

# World War II, Missing Men, And Out-Of-Wedlock Childbearing

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# Introduction

- Why study sex ratios (as an economist)?

Sex ratios (imbalances) can have profound effects on social, demographic, and economic conditions in societies, including among others:

- Marriage market outcomes
- Fertility patterns
- Intra-household resource allocation
- Female labor force participation

# Introduction

- How can the effects of sex ratios (changes) be identified?
  - To establish causality, we need exogenous variations in sex ratios.
  - Sex ratios, however, are rarely exogenous (mostly because of sex-biased migration).
- ⇒ Observed associations may be confounded by omitted variables and reverse causality.
- ... a problem that potentially besets previous research on the effects of sex ratio imbalances on out-of-wedlock fertility, e.g.:
  - Guttentag and Secord (1983)
  - Fossett and Kiecolt (1990/1993)
  - South and Llyod (1992)

# Introduction

- We contribute to the literature on the determinants of nonmarital fertility by providing first evidence from a natural experiment on the effects of sex ratio changes on out-of-wedlock fertility.
- For the south German state of Bavaria at mid century, we exploit World War II induced county-level variations in sex ratio changes to identify the effects of male shorfalls on the prevalence out-of-wedlock fertility as measured by the nonmarital fertility ratio.

# Introduction

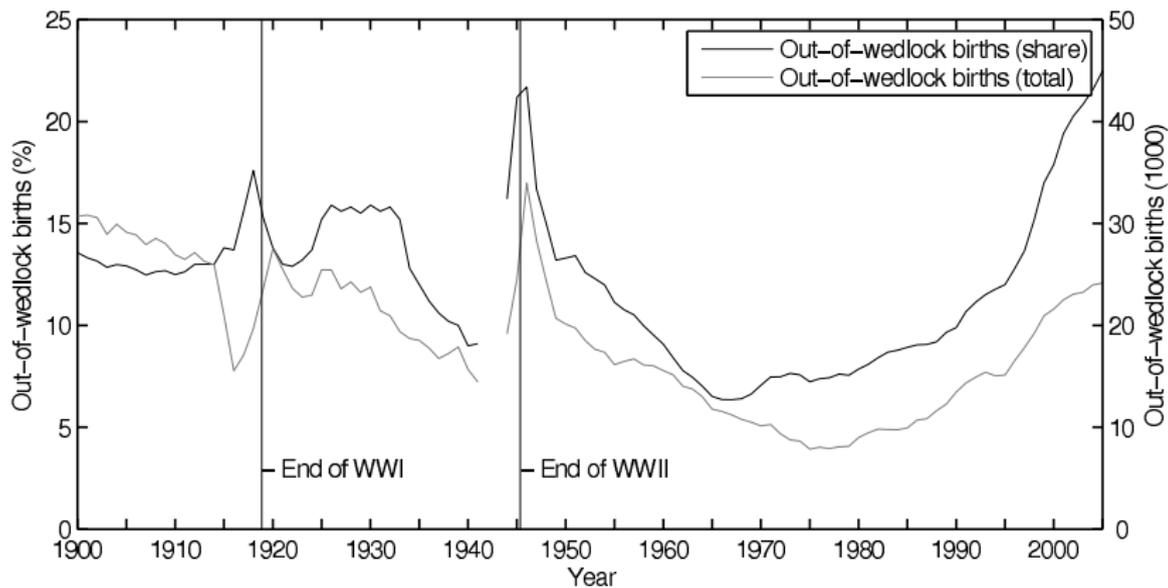
- Preview of results:
  - War-induced shortfalls of men significantly increased the relative prevalence of out-of-wedlock childbearing in Bavarian counties.
  - The nature (expected permanency) of male shortfalls (pows vs. military deaths & soldiers mia) is important for observed changes in out-of-wedlock fertility.

# Background

- For the study of out-of-wedlock childbearing, the pre- / post-WWII period is not only of interest for analytical reasons.
- The late 1930s to mid 1940s also saw the largest:
  - rise in the nonmarital fertility ratio
  - fall in the adult sex ratio... in 20th century Germany.

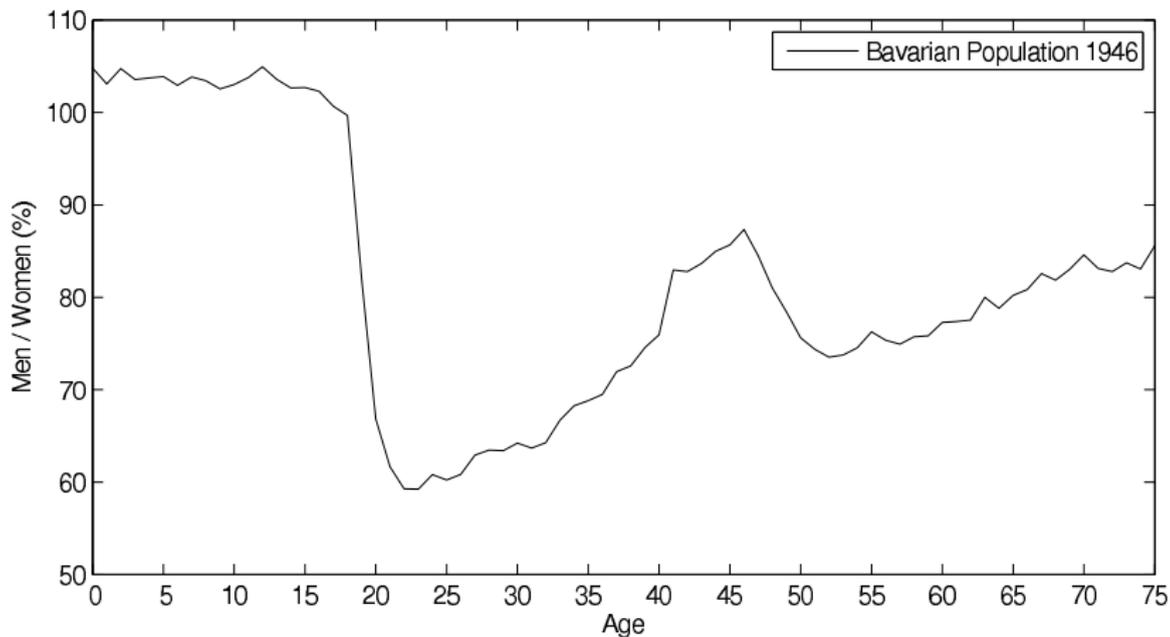
# Background

- Out-of-wedlock fertility in Bavaria, 1900-2005:



## Background

- Sex ratio by age in Bavaria, Oct. 1946 census:



# Background

- Three main groups account for this significant fall in the Bavarian sex ratio after the war:
  - Military casualties: 169,960  
... recorded between Sept 1939 and Dec 1946.
  - Soldiers missing in action (mia): 233,333  
... for 99.3%, last sign of life already before Jan 1946.
  - Prisoners of war: 212,494  
... only 33,000 returned between Oct 1946 and June 1947.

# Background

- Another major population change induced by WWII was the influx of large numbers of refugees, in particular from Silesia and the Sudetenland (19% of Oct 1946 census population):
  - Wild expulsion/flight (until Dec 1945):  
513,000, mainly allocated to north/east Bavaria.
  - Ordered expulsion (Jan-Dec 1946):  
786,00 (+176,000), allocated by authorities based on free housing available.

# Background

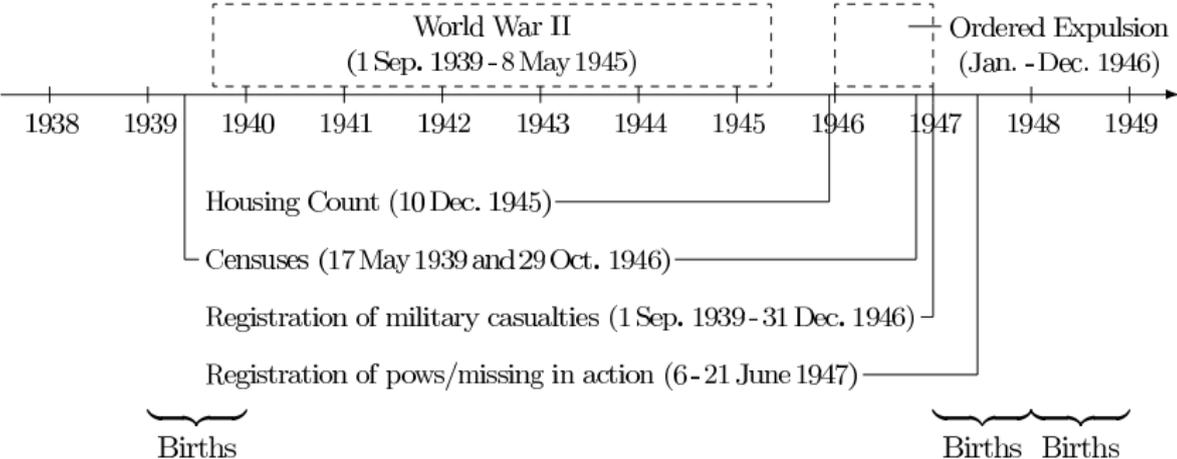
- This inflow of refugees could potentially confound the relationship between sex ratio changes and changes in nonmarital fertility.
- But: unlike peace-time immigrants, no endogenous:
  - migration decision.
  - composition (selection)
  - destination choice.
- Furthermore, refugees were severely restricted in their subsequent freedom of movement at destination.

# Data

- The empirical analysis is based on county-level data for the civilian population in Bavaria in the immediate forefront and aftermath of WWII.
- The data has been compiled from printed publications of the Bavarian Statistical Office and from the periodical "Statistics of the German Empire".
- The data set comprises 156 counties (12 dropped because of territorial changes).
- Censuses carried out on May 17 1939 and October 29 1946 are our primary sources of information.

# Data

- Timeline of data sampling strategy:



# Data

- Data sources for individual variables used in the analysis:

TABLE A.1: DATA SOURCES FOR INDIVIDUAL VARIABLES USED IN THE EMPIRICAL ANALYSIS

	Pre-WWII		Post-WWII		
	1939	1945	1946	1947	1948
Births	BSL (1940)			BSL (1949)	BSL (1949)
Population	SDR (1942a)		BSL (1948c)		
Area (km <sup>2</sup> )	SDR (1942a)		BSL (1948c)		
Refugees			BSL (1948b)		
Military casualties			BSL (1948a)		
Prisoners of war				Swo (1948)	
Soldiers m.i.a.				Swo (1948)	
Catholics	SDR (1942b)		BSL (1948c)		
Housing stock		BSL (1948a)			
Observations	156	150	156	156	156

NOTE: BSL = Bayerisches Statistisches Landesamt (Bavarian Statistical Office), SDR = Statistik des Deutschen Reiches (Statistics of the German Empire).

# Data

- Primary variables of interest:
  - Nonmarital fertility ratio:  
The number of out-of-wedlock births divided by the total number of births in a given year and county.
  - Sex ratio:  
The number of men aged 20-50 relative to the number of women aged 14-40 times one hundred.

# Data

- Summary statistics for Bavarian counties, pre- and post-WWII:

	Year	Mean	Sd	Min	Max
Nonmarital fertility ratio (illegit. births / total births)	1939	9.4	3.8	1.9	24.4
	1947	16.1	3.8	7.0	25.6
	1948	14.4	3.9	4.6	24.8
Sex ratio (men 20-50 / women 14-40) (%)	1939	105.0	8.1	86.9	137.7
	1946	76.5	6.6	63.0	102.7
Population density (population/km <sup>2</sup> )	1939	327.3	649.9	35.6	3,442.1
	1946	373.3	686.4	52.5	3,511.6
Catholics share (%)	1939	74.4	31.2	3.2	99.4
	1946	71.5	24.0	12.9	95.6
War deaths / potential men (%)	1946	7.9	1.0	5.0	11.8
Pows / potential men (%)	1946	10.6	1.8	5.7	13.7
Soldiers m.i.a. / potential men (%)	1946	11.7	1.9	6.6	15.4
Refugee share (%)	1946	21.3	5.8	3.8	33.4
September 1939 housing stock destroyed (%)	1945	4.2	9.3	0.0	74.7
Number of counties: 156 (150)					

NOTE: Potential men are defined as the number of men aged 20-50 in the October 1946 census plus the sum of war deaths, pows, and soldiers missing in action. Six counties lack information on the number of war deaths recorded as of December 1945.

## Identification Strategy

- We run panel regressions with fixed county effects that control for common shifts in out-of-wedlock fertility ratios across time  $t$  (pre-war, respectively post-war period) and counties  $i$ :

$$y_{it} = \theta_t + \delta S_{it} + x_{it}'\beta + \alpha_i + u_{it},$$

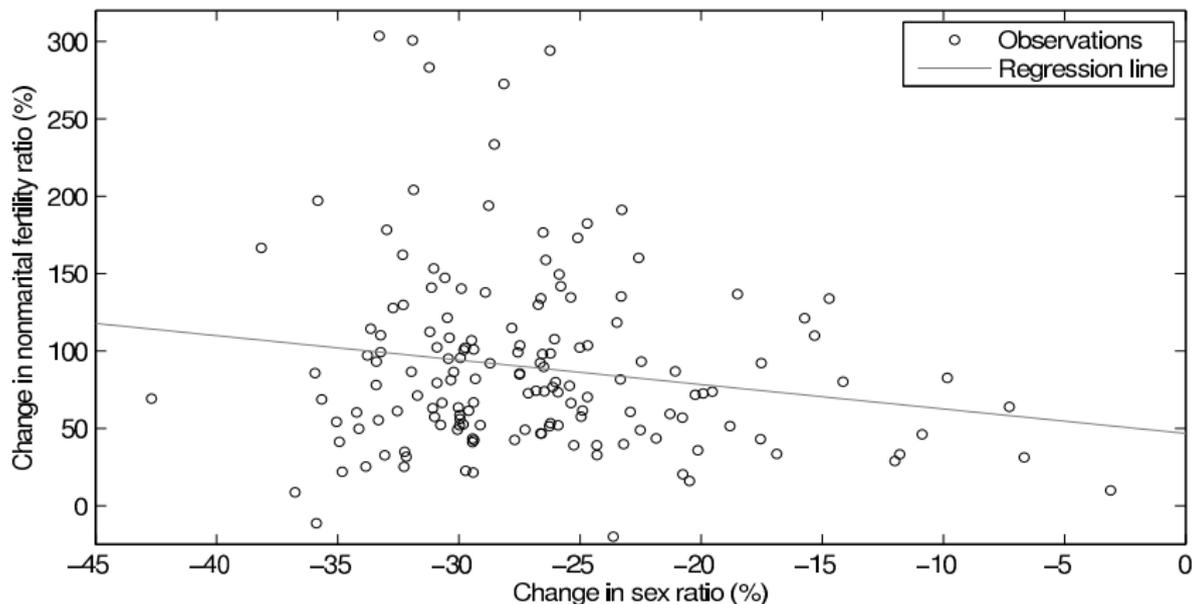
- where:
- $y_{it}$  = county-level nonmarital fertility ratio.
  - $\theta_t$  = dummy for post-WWII observations.
  - $S_{it}$  = county-level sex ratio.
  - $x_{it}$  = vector of time-variant county chrs.
  - $\alpha_i$  = fixed county effect.
  - $u_{it}$  = error term.

## Identification Issues

- We lack data on US occupation forces:
  - But their regional distribution should be uncorrelated with county-level shortfalls of German men induced by WWII.
- We don't control for county-specific time trends:
  - severity of war (break), short time span, and scale of sex ratio changes is likely to flood/render these less important, if indeed they do exist.

# Identification Strategy

- Pre- to post-war percentage changes in sex ratios and nonmarital fertility ratios in Bavarian counties.



## Results

- Fixed-effects estimates for 1939/1947 nonmarital fertility ratio (in logs):

	Model 1	Model 2	Model 3	Model 4	Model 5
Post-war indicator	0.42*** (0.09)	0.55*** (0.09)	0.68*** (0.11)	0.71*** (0.12)	0.71*** (0.12)
Sex ratio (men 20-50/women 14-40)	-0.56** (0.28)	-1.27*** (0.32)	-1.10*** (0.33)	-1.07*** (0.33)	-1.07*** (0.33)
Share non-refugees in population		1.48*** (0.37)	1.72*** (0.38)	1.50*** (0.51)	1.49*** (0.51)
Share 1939 housing stock intact			0.36* (0.18)	0.51* (0.29)	0.51* (0.29)
Population density				-0.23 (0.35)	-0.23 (0.35)
Share catholics in population					0.06 (0.06)
Constant	0.15 (1.28)	-3.36** (1.50)	-6.91*** (2.34)	-5.64* (3.03)	-5.85* (3.04)
Observations	312	312	312	312	312

NOTE: All variables are in logs. \*\*\*,\*\*,\*\*\* denote statistical significance at the 10%, 5%, and 1% level. Standard errors in parentheses.

## Results

- Fixed-effects estimates for 1939/1948 nonmarital fertility ratio (in logs):

	Model 1	Model 2	Model 3	Model 4	Model 5
Post-war indicator	0.36 *** (0.08)	0.48 *** (0.08)	0.60 *** (0.10)	0.63 *** (0.11)	0.63 *** (0.11)
Sex ratio (men 20-50 / women 14-40)	-0.36 (0.24)	-1.02 *** (0.28)	-0.86 *** (0.29)	-0.83 *** (0.29)	-0.83 *** (0.29)
Share non-refugees in population		1.36 *** (0.32)	1.59 *** (0.34)	1.40 *** (0.45)	1.40 *** (0.45)
Share 1939 housing stock intact			0.35 * (0.16)	0.47 * (0.25)	0.47 * (0.25)
Population density				-0.19 (0.30)	-0.20 (0.30)
Share catholics in population					0.04 (0.05)
Constant	-0.77 (1.13)	-3.98 *** (1.32)	-7.37 *** (2.05)	-6.30 ** (2.66)	-6.44 *** (2.67)
Observations	312	312	312	312	312

NOTE: All variables are in logs. \*,\*\*,\*\*\* denote statistical significance at the 10%, 5%, and 1% level. Standard errors in parentheses.

## Results

- Fixed-effects estimates for 1939/1947('48) nonmarital fertility ratio (in logs), using alternative sex ratio definitions:

Sex ratio measure	$\Delta$ mean sex ratio (in %)	Estimated sex ratio coefficient	
	1939 – 1946	1939 – 1947	1939 – 1948
Men 20-40 / women 14-30	-41.1	-1.07*** (0.26)	-0.86*** (0.23)
Men 20-40 / women 14-40	-37.5	-0.74*** (0.26)	-0.59** (0.23)
Men 20-50 / women 14-40	-27.2	-1.07*** (0.33)	-0.83*** (0.29)
Men 20-50 / women 14-50	-27.4	-0.78** (0.34)	-0.62** (0.29)
Observations		312	312

NOTE: The tabulated coefficients were estimated from separate regressions of Model 5 for different sex ratio measures and post-war sampling years of fertility data. Endogenous and explanatory variables are specified in logs. \*,\*\*,\*\*\* denote statistical significance at the 10%, 5%, and 1% level. Standard errors in parentheses.

## Results

- OLS estimates for 1947/1948 nonmarital fertility ratio and rate (in logs):

	1947		1948	
	Ratio	Rate	Ratio	Rate
Sex ratio (men 20-50 / women 14-40)	0.02 (0.23)	0.21 (0.27)	-0.16 (0.23)	-0.08 (0.26)
Pows / women 14-40	-0.32** (0.14)	-0.57*** (0.16)	-0.27* (0.14)	-0.44*** (0.16)
(Soldiers dead or missing in action) / women 14-40	0.35* (0.20)	0.39* (0.23)	0.24 (0.20)	0.33 (0.23)
1939 nonmarital fertility ratio	0.39*** (0.04)		0.52*** (0.04)	
1939 nonmarital fertility rate		0.46*** (0.04)		0.55*** (0.04)
+ Population density				
Share refugees in population				
Share September 1939 housing stock destroyed	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Share catholics in population				
Constant				
R <sup>2</sup>	0.65	0.68	0.73	0.71
Observations	150	150	150	150

NOTE: All variables are in logs. \*\*\*,\*\*,\* denote statistical significance at the 10%, 5%, and 1% level. Standard errors in parentheses.

## Conclusion

- War-induced declines in county-level sex ratios in Bavaria at mid-century have significantly increased county-level nonmarital fertility ratios.
- The effect of these sex ratio changes on the prevalence of nonmarital fertility, however, appears to be mediated by the nature of county-level male shortfalls.
- In particular, a larger fraction of prisoners of war tends to reduce nonmarital fertility, whereas a larger fraction of military deaths and soldiers missing in action tends to increase the prevalence of out-of-wedlock fertility.
- The latter finding underscores the importance to control for expected improvements in the marriage market prospects of individuals, when assessing the effects of sex ratio imbalances.