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## Life-Time Effects of the German Food Crisis: Earnings, Employment, and Retirement

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# Life-Time Effects of the German Food Crisis: Earnings, Employment, and Retirement

March 1, 2016

## **Abstract**

Using German register data for the period between 1970 and 2010, this paper studies the labor market consequences of being born during the German food crisis after World War II. The paper finds that those born during the first half of 1946—about nine months after the period of most severe malnutrition—have significantly lower earnings than those born shortly before and after. The effect persists throughout their entire labor market careers, so that their total earnings losses accumulate to about one and a half year of average annual earnings. In addition, those affected by the malnutrition early in life have lower employment prospects and retire earlier. The paper provides novel insights to better understand how nutritional conditions early in life influence economic outcomes over the entire life course.

JEL-Classification: J24, N34, I18

# 1 Introduction

Recently a number of recent studies have analyzed the influence of intrauterine and early-life conditions on later-life outcomes (Jürges, 2013; Scholte *et al.*, 2015; Kesternich *et al.*, 2015 and van den Berg *et al.*, 2015). Most of those studies found that malnutrition during pregnancy and early life has severe consequences for individuals' health much later in life—particularly, for individuals who were exposed to malnutrition in utero or during the first year of their lives. However, fewer studies have analyzed to which extent intrauterine and early-life conditions influence economic outcomes such as employment, education, and income.<sup>1</sup>

Although the recent literature has made important progress in understanding how intrauterine and early-life conditions influence health and economic outcomes later in life, at least one main gap to a full understanding of this relationship remains. No previous study has analyzed the influence of intrauterine and early-life conditions on economic outcomes throughout peoples' entire life span. While some studies focused on younger individuals, most previous studies have analyzed long-term consequences for samples of elderly individuals who were close to retirement. However, due to the lack of suitable data sources, no previous study has documented how these effects evolve over peoples' entire course of life.

Therefore, this paper contributes to the literature by documenting how malnutrition during pregnancy influences labor market outcomes over the lifecycle. Doing so is important for the following reasons: First, the consequences of intrauterine and early-life conditions may vary substantially by age. For example, young people may be better at coping with health issues than older individuals, such that the consequences of malnutri-

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<sup>1</sup>For example, Jürges (2013) finds that people who were born during the German post-war famine have lower education and are less likely to be employed than those who were born shortly before or after. Scholte *et al.* (2015) find similar results for people born during the Dutch Hunger winter.

tion for economic outcomes may be modest at first but then become more severe as people age over the lifecycle. Second, studies measuring the effects at only one instant of life may fail to uncover important long-term consequences of malnutrition during pregnancy and childhood. For example Jürges (2013) argues that they fail to find significant effects on workers' income, because he has to focus on young people of whom many were still in school during the sample period. Similarly, Scholte *et al.*(2015) fail to find significant income effects for elderly workers from the Netherlands, because collective wage agreements forbid wage reductions for elderly workers in the Netherlands. Moreover, elderly workers who are still in employment are likely to be a positive selection of all affected individuals.

Third, to provide an estimate of the total costs that may arise as a consequence of adverse intrauterine and early-life conditions, one cannot simply extrapolate from the results that are measured at only one instant of the life course. To produce accurate estimates of the total costs—for example, in terms of a countries' tax revenues or its' spendings on unemployment and retirement funds—researchers need to understand the life-time dynamics of the relationship between intrauterine conditions and economic outcomes.

To provide evidence for the relationship between malnutrition during pregnancy and labor market outcomes over the life course, this paper relies on a unique sample of highly accurate German register data that allows us to follow a substantial portion of the German population throughout their labor market careers. To reliably identify individuals who were affected by malnutrition during pregnancy, we follow the previous literature and exploit the conditions during the German food crisis immediately after World War II. The German post-war food crisis of 1945/46 induced a severe shock to the nutrition of the German population, and, therefore, provides a clean natural experiment to identify the effects of malnutrition. A number of previous studies have used other data sources to analyze the consequences of the German food crisis on health and economic outcomes,

but this paper is the first that is able to examine its consequences across the entire life-course.

In contrast to the previous literature that fails to find a significant effect of adverse intrauterine conditions on workers' income, we find relative persistent and long-lasting income effects. In detail, individuals who were born nine months after the period of most severe malnutrition have significantly lower earnings than those born shortly before or after. The earnings effect persists for most of workers' careers, but the estimates become less precise for older workers. In total the affected individuals lose about one and a half year of their average yearly earnings.

## **2 Data and sample selection**

We use a specific sample of the German Social Security Records (BEH, Beschäftigtenhistorik Panel). The sample includes a 10 percent draw of all Germany individuals who have social security register information and were born between 1940 and 1956. We follow those individuals between 1970 and 2010 and therefore cover the largest part of their labor market career. We merge the German Social Security Records with Unemployment Insurance Records (LEH, Leistungsempfängerhistorik Panel). We restrict our sample to male workers who are commonly more strongly attached to the labor market.

The data provides information about workers' education, occupation, employment status, unemployment duration, age and labor income. From that data we calculate the workers' average daily income for every observation year. To calculate real earnings we use the National Inflation Index. We follow the previous literature and impute earnings that are above or below the Social Security thresholds. About 1% percent of all earnings are subject to this imputation. Descriptive statistics appear in the following table.

### 3 Methods

To estimate the effect of intrauterine malnutrition on later-life outcomes, we apply the following simple version of a regression-discontinuity (RD) design:

$$y_i = \alpha + F(\text{Birth}_i) + \delta D_i + \epsilon_i \quad (1)$$

where  $y_i$  measures the outcome variable of worker  $i$  and this may be in the form of log of daily real wages, education, or employment status,  $F(\text{Birth}_i)$  is a functional form of the workers term of birth and  $D_i$  is the treatment indicator.  $D_i$  is one if the worker is born in the first half of 1946, i.e. about nine month after the period of most sever malnutrition, and zero otherwise<sup>2</sup>. Finally,  $\epsilon_i$  is a normally distributed error term.

We estimate three versions of equation (1). First, we estimate equation (1) using all observations in the sample. Second, we estimate a version of equation (1) for which we remove the general time trend by, first, regressing the outcome variable  $y_i$  on a set of year dummies and then estimating equation (1) on the residuals of this first stage estimation. Third, we estimate equation (1) for each age group separately to describe the life-time dynamics of the effects, i.e. we estimate equation 1 for all workers at age 30, at age 31 and so forth until the age of 63.

### 4 Results

Figure 1 presents descriptive results for the relationship between average log daily wages and the workers' term of birth. The dots represent average log daily wages for each term of birth respectively, i.e. the first dot marks the average daily wage for all workers who were

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<sup>2</sup>For more details, see Jürges, (2013:287–289) There is clear evidence that calorie intake dipped severely in mid-1945 and that birth weights dramatically decreased in early 1946.

born in the first half of 1941 and so forth. To take into account the fact that we observe workers of different cohorts for different periods, we remove a general age trend before calculating average wages. In other words, we performed a first stage regression of log daily wages on a cubic function of age, and calculate the age adjusted average log wages from the residuals of this first stage regression.

The dashed line presents the results of a local polynomial plot on workers log daily wages. To calculate the local polynomial plot we excluded all observation around the treatment year, i.e. we excluded workers who were born the last 6 months of 1945, in the first 6 months of 1946, and in the second 6 months of 1946. Thus we can interpret the dashed line as the wage trend that would have occurred without the famine after World War II.

—Figure 1 about here—

Our results in Figure 1 show that real average wages rose substantially for the labor market cohorts between 1941 and 1950, particularly for the cohorts of workers who were born between 1941 and 1945. Due to the aforementioned age de-trending the increase in average real wages is likely to have occurred due to natural up-skilling and in increasing investment in human capital by successive cohort (see Figure 2 for more evidence on this).

However, our results also show that there is a clear structural break in the development of average real wages for workers who have been born in the first half of 1946. Average wages of those workers deviate substantially from the overall trend, age-adjusted, trend. Individuals born in period 1st Jan 1946 to 30 June 1946 earn significantly less (0.1 log points less) than workers who were born shortly before or after. The effect equates to a approximately 2% fewer earnings for this particular cohort; however, due to the size of our data we are able to identify such an effect precisely and with statistical relevance. Note that we also exclude the neighboring cohorts of the 1946 cohort before estimating

the local polynomial plot. Yet average wages of those two neighbouring cohorts appear not to deviate from the overall trend.

Figure 2 shows similar results for the relationship between workers' education and their term of birth. The y-axis of Figure 2 represents the fraction of workers who have obtained a university degree and our results show that workers become more educated over time. While about 10 percent of all workers who were born in the first half of 1941 obtained a university degree, about 15 percent of workers who were born in the last half of 1950 obtained a university degree. However, again we see a clear structural break in the increasing trend for workers who were born in the first half of 1946. Individuals conceived during the German hunger famine were significantly less likely to have obtained a university degree. The effect is slightly larger than 1 percentage point which equation to an approximate reduction of 10% in the probability of obtaining a degree for this particular cohort.

—Figure 2 about here—

Thus overall our results are in line with the findings of previous studies who also show that malnutrition during pregnancy has long-term consequences for children. Nevertheless, in contrast to previous studies we find a relatively clear cut effect for workers' wages. The following results analyze this relationship in more detail.

Figure 3 shows the regression results of equation (1) on a pooled sample. Figure 3a does not account for a time trend, Figure 3b accounts for a general time trend. The light gray dots present the estimated residuals from equation (1). The figure shows that our regression approach captures the data quite well as the residuals are closely distributed around zero (grey dots). Most importantly the results show no systematic trend in the residuals that would indicate some form of misspecification.

—Figure 3 about here—



Table ? presents the corresponding results in numbers and shows a treatment effects of about  $-1.4$  percentage points. The effect is precisely estimated and significantly different from zero.

—Table ? about here—

Figure 4 presents the life-time dynamics of the famine effect. For this purpose, we estimated equation (1) for 35 different subsamples—one subsample for each age group. The presented results stem from the two-step procedure version for which we removed the general time trend. The figure clearly shows that the wage effect of the famine is persistent throughout workers entire careers. Importantly, this effect does not appear to change over the life course, suggesting that famine shocks have an immediate labour market effect which do not dissipate over time. It should be noted that these effects are estimated with less precision for workers in their late 50's and early 60's, however, this is likely to adverse sample selection and early retirement as workers age. We investigate this issue further in an updated version of this paper.

—Figure 4 about here—

Table ? intends to explain the mechanisms that account for the wage effect by controlling for a number of observable worker characteristics.

—Table ? about here—

The first specification of table ? controls for the workers' education. Doing so, reduced the magnitude of the famine effect by about 40 percent. Specification 2 trough 4 account for real work experience and tenure but these variables appear not to change the magnitude of the effect in a meaningful way. Thus a large fraction of the effects appears to be related to workers' lower investment in education.

## 5 Conclusion

Using German register data for the period between 1970 and 2010, this paper studies the labor market consequences of being born during the German food crisis after World War II. The paper finds that those born during the first half of 1946—about nine months after the period of most severe malnutrition—have significantly lower levels of education and lower levels of earnings than those born shortly before and after. The effect persists throughout their entire labor market career, so that their total earnings losses accumulate to about one and a half year of average annual earnings. In addition, those affected by the malnutrition early in life have lower employment prospects and retire earlier. The paper provides novel insights to better understand how nutritional conditions early in life influence economic outcomes over the entire life course.

## 6 Bibliography

Jürges, H. (2013) “Collateral damage: The German food crisis, educational attainment and labor market outcomes of German post-war cohorts”, *Journal of Health Economics*, Vol 32., pp. 286–303

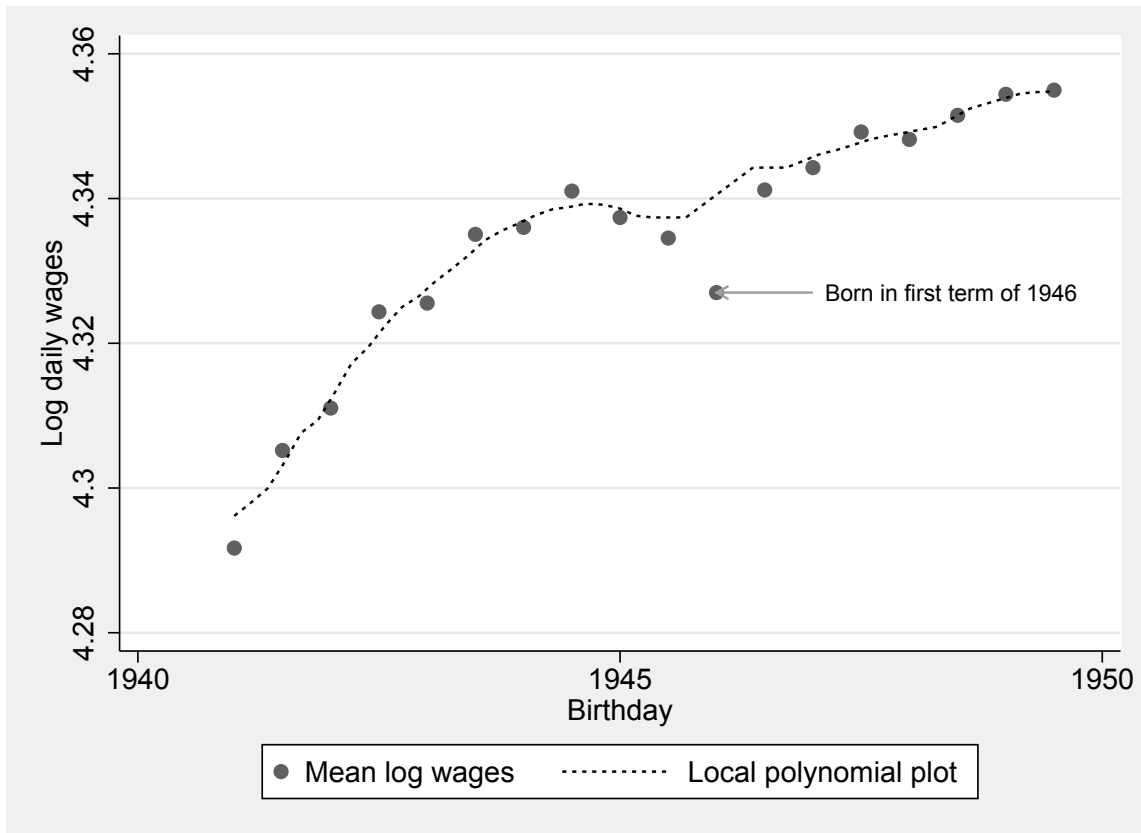
Kestnerich, I., Siflinger, B., Smith, J. and Winter, J. (2015) “Individual Behaviour as a Pathway between Early-life Shocks and Adult Health: Evidence from Hunger Episodes in Post-war Germany”, *The Economic Journal*, Vol. 125, Issue 588., pp. F372–F393

Scholte, R.S, van den Berg., G.J. and Lindeboom, M. (2015) “Long-run effects of gestation during the Dutch Hunger Winter famine on labor market and hospitalization outcomes”, Vol 39., pp. 17–30

van den Berg., G.J., Pinger. P.R. and Schoch, J. (2015) “Instrumental Variable Estimation of the Causal Effect of Hunger Early in Life on Health Later in Life”, *The Economic Journal*, early view, published online 3 Oct 2015

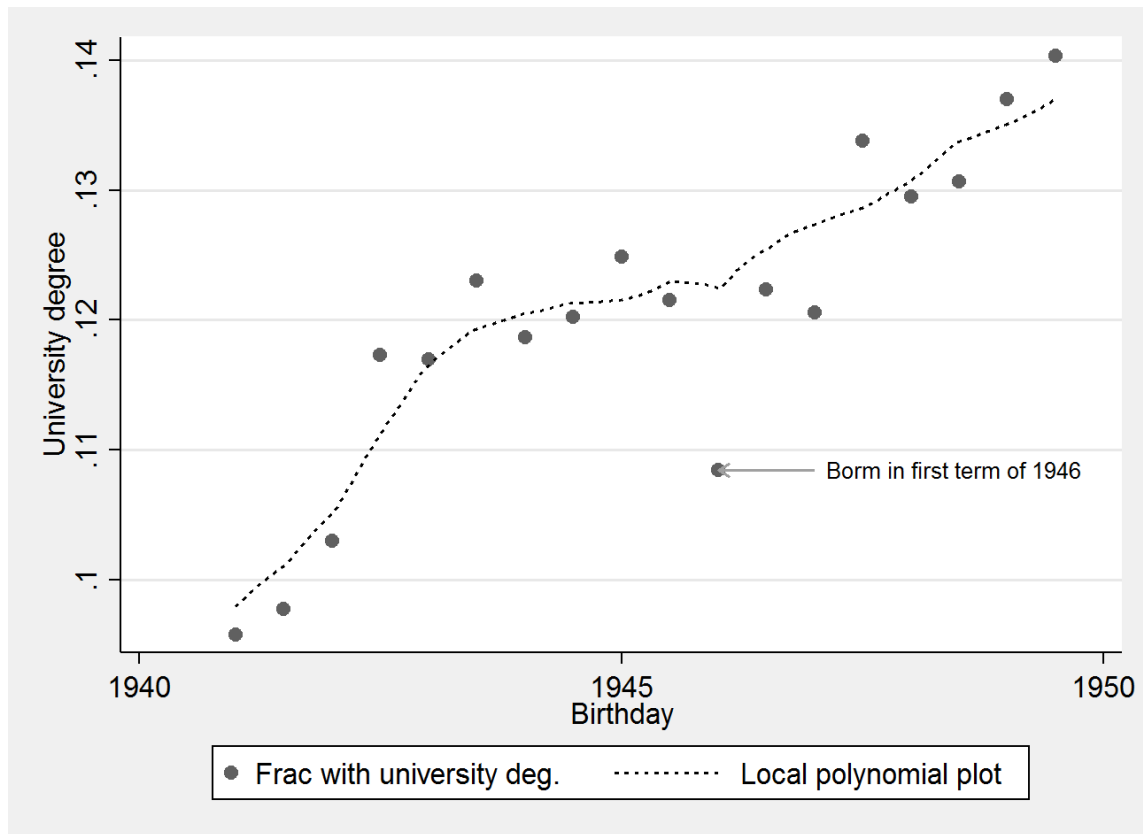
## A Figures in the text

Figure 1: **Log daily wages over term of birth.**



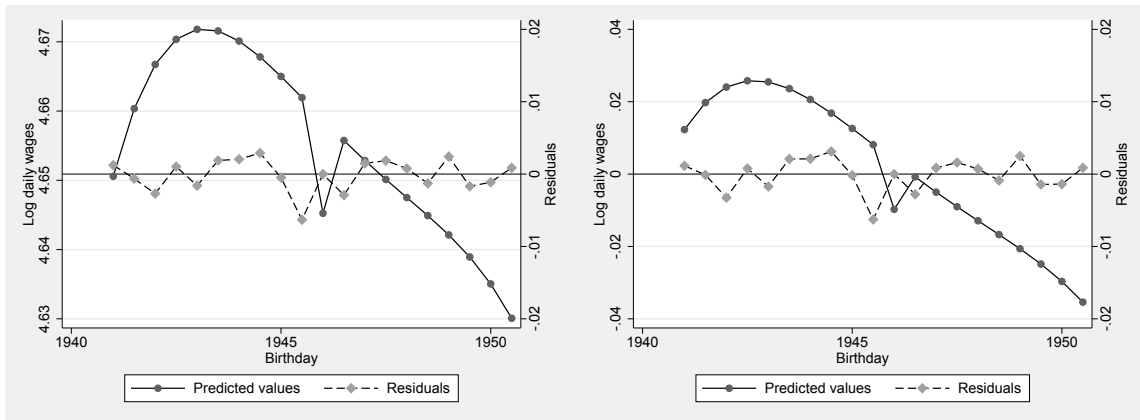
Source: BEH, Beschäftigtenhistorik Panel. Dependent variable: Log daily wages. x-axis indicates term of birth. Dashed line presents the results from a local polynomial plot for which two terms around the treatment term are excluded.

Figure 2: **Education over term of birth.**



*Source:* BEH, Beschäftigtenhistorik Panel. Dependent variable: Dummy indicating whether the individual has a university degree.  $x$ -axis indicates term of birth. Dashed line presents the results from a local polynomial plot for which two terms around the treatment term are excluded.

Figure 3: **Regression results (Equation (1), pooled sample)**

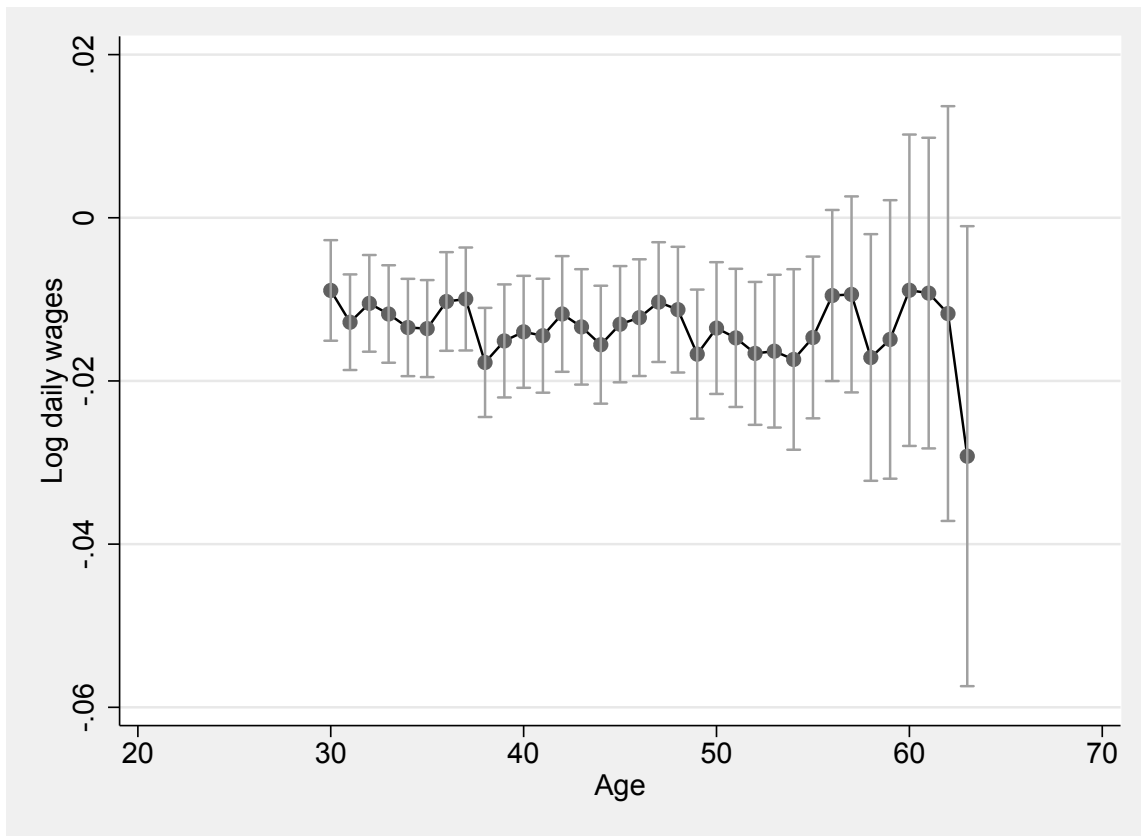


(a) Without time trend

(b) With time trend

Source: BEH, Beschäftigtenhistorik Panel. Dependent variable: Log daily wages. Regressions according to equation (1). Grey dots show the estimated residuals.

Figure 4: **Life-time dynamics: Real log daily wages**



Source: BEH, Beschäftigtenhistorik Panel. Dependent variable: Log daily wages. Regressions according to equation (1) for each age group. Capped spikes indicate confidence intervals at the 5 percent level.