Maternal Stress and Offspring Lifelong Labor Market Outcomes

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July 2020

Centre for Economic and International Studies

Roadmap

QUESTION:

- ▶ Is in-utero **stress relevant** for labor outcomes?

STRATEGY:

- ▶ **Link lifelong** longitudinal employment histories of ALL Italian workers with **granular** (city/month) information on episodes of Nazi **raids** in prenatal period.
- ▶ Focus on individuals **born before or in utero** at the start of the violence.

TAKEAWAYS:

- ▶ **Penalty** from in-utero stress **opens up** early - lower qualifications and wages at the labor market **entry**.
- ▶ The **gap widens** during the working career and culminates at the age of 55-60.
- ▶ Shock **dynamic complementarities** - **MASS LAYOFF** episode during the working career penalizes the disadvantaged individuals more.

Why do economists care about early-life?

- Effect of environmental conditions on health is **strongest** in the **earliest periods of life**, when **growth is most rapid** (Barker, 1990; Almond and Currie, 2011; Almond et al., 2018).

- Ability **gaps** between the advantaged and disadvantaged **open up** in the earliest phases of individual lives.

- **Low socioeconomic** status pregnant women are more likely to undergo negative experiences while pregnant - **disadvantage is transmitted** across generations.

What do we know about stress in-utero?

- Clinical studies - mothers' hormonal response to anxiety/stress has profound impact on neurological development of fetus, and cognitive, emotional and mental problems and stress vulnerability later in life.

- Aizer et al. (2016) show that higher **levels of cortisol** have small effect on birth weight but have significant **negative impact** on school attainment and IQ scores at age 7.

- Black et al. (2016) and Persson and Rossin-Slater (2018) exploit **deaths in family** as source of acute stress and rely on mother FE's or randomness in timing of birth.

- Black et al. (2016) find small effects on birth outcomes and no effects on later life SES.

- Persson and Rossin-Slater (2018) find significant effects on anti-anxiety and depression medications consumption in adulthood.

What is our contribution?

- **Start where others stopped**: working histories of the **universe** of Italian private sector male **workers** form the Italian social security and welfare institute (INPS).

- Exploit **dynamic complementarities of shocks** - *lightening that strikes twice* - **mass layoff** episode during working career.

- Exploit **quasi-experimental** setting of the WWII conflicts onset on the 8th of September 1943 - **Armistice**.

- Among males **conceived all before** Armistice, analyze differences between cohorts **born** in municipalities **before and after** Nazi rides, relative to the same cohorts born in municipalities that saw no violence.

WWII evolution and Nazi violence

- WWII in Italy began in 1940, but a crucial date was **Armistice** - 18:00 on 8th Sept 1943 - when Italy surrendered to Allied forces
- The Armistice represented the onset of WWII conflicts
- The Armistice gave rise to the outbreak of **violent Nazi raids**.

Nazi episodes data - "The Atlas of Nazi and Fascist massacres", all raid episodes and **number of victims** by age, gender, civil/partisan, character and by **month/municipality**

Couple the data with ISTAT data "Morti e dispersi per cause belliche negli anni 1940-45", **victim toll** of WWII by **month/province**
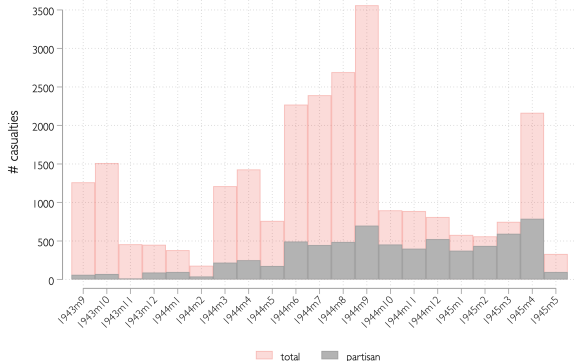
WWII evolution and Nazi violence

- The average duration of raids was of 1.4 days, 90% of them lasted 1 day only.

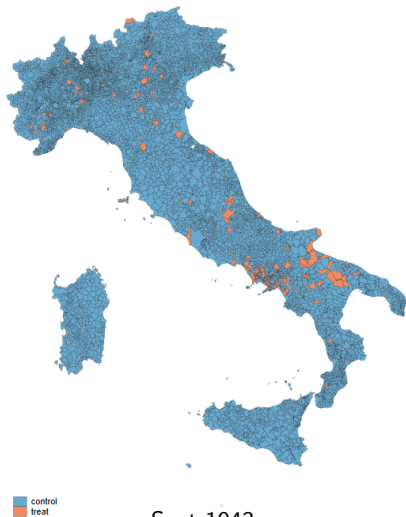- On average raids involved 4 victims, 90% of episodes had less then 32 victims.
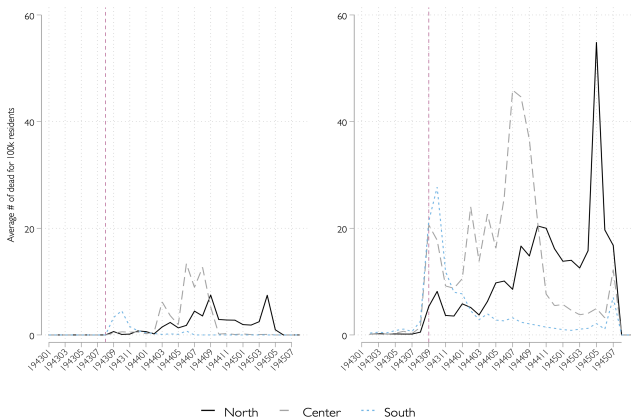
Nazi episodes data

- Episodes aimed at both the **civil population** and at **resistance fighters**

- more than 76% of victims were civilian, and 22% of aimed at resistance fighters.

- Rest was rooted in racial ideology aiming at **disrupting social dimension** by perpetrating **terror**.

Nazi violence episodes during WWII

Sept 1943

Nazi violence episodes during WWII

Oct 1943

Nazi violence episodes during WWII

control
treat

Nov 1943

Nazi violence episodes during WWII

Dec 1943

Nazi violence episodes during WWII

control
treat

Jan 1944

Nazi violence episodes during WWII

Feb 1944

Nazi violence episodes during WWII

Mar 1944

Nazi violence episodes during WWII

Apr 1944

Nazi violence episodes during WWII

May 1944

Nazi violence episodes during WWII

control
treat

Jun 1944

Nazi violence episodes during WWII

Jul 1944

Nazi violence episodes during WWII

control
treat

Aug 1944

Nazi violence episodes during WWII
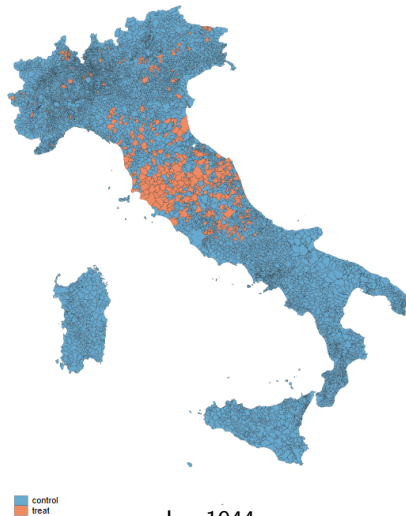

control
treat

Sep 1944

Nazi violence episodes during WWII

control
treat

Oct 1944
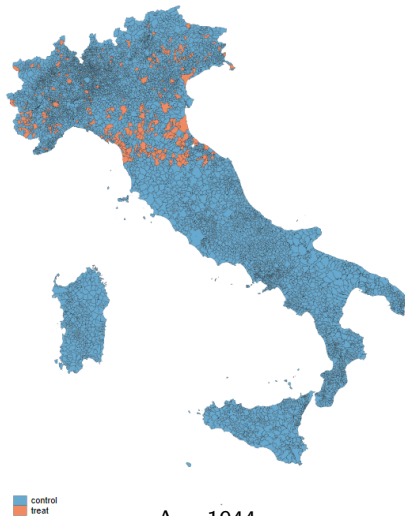
Nazi violence episodes during WWII

Nov 1944

Nazi violence episodes during WWII

control
treat

Dec 1944

Nazi violence episodes during WWII

Jan 1945

Nazi violence episodes during WWII

control
treat

Feb 1945
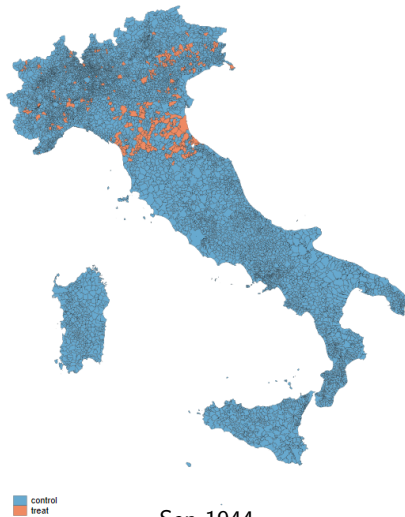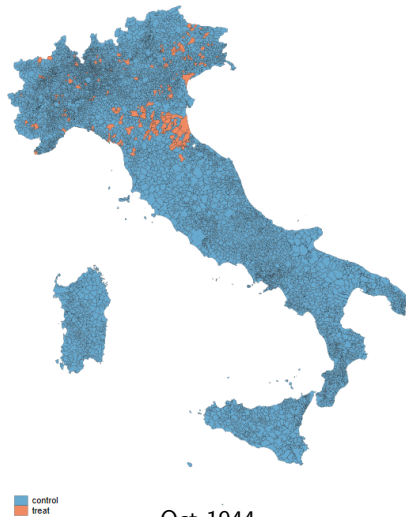
Nazi violence episodes during WWII

Mar 1945

Nazi violence episodes during WWII

Apr 1945

Nazi violence episodes during WWII

May 1945

INPS working histories data

Link **potential exposure** to Nazi raids with individual level INPS data on the universe of male workers in the period 1974-2017 according to **month/municipality** of birth:

- ▶ **Employees' labour outcomes** - working histories from 1974 onwards, earnings, qualifications, contract terminations etc.

- ▶ **Employers** - employer-employee matched data - retrieve mass layoff episodes.

- ▶ **Pensions and disabilities** - work pensions and disability collection.

- ▶ **Demographic characteristics** - age at first employment, age at retirement, age at death.

Data selection

- **conceived before Armistice**: born January 1943 - May 1944 (R: we estimate alternative specifications where instead of the 9-month window we adopt 6-24 months windows)
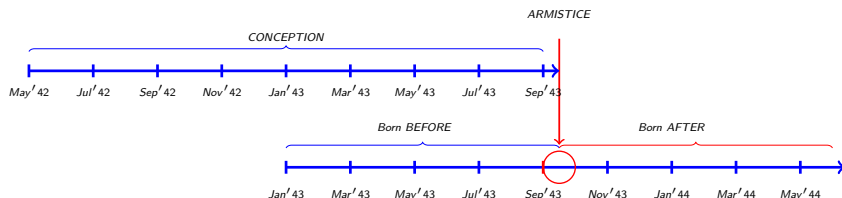
- as we exploit potential exposure, we focus on workers born in **towns with population under 200k** (R: none, 500, 100, 75k) - shock dispersion, political reasons, repeated violence, food shortages.

- exposure period = 9 months backwards from month/year of birth (R: 6, 7, 8, 18, 24 months)

Mass layoffs

- how does the gap evolve under **dynamic complementarities** between in-utero stress exposure and random later life labour shocks?

- if according to Heckman (2007) **"skill begets skill"**, disadvantage from an in-utero shock is likely to **bolster disadvantage from a future shock**.

- Identify episodes of contract termination as a result of a mass layoff (Sullivan and Wachter, 2009)

- **Mass layoff**: $TotEmpl > 25$ workers, and $TotEmpl_t / TotEmpl_{t-1} < .7$

- Match firm layoff episodes with individual contract termination between the age of 45 and 65.

Identification strategy

- ► Conflicts struck on the 8th of Sept 1943 - cohorts **born just months** apart experienced markedly different in-utero conditions.

- ► Nazi violence incidence varied idiosyncratically across municipalities - similar pregnant mothers experienced strikingly different environments while pregnant.

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

- ► We estimate age specific models, $a = 30, 35, 40, 45, 50, 55$ and 60
- ► $Nazi_{mt}$ is a dummy variable for individuals born in municipalities which had an episode of violence in the 9 months before birth.
- ► War_{pt} is a continuous z-score of the number of war deaths in the province of birth per 100k residents in the 9 months before birth.
- ► α_m and γ_t are municipality and time of birth (year x month) fixed effects, while δ_{tr} are 21 region specific time trends.

Descriptives - unconditional wage differentials
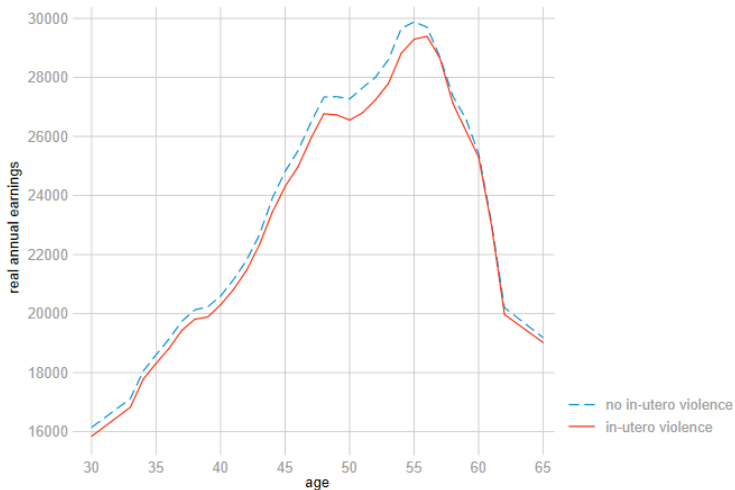
Earnings

	earn 30	earn 35	earn 40	earn 45	earn 50	earn 55	earn 60
Nazi raid	-0.0218***	-0.0238***	-0.0155**	-0.0177**	-0.0268***	-0.0254**	-0.0551***
9mths	(0.0080)	(0.0075)	(0.0076)	(0.0077)	(0.0085)	(0.0120)	(0.0194)
WWII casualties	-0.0065**	-0.0073**	-0.0046	-0.0053	-0.0052	-0.0115**	-0.0118*
(SD)	(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
CITY 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 onset (Jan 1943 - May 1944), and refer to each age specific outcomes between the ages pf 30 and 60. All regressions include month-of-year and municipality fixed effects as well as region specific trends. Standard errors (in parentheses) are clustered at the municipality level.

Qualifications

	Blue collar 30	Blue collar 35	Blue collar 40	Blue collar 45	Blue collar 50	Blue collar 55	Blue collar 60
Nazi raid	0.0222***	0.0028	0.0176***	0.0172***	0.0184***	0.0277***	0.0370***
9mths	(0.0055)	(0.0067)	(0.0063)	(0.0062)	(0.0065)	(0.0072)	(0.0109)
WWII casualties	0.0030	0.0039**	0.0062***	0.0048**	0.0050**	0.0064**	0.0027
(SD)	(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
TIME FEs	YES	YES	YES	YES	YES	YES	YES
CITY 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 onset (Jan 1943 - May 1944), and refer to each age specific outcomes between the ages pf 30 and 60. All regressions include month-of-year and municipality fixed effects as well as region specific trends. Standard errors (in parentheses) are clustered at the municipality level.

In-utero vs early life

	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**	-0.0472***
in utero	(0.0084)	(0.0076)	(0.0067)	(0.0069)	(0.0081)	(0.0111)	(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)
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
WWII	YES	YES	YES	YES	YES	YES	YES
TIME FEs	YES	YES	YES	YES	YES	YES	YES
CITY FEs	YES	YES	YES	YES	YES	YES	YES
REG FEs	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 onset (Jan 1943 - May 1944), while the bottom row of panel A and panel B refer to individuals born in the 24 month prior Armistice to 9 month after armistice window (Sept 1941 - May 1944), the columns refer to each age specific outcomes between the ages of 30 and 60. All regressions include monthly date and municipality fixed effects as well as region specific trends. Standard errors (in parentheses) are clustered at the municipality level.

Effect of mass layoff on log earnings in the following period.

	age 45	age 50	age 55	age 60
layoff	-0.3061***	-0.2648***	-0.3077***	-0.3293***
	(0.0105)	(0.0100)	(0.0129)	(0.0195)
Nazi raid	-0.0245***	-0.0238***	-0.0208*	-0.0528***
	(0.0078)	(0.0082)	(0.0122)	(0.0197)
layoff $\times$ Nazi massacre	- 0.0223	**-0.0603****	**-0.0881****	-0.0135
	(0.0351)	(0.0294)	(0.0415)	(0.0603)
WWII casualties	-0.0062*	-0.0067*	-0.0105**	-0.0049
	(0.0034)	(0.0034)	(0.0049)	(0.0070)
R^2	0.1500	0.1427	0.1682	0.2006
N	155,491	145,806	85,247	39,305
TIME FEs	YES	YES	YES	YES
MUNICIPALITY FEs	YES	YES	YES	YES
REGION 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 onset (Jan 1943 - May 1944), and refer to each age specific outcomes between the ages of 45 and 60. All regressions include month-of-year and municipality fixed effects as well as region specific trends. Standard errors (in parentheses) are clustered at the municipality level.

Mass layoff on probability of death in 10 years following the event.

	age 45	age 50	age 55	age 60
layoff	0.0044	0.0034	**0.0137****	**0.0165***
	(0.0030)	(0.0033)	(0.0055)	(0.0086)
nazi massacre	0.0005	-0.0034	-0.0084	-0.0114
	(0.0026)	(0.0033)	(0.0044)	(0.0083)
layoff× nazi massacre	-0.0031	-0.0011	0.0071	-0.0170
	(0.0110)	(0.0110)	(0.0190)	(0.0262)
WWII casualties	-0.0004	-0.0005	0.0007	-0.0005
	(0.0008)	(0.0011)	(0.0016)	(0.0026)
R^2	0.0422	0.0461	0.0662	0.1107
N	170,775	158,164	101,081	47,560
TIME FEs	YES	YES	YES	YES
MUNICIPALITY FEs	YES	YES	YES	YES
REGION 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 onset (Jan 1943 - May 1944), and refer to each age specific outcomes between the ages of 45 and 60. All regressions include month-of-year and municipality fixed effects as well as region specific trends. Standard errors (in parentheses) are clustered at the municipality level.

Selection, sensitivity and randomness

Selection:

- ▶ **Conception**
- ▶ **In-utero**: Mortality due to pregnancy complications increases with WWII intensity, the effect of Nazi violence incidence is null. ▸ fig
- ▶ **Later life**: check for cohort composition and for attrition in INPS data. ▸ fig ▸ tab

Assignment of treatment:

- ▶ Random assignment of Nazi raids (municipality characteristics)
- ▶ Random assignment of layoffs wrt Nazi raids
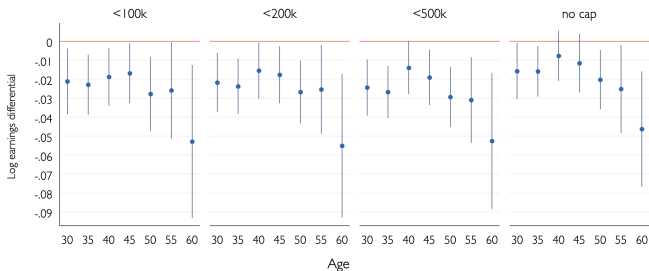
Sensitivity:

- ▶ Municipality size
- ▶ Month window size

Is it stress?

- ▶ Analyze impact of Nazi raids on **different types of health expenditure** - effect on mental and neurological ATC related drugs.

Sensitivity to municipality size - the effect of Nazi raids on age specific log earnings

Notes: Nazi exposure in utero among individuals born in the [-9,9] month window ariund the Armistice in subsamples which include municipalities with progressively increasing resident population size (under 100,000, under 200,000, under 500,000, no cap).

# Sensitivity to municipality size - the effect of WWII casualties on age specific log earnings
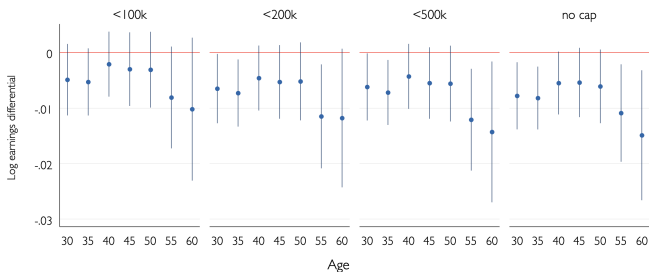
Notes: WWII exposure in utero among individuals born in the [-9,9] month window ariund the Armistice in subsamples which include municipalities with progressively increasing resident population size (under 100,000, under 200,000, under 500,000, no cap).

Random assignment - placebo
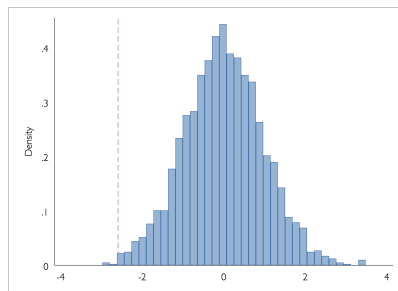
Earinings
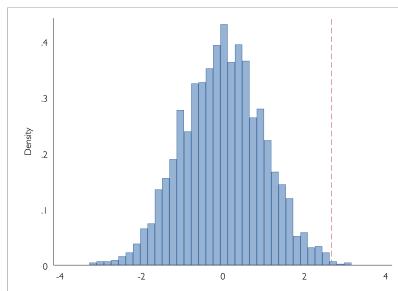
Blue collar

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 line).

Conclusions

▶ Exposure to stress in utero exerts a negative effect on long-run earnings

▶ The results driven by qualifications and unemployment spells, no effects of Nazi raids on disability and mortality.

▶ Different working career trajectories depend on early-life events which also determine the response to further adverse events.

▶ Results robust to various sensitivity and robustness checks.

THANK YOU

Effect of WWII intensity and Nazi rides on mortality rate from pregnancy complications

	mortality rate pregnancy complications
no. nazi massacres	-.00092
	(-0.21)
WWII casualties (SD) victims	.0247***
	(2.74)
r2	0.45
N	132

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

Notes: The sample of 132 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).

Event study - probability of death
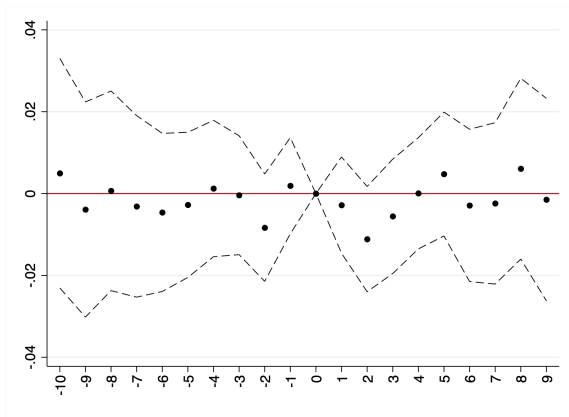
The figure is constructed alineating all Nazi violence episodes on a homogenous time scale testing for lags and leads effects, controlling for municipality and year/month fixed effects

Selection and attrition

	in uni30	in uni40	in uni50	empl30	empl40	empl50	alive50	dead40	dead50
t-7	-.02735	-.02749	-.06866	-.08539	-.08561	-.12515	-.18968	-.00773	.02592
	-.28777	-.28747	-.27646	-.40486	-.40646	-.42494	-.64284	-.00863	-.03993
t-6	.11522	.11744	.07658	.1102	.10734	.0738	.03177	-.00324	.02433
	-.26392	-.26369	-.25503	-.36824	-.36974	-.38315	-.57154	-.00832	-.03405
t-5	-.24098	-.24116	-.26413	-.25395	-.25813	-.28103	-.38738	.00064	.01174
	-.19808	-.19796	-.19159	-.28727	-.28868	-.30116	-.44675	-.00888	-.03038
t-4	.06128	.06248	.00622	.07924	.08128	.02842	-.03365	-.0052	.0336
	-.18875	-.18866	-.18162	-.24855	-.24979	-.25629	-.37347	-.00703	-.02527
t-3	.09898	.10354	.08619	.18068	.18204	.16	.17503	-.00505	.00599
	-.14283	-.14273	-.13941	-.1901	-.19099	-.1953	-.27936	-.00675	-.02061
t-2	.11248	.1178	.1097	.07077	.0727	.06164	.14466	-.00279	.01221
	-.14597	-.14569	-.14178	-.18151	-.18298	-.18039	-.23559	-.00699	-.0174
t	-.00525	-.00334	-.0012	.00288	-.00098	-.01167	-.0482	.00236	-.00076
	-.10238	-.10238	-.10063	-.11968	-.12042	-.12175	-.15955	-.00641	-.0164
t+1	.06281	.06241	.05174	.13046	.1248	.10973	.1093	.01051	.0206
	-.13544	-.1351	-.13063	-.16792	-.16821	-.17186	-.23772	-.00802	-.02051
t+2	.18641	.19234	.19028	.19373	.19711	.17865	.24301	.011	.02671
	-.17037	-.1704	-.16289	-.22727	-.22837	-.23441	-.34625	-.00772	-.02485
t+3	.0339	.03682	.0558	.04898	.04569	.04981	.08336	.01044	.00217
	-.20472	-.20478	-.19768	-.27089	-.27206	-.28483	-.42052	-.0084	-.0294
t+4	0.69901	0.69719	0.70412	0.94037	0.93393	0.91570	1.19221	0.01585	.02668
	-.3775	-.3773	-.36619	-.51108	-.51269	-.51678	-.72085	-.0089	-.03655
t+5	.38989	.38892	.41075	.53762	.53937	.54226	.65412	.01076	-.00001
	-.31836	-.31789	-.30678	-.41704	-.4188	-.43618	-.6383	-.01016	-.04037
t+6	.45144	.45353	.48074	.53515	.53303	.5339	.60028	.01298	-.00238
	-.37677	-.37665	-.36325	-.50136	-.50322	-.52173	-.77027	-.01038	-.0454
t+7	.26007	.25802	.29562	.31917	.31075	.31943	.43406	.02239	-.00045
	-.37843	-.37799	-.36166	-.52181	-.52408	-.54862	-.83786	-.01077	-.05114
Obs.	25,905	25,905	25,905	25,905	25,905	25,905	25,905	25,905	25,905

$^{***}\,p < 0.01,^{**}\,p < 0.05,^{*}\,p < 0.1$
Notes: The sample of 25,905 refers to 1,727 episodes of rides in the 7 month window around their onset, the dependent variable
are the cohort sizes observed in the private market labor dataset at the age of 30, 40 and 50, as well as all individuals employed
(also outside of the private market), and finally individuals alive at the age of 50, individuals dead at the age of 40 and 50.
All regressions include month-of-year, monthly date, and municipality fixed effects as well as region specific trends. Standard
errors (t statistics in parentheses) are clustered at the municipality level.