

ECONOMIC CONSEQUENCES OF WAR: EVIDENCE FROM FIRM-LEVEL PANEL DATA

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Introduction

- economic consequences of wars usually studied at the macroeconomic level
- lost economic growth, post-war reconstruction and efforts aimed into development of the war-struck areas (Collier, 1999)
- microeconomic evidence is still rather scarce, and interested in a wide array of possible effects (household consumption, health, human capital accumulation, violent behavior etc.)
- one of the most obvious channels, the one through firms, is underexplored
- there is only the research by Collier and Duponchel (2013) (survey data, post-conflict only)

Some theory

- Cerra and Saxena (2008) document that output rebounds after war, but not instantly nor evenly
- infrastructure is repaired immediately after the conflict ends, but it takes a lot more time to rebuild the non-materialistic aspects of companies (i.e. human capital, production process, transport security, decline in demand etc.)
- war effects are persistent while at the same time firms grow at a high rate
- one might think that firms are back on their path quickly, while in reality firms are potentially far from their counterfactual

About the war

- Croatian War of Independence 1991–1995
- Croat forces loyal to Croatia—which had declared independence from Yugoslavia
- local Serb forces and Serb-controlled Yugoslav People's Army
- 220,000 Croats/ 300,000 Serbs displaced
- 16,000 Croatian/8,000 Serbian killed or missing soldiers and civilians
- peaceful reintegration of the remaining Croatian territory in 1998

Sources of variation

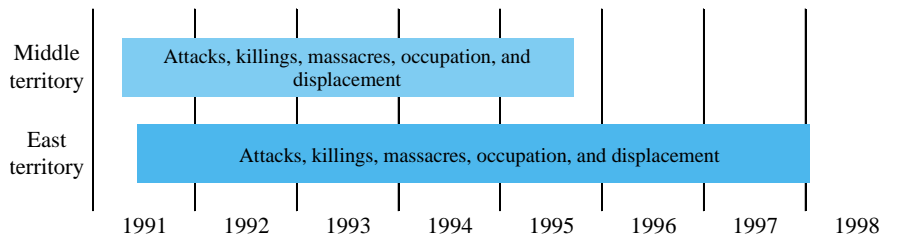
- the dataset and the specific timeline of the war in Croatia gives us enough variation to study post-war firm performance and convergence
- ① we observe firms registered on occupied territory during and after occupation
- ② the duration of occupation differed for municipalities and spanned from only a couple of months to seven years of occupation
- ③ three different political and military approaches are potentially a source of diverse post-conflict firm performance patterns

Three phases of occupation

- ① 1991 to mid 1995—great uncertainty, warfare, and considerable losses in which the occupation of municipalities on the frontline was only short-lived
- ② from mid 1995—all occupied territory (excluding the East part) was returned to Croatia and a process of rebuilding quickly followed
- ③ from January 15, 1998—peace was restored in Croatia, as its full territory was regained by a peaceful reintegration that was internationally monitored

With 1998, a full-blown rebuilding of the country started, and the business environment significantly improved as probability of war basically went down to zero.

Occupation timeline

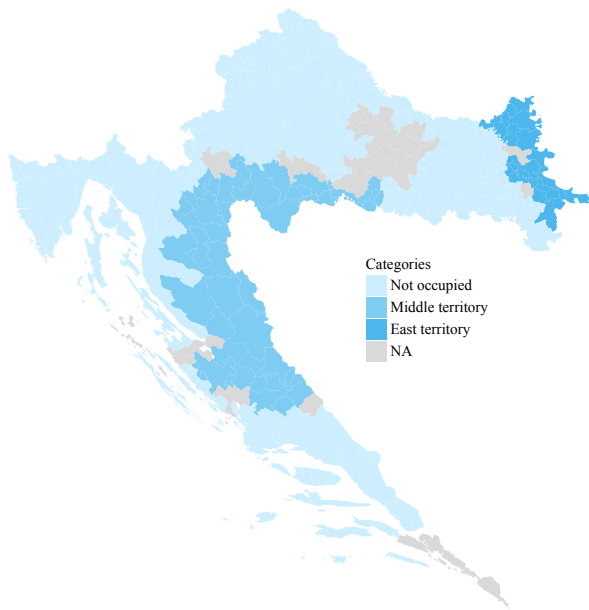


Data

- annual financial reports (balance sheets and profit and loss reports) from 1993 to 2015
- identifiers of firm location, on municipality level: measure occupation duration by municipality, and thus by firms
- 101/556 occupied municipalities; another 10 municipalities partially occupied (from 10 to 50 percent of territory)
- dummy for firm exit: registered in the last year in which the firm filed financial reports (the first year in which we can actually observe exit is 1994)
- firm-specific financial variables: revenues, number of employees and capital

Take only firms that were either never occupied or occupied until 1995 and 1998, as for the firms that were occupied during 1991–1993 we do not observe firm exit.

Territory classification



What we do

- use geographical and time variations to estimate the impact of war on firms
- propose that during occupation firm exit was significantly subdued in the whole country
- find that firm exit and entry rates intensify in occupied areas
- compare different occupation resolutions

Variables

- Croatian Law on areas of special state concerns for detecting municipalities that were occupied during the early nineties
- different website sources to measure occupation duration by municipality, and group firms into the "middle" and "east" group, long and very-long occupation, or violent and peaceful termination
- time-invariant (dummy or factor variable fixed over the time span):
 - ① *War* obtains value 1 if the firm was on occupied territory, even after occupation ceased
 - ② *Occupation indicator* obtains three possible values, 0, 4 or 6.5, that represent years of occupation
 - ③ *Violence* obtains value 1 if the municipality had war casualties, and 0 if it did not (UCDP and manually geomatched with firms location)
- time-variant (dummy or a continuous variable that is not fixed in time):
 - ① *Occupation* is a dummy variable that has 1 only in the years of occupation
 - ② *Duration of occupation* is cumulative years of occupation
 - ③ *Casualties* is the number of casualties corrected by 1991 population

Descriptive statistics for never-occupied territory

Statistic	N	Mean	St. Dev.	Min	Max
revenues	1,551,563	6.2	107.6	0.0	28,103.6
capital	1,551,563	5.0	275.5	0.0	71,786.8
employees	1,551,563	10.622	123.119	0	18,268
entry	1,551,563	0.114	0.317	0	1
exit	1,551,563	0.063	0.242	0	1
location change	1,551,563	0.121	0.357	0	4
war	1,551,563	0.000	0.000	0	0
occupation indicator	1,551,563	0.000	0.000	0	0
violence	1,551,563	0.570	0.495	0	1
occupation	1,551,563	0.000	0.000	0	0
duration of occupation	1,551,563	0.000	0.000	0	0
casualties	1,551,563	0.011	0.189	0	11.1

Notes: Revenues and capital are expressed in million HRK. Mean of *violence* is not equal to 0 because there were civilian casualties in never-occupied territory. For example, the capital Zagreb was never occupied but there were 4 casualties in 1991, and 16 casualties in 1995. As on average 39.3 percent firms are registered in Zagreb, the mean for *violence* is large.

Descriptive statistics for "middle" territory

Statistic	N	Mean	St. Dev.	Min	Max
revenues	21,918	3.6	19.3	0.0	639.7
capital	21,918	3.9	42.4	0.0	1,820.0
employees	21,918	9.149	46.169	0	4,137
entry	21,918	0.135	0.342	0	1
exit	21,918	0.077	0.267	0	1
location change	21,918	0.152	0.398	0	3
war	21,918	1.000	0.000	1	1
occupation indicator	21,918	4.000	0.000	4	4
violence	21,918	0.818	0.386	0	1
occupation	21,918	0.023	0.150	0	1
duration of occupation	21,918	4.482	0.166	2.5	4.5
casualties	21,918	0.053	0.507	0	6.6

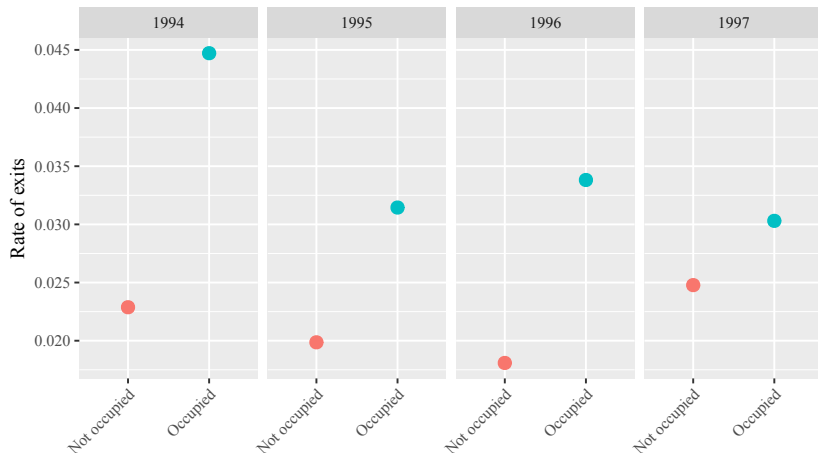
Note: Revenues and capital are expressed in million HRK.

Descriptive statistics for "east" territory

Statistic	N	Mean	St. Dev.	Min	Max
revenues	15,867	6.3	58.1	0.0	3,752.4
capital	15,867	6.4	76.6	0.0	2,623.8
employees	15,867	13.541	86.061	0	2,605
entry	15,867	0.149	0.356	0	1
exit	15,867	0.088	0.284	0	1
location change	15,867	0.146	0.379	0	3
war	15,867	1.000	0.000	1	1
occupation indicator	15,867	6.500	0.000	6.5	6.5
violence	15,867	0.844	0.362	0	1
occupation	15,867	0.033	0.179	0	1
duration of occupation	15,867	6.453	0.355	2.5	6.5
casualties	15,867	0.204	2.851	0	42.3

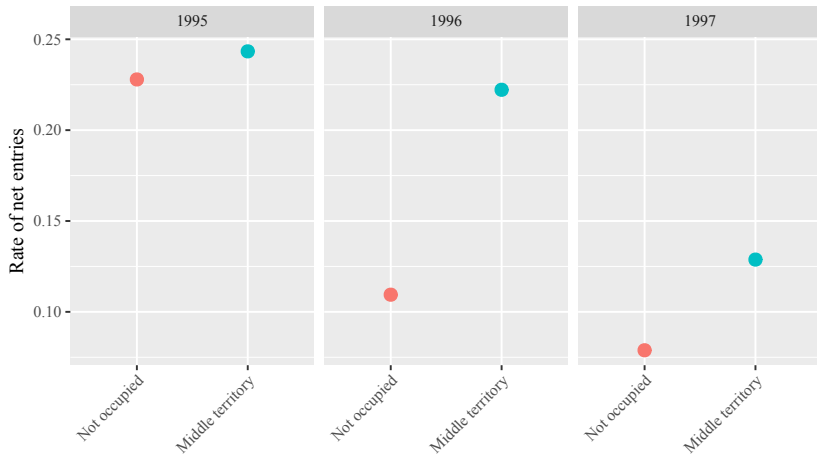
Note: Revenues and capital are expressed in million HRK.

Firm exit during war-time with respect to occupation



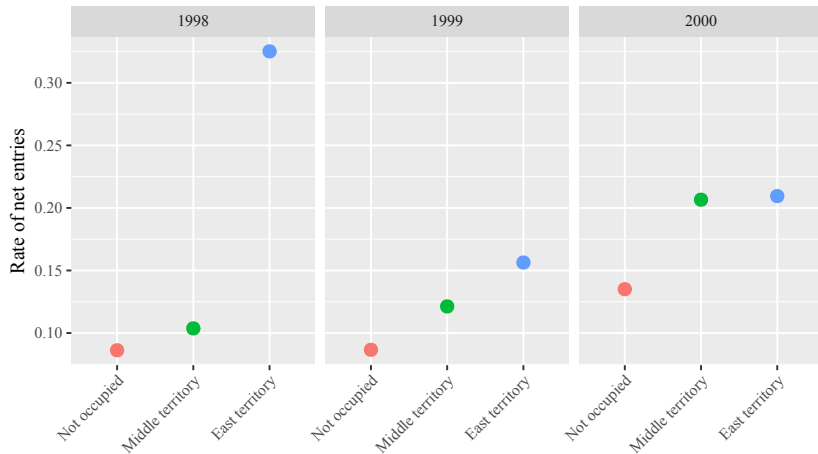
Note: Rate of firm exit is defined as the share of firm exits in the total number of firms.

Short-term recovery patterns: no-occupation vs. "middle" territory



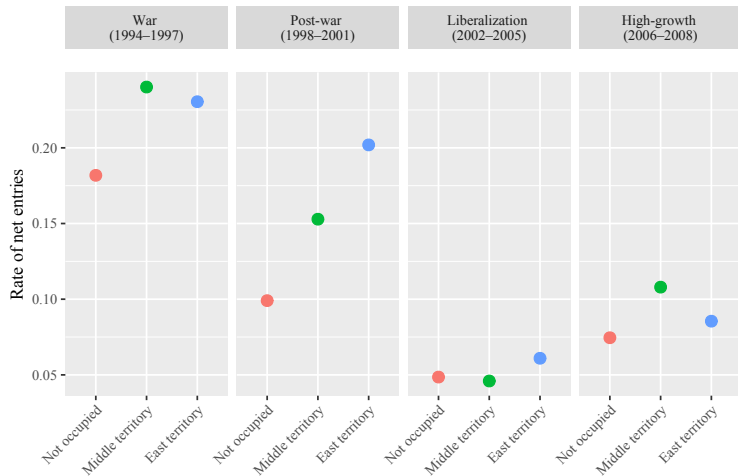
Note: Rate of net entries is defined as the difference between the rate of entries and rate of exits.

Short-term recovery patterns: no-occupation vs. occupation territory



Note: Rate of net entries is defined as the difference between the rate of entries and rate of exits.

Long-term recovery patterns—occupation duration



Note: Rate of net entries is defined as the difference between the rate of entries and rate of exits.

Identification and methodology

- to reduce the impact of unobservables we add fixed effects on the firm level
- standard errors are clustered on the firm level

$$Firm_outcome_{it} = \alpha war_{it} + \sum_{k=1}^K \beta_k X_{kit} + \rho_i + \epsilon_{it}$$

- where i stands for firm, t for year, and k for different covariates
- indicator variable war takes three different specifications
- ρ_i are firm fixed effects
- firm-level covariates such as number of employees, stock of capital and revenues presented by the β_k parameters
- parameter of interest is α as it captures the effect of war on firm outcomes

Effect of war on firm exit (1993–2015)

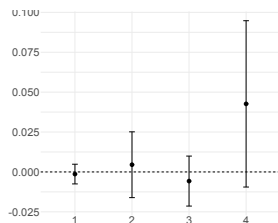
	<i>Dependent variable:</i>					
	firm exit					
	(1)	(2)	(3)	(4)	(5)	(6)
Occupation	-0.027*** (0.006)	-0.038*** (0.007)				
Duration of occupation			0.004*** (0.0003)	0.005*** (0.001)		
Casualties					-0.003*** (0.001)	-0.003*** (0.001)
Employees	-0.001*** (0.0002)	-0.024*** (0.001)	-0.002*** (0.0002)	-0.024*** (0.001)	-0.001*** (0.0002)	-0.024*** (0.001)
Capital	-0.004*** (0.0001)	-0.004*** (0.0001)	-0.004*** (0.0001)	-0.004*** (0.0001)	-0.004*** (0.0001)	-0.004*** (0.0001)
Revenues	-0.007*** (0.0001)	-0.008*** (0.0001)	-0.007*** (0.0001)	-0.008*** (0.0001)	-0.007*** (0.0001)	-0.008*** (0.0001)
Firm fixed effects	No	Yes	No	Yes	No	Yes
Observations	1,589,348	1,589,348	1,589,348	1,589,348	1,589,348	1,589,348

Effect of war on firm exit and entry (1993–1997)

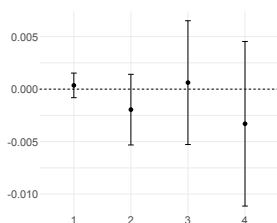
	<i>Dependent variable:</i>					
	exit (1)	entry (2)	exit (3)	entry (4)	exit (5)	entry (6)
Occupation	-0.001 (0.014)	0.252*** (0.028)				
Duration of occupation			0.005 (0.005)	-0.076*** (0.009)		
Casualties					-0.001 (0.001)	0.026*** (0.003)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	144,609	144,609	144,609	144,609	144,609	144,609

Results by capital intensity (1993–1997)

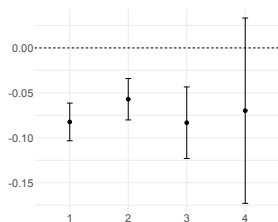
(c) Exit: duration of occupation



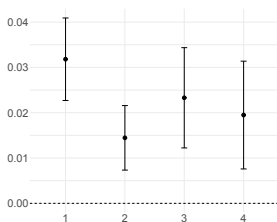
(d) Exit: casualties



(e) Entry: duration of occupation

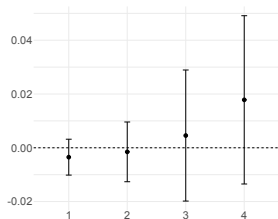


(f) Entry: casualties

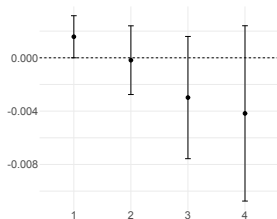


Results by minimum efficient scale (1993–1997)

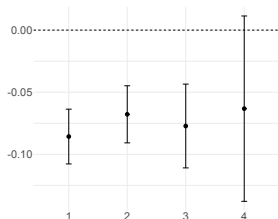
(g) Exit: duration of occupation



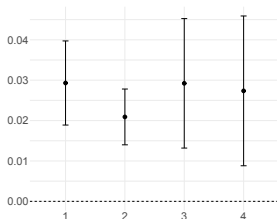
(h) Exit: casualties



(i) Entry: duration of occupation



(j) Entry: casualties



Absence of "exit" effect during war

- most of war-related firm exits occurred in the first two years of conflict (1991 and 1992 for which data are not available) and in 1993 (for which we cannot identify exit)
- the end of conflict was uncertain so firm owners mostly postponed their exit decisions during war-time
- possibly it was not easy to formally close down a firm in time of war

After-war (1998–2015)

	<i>Dependent variable:</i>		
	No occupation	firm exit "Middle" territory	"East" territory
Employees	-0.006*** (0.001)	-0.007 (0.007)	0.024* (0.014)
Capital	-0.003*** (0.0003)	-0.0001 (0.002)	-0.003 (0.004)
Revenues	-0.005*** (0.0004)	-0.003 (0.003)	-0.003 (0.005)
Firm fixed effects	Yes	Yes	Yes
Observations	251,665	3,007	2,203

Noisy firm data? Municipality data

$$\text{Municipality_outcome}_{mt} = \alpha \text{war}_{mt} + \rho_m + \phi_t + \epsilon_{mt}$$

	<i>Dependent variable:</i>					
	exit (1)	entry (2)	net (3)	revenues (4)	employees (5)	capital (6)
Duration of occupation	0.006*** (0.002)	0.028*** (0.008)	0.022*** (0.008)	0.030 (0.126)	0.008 (0.059)	0.442 (0.298)
Casualties	-0.0003 (0.001)	-0.003*** (0.001)	-0.003** (0.001)	0.027*** (0.007)	0.005 (0.008)	0.012 (0.014)
Municipality fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,055	12,055	12,055	12,055	12,055	12,055

Conclusion

- rate of net entries is consistently higher in occupied territories, especially during war and shortly after war
- while longer occupation significantly increases firm exit, having casualties works in the opposite direction
- during occupation firm exit was subdued in the whole country, while firm entry decreased with years of occupation, and increased with casualties
- result for firm entry is robust across different sectors
- different areas behave differently after war (what is driving this?)
- is aggregate data showing more logic?
- look into location changes