ratio, we would expect the elasticity of the former to be much smaller than that of the latter. The fact that

[20] The IABS is a 2% random sample of all individuals that have been subject to social security contributions in their life at least once. It contains information on the job when employed and on unemployment when unemployed. For details see Bender/Haas/Klose (2000). We use 24 hours for individuals employed more than 50% and 16 hours for individuals with less than 50%.

Table 6: NUTS-3 regions and extended observation period

	OLS	IV
Unemployment ratio, 1985-2008	0.9451 (0.1427)	N.A.
Official unemployment rate, 1985-2008	0.9050 (0.1459)	N.A.
Unemployment ratio, NUTS-3, 1985-2008	0,3324 (0.0002)	N.A.
Unemployment ratio, NUTS-3, 1993-2008	0.0429 (0.0002)	0.9718 (0.1671)
Employment ratio, NUTS-3, 1999-2008	-0.3300 (0.0001)	-0.5661 (0.0607)

Remarks: Estimation equations are saturated with region and year dummies. Observations are weighted with population shares to account for the different size of the regions. GLS estimates (analogue to Table 4) deviate only to a minor extent from the OLS and IV results and are available from the authors Standard errors are given in parentheses.

the numbers are almost the same implies that the decision to participate in the labor market plays an important role.[21]

Overall, in our preferred specifications we confirm the cohort crowding hypothesis, i.e. we find that a 10 percent decrease in the youth share results in a decrease in the unemployment rate between 2.8 and 4 percent. However, our results contradict those of Shimer (2001) for the United States and Nordström-Skans (2005) for Sweden who found that an increase in the youth share caused a decline in the unemployment rate. It remains an open question, why the German labor market seems to be affected so differently by demographic change as the two former countries. Future research hopefully can contribute to answer this question.

6 Conclusion

Demographic change in Germany has significantly altered the composition of labor supply over the last three decades. Although, the population aged 15-64 has increased by 4.1 million in the period from 1978 to 2009 there are quite heterogeneous developments across the age groups. Whereas the number of young individuals aged 15-24 has decreased by over 1.6 million persons (-19%) in the considered period we observe a strong increase in the age groups 40 and older. This development is due to the sharp decline in birth rates at the beginning of the 1970s when the baby boom generation was followed by a baby bust generation. At the same time Germany has been facing a relatively high unemployment rate over the last two decades, so that the question whether the shrinkage of the young population had any effects on the labor market is of high interest.

[21] Consider the example of the youth share increasing by 1 percent, values for the employment ratio of 50% and for unemployment ratio of 10%. Under these assumptions an elasticity of 1 implies that the employment ratio decreases to 49.5% whereas at the same time the unemployment increases to only 10.1%. Thus non-participation (or whatever is summarized in this third state) must increase to 40.4%.

Against this background, we studied the combined impact of smaller labor market entry cohorts on (un)employment using regional labor market data for the years 1993 to 2008 (with population data from 1978 to 2008) and the direct effect of the age structure on unemployment for the years 1991-2009. The analysis of the direct (compositional) effect demonstrates that the unemployment rate would have been higher if there were no changes in the composition in the age structure. Thus, the counterfactual unemployment rate, given the stability of demography, is higher than the actual unemployment rate in Germany. However, the difference (mounting to 0.19 percentage points) is not large. The econometric analysis of the combined effect indicates that there is positive relationship between the youth share and the unemployment rate. Given that Germany experiences declining cohort sizes among the young, demographic change is likely to improve the situation of job seekers and thus decrease the overall unemployment rate. This is a robust finding across all our econometric specifications and is also consistent with the evidence of the (direct) compositional effect.

The quality of the instrument indeed suggests that we have discovered a causal effect. However, it is hard to disentangle the origin of this positive effect on unemployment and the negative effect on employment as long as we do not dispose of age-specific data. Presumably, it is reasonable to argue that the biggest competition occurs within the age groups (Korenman/Neumark, 2000). However, the generous early retirement programs in Germany in the 1990s are likely to have influenced the decision of elderly workers whether to stay or to leave the labor market. Given our empirical analysis there is clearly room for further research in at least three directions. First, it would be promising to disentangle the impact of the declining youth share for specific age groups and to explain the origin of these impacts. Second, given that demographic change will alter the population size as well as the age composition in the future it would be promising to analyze the persistence of the relationship between the youth share and both labor market variables. Third, the institutional framework in each economy may be decisive for the magnitude and the direction of the impact demographic change may have on the labor market.

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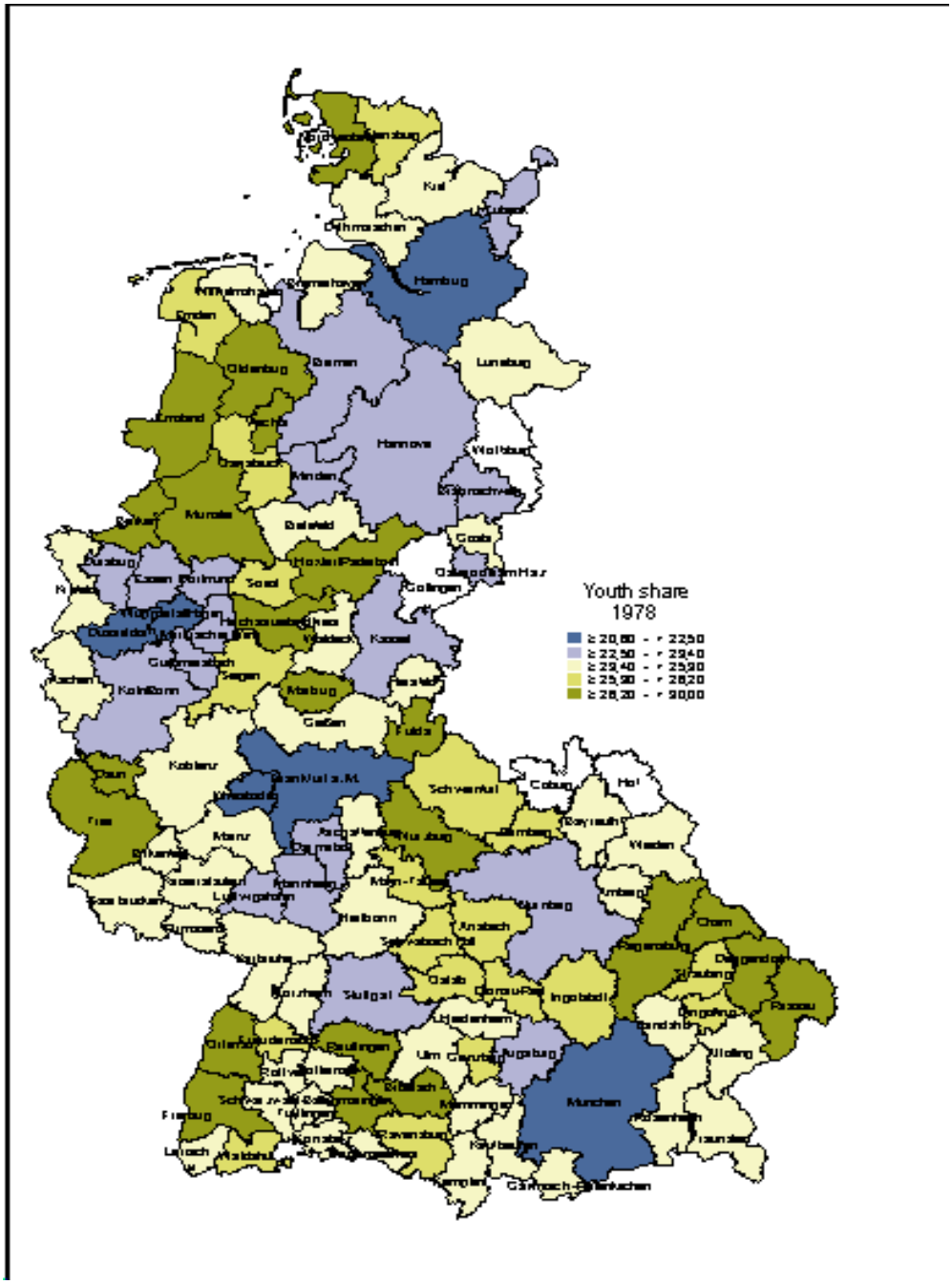
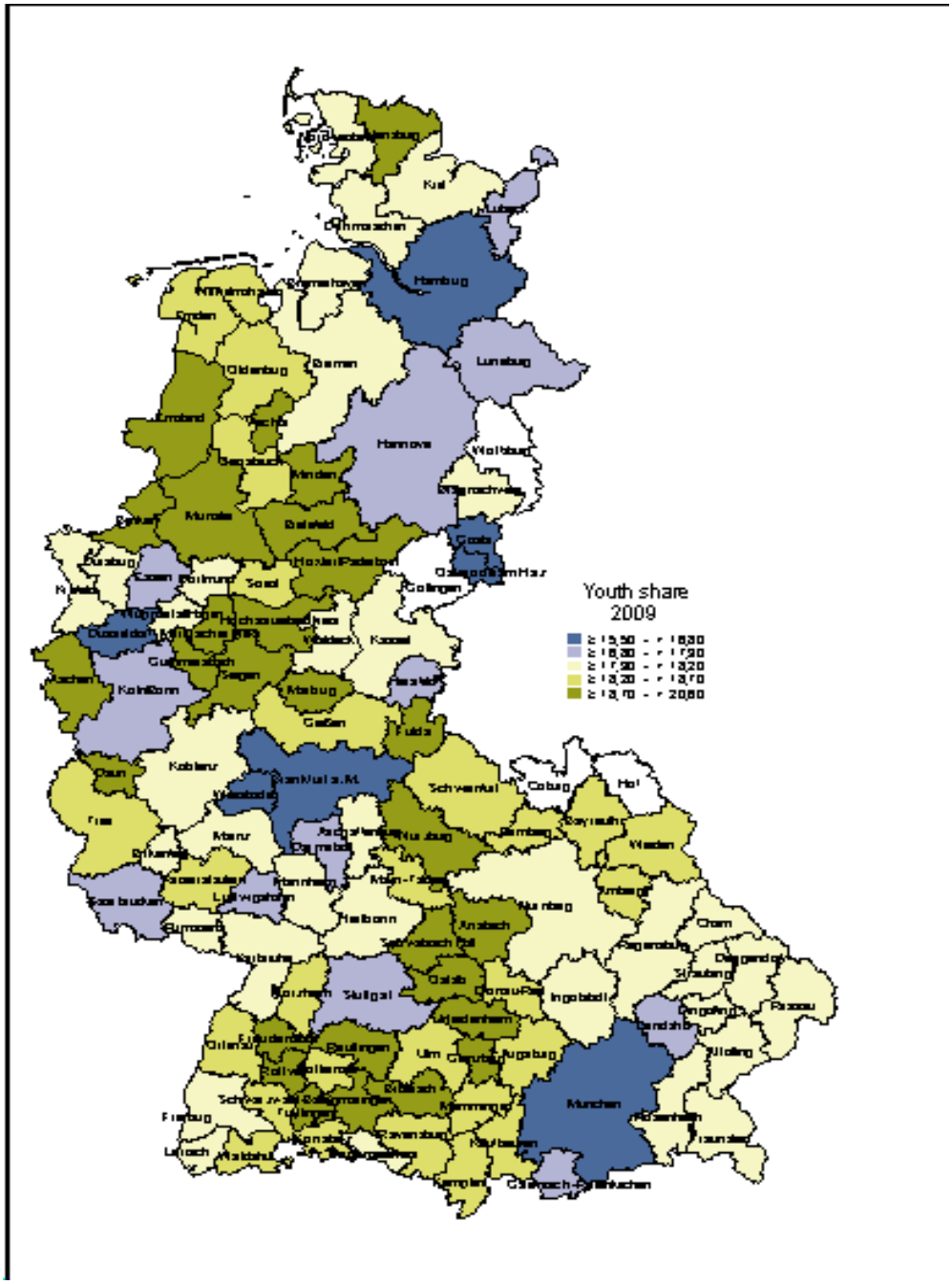
A Appendix



Source: Federal Statistical Office of Germany, own calculations

Figure 7: Youth share (individuals aged 15-24 over individuals aged 15-64) in West German labor market regions in 1978



Source: Federal Statistical Office of Germany, own calculations

Figure 8: Youth share (individuals aged 15-24 over individuals aged 15-64) in West German labor market regions in 2009

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