Traumatic experiences adversely affect life cycle labor market outcomes of the next generation - Evidence from WWII Nazi raids. *

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Abstract

This paper examines the causal effect of a traumatic and stressful event experienced by pregnant women on the life long labor market outcomes of their offspring. We exploit a unique natural experiment that involved randomly placed Nazi raids in municipalities in Italy during WWII. We link administrative data on male private sector workers to information about war casualties and Nazi raids. Our results suggest that prenatal exposure to violence affects offspring earnings along the whole working career and in retirement. The lower earnings are due to lower educational attainment, the type of jobs that are held and interruptions in working careers due to unemployment. We further find that prenatal exposure exacerbates the negative effects of later life job loss on earnings, deepening the negative impact on earnings in later life. We use a medical database on health expenditures to interpret the effect estimates. The prenatally exposed have higher medical care expenditures on diseases of the nervous system and mental disorders. This indicates that stress induced by the violent raids is likely to be an important factor driving our findings.

JEL Codes: J24, I15

Keywords: WWII; Violent raids; Prenatal exposure; Offspring; Life-cycle earnings; Mass layoff; Stress.

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1 Introduction

It is estimated that on average between 50 and 85% of the population in developed countries experience a potentially traumatic life event (PTE) during their lifetime, such as being involved in a serious accident, losing a partner, being a victim of crime or witnessing acts of severe violence or terror (Benjet et al., 2016; de Vries and Olff, 2009; Kessler and Wang, 2008). PTEs pose a significant threat to a person's physical and/or psychological well-being, but negative effects may also extend to the next generation. Previous work (Almond and Currie, 2012; Black et al., 2016; Kuzawa and Quinn, 2009; Persson and Rossin-Slater, 2018) has demonstrated that a mother's exposure to traumatic experiences during pregnancy may compromise the health and human capital of her children. Until now, not much has been known about the effect of traumatic and stressful experiences on life cycle labor outcomes of the next generation. With this paper we aim to fill this gap. Specifically, this paper studies: *i)* how a traumatic event experienced by a pregnant mother shapes the evolution of the working career of her offspring from the start of the career to retirement; and *ii)* how the prenatally exposed respond to job loss later in life. To this end we exploit a series of events in Italy that followed after the "Armistice" in WWII on September 8^{th}, 1943, when Italy ceased hostilities against the allied forces. In response to this act the Germans occupied the country and performed violent raids, with the intention of spreading fear and terror. The raids were intentionally unpredictable and idiosyncratically distributed in time and space. Although there were relatively few Italian casualties and the raids only lasted for a few days, these raids were characterized by intense violence that caused great stress and trauma to those who witnessed it.

This unique quasi-experimental setting allows us to analyze differences in outcomes for cohorts born in municipalities before and right after a Nazi raid, relative to otherwise similar cohorts which were never exposed. We exploit the unexpected outbreak of the raids and the spatial (municipalities) and temporal (months) variation after controlling for potentially confounding factors (i.e. armed conflicts between German and Allied forces, the evolution of WWII, and local time invariant and time varying characteristics). We thus identify the average causal effect of prenatal exposure to a traumatic event, *over and above* other adversities related to war.

To identify life cycle labor market effects, we build a unique dataset combining three main data sources. The “Atlas of Nazi and Fascist massacres” lists all raids occurred in Italy after September 8, 1943. We link this dataset to an administrative individual employer-employee matched dataset from “Istituto Nazionale della Previdenza Sociale” (INPS) that covers the universe of Italian private sector workers between 1974 and 2018. We focus on male cohorts born around September 8, 1943. The data contain detailed working histories and information on earnings, occupation, employment status, educational attainment, pensions, disability and unemployment benefits. The third source of information is the archive of WWII conflicts in Italy collected by Statistics Italy (ISTAT, 1957) including granular information on the number of victims in WWII by province and month.

The results from a generalized Difference-in-Differences (DiD) model show that prenatal exposure to a traumatic event reduces earnings by about 2% at the start of the labor market career. The earnings penalty gradually increases along the career to about 6% at retirement. Moreover, we find that the lower earnings can be attributed to lower educational attainment and occupation sorting; those prenatally exposed to a Nazi raid (hereafter often referred to as the "exposed" or "prenatally exposed") are more likely to sort in lower skilled blue collar jobs. We also find that the exposed are more likely to experience spells of unemployment in their working career. So, interruptions in the labor market career might be a cause of the increase in the earnings penalty as people age. It could also be that the earnings penalty increases because the exposed suffer more from job loss later in life. To shed light on this hypothesis we exploit the matched worker-firm information to examine the effect of job loss due to a mass layoff at the firm. Using a triple DiD model we find that later life job loss dis-proportionally affects the exposed: job loss effects on next year earnings are between 31-34% for all workers and up to 47% for the exposed.[1] Moreover, and in line with the existing literature (e.g. Sullivan and von Wachter, 2009), we find that mass layoff episodes are likely to increase mortality among workers, but this effect is independent of in utero exposure to a Nazi raid.

While the effects of prenatal exposure to a Nazi raid are substantial, no effects are found for exposure in the first and the second year of life. This is important as the raids may have caused a lasting psychological trauma (PTSD), which may affect parental health (behaviors) and parenting skills. Also, the raids may have led to property destruction and persistent income losses. Should

[1]Mass layoffs are plausibly more exogenous than regular job separations. In section 5.2 we show that the allocation of mass layoffs across the workers in our sample is independent of prenatal exposure to a Nazi raid.

these alternative mechanisms be relevant, they would harm both the prenatally exposed and those exposed shortly after birth. Our results thus are driven by in-utero exposure to a raid and not by behavioral and/or income effects post-birth.

Our results are confirmed by a series of robustness checks. We use more flexible specifications, vary the definition of our outcome variables, use different analytic samples, use a different identification strategy and perform falsification tests. Additionally we show that selective fertility, mobility and mortality do not bias our estimates.

As a further step in our analysis, we argue that maternal stress triggered by the traumatic event is likely to be the most important mechanism driving our empirical findings. Several medical studies show that the mother's hormonal response to anxiety and stress increases maternal Glucocorticoids (such as Cortisol) and that this may have a profound impact on the neurological development of the fetus, leading to cognitive, emotional and mental problems as well as increased stress vulnerability of the offspring (see Boersma and Tamashiro, 2014; Cotter and Pariante, 2002; Marmot et al., 1991; Van den Bergh et al., 2005; Weinstock, 2005, and the literature reviewed in these papers). Also recent economic literature has given support to these claims (Black et al., 2016; Persson and Rossin-Slater, 2018; Quintana-Domeque and Rodenas-Serrano, 2017), showing causal effects of maternal stress during pregnancy on the birth outcomes, educational attainment and mental health of offspring. Aizer et al. (2016) measure actual maternal Cortisol levels. They use a sibling fixed effects estimator and find that elevated Cortisol levels adversely affect cognition, education and behavioral and motor development in childhood. In support of our interpretation and in line with the literature cited above we find lower educational attainment among the exposed. A mediation analysis shows that a large share (42%) of the total treatment effect on wages can be explained by the effect of the treatment on educational attainment. Additionally, we use a medical database on health expenditures and find that prenatal exposure to a Nazi raid has significant and sizeable effects on health expenditures only for diseases of the nervous system and mental disorders, conditions typically associated with prenatal stress exposure. We also show that the effects of a Nazi raid do not include effects of hunger, changes in maternal health, maternal health behaviors and reduced family income. We turn to the interpretation of our findings in Section 7.

Several features distinguish our study from previous work. First, most previous studies that looked at potentially traumatic events primarily looked at infant and childhood education and health outcomes (e.g. Bundervoet and Fransen, 2018; Camacho, 2008; Quintana-Domeque and Rodenas-Serrano, 2017). To the best of our knowledge there are only two exceptions that also looked at the causal effect of in-utero exposure to a PTE on adult outcomes (Black et al., 2016; Persson and Rossin-Slater, 2018). These studies examined the effect of the death of a relative of pregnant mothers in Sweden and Norway.

Persson and Rossin-Slater (2018) found that the offspring of mothers who experience a family rupture while pregnant as opposed to mothers who undergo it shortly after giving birth, use more ADHD medications. For adults (aged 30) they found increases in the likelihood of consuming prescription drugs for anxiety and depression, evidence that corroborates our findings based on the medical database. Black et al. (2016) compared children born to the same mother who experienced a parental death during one of the pregnancies. They found that parental death experienced in utero leads to small negative effects on birth outcomes. They found no effect on labor supply and earnings in 2010, when the individuals were between 25 and 43 years old.

Our analyses complement the findings of both studies. We show that the effects of prenatal exposure to a traumatic event experienced by the mother persist over the rest of the offspring's life. Our outcomes include the level of earnings at the start of the labor market career, as well as the evolution of subsequent wage earnings between ages 30 and 60, and income after retirement. We examine the effect of exposure on educational attainment and selection into the type of job (blue collar or white collar) as possible mediators for the large earnings penalty. We also study the effects of job loss due to a mass layoff at the firm. Jointly our findings indicate that early life traumatic experiences set in motion a chain of education and labor outcomes across the life cycle that ultimately lead to increasing earnings penalties with age and ultimately lower pensions in retirement.

Second, our mass layoff analyses supplement the existing economic literature that shows that workers displaced during a mass layoff experience significant long-term earnings losses as well as lower job stability, lower employment rates and earlier retirement (see Chan and Stevens, 2001; Ruhm, 1991, and the literature cited in these papers). On the health side, Sullivan and von Wachter

(2009) found strong increases in mortality rates for male workers that persist up to 20 years after job displacement. For male workers with a strong attachment to the labor market Browning and Heinesen (2012) found effects on overall mortality and mortality caused by circulatory disease, suicide and traffic accidents, and effects on alcohol-related diseases, and mental illness. Recently, Kaila et al. (2022) showed that workers with less-well-off parents have lower earnings and higher unemployment than similar workers with wealthier parents who were laid off. We add to this literature by examining the heterogeneous impact of job loss on mortality and earnings by prenatal exposure to a traumatic event. We show that the earnings penalty of job loss are up to 14 percentage points higher for those who are prenatally exposed to a traumatic event and that this effect increases with age.

Our job displacement analyses also speak to a small but growing literature that empirically addresses the issue of dynamic complementarities (see for example Almond and Mazumder, 2013; Malamud et al., 2016). Dynamic complementarities, as defined by Cunha and Heckman (2007), refer to the idea that human capital investments later in life are more productive when the initial stock of skills is higher. In our context, an adverse shock early in life may exacerbate the adversity of later life shocks. Our results support the idea that maternal exposure to a traumatic event impairs the offspring's cognitive and/or stress management skills, leaving them more vulnerable to stressful and challenging events later in life. This finding also shows that parents do not make fully compensating investments in their child to counter the consequences of the initial shock (i.e. prenatal exposure to a Nazi raid).[2]

Third, our setting features a unique natural experimental design with desirable properties supported by excellent administrative data. The raids lasted mostly one day, were unexpected and varied widely and idiosyncratically across municipalities and time. As a result, otherwise similar mothers experienced strikingly different environments while pregnant. This design and detailed administrative data allows us to continuously monitor individuals over their entire labor market career, while controlling for several confounding effects due to other war related events. The previous studies in this literature exploiting deaths of family members or relatives relied on comparisons between siblings within families (Black et al., 2016) or on the assumption of randomness in the exact timing of

[2]See section 5.2 for details

births (Persson and Rossin-Slater, 2018). For the sake of comparison and to examine the robustness of our findings we also estimate models that only exploit randomness in the exact timing of the raid (Persson and Rossin-Slater, 2018).[3] In all our models the idiosyncratic shocks are assigned at the aggregate level (municipality) and are beyond the individual's control, making them more likely to be exogenous from an individual perspective.

2 Historical background

This section summarizes the historical events that occurred in Italy around September 8^{th} 1943, the date of the so called *Armistice*, and briefly describes the living conditions of the local population during WWII.

Despite the start of WWII in September 1939, Italy was a non-belligerent country until June 1940, when Mussolini declared war on Britain and France. From June 1940 until the end of the summer of 1943, Italy moved her troops mostly outside the national territory and the Italian territory was only modestly affected by war events. In fact, this period was marked by relatively few casualties, which were concentrated around strategic bombing targets, such as military and commercial harbors, significant industrial sites (i.e. metallurgic, transport and heavy machinery industries), and important railways (Baldoli and Knapp, 2012; Baldoli et al., 2011).

The Armistice ceased hostilities between the Kingdom of Italy and the Allies and began the German occupation and Italian resistance against fascism. The act was secretly signed on September 3rd 1943, but was made public on the radio on September 8th at 18:30 Italian time.[4]

Only a few weeks before September 8th 1943, the Allies landed in Sicily (July 1943) to start their campaign against the German forces (see Figure 1). While the arrival of the Allied troops occurred before the 8th of September, the Italian campaign changed radically after the Armistice.

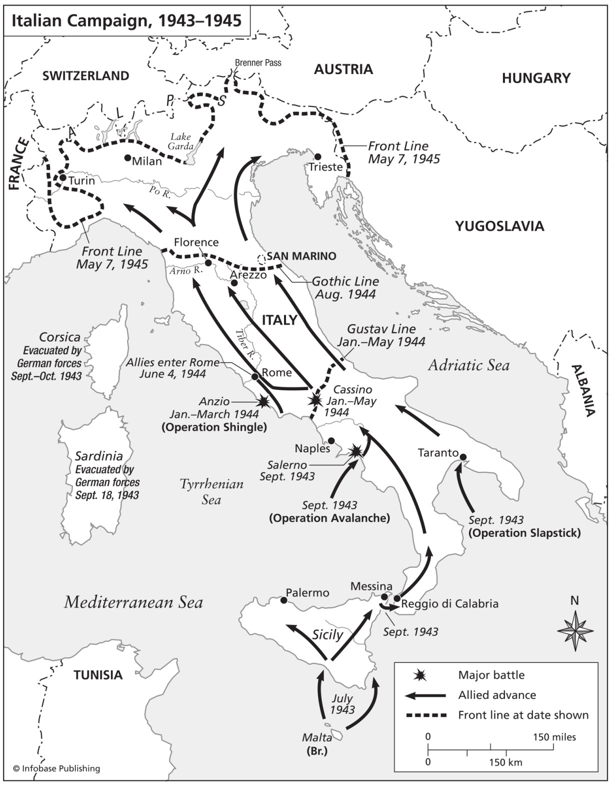
In the days following the Armistice most Italian servicemen were left without orders from their commands, due to the German 'Wehrmacht' disrupting Italian radio communication. The dismantling

[3] See section 4 for a more detailed discussion.

[4] The Armistice was secretly signed in Santa Teresa Longarini district of Syracuse, 3 km from Cassibile. The act was announced a bit earlier than 18:30 hrs on Radio Algiers with a declaration from General Dwight Eisenhower. Just one hour later, at 19:42, it was confirmed by a proclamation from Marshal Pietro Badoglio via the Italian public broadcasting network EIAR, (Zangrandi, 1974). After the signing of the act the Royal family and the prime minister fled from Rome on the morning of September 9th.

of the Italian military was immediately evident, as was the absence of a clear military strategy. There is abundant historical evidence of episodes of contradictory orders coming from higher ranking officers.[5] The civilian population also had no information about the evolution of relations with Germany.

Figure 1: WWII fronts in Italy



Given the unforeseen circumstances in the first few days of September 1943, the events that followed were very difficult to predict, ruling out strategic migration responses by civilians. According to Strazza (2010), frequently information about the arrival of military troops did not spread across neighbouring villages. Moreover, there were no national evacuation plans (Baldoli et al., 2011). From a logistics point of view, moving across provinces was extremely difficult, since railroads and main transportation networks had been destroyed by tactical bombing by the Allied forces (Baldoli

[5]For example, on the 10th of September 1943, in Piombino, a small German flotilla tried to enter the harbour of Piombino but was denied access by port authorities. Servicemen received two contrasting orders, one from the Italian coastal forces commanded by a former fascist "Gerarca" granting access, while the naval commander denied access to the port.

and Knapp, 2012).

After 8th September 1943 Italy was exposed to two major types of adversities: *i)* general armed conflicts between the Italian and German forces that affected civilian life, and *ii)* Nazi (and fascist) violence aimed directly at the civilian population and the partisan (resistance) fighters. Regarding the general armed conflict, the post Armistice period was characterized by military battles, ranging from quick victories and front-line movements entailing relatively limited casualties, to long stalemates associated with a sizeable number of fatalities. The underground resistance was not coordinated at the national level. Especially immediately after the Armistice, the nascent movement was formed of independent operating groups led by previously outlawed political parties or by former officers of the Royal Italian army. The first major act of resistance against the German occupation was in the city of Naples, which was liberated by a chaotic popular rebellion on September 28-30, 1943. Figure 1 provides a detailed map of the WWII events over time and space. The allied forces entered Italy in the South and slowly moved North and then got stuck along the Winter line at Monte Cassino (just above Naples) in December 1943. The seven month stalemate that followed caused huge losses among civilians.[6]

The violent Nazi raids were intentionally unpredictable and randomly placed with the aim of disrupting civilian life in Italy and disseminating fear and terror (Portelli, 2003). The violence was generally aimed at the Italian population.[7] German terror acts included exploiting women and children, confiscating economic resources and rounding up civilians and deporting them to labor camps. Although the raids involved relatively few Italian casualties and lasted only for a few days, these massacres were characterized by intense violence which was witnessed by the civilian population causing fear and stress.

[6]The Winter (or Gustav) Line, though ultimately broken, effectively slowed the advance of the Allied forces for seven months between December 1943 and June 1944. Major battles in the assault on the Winter Line at Monte Cassino and Anzio alone resulted in 98,000 Allied casualties and 60,000 German and fascist casualties.

[7]Over time, when the front moved forward, the raids gradually involved more resistance fighters. See also Table B1 of Appendix B

3 Data

We construct an individual-level dataset as a combination of several administrative datasets. We collect historical information on *i)* Nazi violence episodes and *ii)* the number of deaths and missing persons in Italy during WWII. We refer to this data as “War data”. Secondly, we use an administrative employer-employee matched dataset on the universe of Italian private sector workers containing detailed working histories including information on earnings, occupation, employment status, education, pensions, disability, unemployment benefits and mortality. We refer to this data as “labor data”.

3.1 War data

3.1.1 Nazi violence data

Following the recommendation of a joint Italian-German commission, the German Foreign Ministry created a German-Italian “Fund for the future”. Under this fund, the INSMLI (National Institute for the History of the Italian Liberation Movement) and the ANPI (National Association of Italian Partisans) started a project the aim of which was to provide a complete picture of the violence perpetrated against civilians by the German army and its fascists allies in Italy between 1943 and 1945. The project gave rise to the “Atlas of Nazi and Fascist massacres”, including a database and a wide collection of material (documents, pictures, videos) on all the violent episodes.[8]

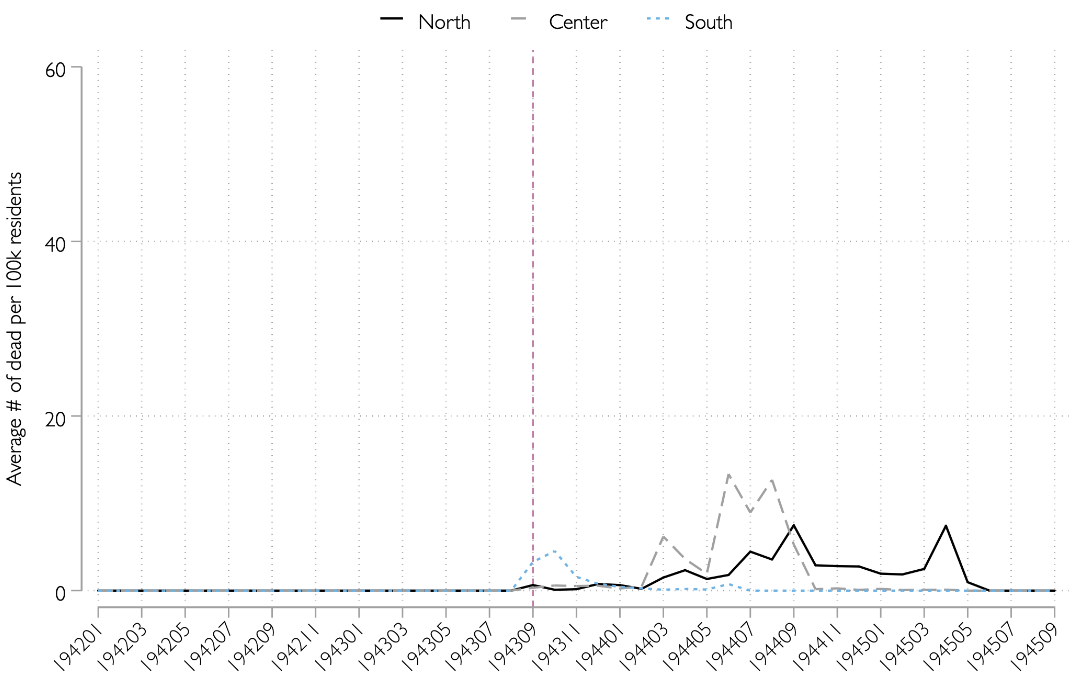
The database lists and analyses all the raids that occurred in Italy after September 8$^{\text{th}}$, 1943 by German soldiers and Italian fascists. These events range from the first murders in the South to withdrawal massacres committed in the days after the Liberation (April 25$^{\text{th}}$ 1945) in the regions of Piedmont, Lombardy and Trentino Alto Adige.

The database provides information on the number and type of victims by age and gender and the precise timing (day) and place (municipality).[9] The database counts more than 5,800 episodes producing 20,000 victims distributed across 2,200 municipalities. For reasons that will become clear in Section 3.3, we focus on raids in smaller municipalities (less than 200,000 residents) and only use

[8]This database is also used by Gagliarducci et al. (2020). Information about the project, the database and access possibilities is available at `http://www.straginaziFasciste.it/?page_id=9&lang=en`.

[9]This is the smallest administrative unit.

Figure 2: Average number of Nazi raid victims per 100,000 residents by region



raids in the first 9 months following the armistice (September 1943–May 1944). This restricts the sample to 1,603 episodes, lasting on average 1.4 days with an average of 3.27 victims per episode (see Table 1).[10] Figure 2 depicts the evolution of casualties due to raids by region, over time. Additionally, Figure A1 of Appendix A shows that in the 9 months after the armistice the raids covered all Italian regions north of the battlefront. Table B2 in Appendix B.1 reports the number of raids by month for the first 9 months after the armistice.

HERE GOES TABLE 1

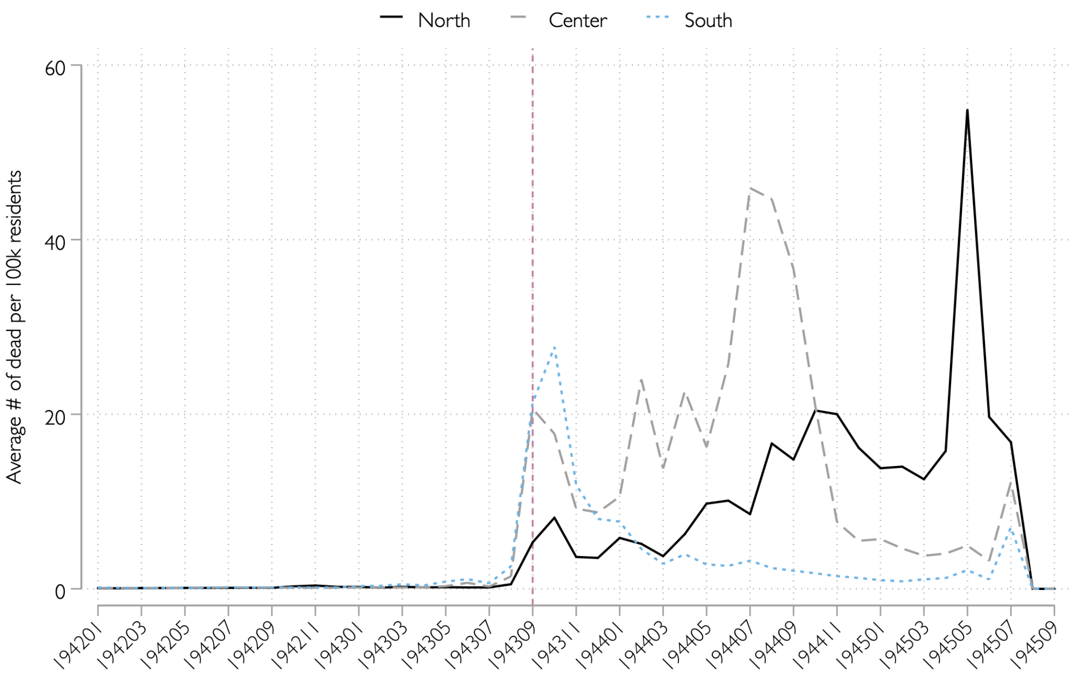
3.1.2 General data on deaths and missing persons during WWII in Italy

This dataset was reconstructed from an official archive publication "Morti e dispersi per cause belliche negli anni 1940–45" (The dead and the missing due to war causes between 1940–1945), collected

[10]The summary statistics of the Nazi raids over the entire period are reported in Table B1 of Appendix B.

by the Italian National Institute of Statistics (ISTAT, 1957).[11] The dataset includes the number of victims of armed conflicts by province and month. We use this information to control for the intensity of the battles between the Allied Forces and the Germans.

Figure 3: Average number of WWII victims per 100,000 residents by region



As described in the previous section, the Allied forces gradually progressed from the South in September 1943, ultimately freeing the Northern part of Italy in May 1945. Figure 3 shows how casualties by region evolved over time, starting from the South, moving to the Center and finally to the North.

3.2 The labor data

The longitudinal employer-employee data are provided by the Istituto Nazionale della Previdenza Sociale (INPS), the national social security and welfare institute in Italy, one of the largest administrative bodies at the European level.[12] INPS oversees all private sector employees and employers

[11]The publication is available and accessible either at the ISTAT archives, or online at `http://lipari.istat.it/digibib/causedimorte/IST3413mortiedispersipercausebellicheanni1940_45+OCRottimizz.pdf`.

[12]More information about INPS can be obtained from https://www.inps.it/nuovoportaleinps/default.aspx?itemdir=47212

operating in Italy during the years 1974–2018.

3.2.1 Matched employer-employee data

INPS provides longitudinal employment and earning histories including employee demographics, occupation, contract type and earnings. The INPS data cover the universe of private sector work contracts (excluding agriculture) in Italy over the period 1974–2018. The dataset tracks the labor market mobility of workers over their entire working careers. Being a matched employer-employee database, it also includes information on all private sector employers. Private sector jobs amount to more than 70% of all jobs in Italy. Zero earnings in the INPS data can arise due to employment in a non-private sector or movements out of the labor market. This is a common feature of administrative employer-employee data.

Additionally, for all Italian residents, INPS collects information on municipality and date of birth, date of death and date of labor market entry. The data also include detailed information on pensions, Unemployment Insurance (UI) and Disability Insurance (DI) premiums and claims.

3.2.2 Pension and benefits data

The data on pensions are available from 1995 onward and include information on the age at which retirement benefits are collected, the type of pension, the number of years of contributions as well as the benefit amount. The UI and DI premiums and benefit information is available for all Italian workers, independent of the sector of work. This allows us to examine whether prenatal exposure leads to interruptions in the labor market career. Additionally, this information also allows us to address the external validity of our estimates based on private sector workers. Specifically, we examine whether prenatal exposure to a raid is related to the sector of work. We find it is not. We refer to Section 6.6 for more detail.

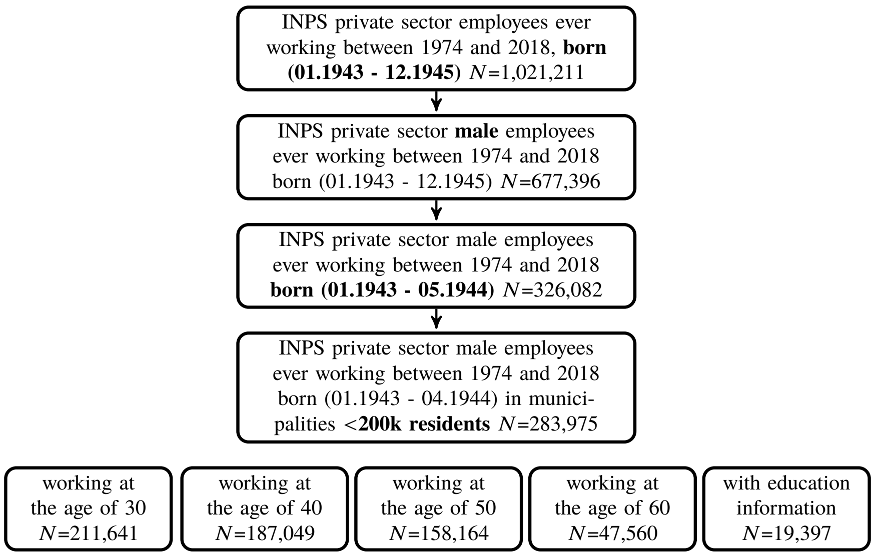
3.2.3 Education data

After 2010, employers were obliged to disclose information about educational attainment for all contracts that opened, changed or closed to the Ministry of Labor and INPS. We observe educational attainment for 52% of the sample of workers who were still employed in 2010 (19,397 out of 37,471 workers, see below in Section 3.3). This subsample is representative of the total sample.[13]

3.3 Data selection

We link the Nazi raids data to the individual INPS data through the municipality, month and year of birth. For the general WWII data, we link the records at the province, month and year of birth level. We make a number of sample restrictions to obtain the dataset used in the analyses. Figure 4 graphically describes the selection process.

Figure 4: INPS data selection



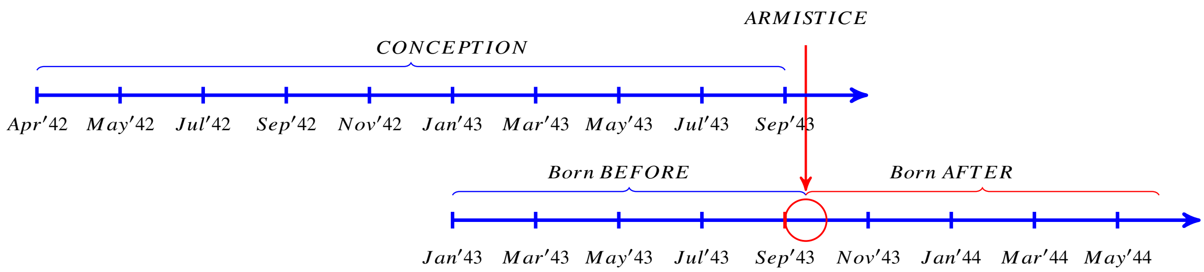
We first select all employees who worked at any point between 1974 and 2018 and who were born in the WWII era, here defined as the period between January 1943 and May 1945. This results in a total of 1,012,211 individuals. We then restrict our sample to males, since female labor force participation was very low (less than 30%) among the cohorts considered.[14] This results in 677,396 individuals. We restrict our sample to individuals born in a 9 month window around both sides of the date of the Armistice (i.e. born between January 1943 and May 1944). This results in 326,082 individuals.

[13]We perform a regression analysis of being present in the education sample on being prenatally exposed to a Nazi raid, and find no evidence of a significant association. See Section 5.1 for details.

[14]Exposure to stress early in life may also affect fertility behavior, which in itself may affect the labor force participation decisions of females and make the results difficult to interpret.

Figure 5 describes the timeline of the events by month. We select those conceived between April 1942 - September 1943. Those born after September 8th were (potentially) prenatally exposed to a Nazi raid, while others (born in the 9 months preceding September 8th) were not. This short time window rules out selective fertility and limits the potential impact of other behavioral responses that may occur after the Armistice as time proceeds (more on that in section 6.4). Yet, it does not rule out mortality selection in utero (still births) and between birth and 1974, when we observe our outcome measures for the first time. We return to selection issues in Section 6.6).

Figure 5: Cohort selection and timing of events.



Another confounding factor to consider is that the nature of the war was different in large cities. Raids in large cities generally involved more victims and nearby areas were more likely to know about them. This blurs the distinction between the treated and control subjects. Besides, some large cities experienced other adverse WWII conditions such as mass destruction due to bombing and nutritional shortages. These other hardships may confound our estimates and may also affect the interpretation of our estimates. We therefore further restrict our sample to individuals born in municipalities with less than 200 thousand residents. Generally raids in such small municipalities were not part of the German war strategy (Portelli, 2003).[15]

This final selection reduces our sample to 283,975 males born in 7,507 municipalities. In this sample we have 1,603 Nazi raids and 22,194 (7.8%) individuals who were prenatally exposed to a Nazi raid.

[15]We examine the sensitivity of our estimates to different cut-offs for the municipality size in section 6.4.

3.4 Exposure variables

For each individual in the sample we determine the intra-uterine period by counting 9 months backwards from the exact date of birth. In Section 6.4 we examine the robustness of our results to alternative lengths of gestation.

Based on individual intra-uterine period and municipality of birth, we create an indicator for Nazi violence exposure. This indicator equals 1 if the municipality of birth had at least one Nazi violence episode in the 9 months preceding birth. Analogously we construct a variable describing exposure to general war intensity (see Section 3.1). This variable is defined as the number of war victims in the province of birth due to armed fights between Allied forces and the German troops in the 9 months prior to the month of birth. For ease of interpretation, we express this variable as a z-score with mean zero and standard deviation of one.

3.5 Outcome variables

Using individual level INPS working histories, we create two key annual labor outcomes: log earnings and an indicator for manual (unskilled) labor.[16] We define our outcomes at different ages a (for $a = 30, 35, 40, 45, 50, 55$ and 60). To minimize the variance in earnings, for each a we take the average of the earnings at $(a-1)$, a and $(a+1)$. We also construct indicator variables for less than secondary and less than tertiary education for the sub-sample of workers with information on educational attainment.

For each individual we construct binary indicators for mortality, unemployment benefit claims and disability benefit receipt. We also examine the effect of prenatal exposure to a Nazi raid on the age at retirement and the pension benefit amount.[17]

We also examine income and mortality effects of job loss at later ages (Section 5.2). For these analyses we use the matched employer-employee information in the INPS data to identify episodes of job loss due to mass layoffs at the firm level.[18] In line with the literature (Sullivan and von Wachter,

[16]The blue collar indicator is derived from a hierarchical categorical variable that has 5 values: 1) Manual; 2) Skilled non-manual; 3) Professional; 4) Managerial; 5) Apprentice. Earnings are expressed in 2005 euros, adjusted for inflation using the CPI index.

[17]The cohorts in our study have defined benefit (DB) pensions. The pension benefit amount is a function of work experience, age when the benefit is claimed, and average earnings over the last working years.

[18]Job loss due to a mass layoff is arguably more exogenous than an individual contract termination. See Sullivan and

2009), we use mass layoff episodes in firms with more than 25 workers who reduce their total work force by more than 30% in a given year.

3.6 First descriptive evidence based on the INPS data

Table 2 provides some relevant initial evidence. The table shows that earnings gradually increase with age, that about three quarters of the workers enter the labor market as blue collar workers and that this share declines with age. Figure 6 and 7 depict this graphically with granular age data. Interestingly, the fall in earnings at around age 55 coincides with an increase in the share of lower skilled blue collar workers. At age 55 retirement becomes more prominent. This suggests that that higher earning and more skilled workers retire at earlier ages. Table 2 also shows that 22% of the workers are beneficiaries of a disability benefit at some point during their working career, that at the end of our observation period about 82% of them are retired, and that the average age at retirement is about 58 years old.

HERE GOES TABLE 2

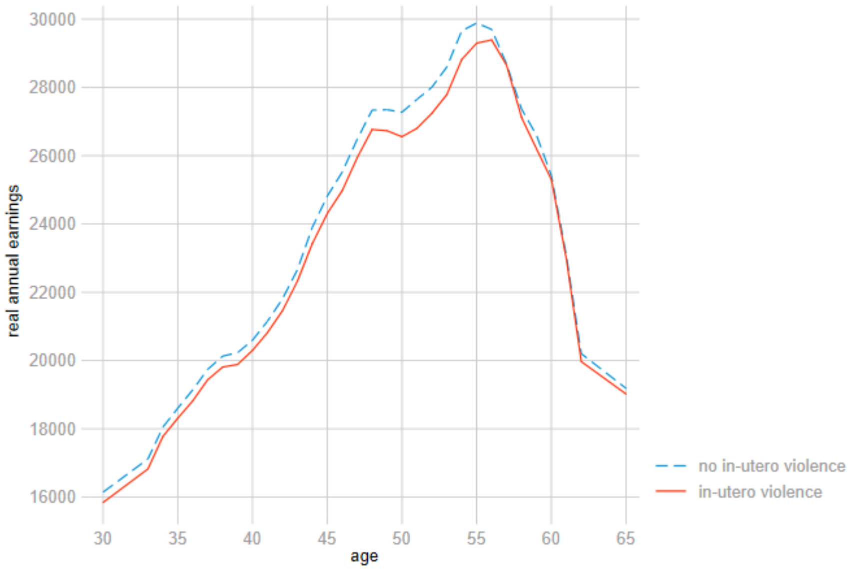
Table 3 provides the first descriptive evidence of prenatal exposure to a Nazi raid on selected outcomes. Columns 1 and 2 report the mean of the outcomes for individuals born in municipalities without any Nazi raid during our observation period, while columns 3 and 4 report the same information for individuals born in municipalities with a raid episode. The distinction between before and after is based on the date of the Armistice (September 8, 1943). Finally, column 5 provides simple difference-in-differences calculations of the variable means. The results in Column 5 confirm our prior expectations (see Figures 7 and 6): exposure leads to lower earnings[19] and a higher likelihood of being in a blue collar job. Column 5 also shows that exposed individuals are more likely to experience a disability and an unemployment spell during their working career. Interestingly, exposed individuals are also found to retire a bit later.

HERE GOES TABLE 3

von Wachter (2009) for a discussion.

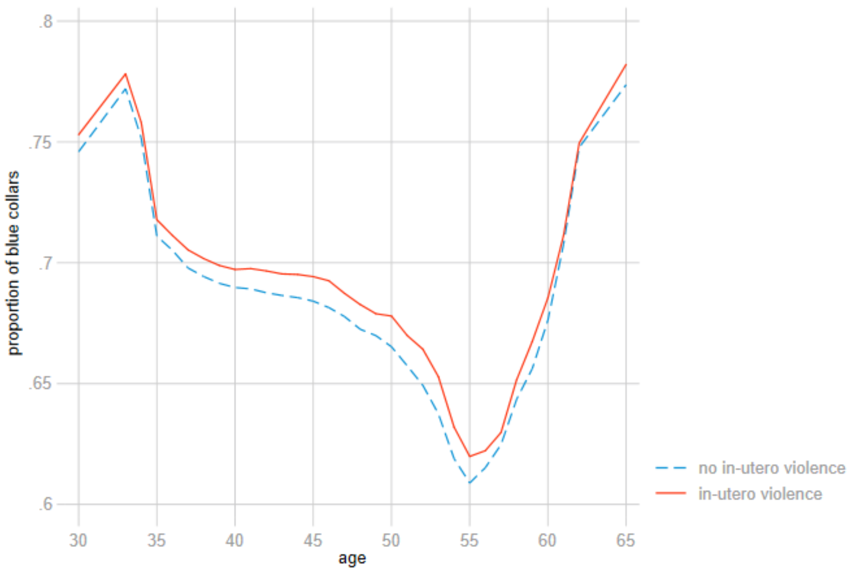
[19]This is about 2% at age 30 and 6% at age 60)

Figure 6: Wage earnings by treatment status



Notes: The numbers refer to 283,975 men working in the private sector between 1974 and 2017, born between January 1943 and May 1944 in municipalities with fewer than 200,000 residents. The figure plots differences between individuals exposed in-utero to a Nazi raid and those not exposed, controlling for municipality fixed effects. Annual earnings are expressed in 2005 euros.

Figure 7: Proportion of blue collar workers by treatment status



Notes: The numbers refer to 283,975 men working in the private sector between 1974 and 2017, born between January 1943 and May 1944 in municipalities with fewer than 200,000 residents. The figure plots differences between individuals exposed in-utero to a Nazi raid and those not exposed, controlling for municipality fixed effects.

4 Empirical model and identification strategy

The descriptive analyses above provide preliminary and tentative evidence of the effect of in-utero exposure to a Nazi raid on a range of outcomes. However, they do not exploit the exact timing of the raids, nor do they control for other circumstances, municipality characteristics and time fixed effects, which might confound our preliminary reading of the evidence. In this section, we present our empirical model and identification strategy, which are designed to overcome these concerns.

As discussed in Section 2, the German response to the Armistice was to occupy the country and to perform violent raids. This caused fear and stress among the Italian population. The raids were intentionally unpredictable and idiosyncratically placed across time and space. Our empirical analyses exploit the random variation in the violent raids to assess the causal effects of the raids on a range of labor outcomes.[20] Specifically, our baseline specification is the following generalized Difference-in-Differences model (DiD):

$$y^a_{imt} = \beta^a_0 + \beta^a_1 Nazi_{mt} + \beta^a_2 War_{pt} + \alpha^a_m + \gamma^a_t + \delta^a_{tr} + \epsilon^a_{imt}, \quad (1)$$

where y^a_{imt} represents the labor outcome for individual i, born in municipality m at time t, measured at age a (for a=30, 35, 40, 45, 50, 55, 60). For notational convenience we suppress subscripts p for the municipality's province (103 in total) and r for the municipality's region (20 in total). $Nazi_{mt}$ is an indicator for whether an individual's municipality of birth had at least one episode of Nazi violence in the 9 months before birth. This variable aims to pick up the direct effects of a raid. To control for general war effects we include War_{pt}, a z-score of the number of war related deaths in the province of birth p in the 9 months prior to the month of birth. General war effects aim to control for the adversities of war, including fear and stress resulting from the potential threat of a raid or bombings; nutritional shortages; disease spread; and sub-optimal functioning of health care systems. We also include municipality fixed effects (α_m), $year \times month$ fixed effects (γ_t), and region specific time trends (δ_{tr}). ϵ^a_{imt} is an idiosyncratic error term. In all our analyses we cluster standard errors at

[20] We address the randomness of the raids later on.

the municipality level.[21]

The coefficient β_1 is identified by comparing individuals exposed in utero to a Nazi raid to those exposed in the first year of life and those born in municipalities not exposed to a Nazi raid, while controlling for general war effects (War_{pt}). As such, β_1 measures the direct effect of a Nazi raid *over and above* general war effects. This margin is similar to Camacho (2008) and Quintana-Domeque and Rodenas-Serrano (2017) who study the effects of landmine explosions and terrorist attacks on birth outcomes in Columbia and Spain, respectively.

While it is plausible that the timing of the raids is unpredictable, one could argue that even after conditioning on municipality fixed effects the targeting of treated municipalities was not random.[22]

To address this concern, we also use an alternative identification strategy that only relies on the weaker assumption of random variation in the exact timing of the raids (results reported in subsection 6.2).[23] Effectively we compare the offspring of mothers exposed to a raid during pregnancy, as opposed to mothers exposed after giving birth. So, within this sub-sample of treated municipalities, all children face the same postnatal consequences of a raid, but only some of them are also exposed in-utero. This identification strategy is the same as that in Persson and Rossin-Slater (2018) who examined the effects of grief and stress during pregnancy on the mental health of offspring.

Some other considerations are in order before we present our estimation results. It could be argued that the effects of a raid are not limited to the affected municipality, but also extend to neighboring control municipalities. If true, the control municipalities would be indirectly affected by the raid, which may lead to an underestimate of the effect of a raid. In section 6 we also provide the results of additional analyses where we examine the effect of a raid on neighboring control municipalities. Further, note that spillover effects are not relevant when we estimate our models on the sample of treated municipalities only. Both analyses show that spillovers are not important (see subsection

[21]Spatial correlation may be relevant. One way of taking this into account is to cluster the standard errors at the province level. This hardly affects the standard errors.

[22]Historical studies (O'Reilly, 2001) document engagement of the partisans with the occupants, but this primarily occurred in big cities or around strategic points and, most importantly, this occurred later in the war when the partisan movement became better organised.

[23]Further, in Section 6 we examine the conditional (on municipality fixed effects) random assignment of the raids in more detail. Briefly, we estimate the baseline model, excluding raids involving resistance fighters and the results (see subsection 6.4) become stronger. We also more formally test for conditional random assignment and conclude that this assumption cannot be rejected (More detail can be found in Appendix A).

6.2)).

Further, a potentially traumatic event may give rise to a psychological trauma for the parent(s) that persist for a longer period (Post Traumatic Stress Disorder, PTSD).[24] PTSD may influence parental (health) behaviors and parenting skills when the child grows up (Akresh et al., 2012a; Christie et al., 2019). The systematic review of Christie et al. (2019) found that PTSD is associated with impaired functioning across a number of parenting domains such as parenting stress, less optimal parent-child relationships and negative parenting practices. Further, the violent raids, led in some cases to property destruction and confiscation of economic resources, which in turn may have led to structural income losses.

Lasting effects of a Nazi raid can have important implications for the interpretation of the parameter estimates of Equation 1. The estimate of β_1 will in this case include both a biological and a behavioral (PTSD)/income effect that may also affect the child after birth. Additionally, in the baseline specification (equation 1) part of the reference group, namely those exposed to a Nazi raid post-birth, may also be affected by the PTSD/income effect, leading to a downward bias of the treatment effect. To examine the relevance of such effects we also estimate models that, in addition to the in-utero effect, allow for the effect of a Nazi raid in the child's first and second year of life. The absence of statistically significant effects for the first and the second year of life suggests that the estimate of β_1 should be interpreted primarily as driven by a biological effect, rather than via income and/or altered parental behavior. Note that the test for the first and the second year effects is equivalent to a test of the common trends assumption. The results of this model, presented in the robustness section 6, show that only *prenatal* exposure to a Nazi raid has a lasting negative effect on the labor market outcomes of the offspring.

Besides the alternative models, section 6 also includes a range of additional robustness checks. Failure to adequately control for the general war effect may impact our treatment effect and its interpretation. We therefore also estimate more flexible models where we replace WWII casualties (War_{pt}) and regional trends with flexible $province \times year \times month$ fixed effects. We also examine the sensitivity of our finding with respect to changes in the sample and the definition of the treatment

[24]Note, however, that only about 2% of individuals exposed to a potentially traumatic life event are diagnosed to have PTSD (Benjet et al., 2016).

variable. We further verify our identification assumptions and the statistical power by a falsification test where we randomly assign the Nazi raid to each individual in the sample. In section 6.6 we also examine whether selection of the private sector, selective mobility and selective fertility and mortality may confound our findings. Lastly, in section 7 we address the interpretation of our findings. We argue that prenatal stress is likely to be the most important factor driving our findings. However, it should be noted that any study attempting to study the effects of stress can never rule out other confounding mechanisms and this holds even for studies that measure actual stress hormone (Cortisol) bio-markers.

5 Results

In subsection 5.1 are estimates of our baseline model (Equation 1) on the sample of 283,975 individuals born in the 9 month window around the date of the Armistice (Jan 1943–May 1944). For these cohorts we observe earnings (in logarithms), blue collar status, disability and unemployment benefit receipt, retirement age, pension benefits (in logarithms) and mortality over the period 1974 (aged 30–31) to 2018 (aged 74–75). In section 5.2 we present the results of job loss due to a mass layoff on subsequent labor earnings and mortality.

5.1 Labor market outcomes across the life cycle

Table 4 shows estimates from the main model (Equation 1) for wage earnings. By the age of 30 we observe an earnings penalty of about 2% for those who are prenatally exposed to a Nazi raid ('the exposed') and this effect does not dissipate over time. The penalty is slightly smaller at ages 40 and 45, but it widens at age 50 and older. At age 60 the earnings penalty increases to about 5.5%.[25] We also find significant negative general war effects (WWII casualties) on earnings.

HERE GOES TABLE 4

The persistent differences in earnings for the exposed could be due to differences in the skill level and the type of jobs that are held. However, sorting into lower skill jobs cannot alone explain the

[25]Note that this is remarkably similar to the results in Table 3

stark increase in the earnings penalty later in the working career. A possible reason for this pattern might be related to interrupted working careers, for instance, due to unemployment or disability. An alternative explanation is retirement timing. The male cohorts that are considered started retiring as early as age 55 and by age 60 only 22% of these cohorts were still at work. This retirement effect may be selective with respect to earnings and the type of job.

Table 5 shows the results for the type of job. The prenatally exposed are more likely to work in lower skilled blue collar jobs. As in Table 4 the strongest effects are found at age 60. This supports the idea that those retiring prior to age 60 are more likely to hold white collar jobs (with higher earnings on average).

HERE GOES TABLE 5

To understand to what extent sorting into low skilled blue collar jobs is mediated by the accumulation of human capital before labor market entry, we use information about educational attainment. We have information on the educational attainment of individuals whose employment contract changed after 2010. This concerns 52% the sample of workers who are still in work after 2010 (19,379 out of 37,471 workers, see Section 3.2.3). A change in the labor contract might potentially be related to prenatal exposure to a Nazi raid. We therefore run a regression that relates the presence in the education sample to in-utero exposure to a Nazi raid. Column 1 of Table 6 shows that there is no significant association between the two variables (t-statistic of 0.014, p-value exceeds 0.99). In column 2 and 3 we show the results for the effect of prenatal exposure to a Nazi raid on educational attainment: the exposed have lower levels of educational attainment. This suggest that the traumatic experience of a Nazi raid affects cognition and education, which in turn may affect job skill levels and earnings. This is also in line with findings from the medical and economic literature (see for instance Gitau et al. (2001), Aizer et al. (2016)).[26]

HERE GOES TABLE 6

[26]Aizer et al. (2016) find effects of elevated Cortisol levels in the mother on offspring cognition and educational attainment.

To further support this interpretation, we quantify the impact of education as a mediator for earnings at age 55.[27] For this we construct a mediation analysis as in Adhvaryu et al. (2019); Heckman et al. (2013); Huber (2014).[28] These results are reported in Table 7 and show that 42% of the treatment effect on wage earnings can be explained by educational attainment and that having a tertiary education accounts for 36% of the total treatment effect.[29] This provides strong support for the plausibility of the assumed mechanism: the traumatic event has an important effect on education, which in turn affects later life wage earnings.

HERE GOES TABLE 7

In Table 8 we present the results for disability, the number of unemployment benefit claims before age 60, the age at retirement, pension benefits and mortality. Disability and mortality are defined as ever having received a disability insurance benefit before age 60 and the probability of dying before age 60, respectively. Pension benefit is defined as the first monthly pension benefit at retirement.

HERE GOES TABLE 8

The results in Table 8 show a small and insignificant effect for disability insurance receipt, but a sizeable and marginally significant effect for the number of unemployment claims prior to age 60. This last result suggests that at least part of the earnings penalty at age 60 for our treated population may be due to interruptions in their labor market careers. There is no differential effect with respect to retirement timing, but we do find that in retirement the exposed have lower pension benefits. Pension benefits are related to average earnings in the years prior to retirement. It therefore seems that the earnings penalty extends to old age. Finally, Table 8 shows that there is no differential mortality according to treatment status.

[27]At later ages the number of workers drops rapidly

[28]This involves estimating two sets of weighted regressions, one for the degree to which the impact of a Nazi raid varies by education attainment and a second for the effect of the Nazi raid on education attainment levels. The inverse probability weights are derived from a regression of the Nazi raids on education attainment levels and the usual set of controls and fixed effects.

[29]The quantitative importance of education in explaining wage earnings can be attributed to the Italian national bargaining system, where education attainment almost exclusively determines the level of job qualifications in a labor contract.

5.2 What if lightening strikes twice?[30]

The evidence presented above shows that the earnings gap increases with age and suggests that work interruptions due to unemployment may play a role. It could also be that the exposed suffer more from job loss later in life. What are the effects on earnings of a second shock (job loss) for the prenatally exposed? Or, what if "lightning strikes twice"? Cunha and Heckman (2007) and Almond et al. (2018) argue that dynamic complementarities may be important. Dynamic complementarities, refer to the idea that investments made in later periods are more productive when the baseline stock of skills is higher. Conversely, a negative shock early in life may amplify the effects of a negative shock later in life. In our context this may imply that the negative consequences of job loss later in life may be stronger for those prenatally exposed to a raid.

To address the sensitivity of later life shocks, following a shock early in life, we use information on mass layoffs available in the linked worker firm data from INPS. Specifically, we examine whether the effect of job loss due to a mass layoff on subsequent earnings and mortality is different for those prenatally exposed to a Nazi raid. Contract terminations resulting from mass layoffs are particularly suitable in this setting, as this type of job separations are more likely to be exogenous from an individual point of view.

The literature on the effects of job loss due to mass layoffs shows that displaced workers tend to experience significant long-term earnings losses (Jacobson et al., 1993; Ruhm, 1991), lower employment rates (Chan and Stevens, 2001), strong increases in mortality rates for male workers, persisting up to 20 years after job displacement (Sullivan and von Wachter, 2009) and higher suicide rates and hospitalization due to traffic accidents, alcohol-related diseases, and mental illness (Browning and Heinesen, 2012).

Following Sullivan and von Wachter (2009) we use the standard mass layoff definition: a reduction of at least 30% in total employment between period $t-1$ and t in a firm with more than 25 workers. We match these firm layoff events with individual contract terminations between 1983 (aged 40) and 2004 (aged 61). For a causal interpretation of our estimates we first have to rule out potential endogenous allocation of mass layoffs to prenatally exposed workers. Table B3 of Appendix B.2

[30]Sub-section title adapted from Almond et al. (2018), Section 5.

shows that there are no effects of prenatal exposure (or general WWII effects) on the probability of working in a firm that experiences a mass layoff.[31]

To assess the causal effect of job loss due to mass layoff (LO) for prenatally exposed workers we specify the following triple difference-in-differences model:

$$y^a_{imt} = \beta^a_0 + \beta^a_1 Nazi_{mt} + \beta^a_2 LO^a_{it} + \beta^a_3 LO^a_{it} * Nazi_{mt} + \beta^a_4 * War_{pt} + \alpha^a_m + \gamma^a_t + \delta^a_{tr} + \epsilon^a_{imt}, \quad (2)$$

where LO^a_{it} is an indicator that equals 1 if an individual i, born at time t loses his job due to a mass layoff at age $a - 1$. As in equation 1, β^a_1 measures the average effect of being exposed prenatally to a Nazi raid. The parameter β^a_2 is the effect of a layoff, the estimate usually reported in the existing literature on mass layoffs (Jacobson et al., 1993; Ruhm, 1991; Sullivan and von Wachter, 2009). The triple difference-in-differences parameter β^a_3 measures the *additional* effect of a job loss due to a mass layoff for the prenatally exposed. So the sum β^a_1 and β^a_3 is the *total* effect of a layoff for the prenatally exposed. When our outcome is earnings, we measure the effect on the next year's earnings. For mortality, we look at the effect on the probability of dying within the next 10 years.

Table 9 presents the estimates of Equation 2 on next year earnings from age 45 to 60. The effect of prenatal exposure to a Nazi raid (β^a_1, in the first row) is very similar to the general treatment effect presented in Table 4, hinting that the assignment of the mass layoff is not associated with prenatal exposure to a Nazi raid. The estimates of β^a_2 indicate that a layoff results in an immediate earnings loss of about 31–34%. This estimate is in line with the evidence of Couch and Placzek (2010), who find for the US earnings penalties of about 32–33%. Jacobson et al. (1993) find immediate losses of more than 40%. Importantly, the estimates of β^a_3 in in Table 9 show that the prenatally exposed suffer an additional earnings penalty at ages 45, 50 and 55 of about 8%, 10% and 15%, respectively.[32] Hence, an average worker faces an immediate earnings loss after job loss (due to a mass layoff) of about 31–33%, which can increase to more than 47% for those prenatally exposed to a Nazi raid.

HERE GOES TABLE 9

[31] Also, neither blue collar, nor white collar workers are over represented in firms that experienced a mass layoff (results available upon request).

[32] Note that the effect at age 55 rather than at age 60 is most relevant for the large earnings penalty at age 60 in Table 4.

Finally, we also examine whether the layoff leads to increased mortality rates within 10 years following the event. The results of this analysis (Table 10) show, in line with the literature (Sullivan and von Wachter, 2009), that job loss leads to increased 10-year mortality rates. However, we do not find evidence of additional effects for those prenatally exposed to a Nazi raid.

HERE GOES TABLE 10

Our findings on the interaction between prenatal exposure to a Nazi raid and another exogenous shock later in life suggest that dynamic complementarities may be important (Almond et al., 2018; Cunha and Heckman, 2007). However, formally testing for dynamic complementarities is difficult. As argued by (Almond and Mazumder, 2013), causal inference on dynamic complementarities requires "lightning to strike twice", i.e. it requires exogenous variation in the baseline stock as well as in the second shock later in life. Such settings are rare in practice, but our empirical design combined with administrative matched worker-firm data that follow individuals over an extremely long period allows us to address this issue.

However, exogeneity of the two shocks is a necessary, but not sufficient condition (Malamud et al., 2016) as parents may respond with investments in their children to counter the negative effects of a bad start. Specifically, following Almond et al. (2018); Yi et al. (2015), the total effect of a prenatal shock (e) on the child's human capital at adult ages θ can be decomposed into two parts:

$$\underbrace{\frac{\mathrm{d}\theta}{\mathrm{d}e}}_{A} = \underbrace{\frac{\partial\theta}{\partial e}}_{B} + \underbrace{\frac{\partial\theta}{\partial I}}_{C} \times \underbrace{\frac{\partial I}{\partial e}}_{D} . \qquad (3)$$

The term (A) on the left-hand side of (3) is the reduced form effect of the early-life shock and corresponds to the usual reduced form estimate in the empirical literature on long run effects of early life shocks. The first term on the right-hand side (B) is the biological effect that directly operates through the human capital production function. The second term ($C \times D$) is the behavioral effect from the parental investment response, where (C) is the productivity effect of the investment (the marginal efficiency of investment) and (D) is the resource allocation effect. When parents make compensating investments to counter the adversities of the initial shock the term $(C \times D)$ will be negative and hence will bias the effect of the second shock (layoff) towards zero. When parents make reinforcing investments, they may decide to invest resources to other, better endowed, children in the family, or even to reduce spending on the disadvantaged child $(C \times D \geq 0)$. In this case the reduced form effect may lead to an upward bias of effect of the second shock. Unfortunately, we do not have information on parental investment decisions and therefore cannot formally check this. However, the negative and significant effect of the triple difference-in-differences parameter β_3^a indicates at least that parents do not make fully compensatory investments in their child.

Taken together, the results in this section indicate that a traumatic experience of a pregnant mother leads to lower earnings for her offspring. This effect increases with age and ultimately leads to lower pensions in retirement. These negative outcomes are due to worse educational outcomes, lower skilled jobs and to interruptions in the working career. Our results for the effects of a layoff later in life indicate that those exposed prenatally to a negative shock face higher earnings penalties in later life after job loss. The latter result suggests that dynamic complementarities may be important.

6 Robustness checks, falsification tests and selection effects

In this section we start with estimates from an alternative model that tests for the relevance of trauma related changes in parental behavior and parenting skills (Section 6.1).

In subsection 6.2 we examine the assumption of conditional random assignment and test for possible spillover effects. We next perform several robustness checks (6.4). The results of these analyses are summarized in Panels B-G of Tables 11 (earnings), 12 (blue collar status) and 13 (mass layoffs). The baseline results are repeated in Panel A. The tables only report the effect estimates of β_1 and β_3. The full tables can be found in the online Appendix D. In Section B.4) we report the results of a falsification tests. Section 6.6 addresses issues of selective fertility, mortality and mobility.

6.1 Post Traumatic Stress Disorder (PTSD) and the Common trend assumption

As discussed in Section 4, witnessing violence may lead to a lasting psychological trauma for the parent(s) (PTSD) which in turn may influence parental (health) behavior and parenting skills when the child grows up (Akresh et al., 2012a,b). Furthermore, property destruction and income losses following a raid may also have longer-term consequences. In the presence of such effects the estimate of in-utero exposure in Equation 1 includes a biological and a behavioral (PTSD) and/or income effect. We examine this by augmenting the specification in Equation (1) with separate effects for exposure in the first and the second year of life. For this purpose we extend the period of the analysis to the left, i.e. the time window is [-24,9] around September 8^{th}, 1943. This alternative specification resembles an event study approach and also allows for a test on the common trend assumption.

The results of these analyses are reported in Panel B of Tables 11, 12 and 13. We see in the top row of Panel B that the coefficients of interest are hardly affected and that the parameter estimates are slightly larger and more precise when we extend the time window to the left. Importantly, the two following rows for the first and the second year effects show small and insignificant coefficients. This indicates that the common trends assumption is satisfied.[33], and that it is primarily prenatal exposure that drives our findings. Thus the effect estimates primarily reflect a biological effect, rather than effects of reduced income and/or altered parental and parenting behavior post-birth.

6.2 Conditional random assignment assumption / a different identification strategy

As argued in Section 2, Nazi raids were idiosyncratically distributed across time and space. For this reason, in Equation 1 the control group includes those who were born in municipalities that were not subject to a Nazi raid and those born in treated municipalities post birth. While the exact timing of the raids was hard to predict, one could argue that the assumption of conditional random assignment across municipalities may not hold. We performed analyses where we excluded raids that involved resistance fighters among the casualties. This did not affect our estimates (results available upon request). In a similar vein, Table B.1 of Appendix B shows that the share of raids that involved casualties from resistance fighters was less than 15% in the first six months after the Armistice. When the war progressed this share increased to about 45%. We estimate our baseline model, using the first six months only (see below in subsection 6.4 for the results). In Appendix A we more formally test for the assumption of conditional random assignment and conclude that the

[33]We additionally estimate a monthly event study that confirms that the common trend assumption cannot be rejected (results available upon request).

assumption of conditional random assignment cannot be rejected. Finally, we also estimate Equation (1) for the sub-sample of treated municipalities only. In this case, identification relies solely on the weaker assumption of randomness in the exact timing of the treatment (Persson and Rossin-Slater, 2018). The results of this exercise for earnings, blue collar status and mass layoffs are reported in Panel C of Tables 11, 12 and 13. The results are very similar for blue collar status and mass layoffs, but become smaller and less precise for earnings at age 55 and 60.

6.3 Testing for spillover effects

Information about a Nazi raid may also transmit to neighboring villages/municipalities and fear of a Nazi raid may also impact their residents. If this is the case, some of the control municipalities may also have been affected. This will induce a downward bias of the estimates of β_1 (Equation 1) and β_3 (Equation 2). To examine the relevance of such effects we exclude the municipalities that underwent a raid. Next, in the remaining sample (of the controls) we define the municipalities in the vicinity (within a distance of 5km) of a treated municipality as treated. Significant estimates of β_1 (earnings and blue collar status) and β_3 (layoffs) indicate relevance of spillover effects. Panel D Tables 11, 12 and 13 present the results. All estimates are small and insignificant, indicating that spillover effects are not important.[34] [35]

6.4 Flexible province trends and different samples

Flexible province trends

The control variable War_{pt} in equation 1 may not be able to fully control for general war effects. This may affect the estimate as well as the interpretation of β_1. We therefore also use more flexible models where we replace War_{pt} and the regional trends by $province \times year \times month$ fixed effects. The results displayed in Panel E of Tables 11, 12 and 13 show that this does not affect our effect estimates.

[34]We also perform analyses where we keep the treated municipalities in the sample, but exclude nearby (5km radius) municipalities. The results are virtually identical to the baseline results (Panel A). Results available upon request

[35]Further, note that spillover effects do not play a role when we use the alternative identification strategy that only uses the sample of treated municipalities. The results of these analyses (see above, Panel C) are very similar, also suggesting that spillover effects are not important.

Changes in the length of gestation

As a further sensitivity test, we explore the effect of changes in the length of gestation. As we will argue later in Section 7, maternal stress is likely to be an important factor explaining our findings. Maternal stress increases the likelihood of a preterm birth (Lilliecreutz et al., 2016), in the medical literature defined as a gestation period of less than 37 weeks. We derived the exposure variable $Nazi_{mt}$ assuming a 9 month gestation period (see Section 3.4). With shorter gestation some of those exposed may in fact have been conceived after September 8, 1943, or may have been exposed post birth. This measurement error may bias the parameter estimates (downward). Unfortunately, we only observe births and lack information on length of gestation or preterm status. We therefore proceed differently and examine the sensitivity of our results by estimating Equation 1 and 2 assuming both an eight month and a seven month gestation period.[36] We report the results of this exercise in Panel F of Tables 11, 12 and 13. Reducing the gestation period, increases the magnitude and significance of the estimates.

Using only information from the first 6 months

The Armistice announced on September 8, 1943 was unexpected and therefore it can be argued that the population had not anticipated the series of events that followed. This limits the role of fertility responses (see also the Section 6.6). However, as the war went on, more information about the raids and the WWII in general may have disseminated across Italy. This may imply that with time, fear and stress may have gained in importance in control municipalities, leading to a downward bias in our effect estimates. Further, Table B2 in Appendix B.1 shows that in the first six months after September 8, the raids involved primarily civilian victims. For these reasons we also estimate our main model using the data up to 6 months after September 8, 1943. Note that by using this restricted time window we also reduce measurement error in the exposure variable ($Nazi_{mt}$) (see above). Results using only information of those born in the interval [-9,6] around the Armistice are reported in Panel G of Tables 11, 12 and 13 present the results. The tables show that the effects are very similar and quantitatively even gain in importance.

[36]We trim the data from the right. For an eight month gestation period we take births in the [-9,8] window around September 8, 1943. For a seven month gestation period we take the [-9,7] window around September 8, 1943.

Changing the municipality size cut-off.

The nature of the war was different in large cities. Also, in large cities the raids were more brutal and involved more victims and therefore nearby areas were more likely to hear about these raids. We therefore restricted our sample to municipalities with less than 200,000 inhabitants. To examine the sensitivity of our findings to this cut-off we also perform additional analyses where we vary the municipality size. The results are in Panel H and I of Tables 11, 12 and 13. Panel H shows the results if we use a cap of 500,000 inhabitants and in Panel I we also include the big cities (i.e. no cap on the size of the municipality. As expected (see the discussion in Section 3.3), relaxing the cap leads to smaller and less precise parameter estimates of β_1 (and β_3).

HERE GO TABLES 11, 12 and 13

6.5 Falsification tests

Finally, we further verify our identification assumptions and demonstrate the statistical power of our inferences by conducting falsification tests where we assign a pseudo-treatment. More precisely, we randomly assign the Nazi raids to each individual in our sample. If our identification strategy is valid, we would expect estimates using those pseudo-samples to be centered around zero. We can then compare our baseline estimates with the results from the pseudo-sample. We plot the distribution of the t-statistics from 5,000 estimated pseudo-treatment effects for earnings at age 30 and blue collar status at age 30 in Figures B3 and B4 of Appendix B.4 (results for other ages are available upon request). As expected, both distributions are centered around zero and the t-stats of our main analyses (indicated with the vertical dotted red line) are at the far end of the left (earnings) and right (blue collar status) tails of the distributions. Specifically, the share of t-values that (in absolute terms) exceeds the t-statistics from our main model is less than 1%. These p-values give confidence in the design and statistical power of our exercises.

6.6 Selection effects

In this Section we address several problems related to sample selection, selective fertility, mobility and mortality.

Private sector worker selection.

Our analyses are based on a sample of private sector workers and this selection may be related to the treatment variable. In this case our effect estimates may be biased and it may also question the external validity of our findings. The INPS data include pension information of all workers, both working in the private and public sector. This allows us to examine whether those prenatally exposed to a Nazi raid were more or less likely to sort into private sector jobs. We find that they did not. More specifically, we regress an indicator for working in the private sector with in utero exposure to a Nazi raid, municipality fixed effects, the number war casualties, year $\times$ month fixed effects and regional trends. The coefficient of the Nazi raid is small (-0.0015) and not significant (s.e. 0.0011, p-value of 0,17).

Selection issues at conception, in utero and in later life

Confounding due to selection can take place at several stages in the life cycle: *i)* at conception; *ii)* in-utero; *iii)* later in life before we observe the individuals in 1974; *iv)* after 1974. With respect to selection at conception, our sample pertains to all births conceived prior to the date of the unexpected proclamation of the Armistice. Thus fertility decisions in treated and control municipalities were made with similar prior information. Still one might argue that conception rates vary with socio-economic status and that there are structural differences between municipalities. Note, however, that in all our regressions we control for municipality specific fixed effects.

Further, selective mortality due to reasons *ii* - *iv* is likely to lead to survival of the stronger individuals. In this case our estimates are likely to be a lower bound of the true effects. It would still be informative to test for the relevance of such selection effects. To deal with in-utero selection, we ideally would like to have birth records at the time of exposure. Unfortunately, these are not available. However, we are able to retrieve regional data on cause specific mortality for complications during pregnancy or at birth in the WWII era. If this mortality rate is higher in periods of a Nazi raid, then this implies that fewer women gave birth in these periods. This may bias parameter estimates if these women are systematically different from women who give birth. We regress regional mortality rates due to pregnancy complications from 1941 to 1946 on the number of WWII casualties (War_{pt}), Nazi raids and year and region specific fixed effects. Table B4 of Appendix B.5 shows that the Nazi raids did not increase mortality due to pregnancy complications.

Mortality selection after conception can take place in utero (miscarriages), between birth and the first time that we observe the individuals at age 30 and at later ages. The results in column 2 of Table 8 show that there is no mortality selection between age 30 and 60 (reason *iv*). In order to test for selective mortality due to miscarriages and between birth and age 30 (reasons *ii* and *iii*), we examine standardized cohort sizes at the municipality level. To test for endogenous mortality selection effects we use the following model on the sample of treated and control municipalities:

$$CS^a_{mt} = \beta^a_0 + \beta^a_1 Nazi_{mt} + \beta^a_2 War_{pt} + \alpha^a_m + \gamma^a_t + \delta^a_{tr} + \epsilon^a_t, \tag{4}$$

where CS^a_{mt} is the standardized cohort size at age a (a = 30) in municipality m at time t (for t = Jan 1943, . . . , May 1944), $Nazi_{mt}$ is an indicator that equals one if municipality m at time t was exposed to a Nazi raid, War_{pt} the number of casualties, α^a_m are municipality fixed effects, γ^a_t are year × month fixed effects, δ^a_{tr} regional trends and ϵ^a_{mt} an idiosyncratic error term.

Our main interest is in the coefficient β^a_1. A significant negative effect indicates a smaller cohort size in the months that a municipality was subject to a Nazi raid (and vice versa). [37] We report this coefficient in Table B5 of Appendix B.5. The results show that the cohort size of a municipality is not significantly different in the months when a Nazi raid took place. This suggests that selection effects for reasons *ii* and *iii* are not likely to bias our effect estimates.

Selective mobility

The unexpected declaration of the Armistice is likely to rule out endogenous residential mobility in the short time window that we use in our analyses. Moreover, movements across Italian provinces

[37]Note that β^a_1 may also pick up fertility effects.

during WWII was very difficult due to the destruction of railroads and transportation networks (Baldoli and Knapp, 2012). To empirically test for selective mobility responses we use the sample of treated and control municipalities and estimate an event history model that relates the standardized municipality cohort sizes to leads and lags of Nazi raid exposure, province level general war effects War_{pt}, municipality fixed effects, year × month effects and regional trends. We take the normalization at the month of a Nazi raid. A positive coefficient indicates that the municipality cohort size in a specific month is larger than the cohort size in the month of a Nazi raid (and vice versa). Residential mobility may affect our effect estimates if prior to the month of the raid people moved out of the municipality. In that case we should find significantly lower cohort sizes prior to the month of the Nazi raid. Figure B5 in Appendix B.5 reports the estimated lead and lag coefficients. The figure shows that the lead and lag effects are very small (less than 0.05 of a standard deviation) and not significantly different from zero. Hence, cohort sizes are relatively constant and endogenous residential mobility is not likely to have played an important role in the 9 month window surrounding the date of the Armistice.

7 Interpreting our results: Is it stress?

The onset of the armistice brought war in Italy. During a war the provision of food may be hampered, infectious diseases may become more prevalent and health care systems function sub-optimal. Importantly, the *potential* threat of a raid produces fear and stress among the population Becker and Rubinstein (2011). To account for such effects we control for general war events (War_{pt}) and other time varying province characteristics (× year × month fixed effects). Therefore, $Nazi_{mt}$ measures the *additional* effect of a Nazi raid, over and above general war effects. Below we argue that maternal stress is likely to be the main driver of this direct effect of a Nazi raid. However, as noted before, any attempt to study the effects of stress can never rule out other confounding mechanisms.

The clinical literature offers exhaustive reviews of the damage related to psychological trauma and associated prenatal maternal stress (PNMS) resulting from potentially traumatic events (PTE). PNMS is found to negatively affect mental, cognitive, emotional and immunological functioning of the offspring (Checkley, 1996; de Kloet et al., 2005; Gitau et al., 2001; Hansen et al., 2000;

Heffelfinger and Newcomer, 2001; Lederman et al., 2004; Leeners et al., 2007; Matthews, 2000; Mulder et al., 2002; Selten et al., 1999; Weinstock, 2001, among others). PNMS may lead to abnormal activity of the Hypothalamic-Pituitary-Adrenocortical (HPA)-axis, which not only exposes the fetus to altered stress hormone levels, but may also increase the permeability of the placental barrier (Van den Bergh et al., 2005), affecting placental functioning and exposing the fetus to higher maternal glucocorticoids (a.o. cortisol) and subsequently also affect domains of the fetal brain that are sensitive to these hormones (Zhang et al., 2018).

Additionally, PNMS stimulates the production of the Corticotropin-Releasing Hormone (CRH) (Majzoub and Karalis, 1999). Amongst others CRH affects responses to stress, addiction and depression. Boersma and Tamashiro (2014) demonstrated how PNMS may modulate the stress-coping phenotype of offspring, inducing a more extreme phenotype. Yehuda et al. (2016) showed that PNMS is associated with epigenetic alterations that is evident in both exposed parent and offspring.

Recent economic literature has given support to these claims by identifying effects of PNMS on birth outcomes, educational attainment and mental health of offspring (Aizer et al., 2016; Black et al., 2016; Camacho, 2008; Persson and Rossin-Slater, 2018; Quintana-Domeque and Rodenas-Serrano, 2017). Our findings for educational attainment and the mediation analysis (Section 5.1) are in line with these studies. Below we examine whether, even after controlling for general war effects, the variable $Nazi_{mt}$, may pick up other possible effects such as hunger, changes in maternal health and health behaviors and family income.

7.1 Supporting evidence in favor of a stress interpretation

Is it prenatal? In Section 4 we refer to studies showing that the effects of a psychological trauma may persist over a longer time period and affect parental health (behaviors) and parenting skills. Moreover, the Nazi raids may also have affected the longer term income of the families involved. This all implies that the effects of the raids may not be limited to the prenatal period, but also extend into childhood. In subsection 6.1 we report the results for models that include possible effects of exposure in the first and second year of life and found small and not significant effects for these variables. This means that the effect of $Nazi_{mt}$ is primarily driven by prenatal conditions and not by behavioral and/or income effects that extend into childhood.

Is it stress or are there other war related conditions such as malnutrition that drive our results?

We use a medical database to examine more directly whether the effect of the Nazi raid primarily reflects stress. This database, the Health Search/CSD Patient Database, is a nation-wide representative sample of Italian adult patients, containing patient electronic clinical records (ECRs) from General Practitioners (GP). The records include ATC (Anatomic Therapeutic Chemical) drug classification codes. With this information we can compute drug expenditures for specific disease types at the patient level.[38] We regressed health expenditure distinguished by ATC codes on our treatment variable, controlling for age, WWII casualties at the province level, GP fixed effects, municipality fixed effects, time fixed effects and regional trends. Tables C1, C2 and C3 in Appendix C show that in-utero exposure to a Nazi raid only has a significant and sizable effect on health expenditure for diseases of the nervous system and mental disorders. This finding is in line with the medical literature that finds strong associations between in-utero stress exposure and various psycho-pathologies later in life such as memory problems, decreased learning function, depression and dementia (Checkley, 1996; Heffelfinger and Newcomer, 2001; Selten et al., 1999). This finding also aligns with the results of Persson and Rossin-Slater (2018) who found effects of maternal grief and stress on adolescent mental health (care).

Still, Italy was at war in the period that we consider and disruptions due to the war, notably food shortages, may also partly drive the effect estimate of the Nazi raid if this resulted in food shortages at the municipality level. Indeed, during and just after WWII some countries (Greece (1941-1942), Russia (Leningrad, 1942), The Netherlands (1944-1945), Germany (1945-1946)) experienced drastic famines, with daily food intake dropping to 500-1,000 calories per day (Van den Berg and Lindeboom, 2018). However, the medical and epidemiological literature generally agrees that famine exposure has the strongest association with weight, diabetes and hypertension (Van den Berg and Lindeboom, 2018). Lumey et al. (2011) reviewed observational studies based on the Dutch, Chinese, and Leningrad famines and show a persistent association across the three famines between famine

[38]More information about this database and the Italian health care system can be found in Appendix C.

exposure early in life and weight, diabetes and schizophrenia.

While Italy's food supply was not as limited as in these countries, still in some areas food availability was not sufficient during WWII. Up to 1942 food production in Italy was at about the pre-war level (2600 calories per day), but food shortages became more apparent in 1942 and supply dropped to about 2000 calories per day and remained at these levels until the end of the war (Daniele and Ghezzi, 2017; Ó Gráda, 2019; Vecchi, 2017). This is substantially higher than the calorie intake of people during the famines of the countries mentioned above. Indeed, the regression results in Tables C1, C2 and C3 of Appendix C show that there is no association between prenatal exposure to a Nazi raid and cardiovascular conditions and diabetes (see the second column of the Tables), conditions generally found in famine studies.

Further, in support of this finding, there was a stark rural - urban distinction: the nutrition of rural households, was quantitatively not significantly dissimilar to that of the pre-war years, while a substantial part of non-rural households suffered from starvation (Daniele and Ghezzi, 2017). Indeed, larger cities generally, for political and strategic reasons, suffered more from bombings, mass destruction and nutritional shortages. For this reason we base our analyses on municipalities with less than 200,000 inhabitants. These municipalities mostly belong to rural areas.

8 Conclusions and Discussion

This paper complements the previous contributions in the literature by examining the causal effect of a traumatic and stressful event experienced by pregnant women on the life long labor market outcomes of her offspring. We exploit a unique natural experiment that involved short lived, randomly placed violent Nazi raids across municipalities after the Armistice of September 8^{th}, 1943, when the Italian Kingdom ceased hostilities against the Allied forces in WWII. We use administrative data on the universe of private sector workers in Italy and link these data to unique historical databases with detailed information about war casualties and the assignment of the Nazi raids across space (Municipality) and time.

We use a generalized Difference-in-Differences model and find that those prenatally exposed to a Nazi raid have an earnings penalty of about 2% at the start of their working career. The earnings penalty persists over time and even increases to about 6% at age 60. These lower earnings translate into lower pensions. The lower earnings are due to lower educational attainment, the type of jobs that they hold and interruptions in their working careers due to unemployment. We find that a bad start (i.e. prenatal exposure) exacerbates the negative effects of later life job loss on earnings, deepening the negative impact on earnings at later ages. These job loss effects on earnings are substantial: between 31–34% for all workers and up to 47% for workers exposed prenatally to a traumatic and stressful event. Our findings are robust against a number of specification and falsification tests.

The results for job loss due to a mass layoff also suggest that dynamic complementarities (Cunha and Heckman, 2007) may be important. Dynamic complementarities refer to the idea that investments in later life are more productive when the initial stock of skills is higher. Conversely, as we find, a bad start may amplify adverse effects of negative shocks later in life.

We argue that stress is likely to be an important mechanism driving our findings. Previous work in medical sciences, epidemiology and economics has documented negative effects of potentially traumatic events and the associated stress on various psycho-pathologies later in life such as decreased learning function, cognition, education and mental health. Indeed, we find a lower educational attainment for those who were prenatally exposed to a Nazi raid and a mediation analysis shows that 42% of the treatment effect on wage earnings can be explained by educational attainment. We additionally use a medical database on health expenditures and find higher medical care expenditures on diseases of the nervous system and mental disorders. We also show that the effects of a Nazi raid do not include effects of hunger, changes in maternal health, maternal health behaviors and reduced family income.

The raids considered here compare to situations of civil conflict (Camacho, 2008) and terrorist attacks (Quintana-Domeque and Rodenas-Serrano, 2017). However, these studies focus on birth outcomes. While our findings are in accordance with results from earlier economic studies that focused on cognition, years of education and the mental health of children and adolescents (Black et al., 2016; Persson and Rossin-Slater, 2018), the raids used in our study are meaningfully different from the bereavement measure used in previous work.

In addition to a different stressor, the labor market outcomes in our study are also different from the outcomes in previous work, and the subjects involved are much older. Nevertheless, the effect estimates on prescription drug consumption are comparable. We find that our subjects of adult males aged 60–65, who were prenatally exposed to a traumatic event, are about 3.6 percentage points more likely (about a 13% increase) to purchase drugs for treating diseases of the nervous system and mental disorders, and they have 17% higher medical expenditures. Persson and Rossin-Slater (2018) found a 13% and 8% increase in the likelihood of consuming prescription drugs for anxiety and depression.

Besides the costs of prescription drugs, prenatal exposure to a traumatic event may also affect other medical costs, increase social security spending, and reduce productivity and life time income. The per-person present discounted value (PDV) of income losses (in 2005 euros) due to additional prenatal stress caused by the Nazi raids is estimated at 14,219 euros. This is equal to about one year of earnings at age 30.[39]

What about external validity? Our study concerns a historical context that could be described as extreme and rare, unfortunately the recent war in Ukraine is a grim reminder that also in the developed world violence against civilians extends to settings still observed today. Besides, stressful conditions are not limited to war like situations, but also hold for deprived neighborhoods, where crime, unemployment and poverty rates are high. Further, the COVID-19 pandemic is associated with fear and stress for health, economic security and the well-being of individuals and their families. Such adversities affect families with poor qualifications and limited resources most. Therefore, traumatic and stressful events may play an important role in the persistence of low socio-economic status across generations (see also Aizer et al., 2016). Our findings suggests that public programs targeted at vulnerable families, in particular (pregnant) women and children, can be very effective in mitigating the negative effects of a bad start and the consequences of adversities later in life.

[39]The per-person PDV of life-long income loss is derived using:

$$PDV^{loss} = \sum_{a=30}^{100} \frac{\beta_1^a \times \overline{income_a}}{(1+i)^{a-30}} \times P(a+1|a) \tag{5}$$

where $\beta_1^a \times \overline{income_a}$ is the yearly income loss due to prenatal exposure at age a, using Table 4, i is the discount factor, which we set at 2%, and $P(a+1|a)$ as the probability of survival to age $a+1$, given survival up to age a.

Tables

Table 1: Descriptive statistics on Nazi raids episodes between Sept 1943 - May 1944 in municipalities with fewer than 200,000 residents.

	N. obs.	Mean	Std. Dev.	Min	Max	p1	p50	p99
Italy								
Length in days	1603	1.4	2.67	1	54	1	1	14
Number of victims	1603	3.27	7.35	1	130	1	1	29
Proportion of women (%)	1603	9.53	25.99	0	100	0	0	100
Proportion of children (%)	1603	1.89	11.49	0	100	0	0	80
Proportion of men (%)	1603	88.58	28.57	0	100	0	100	100
Proportion of partisans (%)	1603	17.2	36.45	0	100	0	0	100
Proportion of searches (%)	1603	30.88	46.21	0	100	0	0	100
Proportion of retaliations (%)	1603	10.67	30.88	0	100	0	0	100
Northwest								
Length in days	248	1.77	3.43	1	36	1	1	21
Number of victims	248	4.9	9.26	1	97	1	2	51
Proportion of women (%)	248	5.74	19.52	0	100	0	0	100
Proportion of children (%)	248	.4	6.35	0	100	0	0	0
Proportion of men (%)	248	93.86	20.41	0	100	0	100	100
Proportion of partisans (%)	248	42.81	46.71	0	100	0	0	100
Proportion of searches (%)	248	51.61	50.08	0	100	0	100	100
Proportion of retaliations (%)	248	15.73	36.48	0	100	0	0	100
Northeast								
Length in days	181	1.67	4.64	1	54	1	1	29
Number of victims	181	3.41	10.42	1	130	1	1	32
Proportion of women (%)	181	7.45	25.2	0	100	0	0	100
Proportion of children (%)	181	.68	7.57	0	100	0	0	19.35
Proportion of men (%)	181	91.87	26.34	0	100	0	100	100
Proportion of partisans (%)	181	35.01	45.98	0	100	0	0	100
Proportion of searches (%)	181	32.04	46.79	0	100	0	0	100
Proportion of retaliations (%)	181	17.68	38.26	0	100	0	0	100
Center								
Length in days	394	1.36	2.2	1	27	1	1	11
Number of victims	394	3.24	5.11	1	46	1	1	29
Proportion of women (%)	394	6.4	20.66	0	100	0	0	100
Proportion of children (%)	394	1.68	10.67	0	100	0	0	66.67
Proportion of men (%)	394	91.92	23.63	0	100	0	100	100
Proportion of partisans (%)	394	22.9	40.63	0	100	0	0	100
Proportion of searches (%)	394	45.94	49.9	0	100	0	0	100
Proportion of retaliations (%)	394	8.63	28.12	0	100	0	0	100
South								
Length in days	780	1.24	1.84	1	28	1	1	8
Number of victims	780	2.74	6.67	1	125	1	1	25
Proportion of women (%)	780	12.81	29.75	0	100	0	0	100
Proportion of children (%)	780	2.75	13.64	0	100	0	0	100
Proportion of men (%)	780	84.45	32.71	0	100	0	100	100
Proportion of partisans (%)	780	2.04	13.78	0	100	0	0	100
Proportion of searches (%)	780	16.41	37.06	0	100	0	0	100
Proportion of retaliations (%)	780	8.46	27.85	0	100	0	0	100

Notes: Nazi raids between Sept 1943 – May 1944 occurring in Italian municipalities with resident population under 200,000.

Table 2: Descriptive statistics for INPS men born between January 1943 and May 1944

	Mean	Std. Dev.	N. obs.
Nazi violence in utero	0.08	(0.27)	283,975
War victims in utero (# for 100k province pop.)	57.08	(69.38)	283,975
First year of earnings	1977	(6.61)	283,975
Last year of earnings	1994	(9.77)	283,975
Number of years with positive earnings	16	(9.89)	283,975
Earnings at 30	15014	(8123)	211,641
Earnings at 40	19999	(10240)	187,049
Earnings at 50	26582	(18626)	58,164
Earnings at 60	24712	(24785)	47,560
Blue collar at 30	0.79	(0.41)	211,641
Blue collar at 40	0.71	(0.46)	187,049
Blue collar at 50	0.68	(0.47)	158,164
Blue collar at 60	0.68	(0.47)	47,560
Ever disabled	0.11	(0.31)	283,975
Ever unemployed	0.22	(0.42)	283,975
Ever unemployed due to mass layoff	0.10	(0.27)	283,975
Retired	0.82	(0.39)	283,975
Retirement age	58	(5.39)	232,035
First monthly retirement pension	1173	(859)	232,035
Dead	0.24	(0.43)	283,975

Notes: The numbers refer to a sample of 283,975 males working in the private sector, born in municipalities with fewer than 200,000 residents between January 1943 and May 1944. Earnings and pensions are expressed in 2005 euros.

Table 3: Descriptive Difference-in-Differences statistics of the sample of INPS men born between January 1943 and May 1944

	Control		*Treated*		*DiD*
	Before (A)	*After* (B)	*Before* (C)	*After* (D)	$(D - C)$ $-(B - A)$
earnings at 30	14579	15212	15183	15531	-285**
earnings at 40	19683	19917	20768	20622	-381**
earnings at 50	26049	26206	28721	27764	-1113***
earnings at 60	23865	24180	27689	26387	-1617***
blue collar at 30	0.8	0.8	0.73	0.77	0.04***
blue collar at 40	0.72	0.71	0.66	0.67	0.02***
blue collar at 50	0.69	0.69	0.63	0.64	0.01***
blue collar at 60	0.69	0.68	0.62	0.65	0.04***
Ever disabled	0.11	0.10	0.10	0.10	0.01*
Ever unemployed	0.23	0.23	0.21	0.21	0.01*
Ever unemployed due to mass layoff	0.1	0.1	0.09	0.09	0
Retired	0.82	0.82	0.82	0.82	0.00
Age at retirement	57.79	57.64	57.99	57.9	0.06*
First retirement monthly pension	1231	1254	1354	1348	-29*
Dead	0.21	0.19	0.21	0.19	0
Observations	103,818	118,557	29,743	31,857	

Notes: The numbers refer to the sample of males working in the private sector between 1974 and 2018 born in January 1943–May 1944 in municipalities with fewer than 200,000 residents. The sample size varies according to outcome variable and to when it was measured. Wages and pensions are expressed in 2005 euros. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 4: The effect of in-utero exposure to a Nazi raid: Age specific (log) earnings

	Earnings at 30	Earnings at 35	Earnings at 40	Earnings at 45	Earnings at 50	Earnings at 55	Earnings at 60
Nazi raid	-0.0218***	-0.0238***	-0.0155**	-0.0177**	-0.0268***	-0.0254**	-0.0551***
in utero	(0.0080)	(0.0075)	(0.0076)	(0.0077)	(0.0085)	(0.0120)	(0.0194)
WWII casualties (SD)	-0.0065**	-0.0073**	-0.0046	-0.0053	-0.0052	-0.0115**	-0.0118*
in utero	(0.0032)	(0.0031)	(0.0030)	(0.0034)	(0.0036)	(0.0048)	(0.0064)
R^2	0.1514	0.1437	0.1391	0.1432	0.1348	0.1418	0.1712
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents. The outcome is age specific earnings between the ages of 30 and 60. All regressions include year × month fixed effects, municipality fixed effects, and 20 region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table 5: The effect of in-utero exposure to a Nazi raid: Age specific blue collar status

	Blue collar at 30	Blue collar at 35	Blue collar at 40	Blue collar at 45	Blue collar at 50	Blue collar at 55	Blue collar at 60
Nazi raid	0.0222***	0.0028	0.0176***	0.0172***	0.0184***	0.0277***	0.0370***
in utero	(0.0055)	(0.0067)	(0.0063)	(0.0062)	(0.0065)	(0.0072)	(0.0109)
WWII casualties (SD)	0.0030	0.0039**	0.0062***	0.0048**	0.0050**	0.0064**	0.0027
in utero	(0.0019)	(0.0019)	(0.0022)	(0.0023)	(0.0024)	(0.0030)	(0.0039)
R^2	0.0885	0.0965	0.1036	0.1107	0.1160	0.1658	0.1976
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01,^{**} p < 0.05,^{*} p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents. The outcome is age specific earnings between the ages of 30 and 60. All regressions include year × month fixed effects, municipality fixed effects, and region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table 6: The effect of in-utero exposure to a Nazi raid: Education attainment

	Presence in education sample	Less than secondary education	Tertiary education
Nazi raid	0.0013	0.0450**	-0.0357***
in utero	(0.0026)	(0.0188)	(0.0121)
WWII casualties (SD)	0.0005	0.0104	-0.0035
in utero	(0.0013)	(0.0076)	(0.0053)
R^2	0.0384	0.2359	0.2122
N	283,741	19,397	19,397
Time FEs	YES	YES	YES
Municipality FEs	YES	YES	YES
Reg trends	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects, and region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table 7: Impact of Nazi raids in utero on education attainment levels and their contribution to the total treatment effect on log wages.

	Mediation model	Baseline model
Nazi raid	-0.004	-0.021**
in utero	(0.078)	(0.009)
No education	-0.506***	
	(0.040)	
Primary education	-0.573***	
	(0.031)	
Tertiary education	0.542***	
	(0.043)	
Nazi×No education	-0.021	
	(0.094)	
Nazi×Primary education	-0.085	
	(0.087)	
Nazi×Tertiary education	-0.194*	
	(0.116)	
R^2	0.479	0.137
N	10,274	158,232
Contribution of mediators		
No education	-4.94%	
Primary education	-1.45%	
Tertiary education	-36.04%	
Total contribution of mediators	-42.43%	

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The top panel of the table contains weighted regression models for the mediation model (column 1) and for the baseline model (column 2). Following Huber (2014), we construct inverse probability weights from the probability of treatment as a function of the full set of education attainment mediators and the usual set of controls and fixed effects. In the bottom panel of the table, we calculate the contribution of each mediating level of education to the total treatment effect on log wages at 55 (Adhvaryu et al., 2019). The sample refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents working in the private sector at the age of 55 (column 2) and with data on education attainment (column 1). All regressions include controls for WWII casualties, year × month fixed effects, municipality fixed effects, and region specific time trends. Standard errors (in parentheses) are clustered at the municipality level.

Table 8: The effect of in-utero exposure to a Nazi raid: Other outcomes before age 60

	Disability before 60	Dead before 60	Age at retirement	First pension (log)	# Unemployment claims before 60
Nazi raid	0.0007	-0.0028	0.0595	-0.0209**	0.0309*
in utero	(0.0018)	(0.0028)	(0.0562)	(0.0093)	(0.0159)
WWII casualties (SD)	0.0033***	0.0006	0.0117	-0.0051	-0.0025
in utero	(0.0012)	(0.0009)	(0.0192)	(0.0034)	(0.0083)
R^2	0.0413	0.0627	0.1970	0.055	0.0535
N	283,975	283,975	227,987	227,987	283,975
Time FEs	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**} p < 0.05, ^{*} p < 0.1$

Notes: The sample refers to 283,975 individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents. Outcomes include Disability, Mortality and Unemployment claims. Age at retirement and first pension are the first outcome occurring between 1974 and 2017. All regressions include year × month fixed effects, municipality fixed effects, and region specific time trends. Standard errors (in parentheses) are clustered at the municipality level.

Table 9: The effect of in-utero exposure to a Nazi raid: Effects of a mass layoff on (log) earnings in the following year

	age 45	age 50	age 55	age 60
Nazi raid	-0.0244***	-0.0247***	-0.0233*	-0.0519***
in utero (β_1^a)	(0.0079)	(0.0083)	(0.0123)	(0.0197)
Layoff (β_2^a)	-0.3359***	-0.3234***	-0.3350***	-0.3157***
	(0.0139)	(0.0120)	(0.0163)	(0.0234)
Layoff × Nazi raid	-0.0781*	-0.0996**	-0.1436**	-0.0445
in utero (β_3^a)	(0.0474)	(0.0490)	(0.0625)	(0.0709)
WWII casualties (SD)	-0.0063*	-0.0063*	-0.0097*	-0.0058
in utero (β_4^a)	(0.0034)	(0.0033)	(0.0050)	(0.0070)
R^2	0.1500	0.1427	0.1682	0.2006
N	155,587	145,885	85,302	39,325
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer then 200,000 residents, and refers to individuals who had positive earnings in the period prior to the layoff. All regressions include year × month and municipality fixed effects as well as region specific time trends. Standard errors (in parentheses) are clustered at the municipality level.

Table 10: The effect of in-utero exposure to a Nazi raid: Effect of mass layoffs on probability of death within 10 years

	age 45	age 50	age 55	age 60
Nazi raid	0.0004	-0.0032	-0.0083*	-0.0110
in utero (β_1^a)	(0.0026)	(0.0032)	(0.0044)	(0.0082)
Layoff (β_2^a)	0.0056	0.0042	0.0155**	0.0187*
	(0.0039)	(0.0042)	(0.0067)	(0.0108)
Layoff× Nazi raid	0.0051	-0.0153	0.0102	-0.0335
in utero (β_3^a)	(0.0153)	(0.0139)	(0.0243)	(0.0295)
WWII casualties (SD)	-0.0004	-0.0006	0.0007	-0.0005
in utero (β_4^a)	(0.0008)	(0.0011)	(0.0015)	(0.0026)
R^2	0.0422	0.0461	0.0662	0.1106
N	170,830	158,232	101,124	47,582
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The sample refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents, and refers to individuals who had positive earnings in the period prior the layoff. All regressions include year × month and municipality fixed effects as well as region specific time trends. Standard errors (in parentheses) are clustered at the municipality level.

Table 11: Robustness checks: Age specific (log) earnings

	age 30	age 35	age 40	age 45	age 50	age 55	age 60
(*A*) *Baseline model [-9,9] window*							
Nazi raid	-0.0218***	-0.0238***	-0.0155**	-0.0177**	-0.0268***	-0.0254**	-0.0551***
in utero	(0.0080)	(0.0075)	(0.0076)	(0.0077)	(0.0085)	(0.0120)	(0.0194)
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
(*B*) *Post Traumatic Stress Disorder (PTSD) and the Common trend assumption [-24,9] window*							
Nazi raid	-0.0177**	-0.0337***	-0.0137**	-0.0206***	-0.0342***	-0.0225*	-0.0372**
in utero	(0.0084)	(0.0076)	(0.0067)	(0.0069)	(0.0081)	(0.0121)	(0.0190)
Nazi raid	0.0131	-0.0057	0.0038	0.0027	-0.0003	0.0038	0.0205
1st year	(0.0092)	(0.0067)	(0.0058)	(0.0063)	(0.0072)	(0.0112)	(0.0188)
Nazi raid	0.0229	0.0011	0.0043	0.0037	-0.0015	0.0013	0.0042
2nd year	(0.0177)	(0.0068)	(0.0060)	(0.0064)	(0.0073)	(0.0111)	(0.0183)
N	376,895	386,610	354,811	319,900	299,326	191,942	89,267
(*C*) *Conditional random assignment assumption/a different identification strategy [-9,9] window*							
Nazi raid	-0.0210**	-0.0214**	-0.0079	-0.0196**	-0.0189*	-0.0149	-0.0202
in utero	(0.0094)	(0.0089)	(0.0090)	(0.0092)	(0.0100)	(0.0156)	(0.0280)
N	93,778	91,319	82,300	75,373	70,457	43,375	18,945
(*D*) *Baseline model - spatial spillovers - 5km radius [-9,9] window*							
Nazi raid	0.0031	0.0001	-0.0045	-0.0009	0.0052	-0.0161	0.0081
in utero	(0.0179)	(0.0169)	(0.0152)	(0.0166)	(0.0169)	(0.0263)	(0.0409)
N	195,406	191,349	172,793	157,893	146,512	92,692	43,255
(*E*) *Flexible province trends [-9,9] window*							
Nazi raid	-0.0210**	-0.0214**	-0.0079	-0.0196**	-0.0189*	-0.0149	-0.0202
in utero	(0.0094)	(0.0089)	(0.0090)	(0.0092)	(0.0100)	(0.0156)	(0.0280)
N	93,778	91,319	82,300	75,373	70,457	43,375	18,945
(*F*) *Changes in the length of gestation [-9,8] window*							
Nazi raid	-0.0241***	-0.0277***	-0.0142*	-0.0198**	-0.0292***	-0.0249**	-0.0526***
in utero	(0.0085)	(0.0079)	(0.0081)	(0.0081)	(0.0092)	(0.0123)	(0.0200)
N	201,078	197,052	177,859	162,270	150,403	95,783	45,091
(*G*) *Changes in the length of gestation [-9,7] window*							
Nazi raid	-0.0216**	-0.0269***	-0.0154*	-0.0185**	-0.0265***	-0.0313**	-0.0636***
in utero	(0.0093)	(0.0087)	(0.0088)	(0.0088)	(0.0099)	(0.0132)	(0.0220)
N	189,423	185,605	167,716	152,960	141,929	89,947	42,377
(*H*) *Using only information from the first 6 months [-9,6] window*							
Nazi raid	-0.0228**	-0.0264***	-0.0211**	-0.0221**	-0.0276**	-0.0391***	-0.0692***
in utero	(0.0102)	(0.0096)	(0.0097)	(0.0095)	(0.0107)	(0.0140)	(0.0234)
N	175,883	172,306	155,884	141,936	131,898	83,162	39,307
(*I*) *Changing the municipality size cut-off - municipalities under 500k residents [-9,9] window*							
Nazi raid	-0.0244***	-0.0268***	-0.0140**	-0.0191**	-0.0294***	-0.0310***	-0.0526***
in utero	(0.0076)	(0.0070)	(0.0071)	(0.0075)	(0.0081)	(0.0116)	(0.0184)
N	222,610	218,207	196,613	179,350	166,095	106,767	50,244
(*J*) *Changing the municipality size cut-off - municipalities no cap on size [-9,9] window*							
Nazi raid	-0.0158**	-0.0159**	-0.0077	-0.0116	-0.0203**	-0.0252**	-0.0463***
in utero	(0.0076)	(0.0068)	(0.0068)	(0.0079)	(0.0080)	(0.0119)	(0.0156)
N	242,079	237,520	213,823	194,641	179,792	118,123	56,271

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: Unless otherwise specified, all estimates are based on municipalities with fewer then 200,000 residents, are obtained for age specific subsamples (30 to 60), include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table 12: Robustness checks: Age specific blue collar status

	age 30	age 35	age 40	age 45	age 50	age 55	age 60
(*A*) *Baseline model [-9,9] window*							
Nazi raid	0.0222***	0.0028	0.0176***	0.0172***	0.0184***	0.0277***	0.0370***
in utero	(0.0055)	(0.0067)	(0.0063)	(0.0062)	(0.0065)	(0.0072)	(0.0109)
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
(*B*) *Post Traumatic Stress Disorder (PTSD) and the Common trend assumption [-24,9] window*							
Nazi raid	0.0291***	0.0053	0.0224***	0.0248***	0.0266***	0.0299***	0.0423***
in utero	(0.0052)	(0.0060)	(0.0061)	(0.0060)	(0.0064)	(0.0079)	(0.0116)
Nazi raid	-0.0013	-0.0001	0.0041	0.0075	0.0076	0.0076	0.0116
1st year	(0.0047)	(0.0048)	(0.0057)	(0.0055)	(0.0057)	(0.0071)	(0.0104)
Nazi raid	-0.0043	-0.0039	-0.0032	0.0002	0.0003	-0.0007	0.0047
2nd year	(0.0048)	(0.0042)	(0.0049)	(0.0053)	(0.0055)	(0.0069)	(0.0105)
N	376,895	386,610	354,811	319,900	299,326	191,942	89,267
(*C*) *Conditional random assignment assumption/a different identification strategy [-9,9] window*							
Nazi raid	0.0206***	0.0003	0.0173**	0.0200***	0.0193**	0.0303***	0.0474***
in utero	(0.0070)	(0.0077)	(0.0079)	(0.0075)	(0.0079)	(0.0097)	(0.0159)
N	93,778	91,319	82,300	75,373	70,457	43,375	18,945
(*D*) *Baseline model - spatial spillovers - 5km radius [-9,9] window*							
Nazi raid	-0.0027	-0.0023	-0.0110	-0.0090	0.0001	-0.0173	-0.0337
in utero	(0.0095)	(0.0097)	(0.0110)	(0.0111)	(0.0123)	(0.0162)	(0.0249)
N	195,406	191,349	172,793	157,893	146,512	92,692	43,255
(*E*) *Flexible province trends [-9,9] window*							
Nazi raid	0.0202***	0.0004	0.0135**	0.0132*	0.0117*	0.0195**	0.0399***
in utero	(0.0059)	(0.0070)	(0.0066)	(0.0068)	(0.0070)	(0.0079)	(0.0119)
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
(*F*) *Changes in the length of gestation [-9,8] window*							
Nazi raid	0.0224***	0.0033	0.0167**	0.0148**	0.0172**	0.0272***	0.0342***
in utero	(0.0056)	(0.0067)	(0.0065)	(0.0063)	(0.0068)	(0.0076)	(0.0111)
N	201,078	197,052	177,859	162,270	150,403	95,783	45,091
(*G*) *Changes in the length of gestation [-9,7] window*							
Nazi raid	0.0241***	0.0028	0.0174**	0.0146**	0.0166**	0.0290***	0.0382***
in utero	(0.0061)	(0.0073)	(0.0070)	(0.0068)	(0.0072)	(0.0080)	(0.0115)
N	189,423	185,605	167,716	152,960	141,929	89,947	42,377
(*H*) *Using only information from the first 6 months [-9,6] window*							
Nazi raid	0.0214***	0.0053	0.0189**	0.0141*	0.0155**	0.0229***	0.0308**
in utero	(0.0065)	(0.0075)	(0.0074)	(0.0073)	(0.0077)	(0.0087)	(0.0129)
N	175,883	172,306	155,884	141,936	131,898	83,162	39,307
(*I*) *Changing the municipality size cut-off - municipalities under 500k residents [-9,9] window*							
Nazi raid	0.0284***	0.0042	0.0220***	0.0212***	0.0223***	0.0308***	0.0419***
in utero	(0.0055)	(0.0063)	(0.0060)	(0.0058)	(0.0060)	(0.0069)	(0.0103)
N	222,610	218,207	196,613	179,350	166,095	106,767	50,244
(*J*) *Changing the municipality size cut-off - municipalities no cap on size [-9,9] window*							
Nazi raid	0.0218***	-0.0060	0.0155***	0.0168***	0.0168***	0.0234***	0.0258***
in utero	(0.0056)	(0.0063)	(0.0059)	(0.0063)	(0.0061)	(0.0070)	(0.0097)
N	242,079	237,520	213,823	194,641	179,792	118,123	56,271

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: Unless otherwise specified, all estimates are based on municipalities with fewer then 200,000 residents, are obtained for age specific subsamples (30 to 60), include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table 13: Robustness checks: Effect of a mass layoff on (log) earnings in the following year

	age 45	age 50	age 55	age 60
(*A*) *Baseline model [-9,9] window*				
Nazi raid	-0.0244***	-0.0247***	-0.0233*	-0.0519***
in utero (β_1^a)	(0.0079)	(0.0083)	(0.0123)	(0.0197)
Layoff (β_2^a)	-0.3359***	-0.3234***	-0.3350***	-0.3157***
	(0.0139)	(0.0120)	(0.0163)	(0.0234)
Layoff × Nazi raid	-0.0781*	-0.0996**	-0.1436**	-0.0445
in utero (β_3^a)	(0.0474)	(0.0490)	(0.0625)	(0.0709)
N	155,587	145,885	85,302	39,325
(*B*) *Post Traumatic Stress Disorder (PTSD) and the Common trend assumption [-24,9] window*				
Nazi raid	-0.0244***	-0.0285***	-0.0161	-0.0373*
in utero	(0.0073)	(0.0082)	(0.0130)	(0.0221)
Layoff × Nazi raid	-0.0667	-0.1411***	-0.1735***	-0.1187*
in utero	(0.0469)	(0.0488)	(0.0602)	(0.0673)
Nazi raid	0.0007	0.0008	0.0066	0.0204
1st year	(0.0062)	(0.0069)	(0.0115)	(0.0194)
Layoff × Nazi raid	0.0256	-0.0305	-0.0302	-0.0830
1st year	(0.0344)	(0.0348)	(0.0440)	(0.0702)
Nazi raid	0.0054	-0.0035	0.0020	0.0076
2nd year	(0.0063)	(0.0068)	(0.0114)	(0.0194)
Layoff × Nazi raid	0.0242	0.0380	0.0110	0.0284
2nd year	(0.0348)	(0.0296)	(0.0522)	(0.0552)
N	292,821	275,090	165,434	73,987
(*C*) *Conditional random assignment assumption/a different identification strategy [-9,9] window*				
Nazi raid	-0.0239***	-0.0187*	-0.0110	-0.0197
in utero (β_1^a)	(0.0092)	(0.0096)	(0.0164)	(0.0277)
Layoff (β_2^a)	-0.2196***	-0.2856***	-0.2949***	-0.3135***
	(0.0221)	(0.0207)	(0.0308)	(0.0485)
Layoff × Nazi raid	-0.1946***	-0.1367***	-0.1815***	-0.0432
in utero (β_3^a)	(0.0497)	(0.0505)	(0.0674)	(0.0823)
N	69,346	65,211	36,922	15,932
(*D*) *Baseline model - spatial spillovers - 5km radius [-9,9] window*				
Nazi raid	0.0069	0.0045	-0.0084	0.0437
in utero (β_1^a)	(0.0155)	(0.0163)	(0.0320)	(0.0487)
Layoff (β_2^a)	-0.3351***	-0.3217***	-0.3355***	-0.3159***
	(0.0141)	(0.0121)	(0.0166)	(0.0239)
Layoff × Nazi raid	-0.0452	0.0075	0.0731	0.0244
in utero (β_3^a)	(0.1293)	(0.1155)	(0.1200)	(0.3137)
N	143,800	135,032	78,326	35,658
(*E*) *Flexible province trends [-9,9] window*				
Nazi raid	-0.0240***	-0.0241***	-0.0131	-0.0566***
in utero (β_1^a)	(0.0085)	(0.0087)	(0.0133)	(0.0215)
Layoff (β_2^a)	-0.3352***	-0.3226***	-0.3319***	-0.3173***
	(0.0140)	(0.0120)	(0.0165)	(0.0236)
Layoff × Nazi raid	-0.0794*	-0.0993**	-0.1469**	-0.0503
in utero (β_3^a)	(0.0474)	(0.0492)	(0.0623)	(0.0721)
N	155,587	145,885	85,302	39,325
(*F*) *Changes in the length of gestation [-9,8] window*				
Nazi raid	-0.0261***	-0.0271***	-0.0264**	-0.0503**
in utero	(0.0084)	(0.0087)	(0.0126)	(0.0204)
Layoff	-0.3359***	-0.3238***	-0.3385***	-0.2980***

	(0.0141)	(0.0122)	(0.0167)	(0.0238)
Layoff × Nazi raid	-0.1011*	-0.0971*	-0.1490**	-0.0547
in utero	(0.0529)	(0.0531)	(0.0679)	(0.0841)
N	147,806	138,618	80,851	37,243
(*G*) *Changes in the length of gestation [-9,7] window*				
Nazi raid	-0.0234***	-0.0241**	-0.0320**	-0.0653***
in utero	(0.0091)	(0.0095)	(0.0140)	(0.0220)
Layoff	-0.3398***	-0.3196***	-0.3399***	-0.2978***
	(0.0144)	(0.0124)	(0.0171)	(0.0244)
Layoff × Nazi raid	-0.0995*	-0.1109*	-0.1286*	-0.0551
in utero	(0.0581)	(0.0577)	(0.0731)	(0.0874)
N	139,311	130,812	76,002	34,939
(*H*) *Using only information from the first 6 months [-9,6] window*				
Nazi raid	-0.0221***	-0.0240***	-0.0293*	-0.0522***
in utero	(0.0088)	(0.0094)	(0.0195)	(0.0201)
Layoff	-0.3371***	-0.3121***	-0.3387***	-0.2928***
	(0.0131)	(0.0119)	(0.0130)	(0.0236)
Layoff × Nazi raid	-0.0976*	-0.1002*	-0.1301*	-0.0493
in utero	(0.0589)	(0.0626)	(0.0765)	(0.0813)
N	130,720	122,832	73,204	31,386
(*I*) *Changing the municipality size cut-off - municipalities under 500k residents [-9,9] window*				
Nazi raid	-0.0244***	-0.0295***	-0.0199	-0.0688***
in utero	(0.0085)	(0.0088)	(0.0130)	(0.0206)
Layoff	-0.3351***	-0.3251***	-0.3333***	-0.3269***
	(0.0138)	(0.0117)	(0.0160)	(0.0240)
Layoff × Nazi raid	-0.1041**	-0.1195**	-0.1829***	-0.0780
in utero	(0.0496)	(0.0509)	(0.0605)	(0.0709)
N	163,426	153,060	89,791	41,543
(*J*) *Changing the municipality size cut-off - municipalities no cap on size [-9,9] window*				
Nazi raid	-0.0152*	-0.0236***	-0.0115	-0.0589***
in utero	(0.0082)	(0.0081)	(0.0121)	(0.0191)
Layoff	-0.3369***	-0.3220***	-0.3389***	-0.3149***
	(0.0134)	(0.0115)	(0.0160)	(0.0253)
Layoff × Nazi raid	-0.0369	-0.0925**	-0.1538**	-0.0663
in utero	(0.0595)	(0.0418)	(0.0654)	(0.0553)
N	177,292	165,623	98,673	46,637

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Unless otherwise specified, all estimates are based on municipalities with fewer then 200,000 residents, are obtained for age specific subsamples (45 to 60), include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

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A Appendix: Examining the random assignment of Nazi raids

In the main model the parameter of interest (β_1) is identified by comparing individuals exposed in utero to a Nazi raid to those who were exposed in the first year of life and those born in municipalities that were not subject to any Nazi raid. This requires an assumption of (conditional on municipality fixed effects) random assignment of the Nazi raids across municipalities. This appendix aims to support evidence in favor of this assumption. Before we proceed it is good to note that we also estimated models that are subject to the weaker assumption that the exact timing of the Nazi raid is not predictable, i.e. analyses based omn treated municipalities only (see section 4 for a discussion about this).

In the spring of 1943 the battlefront was in the north Africa and progressed in the first month following September 8th, 1943 via Sicily to Caserta (October 1943) and Monte Cassino (December 1943) (see section 2, Figure 3). From thereon the Allied forces made little progress up to June 1943 when they broke through the defense lines of the German forces near Rome. This is also reflected in Figure A1 that depicts the monthly distribution of the Nazi raids over the country for the period September - May 1944. Figure A2 aggregates these raids over all months. Figure A1 shows that the raids were not isolated to areas in the vicinity of the battlefront, but rather covered all of Italy, north of the battlefront.

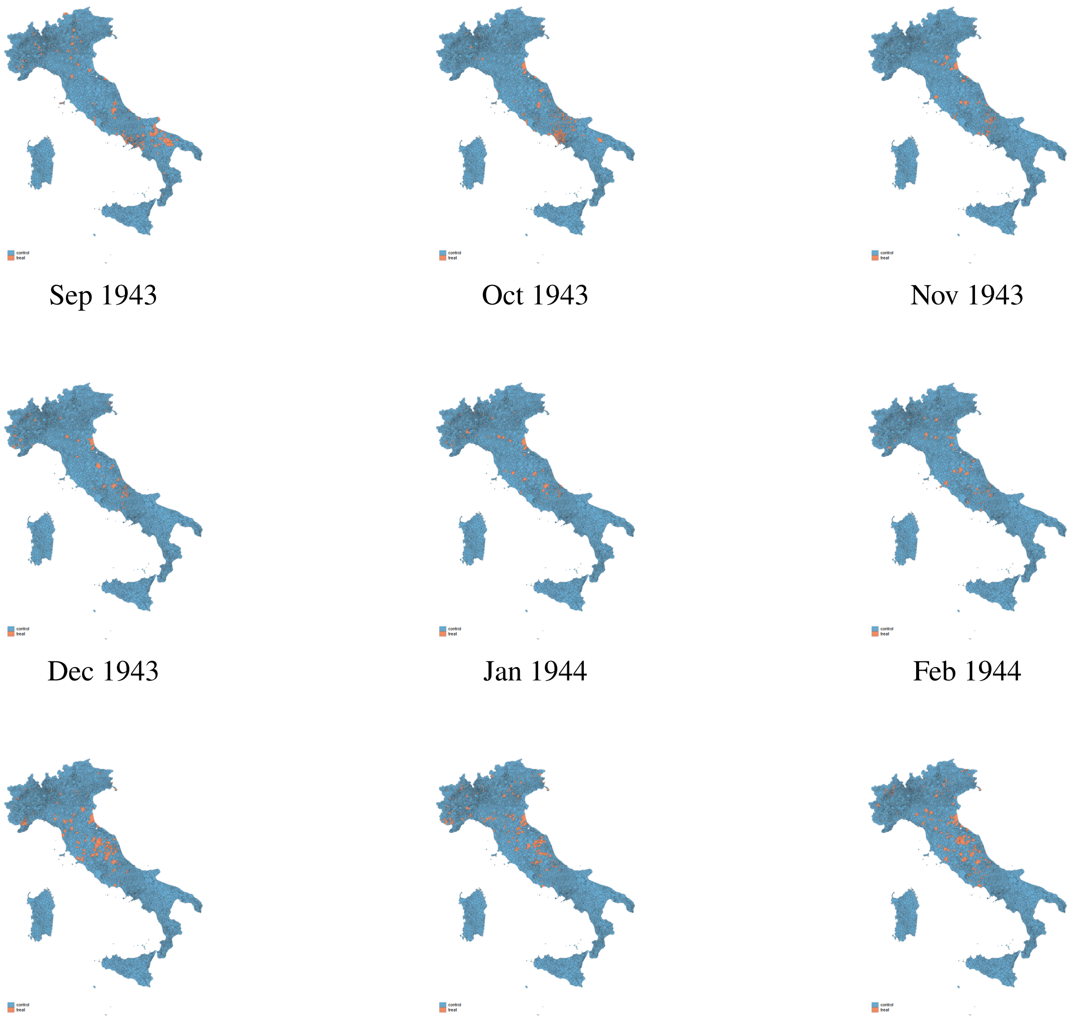
In 1 of section 4 we control for time invariant differences between treated and control municipalities. This, however, still leaves some room for structural differences between municipalities that vary over time. In order to address this we estimated a model that relates whether a municipality experienced a Nazi raid in the period September 1943– May 1944 to a range of municipality characteristics obtained from the 2011 census[40] and province × year × month fixed effects. The characteristics include the (logarithm of) population size, population density, socio-demographic characteristics and geographical information.

The results of this regression are reported in the first column of Table A1. The table shows that apart from population size there are no associations with other characteristics. We next examine whether the impact of the regressors change over time. To this end we also estimated the model for

[40]There is no information for the WWII years

each month over the period September 1943 – May 1944 and tested for time invariant effects of the regressors using an F-test. [41]. For each covariate we report the p-values of the F-test in the last column of Table A1. The p-values of the F-test indicate that the null of time invariant structural differences between treated and control municipalities can not be rejected for any of the explanatory variables.

Figure A1: Evolution of Nazi raids (Sept 1943 - May 1944)



Sep 1943 | Oct 1943 | Nov 1943

Dec 1943 | Jan 1944 | Feb 1944

Mar 1944 | Apr 1944 | May 1944

[41]More specifically, we do a full interaction of all the characteristics with month dummies

Figure A2: Placement of Nazi raids

Notes: The dark spots on the map indicate municipalities with a registered Nazi raid in the period September 1943 and May 1944.

Table A1: The assignment of Nazi raids to municipalities

	Nazi raid event (1943.09-1944.05)	
	Coefficient	Joint sign. (p-val)
Log population size	0.026***	0.1434
	(0.004)	
Population density	0.006	0.2930
	(0.008)	
Mortality 65+	0.001	0.2394
	(0.001)	
Low education	-0.006	0.2801
	(0.003)	
Log per-capita income	-0.006	0.3928
	(0.015)	
Sea access municipality	-0.010	0.6498
	(0.008)	
Snowfall	-0.000	0.2823
	(0.000)	
Rainfall	-0.000	0.1558
	(0.003)	
Maximum temperature	0.001	0.4966
	(0.001)	
Minimum temperature	-0.005***	0.6234
	(0.002)	
N	8,091	
R^2	0.11	

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: $N = 8091$ refers to all Italian municipalities. The characteristics are obtained from the 2011 census. Nazi event is an indicator dummy for a municipality that had a Nazi raid in the period September 1943 – May 1944. The second column reports p-values of joint significance tests of the interaction terms of the municipality level characteristics and year × month fixed effects. All regressions control for province fixed effects.

B Appendix: Additional evidence

B.1 Additional descriptive statistics

Table B1: Summary statistics on Nazi raids episodes between Sept 1943–May 1945 in all Italian municipalities

	N. obs.	Mean	Std. Dev.	Min	Max	p1	p50	p99
Italy								
Length in days	5878	1.36	3.11	1	89	1	1	10
Number of victims	5878	4.14	15.03	0	770	1	1	42
Proportion of women (%)	5878	8.07	23.59	0	100	0	0	100
Proportion of children (%)	5878	1.38	9.41	0	100	0	0	50
Proportion of men (%)	5878	90.55	25.77	0	100	0	100	100
Proportion of resistance fighters (%)	5878	33.93	51.66	0	100	0	0	100
Proportion of searches (%)	5878	29.52	45.62	0	100	0	0	100
Proportion of retaliations (%)	5878	16.77	37.37	0	100	0	0	100
Northwest								
Length in days	1376	1.57	4.24	1	72	1	1	15
Number of victims	1376	3.89	6.45	1	97	1	2	33
Proportion of women (%)	1376	5.31	18.39	0	100	0	0	100
Proportion of children (%)	1376	0.76	7.1	0	100	0	0	33.33
Proportion of men (%)	1376	93.93	19.92	0	100	0	100	100
Proportion of resistance fighters (%)	1376	53.92	69.3	0	100	0	66.67	100
Proportion of searches (%)	1376	44.48	49.71	0	100	0	0	100
Proportion of retaliations (%)	1376	19.77	39.84	0	100	0	0	100
Northeast								
Length in days	2033	1.38	3.42	1	89	1	1	9
Number of victims	2033	4.51	19.01	0	770	1	2	46
Proportion of women (%)	2033	6.85	21.87	0	100	0	0	100
Proportion of children (%)	2033	1.38	9.34	0	100	0	0	50
Proportion of men (%)	2033	91.77	24.39	0	100	0	100	100
Proportion of resistance fighters (%)	2033	47.91	47.34	0	100	0	40	100
Proportion of searches (%)	2033	31.68	46.53	0	100	0	0	100
Proportion of retaliations (%)	2033	19.28	39.46	0	100	0	0	100
Center								
Length in days	1512	1.26	1.92	1	29	1	1	8
Number of victims	1512	4.68	17.94	1	391	1	1	58
Proportion of women (%)	1512	9.42	25.3	0	100	0	0	100
Proportion of children (%)	1512	1.31	8.77	0	100	0	0	50
Proportion of men (%)	1512	89.27	27.14	0	100	0	100	100
Proportion of resistance fighters (%)	1512	16.14	35.58	0	100	0	0	100
Proportion of searches (%)	1512	22.22	41.59	0	100	0	0	100
Proportion of retaliations (%)	1512	12.3	32.86	0	100	0	0	100
South								
Length in days	957	1.22	1.7	1	28	1	1	8
Number of victims	957	2.84	7.03	1	125	1	1	27
Proportion of women (%)	957	12.5	29.49	0	100	0	0	100
Proportion of children (%)	957	2.39	12.78	0	100	0	0	100
Proportion of men (%)	957	85.12	32.13	0	100	0	100	100
Proportion of resistance fighters (%)	957	3.6	17.88	0	100	0	0	100
Proportion of searches (%)	957	14.94	35.67	0	100	0	0	100
Proportion of retaliations (%)	957	14.21	34.93	0	100	0	0	100

Notes: The numbers refer to an overall sample of 5,878 Nazi raids between Sept 1943–May 1945.

Table B2: Descriptive statistics: Nazi raids between Sept 1943 - May 1944 in municipalities with fewer than 200,000 residents

Date	N. of raids	% of resistance victims	% of male victims
Sept 1943	246	1.9	86.7
Oct 1943	358	1.3	88.0
Nov 1943	132	5.9	84.1
Dec 1943	131	12.7	83.3
Jan 1944	97	15.5	89.7
Feb 1944	78	14.5	88.6
Mar 1944	170	35.4	94.1
Apr 1944	201	44.6	90.7
May 1944	190	36.1	91.1

Notes: The numbers refer to a sample of 1,603 Nazi raids between Sept 1943 – May 1944 in Italian municipalities with less than 200,000 residents.

B.2 Layoffs assignment

Table B3: Layoff event random assignment check.

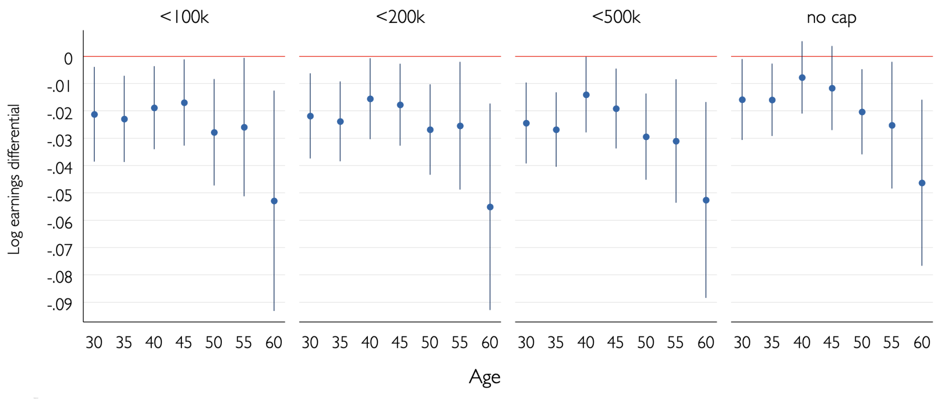
	layoff at anytime	layoff at 45	layoff at 50	layoff at 55	layoff at 60
Nazi raid	-0.0013	0.0001	-0.0018	-0.0006	0.0017
in utero	(0.0027)	(0.0018)	(0.0024)	(0.0023)	(0.0026)
WWII casualties (SD)	0.0000	-0.0004	-0.0009	0.0001	0.0001
in utero	(0.0013)	(0.0009)	(0.0011)	(0.0009)	(0.0011)
R^2	0.0426	0.0454	0.0513	0.0528	0.0666
N	283,975	187,135	170,830	158,232	101,124
Time FEs	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES

$^{***}p < 0.01,^{**} p < 0.05,^{*} p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) in municipalities with fewer than 200,000 residents, and refer to individuals who had positive earnings in the period prior the layoff event. All regressions include year × month and municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

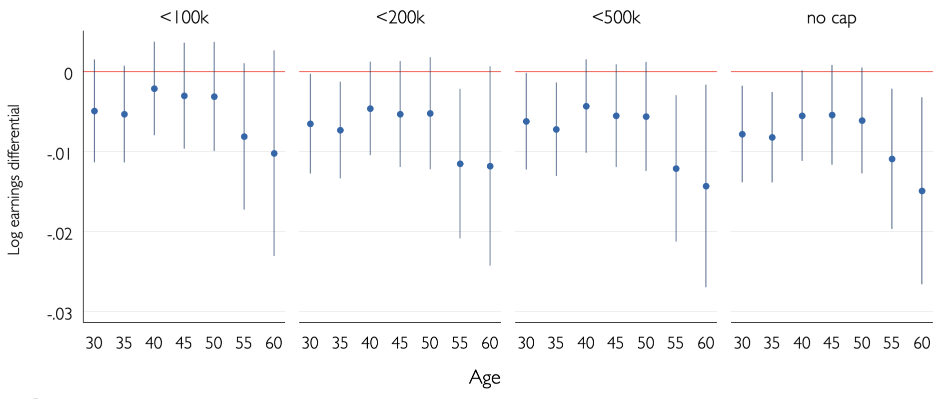
B.3 Sensitivity to municipality size

Figure B1: Sensitivity to municipality size - the effect of a Nazi raid on age specific log earnings



Notes: Effects on earnings of Nazi exposure in utero among individuals born in the [-9,9] month window around the Armistice (coefficients and 95% confidence intervals). Subsamples include municipalities with progressively increasing resident population size (under 100,000, under 200,000, under 500,000, no cap).

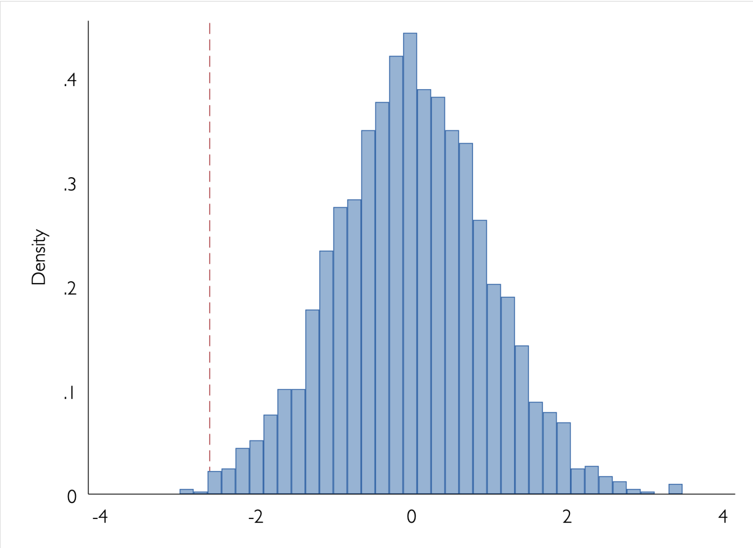
Figure B2: Sensitivity to municipality size - the general WWII effects (WWII casualties) on age specific log earnings



Notes: Effects on earnings of WWII exposure in utero among individuals born in the [-9,9] month window around the Armistice (coefficients and 95% confidence intervals). Subsamples include municipalities with progressively increasing resident population size (under 100,000, under 200,000, under 500,000, no cap).

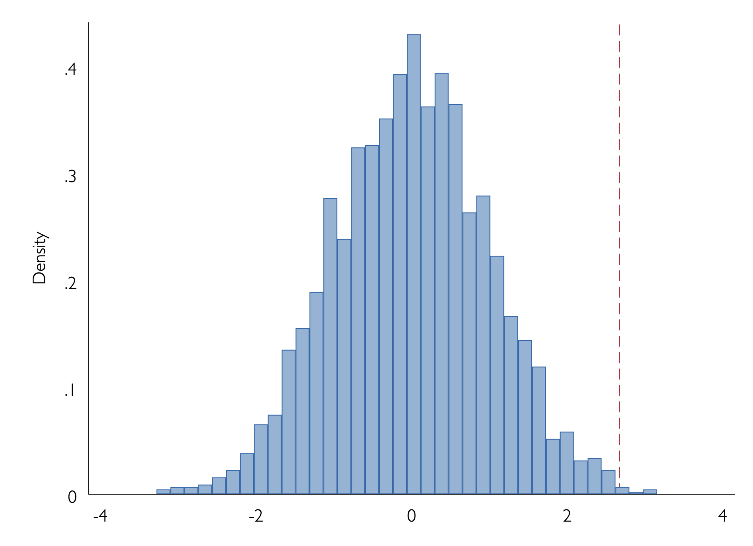
B.4 Falsification tests

Figure B3: Placebo assignment of Nazi raids - earnings at age 30



Notes: Pseudo-treatment vs. actual Nazi raids: the distribution of t-statistics resulting from 5,000 random assignments of treatment to individuals, as well as the t-statistics from the actual treatment (red dotted line).

Figure B4: Placebo assignment of Nazi raids - blue collar status at age 30



Notes: Pseudo-treatment vs. actual Nazi raids: the distribution of t-statistics resulting from 5,000 random assignments of treatment to individuals, as well as the t-statistics from the actual treatment (red dotted line).

B.5 Selectivity checks

Table B4: Effect of WWII intensity and Nazi raids on mortality rate from pregnancy complications

	Mortality rate from pregnancy complications
No. Nazi massacres	-.00092
in utero	(-0.21)
WWII casualties (SD)	.0247***
in utero	(2.74)
R^2	0.45
N	132

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The sample of 132 observations refers to 21 regions in 6 years (1941-1946). All regressions include year and region fixed effects as well as robust standard errors (t statistics in parentheses).

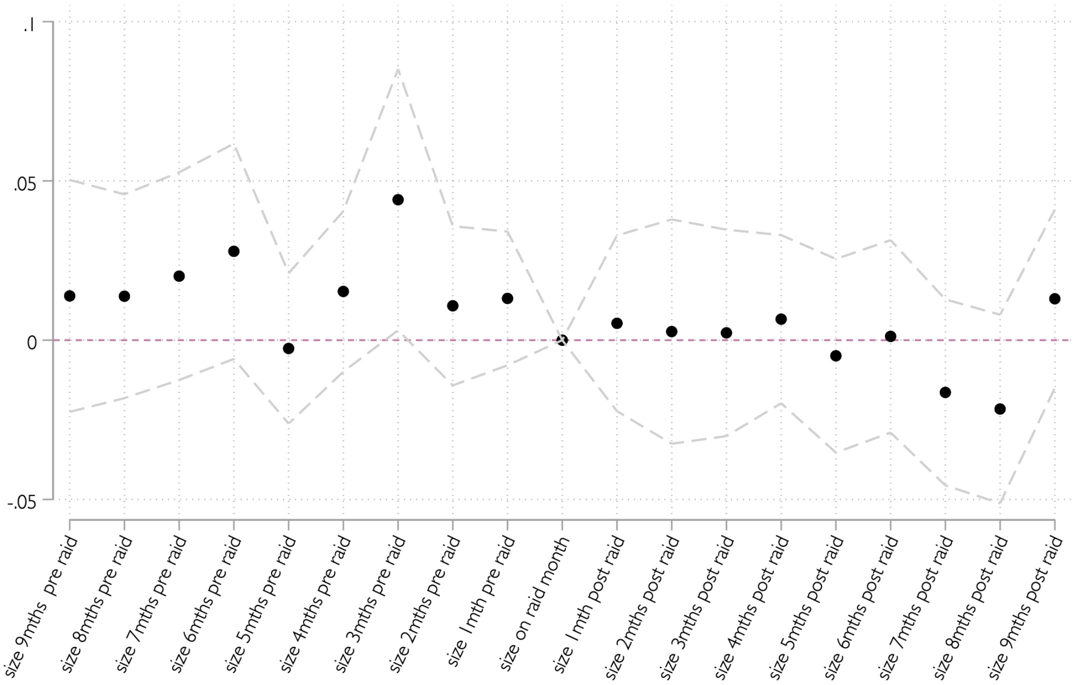
Table B5: Effect of Nazi raids on municipality level cohort size

	cohort size 30-year-olds	cohort size 40-year-olds	cohort size 60-year-olds	cohort size 70-year-olds
Nazi Raid	0.0053	0.0055	0.0027	-0.0041
	(0.0138)	(0.0138)	(0.0130)	(0.0119)
WWII casualties	0.0011**	0.0011	0.009*	0.0007
(SD)	(0.0005)	(0.0008)	(0.0006)	(0.0005)
R^2	0.2979	0.2980	0.2880	0.2707
N	135,150	135,150	135,150	135,150
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: Results from a regression of municipality monthly cohort sizes (as share in total municipality population), derived from the INPS data, concerning individuals born between Jan 1943 and May 1944. All regressions include the number of war casualties, year × month and municipality fixed effects as well as region specific time trends. Robust standard errors are clustered at the municipality level.

Figure B5: Monthly cohort sizes observed at the age of 30



Notes: The figure shows an event study coefficient estimates from a regression of municipality monthly cohort sizes (z-scores), derived from the INPS data, concerning individuals born between Jan 1943 and May 1944. All regressions include year × month and municipality fixed effects. The confidence intervals correspond to a threshold of 95%.

C Appendix: Is it stress?

In-utero stress exposure is proxied by being in utero at the time of a Nazi raid in a municipality where the individual was born. We use information of an external data base on health expenditures to validate our interpretation of the effects of this proxy. The Health Search/CSD Patient Database is a nation-wide representative sample of Italian adults, containing electronic patient level clinical records (ECRs) on diagnosis and prescriptions collected by General Practitioners (GPs).[42] The dataset also includes the patient's date and municipality of birth. Following a GP visit patients obtain their prescriptions which include information on diagnosis and types of drugs classified using the ATC (Anatomic Therapeutic Chemical) drug classification codes. With this information we can track the specific medical condition for which the drugs is prescribed and next compute drug expenditures for a specific disease at the patient level.

From the database we select all individuals born in the nine month time window surrounding September 8, 1943 (see Section 3) and compute annual patient level disease specific expenditures. These disease specific expenditures are then regressed on an indicator for in-utero exposure to Nazi raid, controlling for age, WWII casualties at the province level, GP fixed effects, Municipality fixed effects and regional trends.

The results of this regression are displayed in table C1 (expenditures) and Table C2 (logarithms of expenditures). The tables shows that the Nazi raids have a sizeable and significant effect on health expenditure for diseases of the nervous system and mental disorders (column 1). The coefficients imply a 17 percentage change in expenditures. Table C3 presents the results for the extensive margin (whether or not an individual had a positive expenditure). The table shows that those who were exposed to prenatal stress are about 3.6 percentage points more likely to acquire any drug for treating diseases of the nervous system and mental disorders. These findings are in line with the medical literature that documents strong associations between stress exposure and various psycho-pathologies later in life such as memory problems, decreased learning function, depression

[42]The database involves the ECRs of patients of a group of 900 GPs, representative of the Italian population, covering 1.8 million patients between 2004-2018. As Italian residents receive primary care services for free and are assigned to GPs on the basis of geographical proximity, the data are free of selection issues in the choice of GPs. Moreover, any healthcare service utilisation in Italy is subject to prescription or referral by a GP.

and dementia (Checkley, 1996; Heffelfinger and Newcomer, 2001; Selten et al., 1999). There are no effects on expenditure related to cardiovascular diseases and diabetes (column 2), diseases that typically show up in famine studies (Van den Berg and Lindeboom, 2018). Important for our study, these findings give credit to our interpretation of the effect of the Nazi raids as being primarily a stress effect.

Table C1: Effect of prenatal exposure to Nazi raids on health expenditure types

	(1) Neuro/ Mental.	(2) Cardio/ Diabetic	(3) Respir. syst.	(4) Hormone syst.	(5) Neoplasms	(6) Skin	(7) Musculo/ skeletal
Nazi raid	14.68607**	-.8137636	.2053017	.0604989	-6.213564	-1.089221	-1.453942
in utero	7.027016	3.318328	.395272	.5167893	4.91778	.7845821	1.146788
WWII casualties (SD)	-2.4008	-.1176307	-.0043448	.8692845	-4.107407	-.2607241	-.8289242*
in utero	2.271634	1.307562	.0833904	.6241549	3.653428	.2934628	.4665404
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES
GP FEs	YES	YES	YES	YES	YES	YES	YES
AGE	YES	YES	YES	YES	YES	YES	YES
N	82,299	82,299	82,299	82,299	82,299	82,299	82,299

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: The sample refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) and corresponds to patients managed by 468 GPs between 2004 and 2010. The expenditure refers to annual outpatient drug expenditures expressed in euros. All regressions control for WWII intensity and include year × month, municipality, GP, age and wave fixed effects as well as region specific time trends. Robust standard errors are clustered at the municipality level.

Table C2: Effect of prenatal exposure to Nazi raids on health expenditure types (in logs)

	(1) Neuro/ Mental.	(2) Cardio/ Diabetic	(3) Respir. syst.	(4) Hormone syst.	(5) Neoplasms	(6) Skin	(7) Musculo/ skeletal
Nazi violence	.1737803**	.0049712	.0075452	-.0068495	-.0140483	-.0265167	-.0982221
	.0812961	.0772294	.019095	.0325375	.0247252	.0286837	.068499
WWII casualties (SD)	-.0311454	-.0156929	.0004989	-.0160935	-.0195766*	-.0100156	-.0063346
in utero	.0232688	.0257558	.0049053	.0108522	.0112903	.0092541	.0266152
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES
GP FEs	YES	YES	YES	YES	YES	YES	YES
AGE	YES	YES	YES	YES	YES	YES	YES
N	82,299	82,299	82,299	82,299	82,299	82,299	82,299

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The sample refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) and corresponds to patients managed by 468 GPs between 2004 and 2010. The expenditure refers to annual outpatient (log) drug expenditures expressed in euros. All regressions control for WWII intensity and include year × month, municipality, GP, age and wave fixed effects as well as region specific time trends. Robust standard errors are clustered at the municipality level.

Table C3: Effect of prenatal exposure to Nazi raids on probability of consuming various drug types

	(1) Neuro/ Mental.	(2) Cardio/ Diabetic	(3) Respir. syst.	(4) Hormone syst.	(5) Neoplasms	(6) Skin	(7) Musculo/ skeletal
Nazi raid	.0363725*	.009888	.0025408	-.0028159	-.0011372	-.0059475	-.031536
in utero	.0206139	.0165968	.0058697	.010909	.0042813	.00794	.0207016
WWII casualties (SD)	-.0069781	-.0038541	.0002067	-.0047323	-.0033508*	-.0028436	.0004971
in utero	.0062256	.0055323	.0015742	.0038085	.0018029	.0032363	.0079697
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES
GP FEs	YES	YES	YES	YES	YES	YES	YES
AGE	YES	YES	YES	YES	YES	YES	YES
N	82,299	82,299	82,299	82,299	82,299	82,299	82,299

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The sample refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944) and corresponds to patients managed by 468 GPs between 2004 and 2010. The dependent variable is an indicator for positive annual outpatient drug expenditures. All regressions control for WWII intensity and include year × month, municipality, GP, age and wave fixed effects as well as region specific time trends. Robust standard errors are clustered at the municipality level.

D ONLINE Appendix: Sensitivity checks: Full tables

D1 Exploiting time variation (using only treated municipalities)

Table D1: Age specific earnings, treated in utero versus treated after birth (only treated municipalities)

	Earnings at 30	Earnings at 35	Earnings at 40	Earnings at 45	Earnings at 50	Earnings at 55	Earnings at 60
Nazi raid	-0.0210**	-0.0214**	-0.0079	-0.0196**	-0.0189*	-0.0149	-0.0202
in utero	(0.0094)	(0.0089)	(0.0090)	(0.0092)	(0.0100)	(0.0156)	(0.0280)
WWII casualties (SD)	-0.0114*	-0.0171***	-0.0147***	-0.0126**	-0.0137**	-0.0165*	-0.0138
in utero	(0.0059)	(0.0059)	(0.0053)	(0.0061)	(0.0069)	(0.0095)	(0.0132)
R^2	0.1268	0.1116	0.1066	0.1063	0.1042	0.1155	0.1518
N	93,778	91,319	82,300	75,373	70,457	43,375	18,945
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**} p < 0.05, ^{*} p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in the municipalities with fewer then 200,000 residents that receive a Nazi raid, and refer to age specific outcomes between the ages of 30 and 60. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D2: Age specific blue collar status, treated in utero versus treated after birth (only treated municipalities)

	Blue collar at 30	Blue collar at 35	Blue collar at 40	Blue collar at 45	Blue collar at 50	Blue collar at 55	Blue collar at 60
Nazi raid	0.0206***	0.0003	0.0173**	0.0200***	0.0193**	0.0303***	0.0474***
in utero	(0.0070)	(0.0077)	(0.0079)	(0.0075)	(0.0079)	(0.0097)	(0.0159)
WWII casualties (SD)	0.0048	0.0100***	0.0125***	0.0091*	0.0118**	0.0179***	0.0135
in utero	(0.0039)	(0.0037)	(0.0046)	(0.0049)	(0.0050)	(0.0066)	(0.0083)
R^2	0.0798	0.0886	0.0946	0.0994	0.1020	0.1484	0.1825
N	93,778	91,319	82,300	75,373	70,457	43,375	18,945
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**} p < 0.05, ^{*} p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in the municipalities with fewer then 200,000 residents that receive a Nazi raid, and refer to age specific outcomes between the ages of 30 and 60. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D3: Effect of layoff on wages, treated in utero versus treated after birth (only treated municipalities)

	age 45	age 50	age 55	age 60
Nazi raid	-0.0239***	-0.0187*	-0.0110	-0.0197
in utero (β_1^a)	(0.0092)	(0.0096)	(0.0164)	(0.0277)
Layoff (β_2^a)	-0.2196***	-0.2856***	-0.2949***	-0.3135***
	(0.0221)	(0.0207)	(0.0308)	(0.0485)
Layoff × Nazi raid	-0.1946***	-0.1367***	-0.1815***	-0.0432
in utero (β_3^a)	(0.0497)	(0.0505)	(0.0674)	(0.0823)
WWII casualties (SD)	-0.0104**	-0.0099*	-0.0129	-0.0122
in utero (β_4^a)	(0.0047)	(0.0052)	(0.0089)	(0.0117)
R^2	0.1133	0.1121	0.1386	0.1723
N	69,346	65,211	36,922	15,932
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01,^{**} p < 0.05,^{*} p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in the municipalities with fewer then 200,000 residents that receive a Nazi raid, and refer to age specific outcomes between the ages of 45 and 60. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

D2 Differential effects for exposure in utero, in the first year of life and in the second year of life

Table D4: Differential effects of exposure in utero, in the first year of life, and in the second year of life: (log) earnings

	Earnings at 30	Earnings at 35	Earnings at 40	Earnings at 45	Earnings at 50	Earnings at 55	Earnings at 60
			Panel A				
Baseline model [-9,9] window							
Nazi raid	-0.0218***	-0.0238***	-0.0155**	-0.0177**	-0.0268***	-0.0254**	-0.0551***
in utero	(0.0080)	(0.0075)	(0.0076)	(0.0077)	(0.0085)	(0.0120)	(0.0194)
Baseline model [-24,9] window							
Nazi raid	-0.0224***	-0.0278***	-0.0199***	-0.0235***	-0.0316***	-0.0219**	-0.0502***
in utero	(0.0073)	(0.0064)	(0.0061)	(0.0065)	(0.0075)	(0.0099)	(0.0161)
			Panel B				
First and Second year effects model [-24,9] window							
Nazi raid	-0.0177**	-0.0337***	-0.0137**	-0.0206***	-0.0342***	-0.0225*	-0.0372**
in utero	(0.0084)	(0.0076)	(0.0067)	(0.0069)	(0.0081)	(0.0121)	(0.0190)
Nazi raid	0.0131	-0.0057	0.0038	0.0027	-0.0003	0.0038	0.0205
1st year	(0.0092)	(0.0067)	(0.0058)	(0.0063)	(0.0072)	(0.0112)	(0.0188)
Nazi raid	0.0229	0.0011	0.0043	0.0037	-0.0015	0.0013	0.0042
2nd year	(0.0177)	(0.0068)	(0.0060)	(0.0064)	(0.0073)	(0.0111)	(0.0183)
WWII casualties (SD)	-0.0063**	-0.0048*	-0.0044*	-0.0037	-0.0029	-0.0065*	-0.0062
in utero	(0.0026)	(0.0026)	(0.0023)	(0.0026)	(0.0028)	(0.0036)	(0.0049)
WWII casualties (SD)	-0.0040*	-0.0004	-0.0019	-0.0024	-0.0011	-0.0043	-0.0072
1st year	(0.0023)	(0.0022)	(0.0020)	(0.0023)	(0.0024)	(0.0033)	(0.0052)
WWII casualties (SD)	0.0016	-0.0028	-0.0019	-0.0025	-0.0053**	-0.0028	-0.0050
2nd year	(0.0024)	(0.0023)	(0.0021)	(0.0022)	(0.0024)	(0.0033)	(0.0053)
R^2	0.1391	0.1371	0.1240	0.1324	0.1152	0.1173	0.1357
N	376,895	386,610	354,811	319,900	299,326	191,942	89,267
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The top row of Panel A refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944), while the bottom row of Panel A and Panel B refer to individuals born in the window [-24,9] month around the Armistice (Sept 1941 – May 1944), the columns refer to separate outcomes. All regressions include year × month and municipality fixed effects as well as region specific time trends. Standard errors (in parentheses) are clustered at the municipality level.

Table D5: Differential effects of exposure in utero, in the first year of life, and in the second year of life: Blue collar status

	Blue collar at 30	Blue collar at 35	Blue collar at 40	Blue collar at 45	Blue collar at 50	Blue collar at 55	Blue collar at 60
			Panel A				
Baseline model [-9,9] window							
Nazi raid	0.0222***	0.0028	0.0176***	0.0172***	0.0184***	0.0277***	0.0370***
in utero	(0.0055)	(0.0067)	(0.0063)	(0.0062)	(0.0065)	(0.0072)	(0.0109)
Baseline model [-24,9] window							
Nazi raid	0.0312***	0.0068	0.0217***	0.0218***	0.0234***	0.0272***	0.0360***
in utero	(0.0045)	(0.0054)	(0.0051)	(0.0051)	(0.0056)	(0.0061)	(0.0089)
			Panel B				
First and Second year effects model [-24,9] window							
Nazi raid	0.0291***	0.0053	0.0224***	0.0248***	0.0266***	0.0299***	0.0423***
in utero	(0.0052)	(0.0060)	(0.0061)	(0.0060)	(0.0064)	(0.0079)	(0.0116)
Nazi raid	-0.0013	-0.0001	0.0041	0.0075	0.0076	0.0076	0.0116
1st year	(0.0047)	(0.0048)	(0.0057)	(0.0055)	(0.0057)	(0.0071)	(0.0104)
Nazi raid	-0.0043	-0.0039	-0.0032	0.0002	0.0003	-0.0007	0.0047
2nd year	(0.0048)	(0.0042)	(0.0049)	(0.0053)	(0.0055)	(0.0069)	(0.0105)
WWII casualties (SD)	0.0018	0.0032*	0.0041**	0.0028	0.0018	0.0033	0.0003
in utero	(0.0017)	(0.0017)	(0.0018)	(0.0019)	(0.0019)	(0.0024)	(0.0032)
WWII casualties (SD)	0.0018	0.0008	0.0032*	0.0035**	0.0017	0.0044**	0.0041
1st year	(0.0015)	(0.0016)	(0.0018)	(0.0018)	(0.0018)	(0.0021)	(0.0032)
WWII casualties (SD)	0.0041**	0.0041***	0.0024	0.0043**	0.0031*	0.0055**	0.0061*
2nd year	(0.0017)	(0.0015)	(0.0018)	(0.0018)	(0.0018)	(0.0023)	(0.0032)
R^2	0.0805	0.0818	0.0876	0.0936	0.0997	0.1408	0.1645
N	376,895	386,610	354,811	319,900	299,326	191,942	89,267
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01,^{**} p < 0.05,^{*} p < 0.1$

Notes: The top row of Panel A refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944), while the bottom row of Panel A and Panel B refer to individuals born in the window [-24,9] month around Armistice (Sept 1941 – May 1944), the columns refer to separate outcomes. All regressions include year × month and municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D6: Differential effects of exposure in utero, in the first year of life, and in the second year of life: Mass layoff effects on (log) earnings

	age 45	age 50	age 55	age 60
		Panel A		
Baseline model [-9,9] window				
Nazi raid	-0.0244***	-0.0247***	-0.0233*	-0.0519***
in utero	(0.0079)	(0.0083)	(0.0123)	(0.0197)
Layoff × Nazi raid	-0.0781*	-0.0996**	-0.1436**	-0.0445
in utero	(0.0474)	(0.0490)	(0.0625)	(0.0709)
Baseline model [-24,9] window				
Nazi raid	-0.0267***	-0.0281***	-0.0195*	-0.0488***
in utero	(0.0066)	(0.0072)	(0.0102)	(0.0163)
Layoff × Nazi raid	-0.0702	-0.1417***	-0.1722***	-0.1151*
in utero	(0.0464)	(0.0486)	(0.0603)	(0.0662)
		Panel B		
First and Second year effects model [-24,9] window				
Nazi raid	-0.0244***	-0.0285***	-0.0161	-0.0373*
in utero	(0.0073)	(0.0082)	(0.0130)	(0.0221)
Layoff × Nazi raid	-0.0667	-0.1411***	-0.1735***	-0.1187*
in utero	(0.0469)	(0.0488)	(0.0602)	(0.0673)
Nazi raid	0.0007	0.0008	0.0066	0.0204
1st year	(0.0062)	(0.0069)	(0.0115)	(0.0194)
Layoff × Nazi raid	0.0256	-0.0305	-0.0302	-0.0830
1st year	(0.0344)	(0.0348)	(0.0440)	(0.0702)
Nazi raid	0.0054	-0.0035	0.0020	0.0076
2nd year	(0.0063)	(0.0068)	(0.0114)	(0.0194)
Layoff × Nazi raid	0.0242	0.0380	0.0110	0.0284
2nd year	(0.0348)	(0.0296)	(0.0522)	(0.0552)
R^2	0.1355	0.1207	0.1363	0.1582
N	292,821	275,090	165,434	73,987
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The top row of Panel A refers to individuals born in the 9 month window around the Armistice (Jan 1943–May 1944), while the bottom row of Panel A and Panel B refer to individuals born in the window [-24,9] month around the Armistice (Sept 1941 – May 1944), the columns refer to separate outcomes. All regressions include year × month and municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

D3 Using flexible province × year × month fixed effects

Table D7: The effect of in-utero exposure to a Nazi raid: Age specific earnings - province × year × month fixed effects.

	Earnings at 30	Earnings at 35	Earnings at 40	Earnings at 45	Earnings at 50	Earnings at 55	Earnings at 60
Nazi raid	-0.0263***	-0.0224***	-0.0150*	-0.0187**	-0.0250***	-0.0199	-0.0672***
in utero	(0.0085)	(0.0078)	(0.0082)	(0.0084)	(0.0088)	(0.0130)	(0.0203)
R^2	0.1597	0.1513	0.1480	0.1528	0.1451	0.1580	0.2075
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Prov Time FEs	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$
Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as province × year × month fixed effects. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D8: The effect of in-utero exposure to a Nazi raid: Age specific blue collar status - province × year × month fixed effects

	Blue collar at 30	Blue collar at 35	Blue collar at 40	Blue collar at 45	Blue collar at 50	Blue collar at 55	Blue collar at 60
Nazi raid	0.0202***	0.0004	0.0135**	0.0132*	0.0117*	0.0195**	0.0399***
in utero	(0.0059)	(0.0070)	(0.0066)	(0.0068)	(0.0070)	(0.0079)	(0.0119)
R^2	0.0973	0.1051	0.1127	0.1203	0.1264	0.1817	0.2317
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Prov Time FEs	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$
Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as province × year × month fixed effects. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D9: The effect of in utero exposure to a Nazi raid: Effect of mass layoff on earnings - province × year × month fixed effects

	age 45	age 50	age 55	age 60
Nazi raid	-0.0240***	-0.0241***	-0.0131	-0.0566***
in utero (β_1^a)	(0.0085)	(0.0087)	(0.0133)	(0.0215)
Layoff (β_2^a)	-0.3352***	-0.3226***	-0.3319***	-0.3173***
	(0.0140)	(0.0120)	(0.0165)	(0.0236)
Layoff × Nazi raid	-0.0794*	-0.0993**	-0.1469**	-0.0503
in utero (β_3^a)	(0.0474)	(0.0492)	(0.0623)	(0.0721)
R^2	0.1581	0.1533	0.1857	0.2393
N	155,587	145,885	85,302	39,325
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Prov Time FEs	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as province × year × month fixed effects. Robust standard errors (in parentheses) are clustered at the municipality level.

D4 Using 6-month exposure window

Table D10: Age specific earnings - exposure limited to 6 months after Sept 1943

	Earnings at 30	Earnings at 35	Earnings at 40	Earnings at 45	Earnings at 50	Earnings at 55	Earnings at 60
Nazi raid	-0.0228**	-0.0264***	-0.0211**	-0.0221**	-0.0276**	-0.0391***	-0.0692***
in utero	(0.0102)	(0.0096)	(0.0097)	(0.0095)	(0.0107)	(0.0140)	(0.0234)
WWII casualties (SD)	-0.0091**	-0.0079*	-0.0055	-0.0061	-0.0103**	-0.0164**	-0.0061
in utero	(0.0042)	(0.0041)	(0.0041)	(0.0045)	(0.0047)	(0.0064)	(0.0085)
R^2	0.1558	0.1487	0.1453	0.1501	0.1417	0.1529	0.1845
N	175,883	172,306	155,884	141,936	131,898	83,162	39,307
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born 9 months prior to 6 months post Armistice (Jan 1943 – Feb 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D11: Age specific blue collar status - exposure limited to 6 months after Sept 1943

	Blue collar at 30	Blue collar at 35	Blue collar at 40	Blue collar at 45	Blue collar at 50	Blue collar at 55	Blue collar at 60
Nazi raid	0.0214***	0.0053	0.0189**	0.0141*	0.0155**	0.0229***	0.0308**
in utero	(0.0065)	(0.0075)	(0.0074)	(0.0073)	(0.0077)	(0.0087)	(0.0129)
WWII casualties (SD)	0.0055**	0.0058**	0.0088***	0.0069**	0.0072**	0.0102**	-0.0014
in utero	(0.0027)	(0.0026)	(0.0030)	(0.0032)	(0.0034)	(0.0044)	(0.0052)
R^2	0.0959	0.0986	0.1094	0.1168	0.1226	0.1746	0.2097
N	175,883	172,306	155,884	141,936	131,898	83,162	39,307
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born 9 months prior to 6 months post Armistice (Jan 1943 – Feb 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D12: The effect of in utero exposure to a Nazi raid: Effect of mass layoff on earnings - exposure limited to 6 months after Sept 1943

	age 45	age 50	age 55	age 60
Nazi raid	-0.0221***	-0.0240***	-0.0293*	-0.0522***
in utero (β_1^a)	(0.0088)	(0.0094)	(0.0195)	(0.0201)
Layoff (β_2^a)	-0.3371***	-0.3121***	-0.3387***	-0.2928***
	(0.0131)	(0.0119)	(0.0130)	(0.0236)
Layoff × Nazi raid	-0.0976*	-0.1002*	-0.1301*	-0.0493
in utero (β_3^a)	(0.0589)	(0.0626)	(0.0765)	(0.0813)
R^2	0.0431	0.0881	0.0935	0.1125
N	130,720	122,832	73,204	31,386
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born in the 9 month window around the Armistice (Jan 1943 – May 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

D5 Shorter gestation

Table D13: Age specific earnings and shorter gestation period

	Earnings at 30	Earnings at 35	Earnings at 40	Earnings at 45	Earnings at 50	Earnings at 55	Earnings at 60
9 month gestation period [-9,9] window							
Nazi raid	-0.0218***	-0.0238***	-0.0155**	-0.0177**	-0.0268***	-0.0254**	-0.0551***
in utero	(0.0080)	(0.0075)	(0.0076)	(0.0077)	(0.0085)	(0.0120)	(0.0194)
WWII casualties (SD)	-0.0065**	-0.0073**	-0.0046	-0.0053	-0.0052	-0.0115**	-0.0118*
in utero	(0.0032)	(0.0031)	(0.0030)	(0.0034)	(0.0036)	(0.0048)	(0.0064)
R^2	0.1514	0.1437	0.1391	0.1432	0.1348	0.1418	0.1712
N	211,641	207,420	187,049	170,775	158,164	101,081	47,560
8 month gestation period [-9,8] window							
Nazi raid	-0.0241***	-0.0277***	-0.0142*	-0.0198**	-0.0292***	-0.0249**	-0.0526***
in utero	(0.0085)	(0.0079)	(0.0081)	(0.0081)	(0.0092)	(0.0123)	(0.0200)
WWII casualties (SD)	-0.0050	-0.0055	-0.0034	-0.0039	-0.0049	-0.0124**	-0.0055
in utero	(0.0035)	(0.0035)	(0.0034)	(0.0037)	(0.0040)	(0.0052)	(0.0072)
R^2	0.1530	0.1453	0.1411	0.1456	0.1371	0.1451	0.1742
N	201,078	197,052	177,859	162,270	150,403	95,783	45,091
7 month gestation period [-9,7] window							
Nazi raid	-0.0216**	-0.0269***	-0.0154*	-0.0185**	-0.0265***	-0.0313**	-0.0636***
in utero	(0.0093)	(0.0087)	(0.0088)	(0.0088)	(0.0099)	(0.0132)	(0.0220)
WWII casualties (SD)	-0.0065*	-0.0068*	-0.0033	-0.0054	-0.0067	-0.0128**	-0.0079
in utero	(0.0037)	(0.0037)	(0.0037)	(0.0039)	(0.0043)	(0.0057)	(0.0080)
R^2	0.1545	0.1469	0.1430	0.1476	0.1393	0.1485	0.1788
N	189,423	185,605	167,716	152,960	141,929	89,947	42,377
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born 9 months prior and 9, 8 or 7 months post Armistice (Jan 1943 – May/April/March 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D14: Age specific blue collar status and shorter gestation period

	Blue collar at 30	Blue collar at 35	Blue collar at 40	Blue collar at 45	Blue collar at 50	Blue collar at 55	Blue collar at 60
9 month gestation period [-9,9] window							
Nazi raid	0.0222***	0.0028	0.0176***	0.0172***	0.0184***	0.0277***	0.0370***
in utero	(0.0055)	(0.0067)	(0.0063)	(0.0062)	(0.0065)	(0.0072)	(0.0109)
WWII casualties (SD)	0.0030	0.0039**	0.0062***	0.0048**	0.0050**	0.0064**	0.0027
in utero	(0.0019)	(0.0019)	(0.0022)	(0.0023)	(0.0024)	(0.0030)	(0.0039)
R^2	0.0885	0.0965	0.1036	0.1107	0.1160	0.1658	0.1976
N	211,714	207,515	187,135	170,830	158,232	101,124	47,582
8 month gestation period [-9,8] window							
Nazi raid	0.0224***	0.0033	0.0167**	0.0148**	0.0172**	0.0272***	0.0342***
in utero	(0.0056)	(0.0067)	(0.0065)	(0.0063)	(0.0068)	(0.0076)	(0.0111)
WWII casualties (SD)	0.0035	0.0044**	0.0065***	0.0051*	0.0054**	0.0070**	0.0013
in utero	(0.0022)	(0.0022)	(0.0025)	(0.0026)	(0.0028)	(0.0034)	(0.0044)
R^2	0.0906	0.0972	0.1058	0.1128	0.1179	0.1690	0.2016
N	201,078	197,052	177,859	162,270	150,403	95,783	45,091
7 month gestation period [-9,7] window							
Nazi raid	0.0241***	0.0028	0.0174**	0.0146**	0.0166**	0.0290***	0.0382***
in utero	(0.0061)	(0.0073)	(0.0070)	(0.0068)	(0.0072)	(0.0080)	(0.0115)
WWII casualties (SD)	0.0037	0.0046**	0.0076***	0.0062**	0.0059**	0.0074**	-0.0007
in utero	(0.0023)	(0.0023)	(0.0026)	(0.0027)	(0.0030)	(0.0037)	(0.0046)
R^2	0.0931	0.0981	0.1076	0.1148	0.1205	0.1718	0.2059
N	189,423	185,605	167,716	152,960	141,929	89,947	42,377
Time FEs	YES	YES	YES	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES	YES	YES	YES

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$

Notes: The samples refers to individuals born 9 months prior and 9, 8 or 7 months post Armistice (Jan 1943 – May/April/March 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.

Table D15: Effect of layoff on wages and shorter gestation period

	age 45	age 50	age 55	age 60
9 month gestation period [-9,9] window				
Nazi raid	-0.0244***	-0.0247***	-0.0233*	-0.0519***
in utero	(0.0079)	(0.0083)	(0.0123)	(0.0197)
Layoff	-0.3359***	-0.3234***	-0.3350***	-0.3157***
	(0.0139)	(0.0120)	(0.0163)	(0.0234)
Layoff × Nazi raid	-0.0781*	-0.0996**	-0.1436**	-0.0445
in utero	(0.0474)	(0.0490)	(0.0625)	(0.0709)
WWII casualties (SD)	-0.0063*	-0.0063*	-0.0097*	-0.0058
in utero	(0.0034)	(0.0033)	(0.0050)	(0.0070)
R^2	0.1500	0.1427	0.1682	0.2006
N	155,587	145,885	85,302	39,325
8 month gestation period [-9,8] window				
Nazi raid	-0.0261***	-0.0271***	-0.0264**	-0.0503**
in utero	(0.0084)	(0.0087)	(0.0126)	(0.0204)
Layoff	-0.3359***	-0.3238***	-0.3385***	-0.2980***
	(0.0141)	(0.0122)	(0.0167)	(0.0238)
Layoff × Nazi raid	-0.1011*	-0.0971*	-0.1490**	-0.0547
in utero	(0.0529)	(0.0531)	(0.0679)	(0.0841)
WWII casualties (SD)	-0.0036	-0.0046	-0.0084*	-0.0012
in utero	(0.0030)	(0.0030)	(0.0044)	(0.0064)
R^2	0.1504	0.1445	0.1708	0.2005
N	147,806	138,618	80,851	37,243
7 month gestation period [-9,7] window				
Nazi raid	-0.0234***	-0.0241**	-0.0320**	-0.0653***
in utero	(0.0091)	(0.0095)	(0.0140)	(0.0220)
Layoff	-0.3398***	-0.3196***	-0.3399***	-0.2978***
	(0.0144)	(0.0124)	(0.0171)	(0.0244)
Layoff × Nazi raid	-0.0995*	-0.1109*	-0.1286*	-0.0551
in utero	(0.0581)	(0.0577)	(0.0731)	(0.0874)
WWII casualties (SD)	-0.0049	-0.0069**	-0.0099**	-0.0006
in utero	(0.0031)	(0.0033)	(0.0048)	(0.0074)
R^2	0.1524	0.1465	0.1739	0.2041
N	139,311	130,812	76,002	34,939
Time FEs	YES	YES	YES	YES
Municipality FEs	YES	YES	YES	YES
Reg trends	YES	YES	YES	YES

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: The samples refers to individuals born 9 months prior and 9, 8 or 7 months post Armistice (Jan 1943 – May/April/March 1944) in municipalities with fewer then 200,000 residents. All regressions include year × month fixed effects, municipality fixed effects as well as region specific time trends. Robust standard errors (in parentheses) are clustered at the municipality level.