The Costs of Remoteness: Evidence from German Division and Reunification

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Motivation

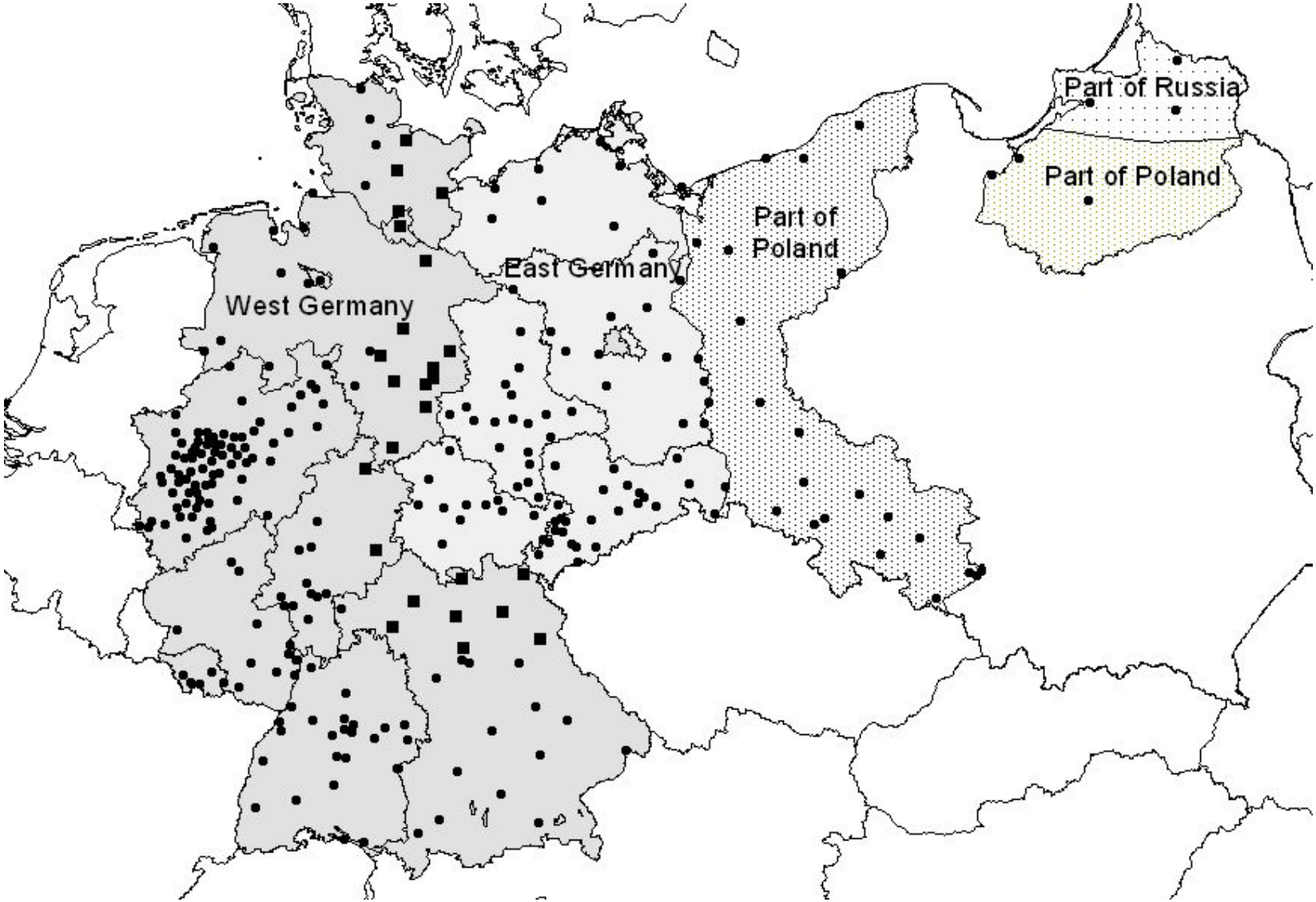
- What determines the spatial distribution of economic activity?
- There are several competing explanations:
  - Institutions
  - Natural advantage
  - Culture
  - Market access
- Very difficult to empirically disentangle the effects of these factors

This Paper

- We exploit German division and reunification as a natural experiment to provide evidence for the importance of market access

- Key Idea: Division and Reunification exogenously changed the relative market access of West German cities

German Pre-war Boundaries



Plan of the Presentation

1. Sketch of the theoretical model
2. Empirical strategy
3. Basic results
4. Further evidence
5. Conclusion

Theoretical Model I

- We consider a standard new economic geography model based on Helpman (1998)
- There are N locations (here cities) which are endowed with an immobile resource (housing)
- Consumer
  - Spend a share μ of their income on manufacturing varieties and the remaining income on the immobile resource
  - Have CES preferences with an elasticity of substitution σ over manufacturing varieties
  - Inelastically supply one unit of labor

Theoretical Model II

- Manufacturing firms have IRS, use labor as the only input and are monopolistically competitive
- Manufacturing varieties are subject to iceberg transport costs T, which are in turn a function of distance ($T_{ij} = dist_{ij}^{\phi}$)
- In the long-run population is perfectly mobile across locations and migration equalizes real wages

Calibration

- We use central values from the existing literature for the three key parameters of the model ($\sigma = 4$, $\mu = 2/3$, and $\phi = 1/3$)
- We calibrate the stock of the immobile resource in each city so that the 1939 distribution of population across cities in pre-war Germany is the (unique) equilibrium of the model
- We simulate the division of Germany and allow the population of the West German cities to adjust to this exogenous shock

Simulate Division I

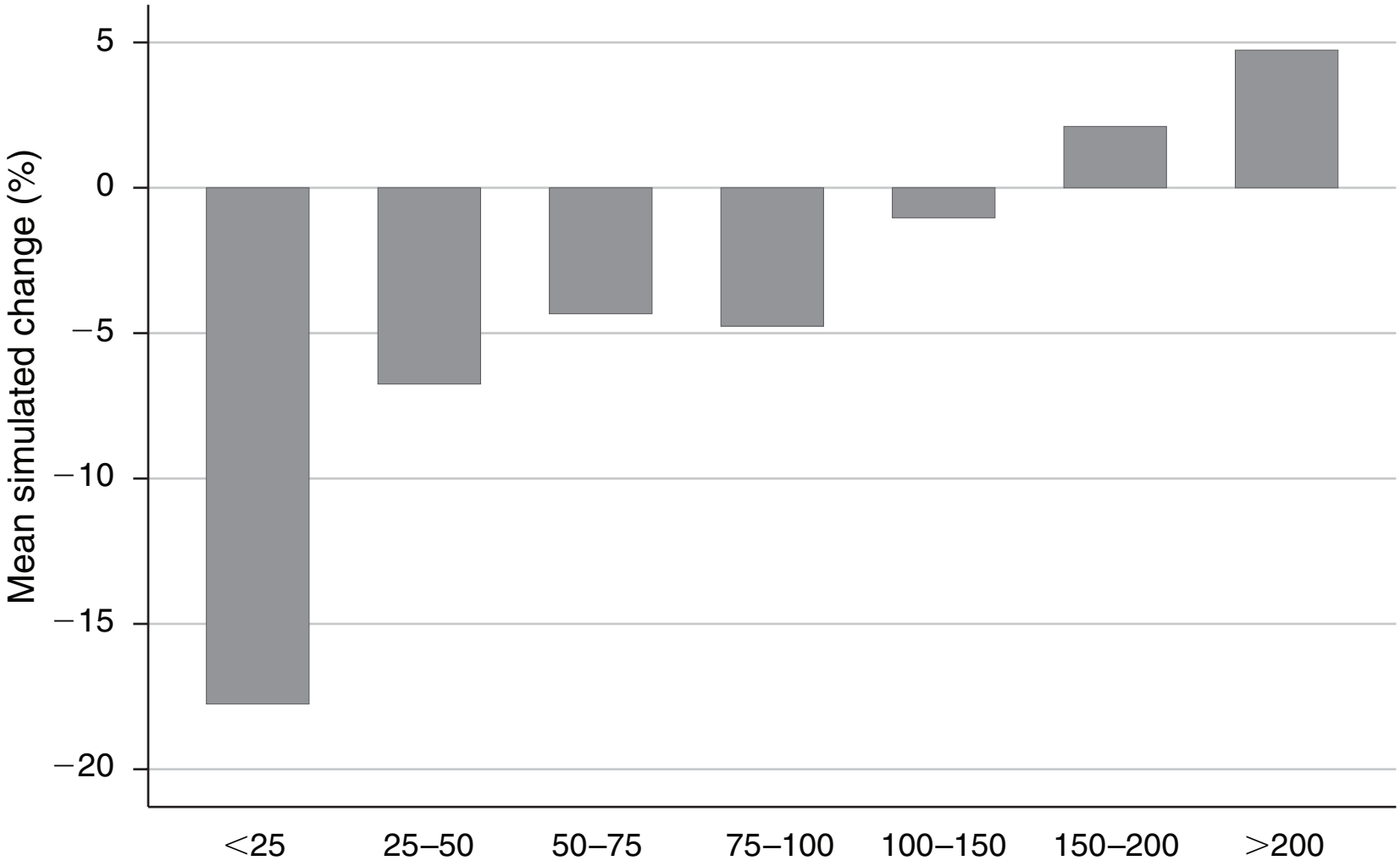


Figure 1. Mean Simulated Change in West German City Population

Simulate Division II

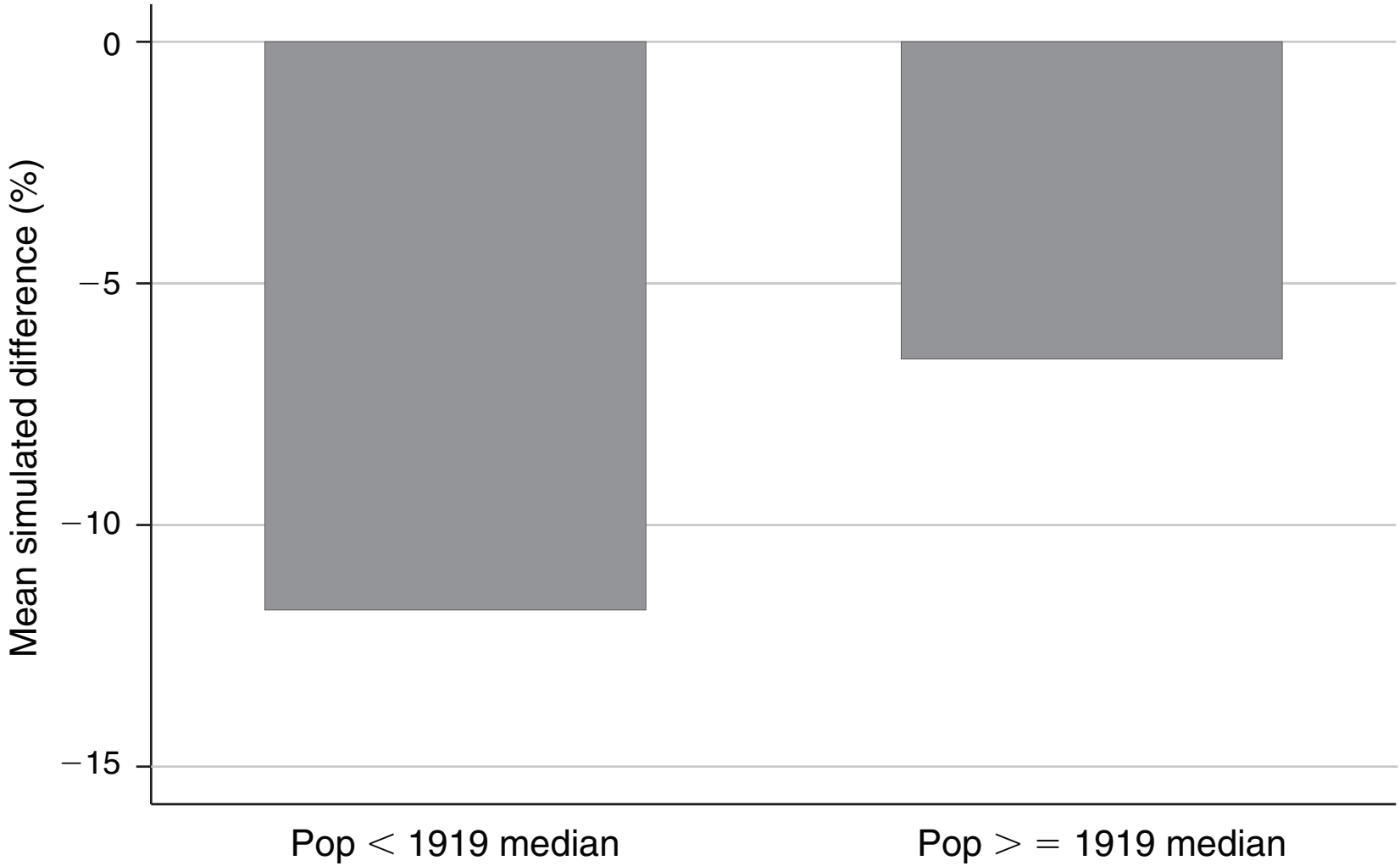


FIGURE 2. DIFFERENCES IN MEAN SIMULATED POPULATION CHANGES

Data

- We focus on a sample of West German cities which had at least 20000 inhabitants in 1919
- We aggregate cities that merge during the sample period
- Observations:
  - Pre-war: 1919, 1925, 1933, 1939
  - Division: 1950, 1960, 1970, 1980, 1988
  - Reunification: 1992, 2002

Basic Empirical Strategy

- Difference-in-Differences Estimation:
  - Compare population growth in West German cities close to the East-West border with other West German cities both before and after division

- Baseline Specification

$$Popgrowth_{ct} = \beta Border_c + \gamma \left(Border_c \times Division_t \right) + d_t + \epsilon_{ct}$$

Border Treatment I

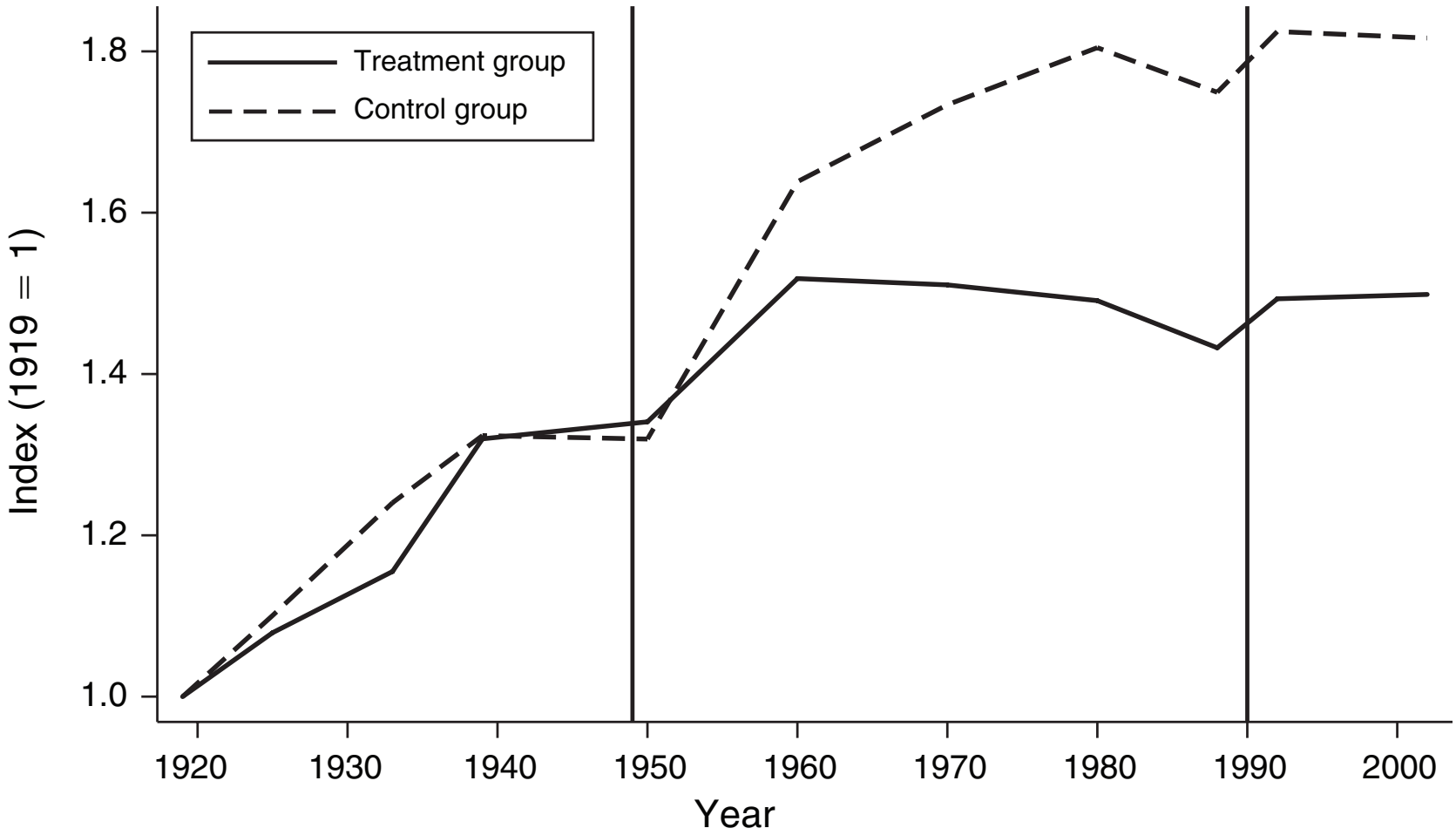


FIGURE 3. INDICES OF TREATMENT AND CONTROL CITY POPULATION

Border Treatment II

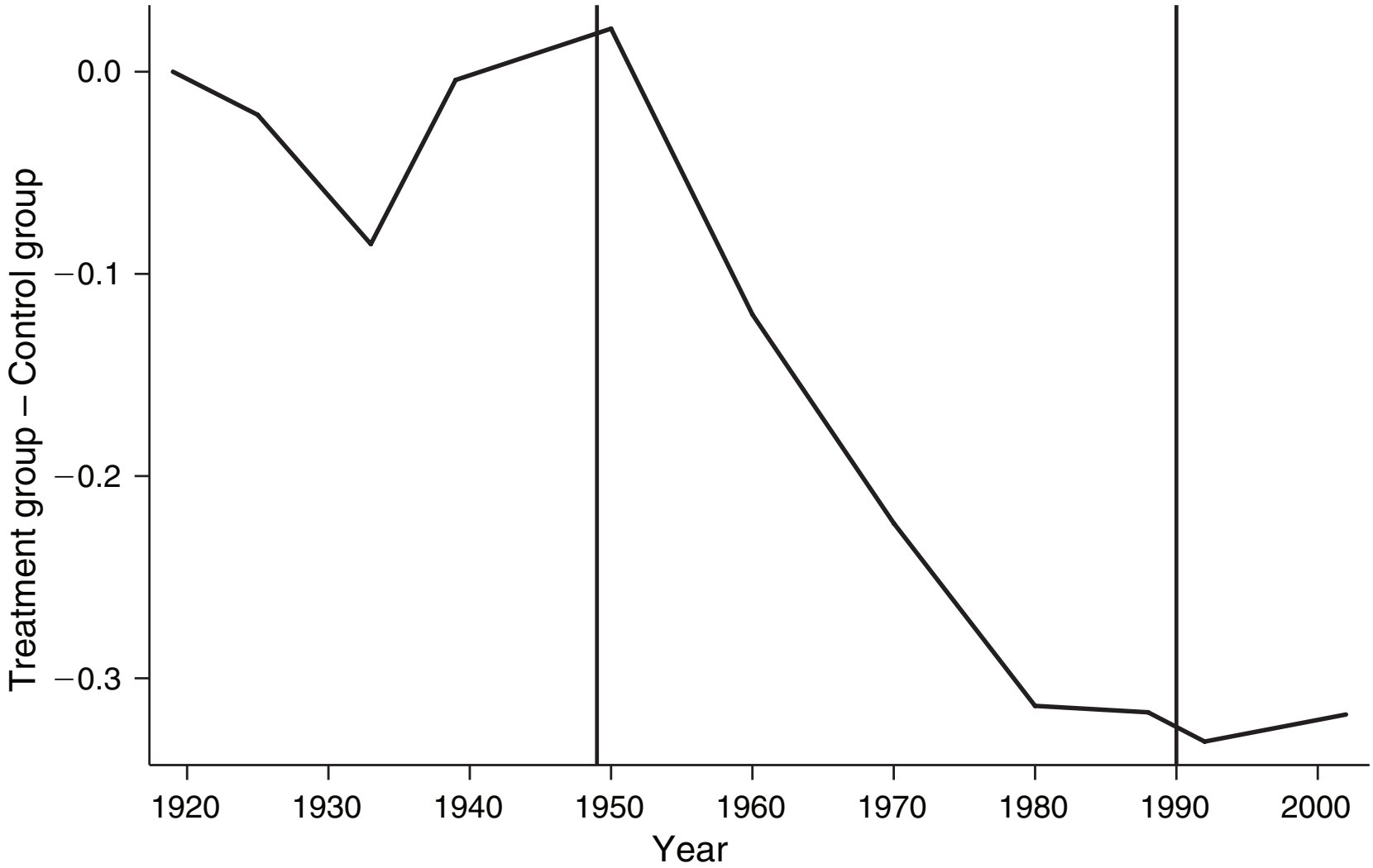


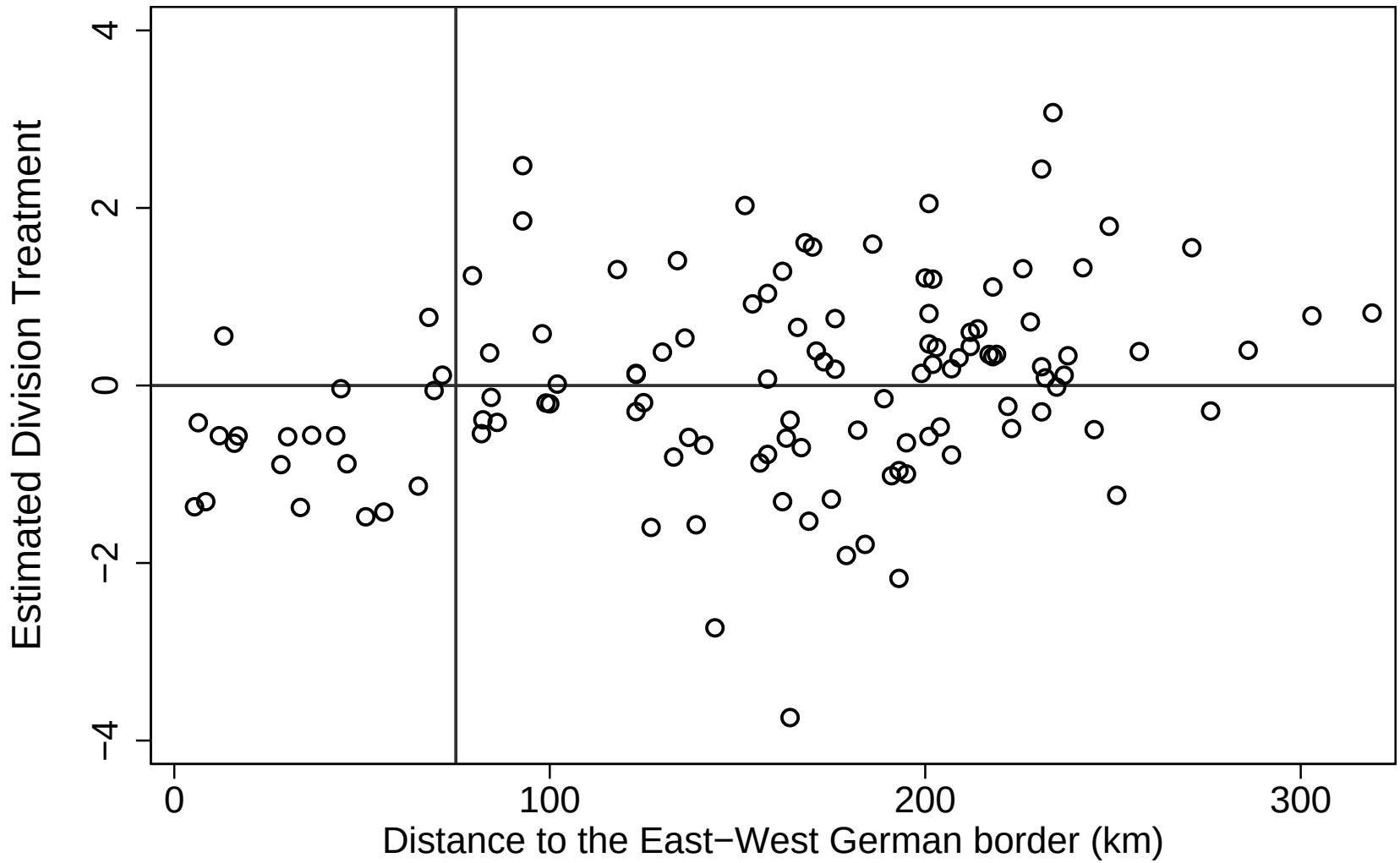
Figure 4. Difference in Population Indices, Treatment–Control

Estimated Treatment

	Population growth				
	(1)	(2)	(3)	(4)	(5)
Border × division	−0.746***			−1.097***	−0.384
	(0.182)			(0.260)	(0.252)
Border × year 1950–60		−1.249***			
		(0.348)			
Border × year 1960–70		−0.699**			
		(0.283)			
Border × year 1970–80		−0.640*			
		(0.355)			
Border × year 1980–88		−0.397***			
		(0.147)			
Border 0–25km × division			−0.702***		
			(0.257)		
Border 25–50km × division			−0.783***		
			(0.189)		
Border 50–75km × division			−0.620*		
			(0.374)		
Border 75–100km × division			0.399		
			(0.341)		
Border 0–25km			−0.110		
			(0.185)		
Border 25–50km			0.144		
			(0.170)		
Border 50–75km			0.289		
			(0.272)		
Border 75–100km			−0.299*		
			(0.160)		
Border	0.129	0.129		0.233	−0.009
	(0.139)	(0.139)		(0.215)	(0.148)
Year effects	Yes	Yes	Yes	Yes	Yes
City sample	All cities	All cities	All cities	Small cities	Large cities
Observations	833	833	833	420	413
R^2	0.21	0.21	0.21	0.23	0.30

Non-parametric Estimates

Figure 5: Non−parametric Division Treatment Estimates



Is it Really Loss of Market Access?

- The decline of the cities along the East-West border is consistent with our model
- There is no simple explanation for the decline in terms of institutions, endowments or culture
- However, there are other possible explanations for the decline:
  - Differences in industrial structure
  - Differences in war-related disruption
  - Western Economic Integration
  - Fear of further armed conflict

Quantitative Analysis of the Model

- Can the model not only qualitatively, but also quantitatively account for the decline of the cites along the East-West border?

- To compare moments in the simulation and the data, we undertake a grid search over 21 values of each parameter:
  - Elasticity of substitution (σ) from 2.5 to 6.5
  - Share of tradeables in expenditure (μ) from 0.65 to 0.85
  - Distance elasticity of transport costs (ϕ) from 0.10 to 1.10

Identification

- We first show that the relative decline of the East-West border cities is a well-behaved function of two relationships:
  - The strength of agglomeration and dispersion forces: $\sigma(1-\mu)$
  - The coefficient on distance: $(1-\sigma)\phi$

- We pin down values for $\sigma(1-\mu)$ and $(1-\sigma)\phi$ by comparing the predictions of the model with our two key empirical findings:
  - The relative decline of the East-West border cities
  - The more pronounced relative decline of smaller cities

Identification

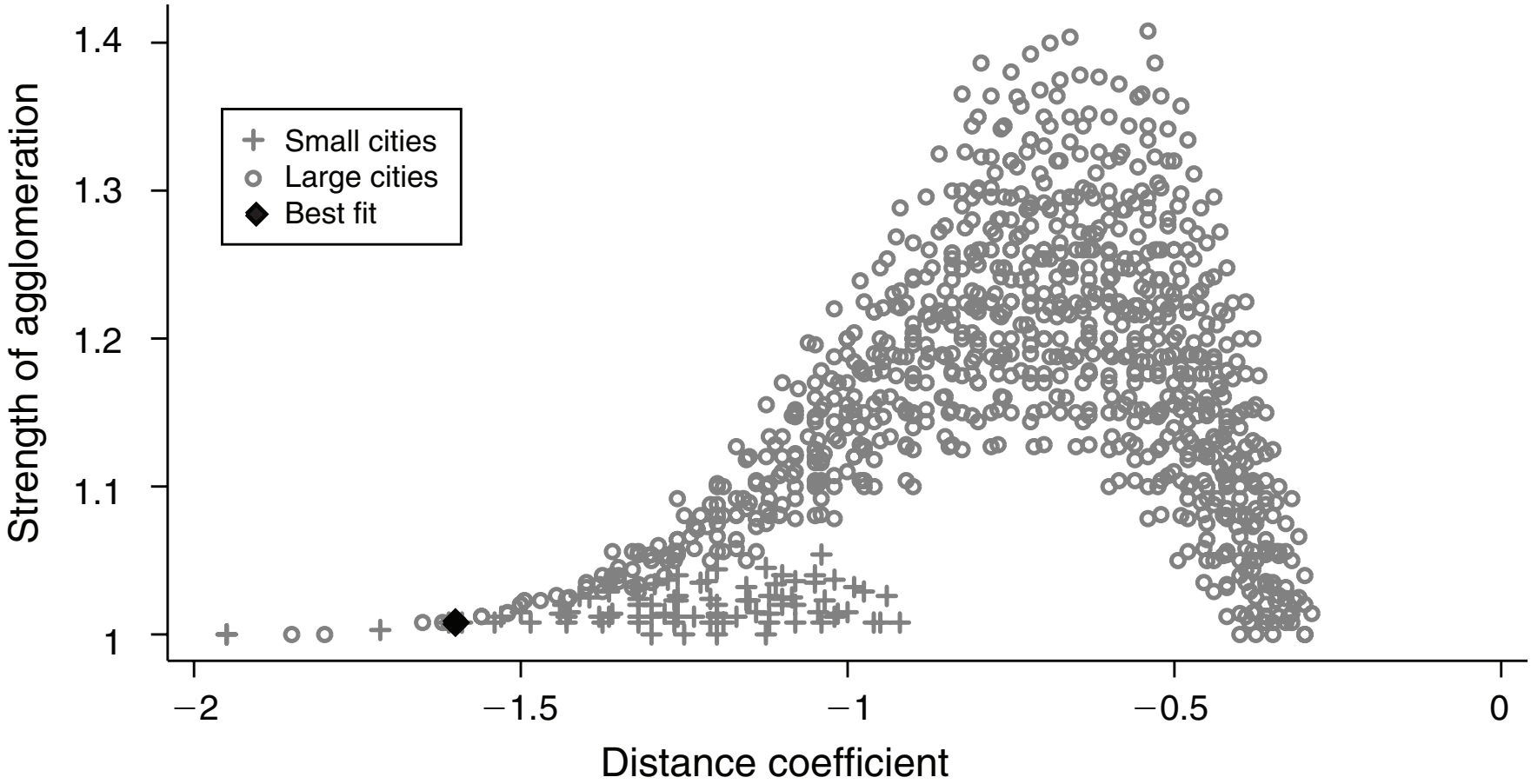


FIGURE 5. SIMULATED DIVISION TREATMENTS

Simulated and Estimated Treatments

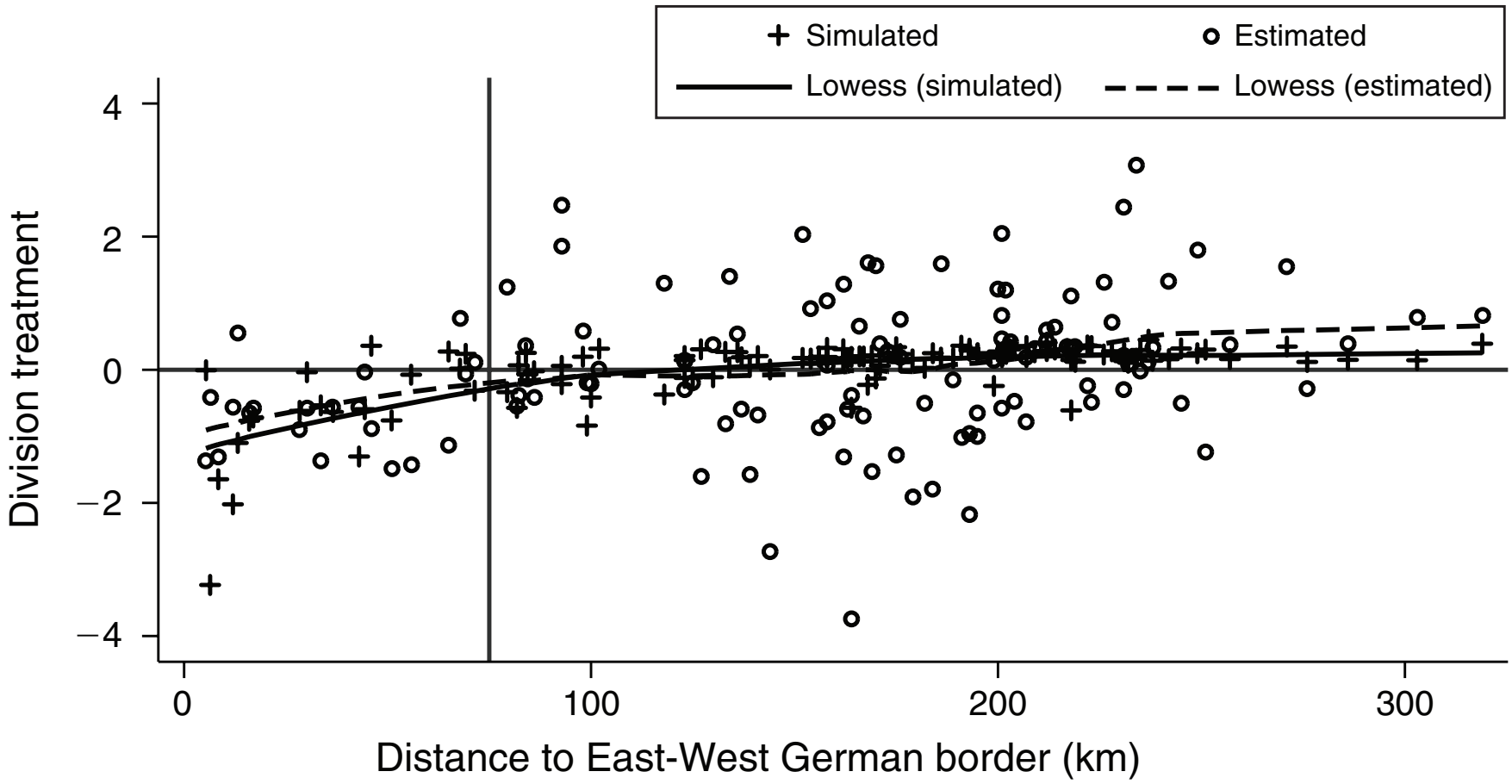


FIGURE 6. SIMULATED AND ESTIMATED DIVISION TREATMENTS

City Structure

- Maybe the cities along the East-West border declined because they were specialized in industries that declined after the war
- To control for this possibility we match each treatment city to a control city that is as similar as possible in terms of observed characteristics

Matching

TABLE 4—MATCHING

	Population growth			
	(1)	(2)	(3)	(4)
Border × division	−0.921***	−1.000***	−0.888***	−0.782***
	(0.218)	(0.253)	(0.247)	(0.261)
Border	0.309*	0.338**	0.082	0.061
	(0.153)	(0.156)	(0.167)	(0.194)
Year effects	Yes	Yes	Yes	Yes
Matching on	Population	Total employment	Employment in 28 sectors	Employment in 28 sectors and geography
Observations	280	280	280	280
R^2	0.29	0.26	0.38	0.29

War-related Disruption

- Could differences in destruction or refugee flows have affected cities post-war growth performance?
- To control for this possibility we include measures of the degree of war-related disruption in the regression and allow their effect to vary over time

War-related Disruption

TABLE 5—CONTROLLING FOR WAR DISRUPTION

	Population growth		
	(1)	(2)	(3)
Border × division	−0.737***	−0.656***	−0.678***
	(0.182)	(0.191)	(0.211)
Border	0.136	0.129	0.029
	(0.139)	(0.146)	(0.167)
War disruption × year 1919–25	−0.014	−0.004	0.004
	(0.011)	(0.006)	(0.020)
War disruption × year 1925–33	0.019	0.006	−0.018
	(0.017)	(0.007)	(0.019)
War disruption × year 1933–39	−0.001	0.004	0.064**
	(0.023)	(0.009)	(0.028)
War disruption × year 1950–60	0.073***	0.033***	−0.056**
	(0.015)	(0.008)	(0.026)
War disruption × year 1960–70	0.012	0.009	−0.006
	(0.017)	(0.007)	(0.026)
War disruption × year 1970–80	−0.014	0.004	0.062*
	(0.025)	(0.012)	(0.034)
War disruption × year 1980–88	0.007	0.002	0.009
	(0.013)	(0.006)	(0.020)
Year effects	Yes	Yes	Yes
War disruption measure	Rubble	Dwellings	Refugees
Observations	777	756	833
R^2	0.24	0.24	0.24

Western Integration

- West Germany experienced considerable economic integration with Western Europe in the post-war period
- Can Western integration (at least partly) explain the relative decline of the cities along the East-West border?

Western Integration

TABLE 6—CONTROLLING FOR WESTERN ECONOMIC INTEGRATION

	Population growth	
	(1)	(2)
Border × division	−0.730***	
	(0.204)	
Border	0.045	
	(0.151)	
Western border × division	0.032	
	(0.226)	
Western border	−0.162	
	(0.152)	
Border 0–25km × division		−0.675**
		(0.297)
Border 25–50km × division		−0.756***
		(0.240)
Border 50–75km × division		−0.593
		(0.403)
Border 75–100km × division		0.426
		(0.372)
Western border 0–25km × division		0.421
		(0.383)
Western border 25–50km × division		0.488*
		(0.289)
Western border 50–75km × division		−0.375
		(0.338)
Western border 75–100km × division		−0.140
		(0.351)
Border distance grid cells		Yes
Western border distance grid cells		Yes
Year effects	Yes	Yes
Observations	833	833
R^2	0.21	0.23

Fear of Further Armed Conflict

- Several pieces of evidence suggest that fear of a further armed conflict cannot explain the decline of the East-West border cities:
  - Difficult to square with the larger decline of small cities and our quantitative analysis
  - There is no evidence of a negative effect of proximity to the East-West border in centrally planned East Germany
  - There is no evidence of stronger treatment effects close to strategic points along the border ("Fulda Gap")
  - Nuclear deterrence made a small scale war very unlikely
  - No evidence that another war was an everyday concern

Reunification

- Do we observe a reversal of fortune in the cities along the East-West border after reunification?

- There are good reasons to be sceptical:
  - The size and income of the area added is much smaller compared to division
  - Heavy subsidies for the border cities are rapidly discontinued
  - While division abruptly severed all links between East and West Germany, the re-creation of such links after reunification is likely to take time

Reunification

TABLE 7—THE IMPACT OF REUNIFICATION

	Population growth			
	(1)	(2)	(3)	(4)
Border × division	−0.477***	−0.127	−0.223	−0.007
	(0.156)	(0.128)	(0.202)	(0.136)
Border	−0.141	−0.141	−0.236	−0.064
	(0.106)	(0.106)	(0.168)	(0.108)
Year effects	Yes	Yes	Yes	Yes
City sample	All	All	Small cities	Large cities
Year sample	1950–1988 & 1992–2002	1980–1988 & 1992–2002	1980–1988 & 1992–2002	1980–1988 & 1992–2002
Observations	595	238	120	118
R^2	0.30	0.15	0.21	0.14

Summary

- West German cities close to the East-West border substantially decline after division relative to other West German cities
- The evidence suggests that this decline can be largely explained by the change in market access of these cities
- While institutions and natural advantage are certainly also important, market access plays a substantial role in determining economic prosperity

Thank You