Empirical Evidence on the local labour market impact of immigration

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27th March 2012

Motivation

What are the **effects of immigration on labour markets?**

specifically on ...

- employment and wage levels in affected locations?
- employment and wages of exposed natives?

Motivation:

- intense interest, large body of work
- controversial subject, conflicting standpoints, little convergence
- total welfare: migrant perspective is most important
- but political economy is driven by the perspective of natives

More generally, migration is interesting as it reveals adjustment mechanisms (and its magnitudes, timing) in labour markets.

Abstract

We exploit a **natural experiment** in which German districts were differentially affected by **immigrant inflows from Czechoslovakia after the fall of the iron curtain**.

- we use microdata that covers all German workers who are subject to social security contributions
- observe geographic variation in immigrant supply as determined by the natural experiment
- analyse the impact of immigration on labour market outcomes in exposed areas and of exposed native workers

The Literature

How does immigration affect labour markets in host countries?

Two **main problems**:

1. the selection problem
   immigrants settle where the economy is doing well
2. general equilibrium adjustments
   natives/firms/capital/... respond to and internalise shock

Empirical findings:

- ambiguous
- most area studies find no or small impact of immigration on native outcomes

The Literature

The selection problem

- recent literature relies predominantly on supply-shift instruments
  Altonji and Card, (1991)
- small number of papers exploit natural experiments
  Card (1990), Hunt (1992), Carrington and Delima (1996), Friedberg (2001), Mansour (2010), Glitz (forthcoming)

General equilibrium adjustments

- disagreement on their importance, e.g. on native out-migration
  Borjas, Freeman and Katz (1997), Card and DiNardo (2000), Card (2001), Borjas (2006), Card (2007), Peri and Sparber (2011)

A third problem: statistical inference

- variation in aggregate outcomes over time need to be accounted for if migrants cluster in specific dimensions (location, occupation)
- not possible if only two cross-sections observed (before/after shock)
  e.g. see Angrist and Krueger (1999), Abadie and Hainmueller (2010)

Political background - Fall of the iron curtain

German Democratic Republic (GDR):

- Mass protests, mass flights of East Germans via Hungary and Czechoslovakia from May 1989. Fall of the Berlin wall on Nov. 9, 1989. *"German reunification"* concluded by October 3, 1990

Czechoslovak Socialist Republic (CSSR):

- Mass protests from Nov. 1989 ("Velvet revolution"). Nov. 15: *exit visas* for travel to the west abolished. Nov. 28: communist party relinquishes power, CSSR becomes Czech and Slovak Federal Republic (CSFR)

Characteristics of border change

- Early 1990: CSFR dismantles fences, barricades and monitoring systems. July 1990: Germany abolishes visa requirements for Czechoslovakians. From January 1st 1991, inflow of Czech workers under **commuting scheme** *"Grenzgängerregelung"*.

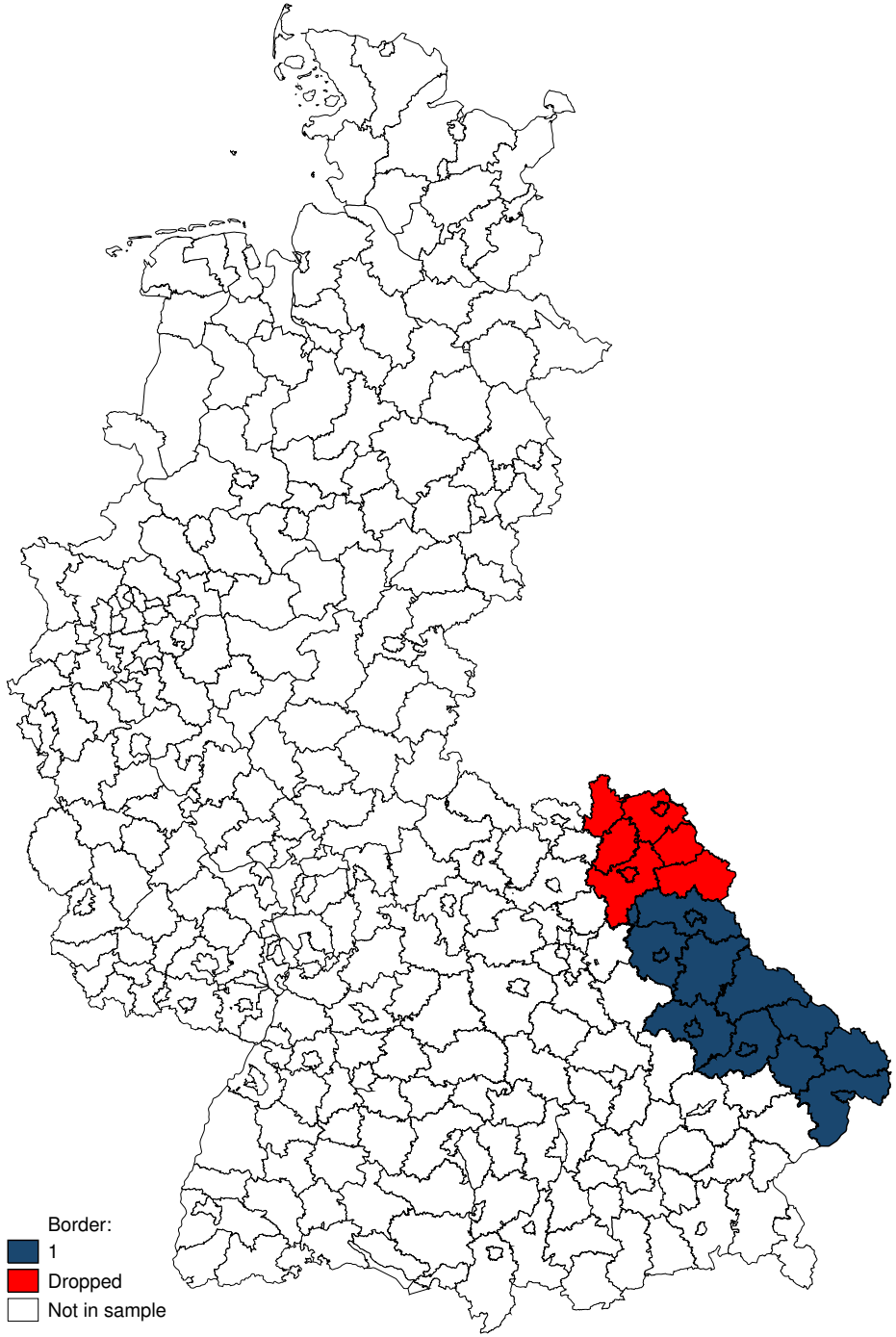
The commuting scheme "Grenzgängerregelung"

Since January 1st 1991 Czechoslovakians could receive work permit if they commute to a place of residence in CSFR

- valid for districts within a band of approx. 100km from border
- no restrictions on type of work
- similar policies existed with other neighbouring countries

Can be exploited as **natural experiment**:

1. **unexpected** (at least until 1989/90)
2. **exogenous** to local labour market conditions:
   - fall of the iron curtain was not caused by relative performance of Bavarian border region vs. other German regions
   - commuting scheme was determined by national policy


Border:
1
Dropped
Not in sample


Employment shares of Czech nationals
Border and Inland
0
.005
.01
.015
.02
.025
.03
1975
1980
1985
1990
1995
2000
2005
year
Border
Inland

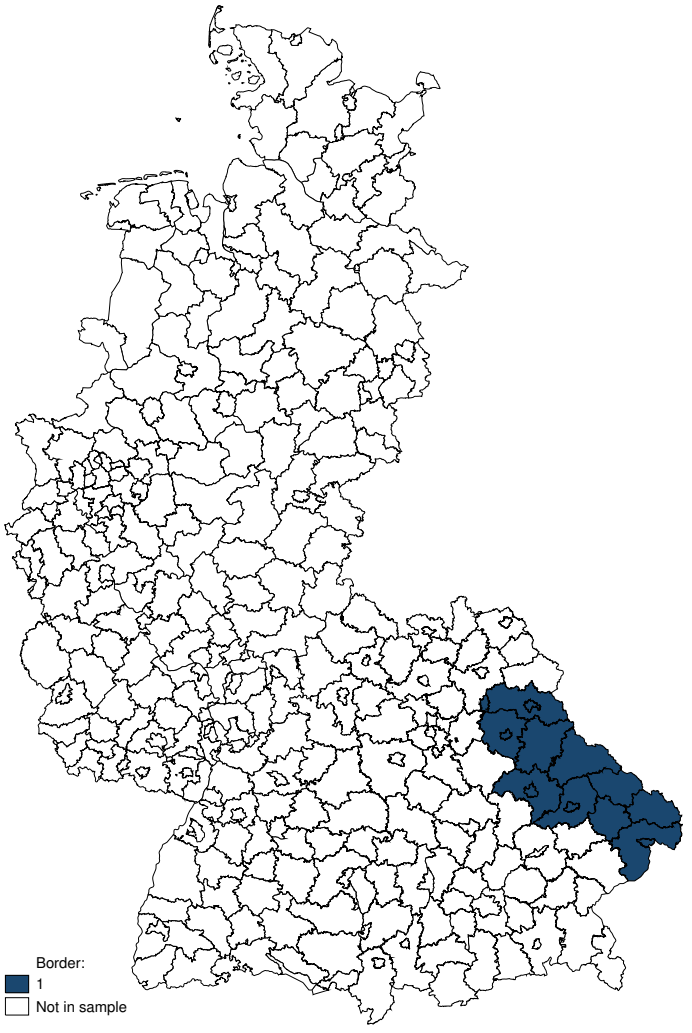
Advantages

(1) Natural experiment

- unexpected labour supply shock, exogenous to local labor market conditions

(2) Distance to border as an IV

- Czech workers had to commute
- distance to border was thus an important determinant of distribution of migrants *within* border region
- can be exploited by using distance to border as an instrument for Czech inflows



Affected border districts

Advantages

(3) We observe large shock, variation in shock

- predicted inflow of Czech workers of more than 10% of local employment in municipalities that are close to the border
- large variation in magnitude of shock across municipalities/districts

(4) Data

- Panel, 1975-2007
  can observe variation in aggregate labour market outcomes over time
- Microdata: we observe almost all workers
  can observe changes in small geographic units or subgroups, and can follow individuals over time
- Administrative data, no attrition

Data and sample selection.

Data and Sample Selection

German social security records
provided by the Institute for Employment Research (IAB)

- covers all workers subject to social insurance contribution
  ca. 75% of working population, excludes self-employed and civil servants
- panel, 1975-2007, in spell form
  measure individual status on June 30th of each year
- approx. 300.000 observations per year in *border region*
- merge with unemployment data (IAB benefit recipients data)

A few issues:

- commuters from former GDR affect local labour markets
  exclude districts that are close to former inner German border
- large amount of workers disappear in 1988 / reappear in 1989
  in two districts, in military establishments -> NATO manoeuvre REFORGER 88
- wages right-censored for 5-10% of workforce
  impute wages on (district x year x sex) level

Control districts

Difference-in-differences strategy sensitive to common trend assumption, thus match control districts with similar characteristics.

Potential control districts:

1. only consider **West-German districts** districts that have similar **urban density** as border districts
2. exclude districts that are close to inner German border
3. **match** control districts that are close in a set of characteristics

▸ Matching procedure

The labour supply shock.


Employment shares of Czech nationals
Border and Inland
0
.005
.01
.015
.02
.025
.03
1975
1980
1985
1990
1995
2000
2005
year
Border
Inland

Distribution over time

Opening of border for Czech commuters (from January 1st, 1991) caused a large and rapid inflow of Czech workers into the border region.

- Czech employment share culminates at 2.6% in 1992
- declines only slightly until 1995, then more rapid decline

We only exploit initial rise, not subsequent decline, since the latter was probably not unexpected, and not exogenous to local conditions.

Table: Characteristics of Czech nationals in border region (in 1992)

	Non-Czech	Czech
female	0.411	0.161
	(0.492)	(0.367)
low education	0.179	0.497
	(0.383)	(0.500)
medium education	0.781	0.496
	(0.414)	(0.500)
high education	0.0407	0.0074
	(0.198)	(0.0857)
age	36.61	34.05
	(11.15)	(8.600)
log wages (censored)	4.097	3.822
	(0.424)	(0.310)
log wages (imputed)	4.196	3.857
	(0.357)	(0.274)
industry share tradables	0.449	0.509
	(0.497)	(0.500)
industry share publicsector	0.170	0.0217
	(0.376)	(0.146)
establishment size	526.4	143.4
	(1347.6)	(406.0)
N	410,486	10,149

mean coefficients; sd in parentheses

Spatial distribution

Compute distance to border:

1. obtain geocoordinates for each border crossing/district/municipality
2. for each district/municipality, calculate airline distance to nearest border crossing
   similar results when using street travel time instead of airline distances

"1st-stage" regression:

- regress Czech employment shares on distance measures
- on district or municipality level

Spatial distribution

Table: Spatial distribution of Czech nationals in border region

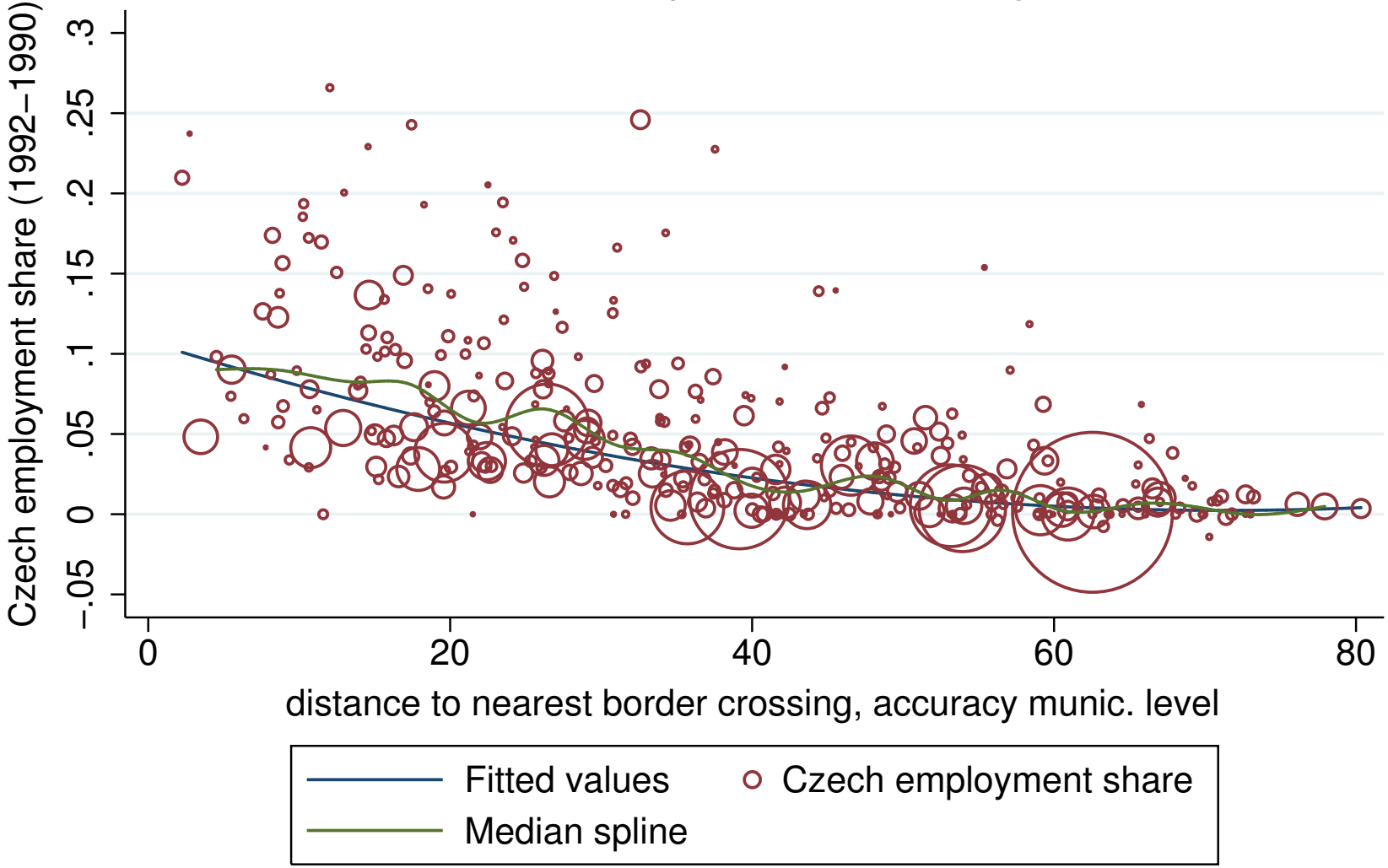
	(1)	(2)
	czechshare_91_90	czechshare_92_90
distance	-0.00180***	-0.00317***
	(-4.85)	(-4.22)
distance_sq	0.0000144***	0.0000231**
	(3.46)	(2.70)
_cons	0.0573***	0.112***
	(7.61)	(7.64)
N	332	332
R^2	0.397	0.462
$F(2, 329)$	47.45	63.79

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Spatial distribution of Czech nationals

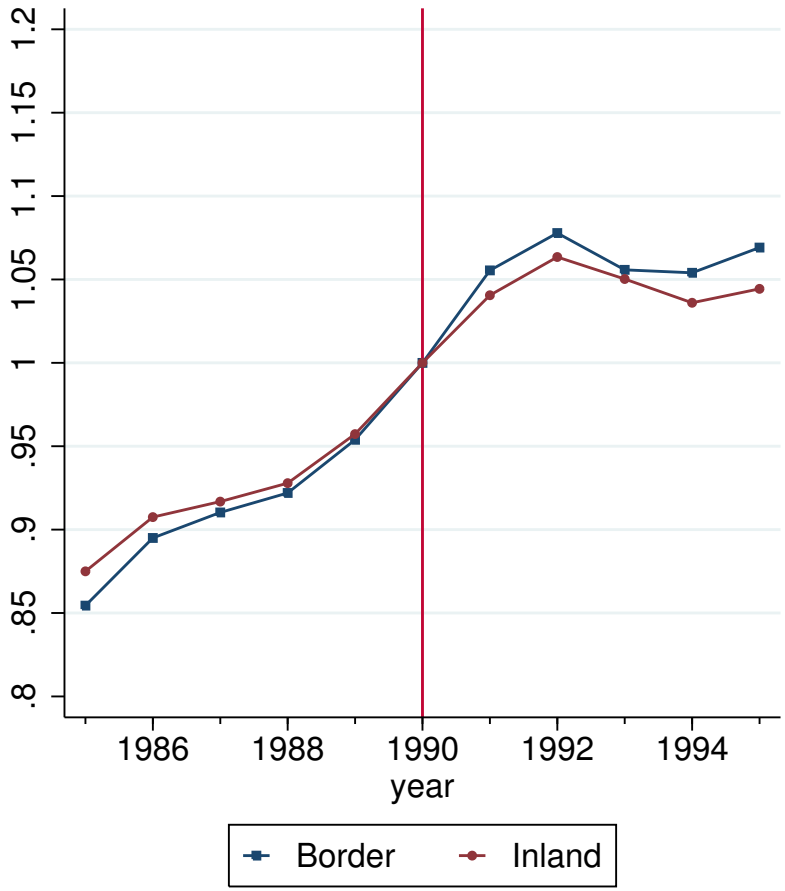
across municipalities in border region

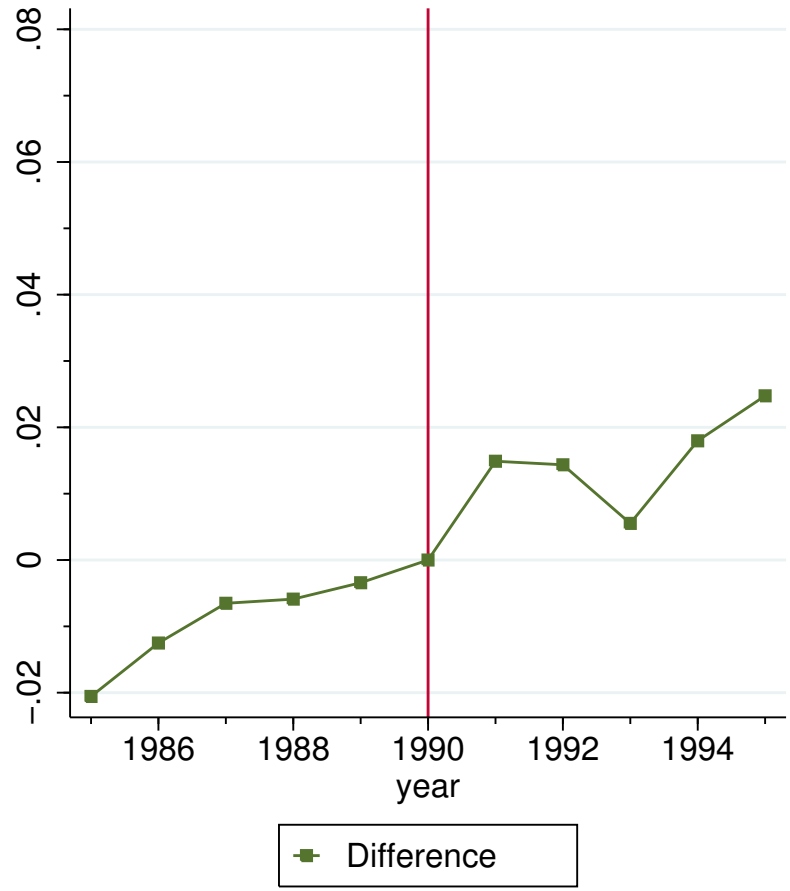


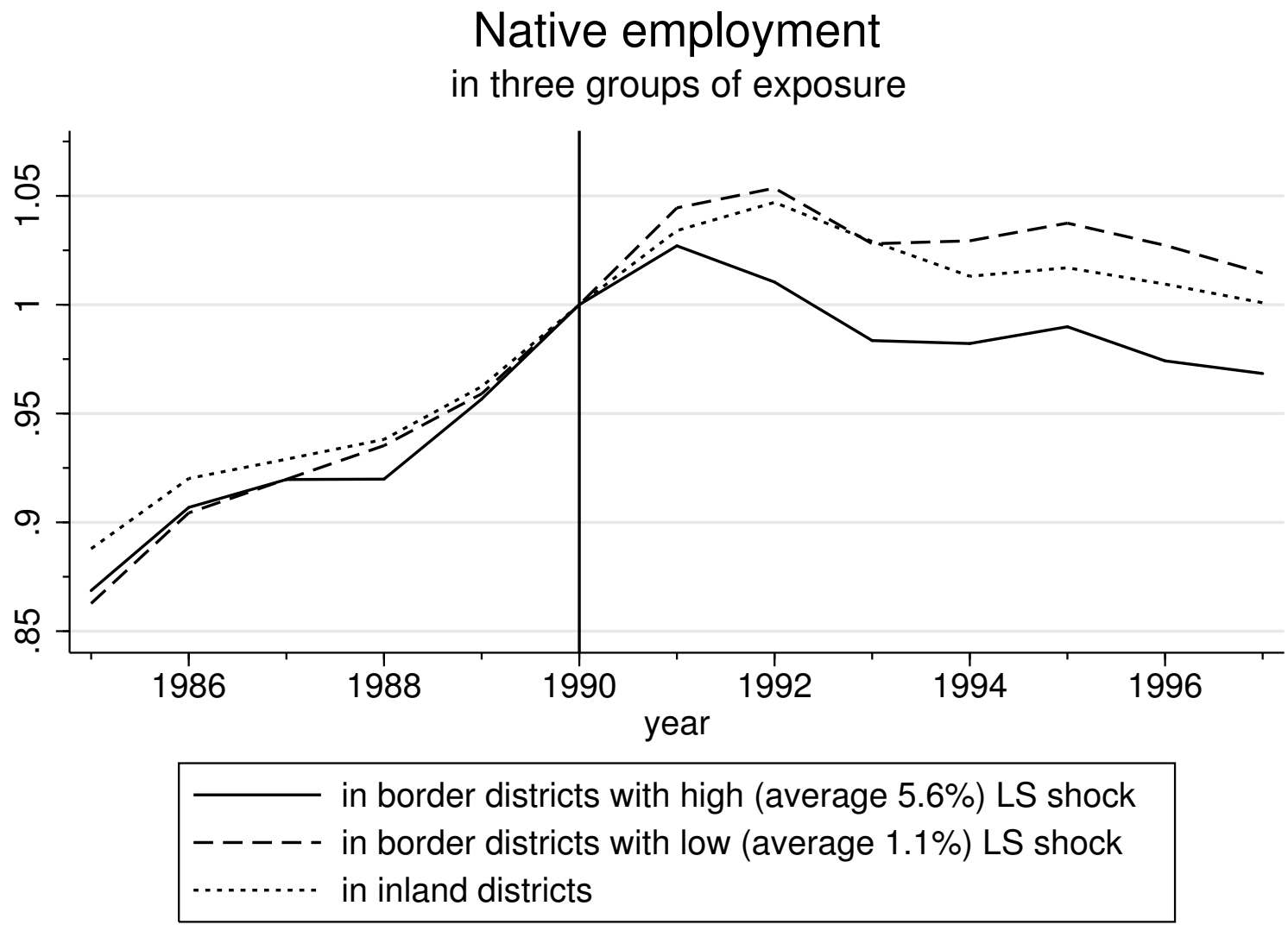
Empirical Results, Employment and Native Employment.

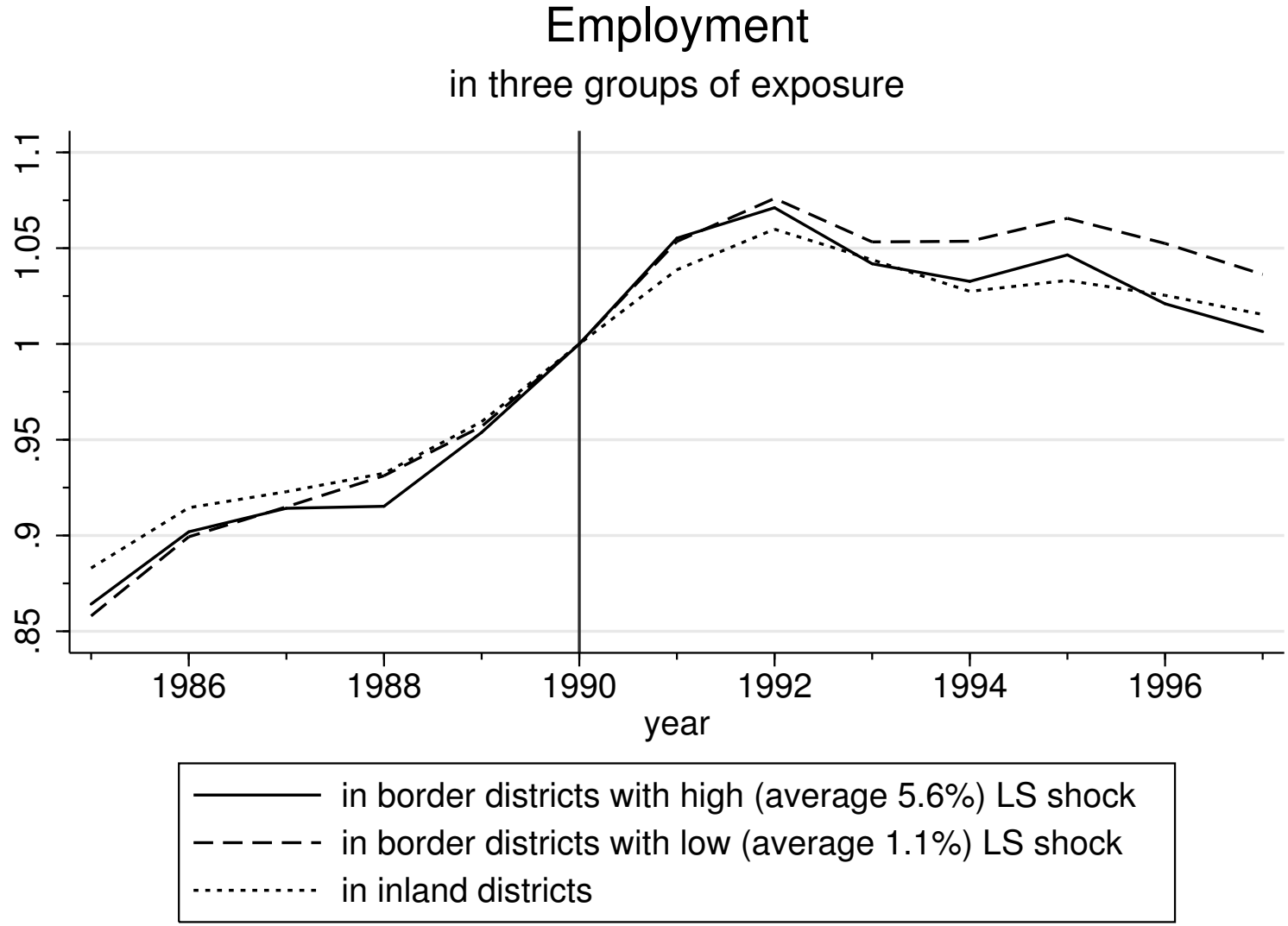
Employment growth border vs. inland

relative to employment 1990






Native employment
in three groups of exposure
.85
.9
.95
1
1.05
1986
1988
1990
1992
1994
1996
year
in border districts with high (average 5.6%) LS shock
in border districts with low (average 1.1%) LS shock
in inland districts


Employment
in three groups of exposure
.85
.9
.95
1
1.05
1.1
1986
1988
1990
1992
1994
1996
year
in border districts with high (average 5.6%) LS shock
in border districts with low (average 1.1%) LS shock
in inland districts

Native employment response

Exploit variation on district / municipality level

Native employment response

Native employment regression derived from theoretical model given by

$$\frac{native_{j,t'} - native_{j,t}}{native_{j,t}} = \alpha_t + \delta_t \frac{czech_{j,1992} - czech_{j,1990}}{czech_{j,1990}} + \varepsilon_{j,t},$$

where j denotes municipalities or districts.

Weights: employment level in 1990 x matching weights x full-time equivalent units

Motivated by simple theoretical model in which natives respond to local wage changes (e.g. by out-migration or leaving/entering the labour force).

▸ Model

Native employment response

Table: Native employment estimates, **district level**

	Native employment growth		
	(1)	(2)	(3)
	1990-1991	1990-1992	1990-1993
czechshare_92_90	-0.149	-0.682**	-0.817***
	(-1.09)	(-3.27)	(-3.59)
_cons	0.0380***	0.0510***	0.0306***
	(9.45)	(7.93)	(4.95)
N	49	49	49

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Native employment response

Table: Native employment estimates, **municipality level**

	Native employment growth		
	(1)	(2)	(3)
	1990-1991	1990-1992	1990-1993
czechshare_92_90	-0.204	-0.778***	-0.962***
	(-1.75)	(-4.10)	(-4.17)
_cons	0.0387***	0.0521***	0.0321***
	(10.63)	(8.95)	(6.21)
N	1430	1429	1425

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

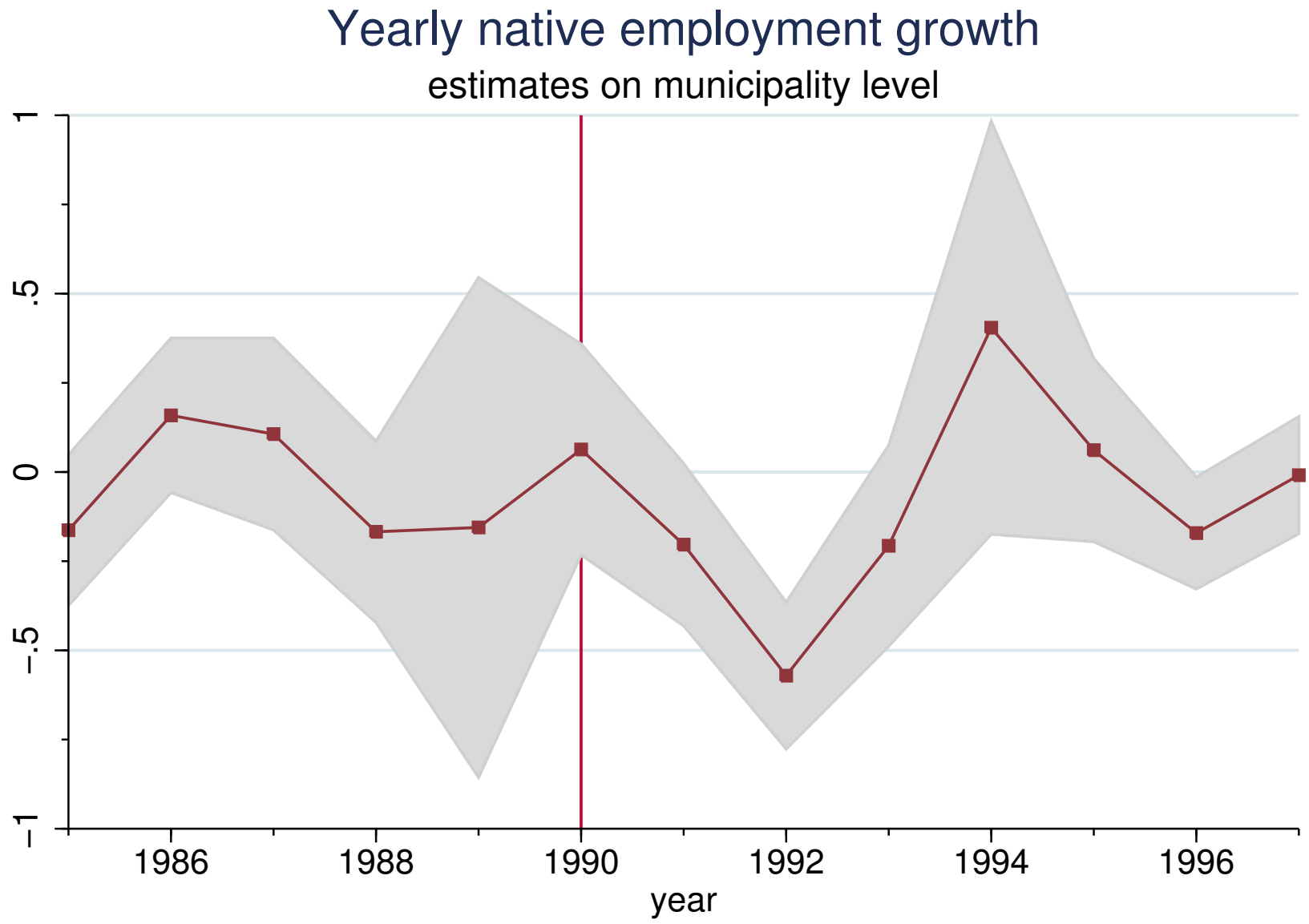
Native employment response

Table: **Yearly** native employment estimates, **municipality level**

	Native employment growth		
	(1)	(2)	(3)
	1990-1991	1991-1992	1992-1993
czechshare_92_90	-0.204	-0.571***	-0.207
	(-1.75)	(-5.44)	(-1.44)
_cons	0.0387***	0.0130***	-0.0190***
	(10.63)	(4.73)	(-7.19)
N	1430	1428	1422

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$


Yearly native employment growth
estimates on municipality level
1
.5
0
−.5
−1
1986
1988
1990
1992
1994
1996
year

Native employment response

Table: Native employment est. across specifications, municipality level

	Native employment growth 1990-1993	
	(Spec. A)	(Spec. B)
czechshare_92_90	-0.962***	-0.660*
	(-4.17)	(-2.56)
_cons	0.0321***	0.0176*
	(6.21)	(2.33)
N	1425	893

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Size of estimates depend on choice of control regions

for example, range of estimates on native employment growth in 1990-1993 is [-0.66,-1.2] across specifications, stat. significant (p<0.05) in all cases.

Native employment response

We find:

1. **a large impact**
   almost full (one-to-one) displacement of native employment
2. **a rapid response** from the first year of the shock
   displacement fully realised one year after full exposure

- arguments in the literature that wages need to be measured *shortly* after immigrant inflow in order to measure factor price elasticity as of potential native responses
- we find that wage responses would needed to be analysed *immediately* after immigrant inflow since response in native employment is rapid
- not practical: (i) typically inflows occur more sluggishly, and (ii) wages will not respond immediately
- one cannot abstract from general equilibrium adjustments

1. **a partial rebound**
   of native employment levels approx. two years after full exposure

Native employment across subgroups

In theoretical models immigration can have a negative impact on native employment and wages typically as of two main mechanisms:

1. sluggishness of capital adjustment (short-run)
2. imperfect substitution between different types of labour

To judge the relative importance of these mechanisms we analyse the impact of Czech inflows across educational groups.

Native employment across subgroups

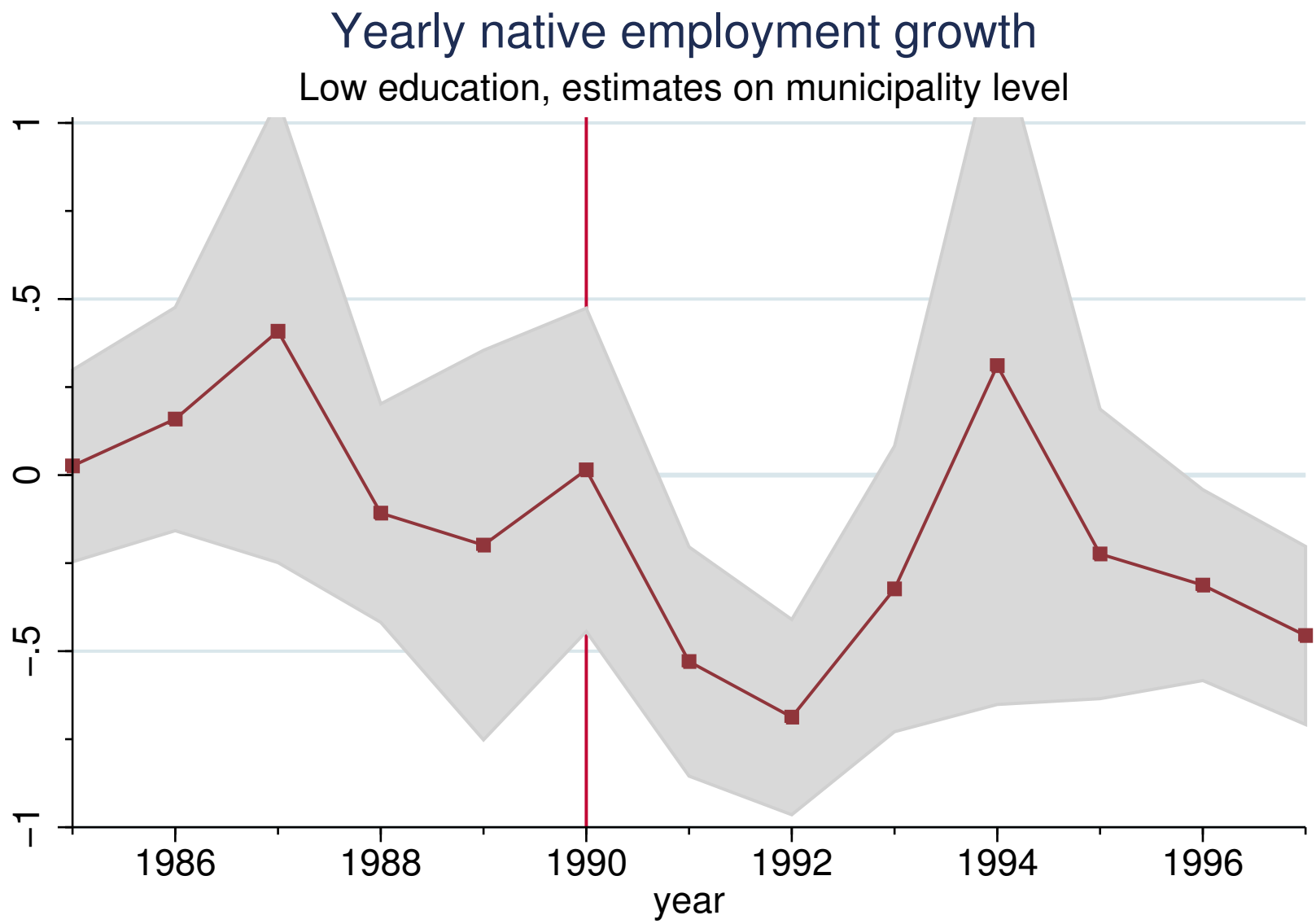
education

Table: Native employment est. **by education group**, municipality level

	Native employment growth, 1990-1993		
	(1)	(2)	(3)
	Low education	Medium education	High education
czechshare_92_90	-1.351***	-0.512*	-0.626
	(-4.94)	(-2.31)	(-0.78)
_cons	-0.122***	0.0540***	0.177***
	(-16.93)	(10.19)	(11.85)
N	1338	1419	1044

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$


Yearly native employment growth
Low education, estimates on municipality level
1
.5
0
−.5
−1
1986
1988
1990
1992
1994
1996
year

Yearly native employment growth

Medium education, estimates on municipality level


Yearly native employment growth
High education, estimates on district level
1
.5
0
−.5
−1
1986
1988
1990
1992
1994
1996
year

Results:

- much stronger impact on natives that have similar education levels to Czechs
- but decrease in employment is substantial and statistically significant even for groups of natives whose relative supply *decreases*
- the role of sluggish capital adjustment or other factors that constrain local labour demand seems thus large in the short-run

Does native employment of higher education groups rebound fully in the long-run?

- analyses of the impact of migration based on (CES) imperfect substitutability assumptions would otherwise tend to underestimate the impact of migration

Native employment across subgroups

men vs. women

Table: Yearly native employment estimates, municipality level

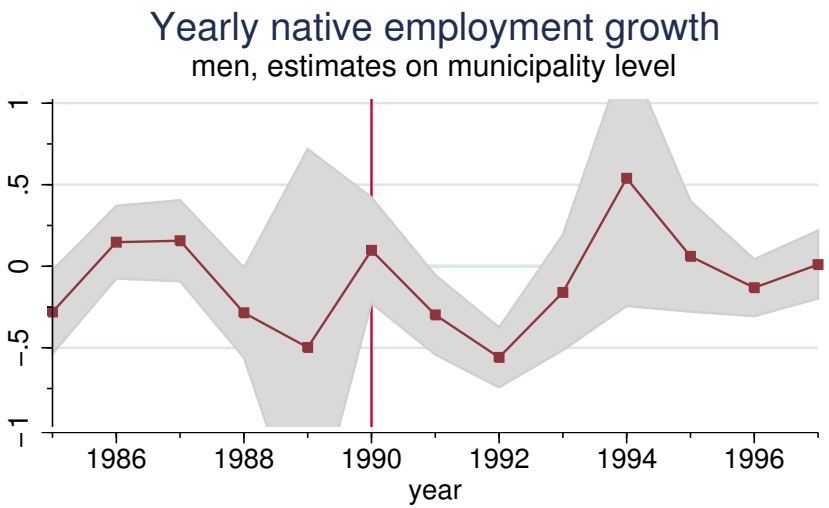
	Native employment growth		
	1990-1991	1990-1992	1990-1993
	men	men	men
czechshare_92_90	-0.298*	-0.856***	-0.986***
	(-2.40)	(-4.54)	(-4.00)
_cons	0.0366***	0.0435***	0.0240***
	(7.78)	(5.98)	(4.13)
	women	women	women
czechshare_92_90	-0.0560	-0.652**	-0.914**
	(-0.39)	(-2.63)	(-3.26)
_cons	0.0420***	0.0655***	0.0448***
	(12.40)	(13.22)	(7.42)

t statistics in parentheses

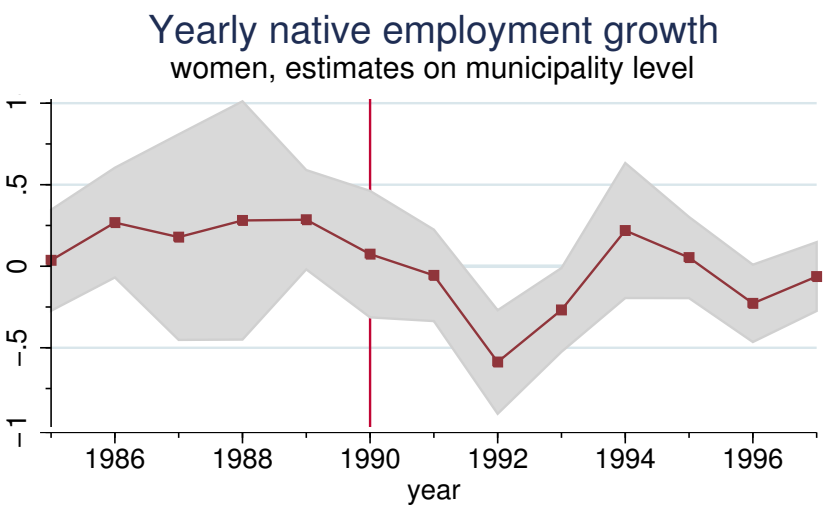
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Native employment across subgroups

men vs. women



men



women

Native employment across subgroups

	Native employment growth		
	1990-1991	1991-1992	1992-1993
		below age 30	
czechshare_92_90	-0.295	-0.726***	0.0500
	(-1.89)	(-4.63)	(0.34)
		age 30-39	
czechshare_92_90	-0.212	-0.440***	-0.204
	(-1.54)	(-4.81)	(-0.98)
		age 40-49	
czechshare_92_90	0.371*	-0.0761	0.109
	(2.21)	(-0.61)	(0.54)
		age 50 and above	
czechshare_92_90	-0.519***	-0.769***	-0.823***
	(-4.01)	(-5.48)	(-5.10)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Native employment across subgroups

Subgroups that are less similar to the characteristics of the Czech migrants are not only ***less*** affected, but they are also affected ***later***.

Potential explanations:

1. sampling error
2. differences in job security across subgroups?
   could potentially explain pattern across education and age groups, but not differences in women vs. men
3. immigrants might initially compete against similar workers, but impact dissipates into less similar subgroups over time, maybe ...

   - because migrants "upgrade" after acquiring country-specific HC, or once their initially preferred occupations/industries become too crowded
   - because natives in strongly exposed occupation/qualification cells enter other (adjunct) cells
   - because firms shift demand to factor that is now in larger supply

Empirical Results, native wages.

Native wages

Wage regression derived from theoretical model given by

$$log\, w_{j,t}^{native} - log\, w_{j,t-1}^{native} = \alpha_t + \beta_t \frac{czech_{j,1992} - czech_{j,1990}}{czech_{j,1990}} + \varepsilon_{j,t},$$

where $log\, w_{j,t}^{native}$ are median log wages of full-time employed native incumbents in district or municipality j at year t.

- selectivity bias: native displacement might not be a random selection from native wage distribution
- thus only sample natives who have been employed in area j in previous and current year ("incumbents")

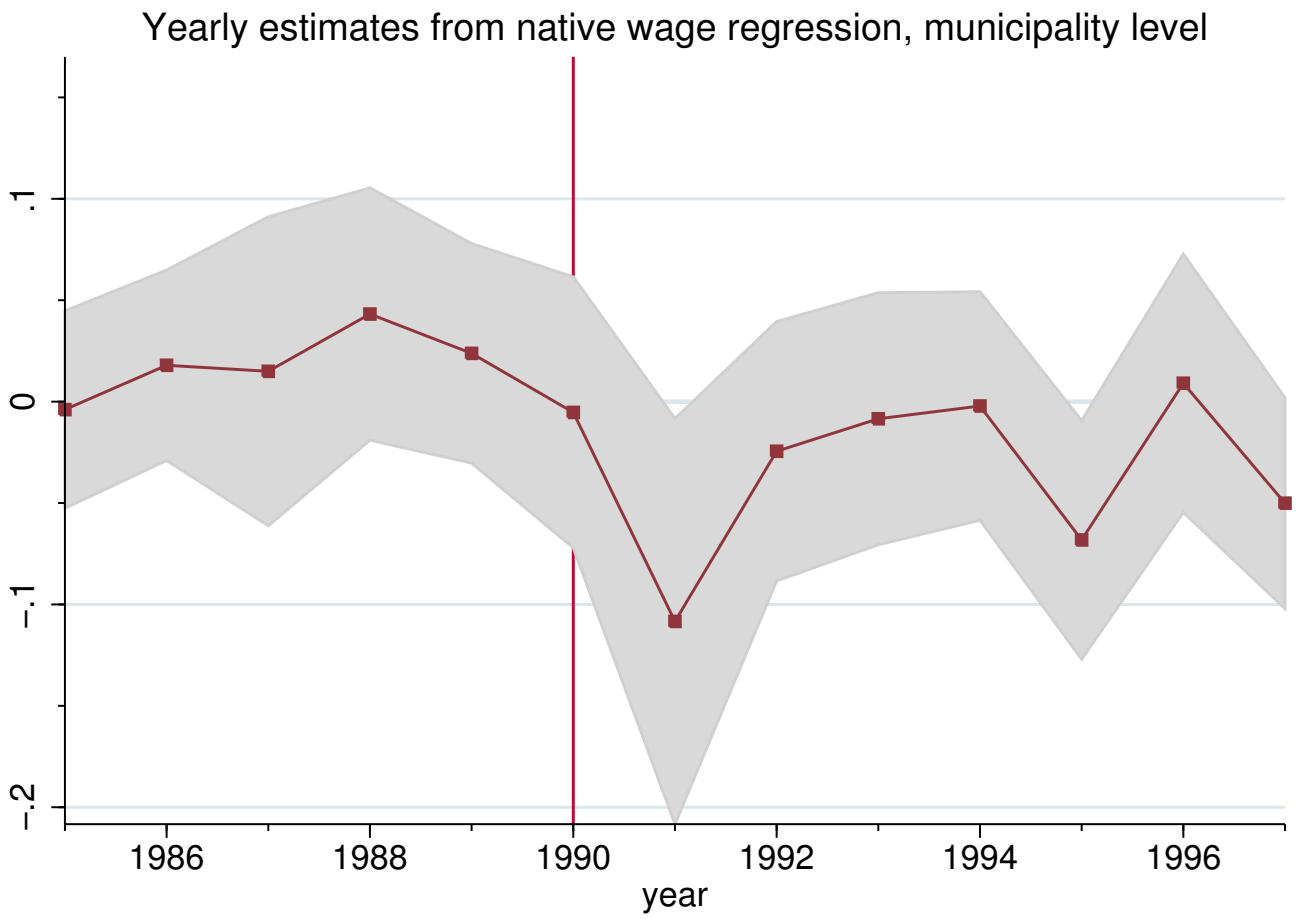
Native wages

Table: Yearly native wage growth, municipality level

	Native wage growth		
	(1)	(2)	(3)
	1990-1991	1991-1992	1992-1993
czechshare_92_90	-0.108*	-0.0245	-0.00844
	(-2.13)	(-0.75)	(-0.27)
_cons	0.0415***	0.0261***	0.00751***
	(14.78)	(22.12)	(6.81)
N	1411	1407	1405

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$


Yearly estimates from native wage regression, municipality level
.1
0
−.1
−.2
1986
1988
1990
1992
1994
1996
year

Native wages

Empirical results:

- small negative impact of Czech inflows on native wages
  estimates only capture realised wage changes for natives who remained employed in same area; potential wage decrease for natives who actually responded to local conditions (by not leaving/not entering local employment) presumably larger
- impact only in the initial year of exposure
- impact on wages not large, most of the adjustment occurs in native employment

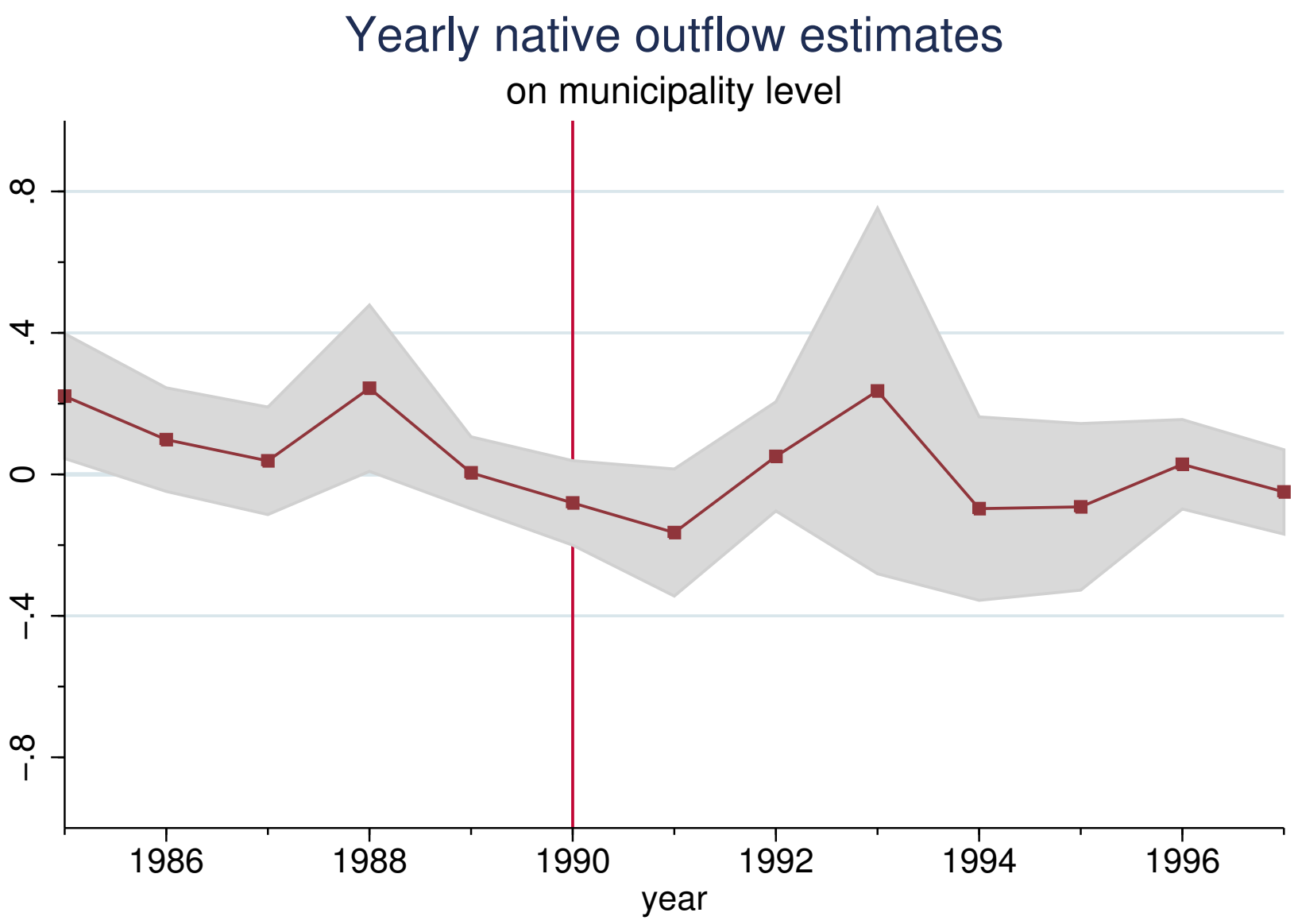
Native employment - underlying mechanisms

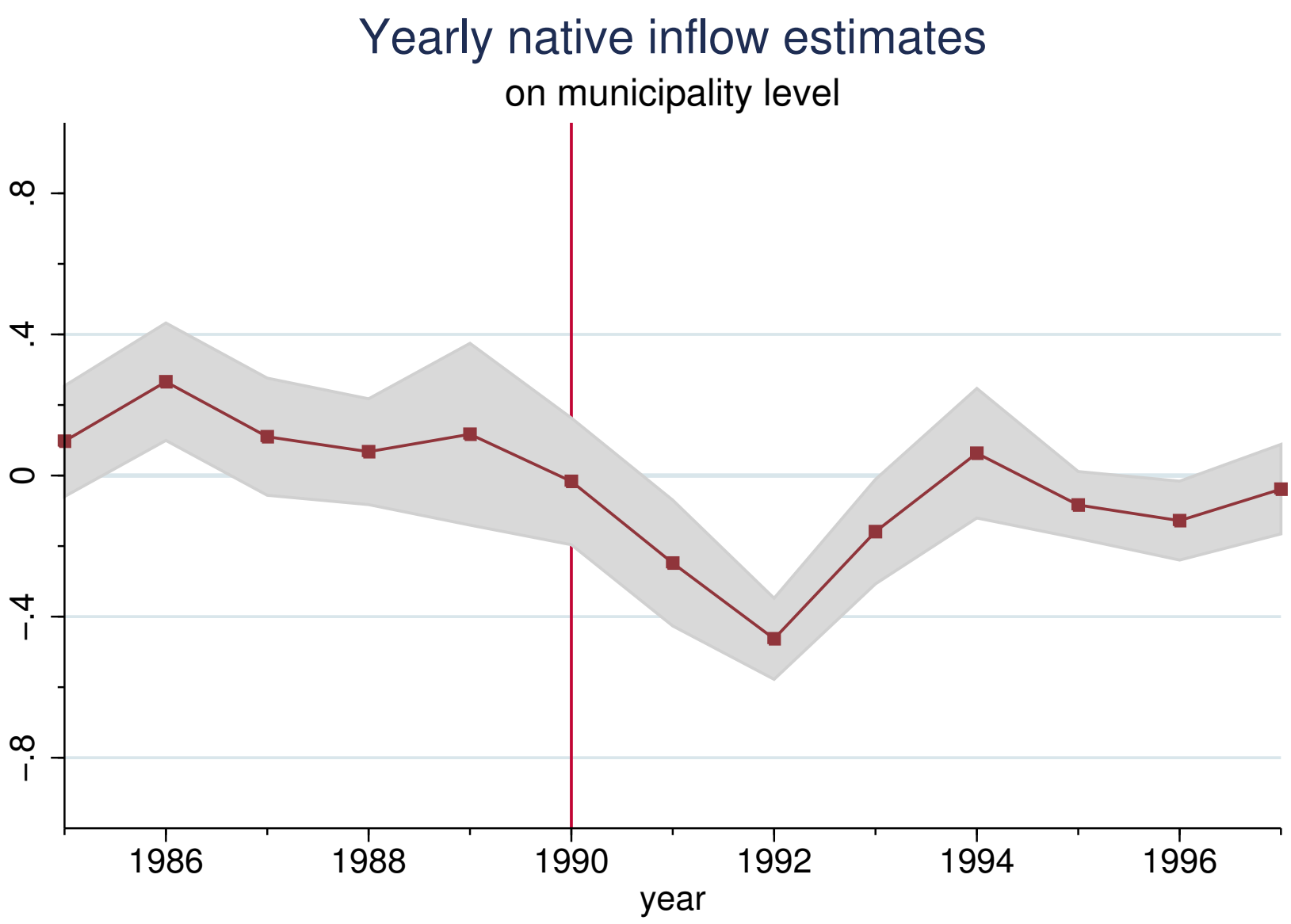
What is the nature of the decrease in native employment in exposed areas that we documented?

- do exposed natives lose their jobs, e.g. exit into unemployment?
- do exposed natives leave the affected areas?

Many potential mechanisms, their welfare implications might be very different

- distinguish two main channels: native **inflows** vs. **outflows**


Yearly native outflow estimates
on municipality level
.8
.4
0
−.4
−.8
1986
1988
1990
1992
1994
1996
year


Yearly native inflow estimates
on municipality level
.8
.4
0
−.4
−.8
1986
1988
1990
1992
1994
1996
year

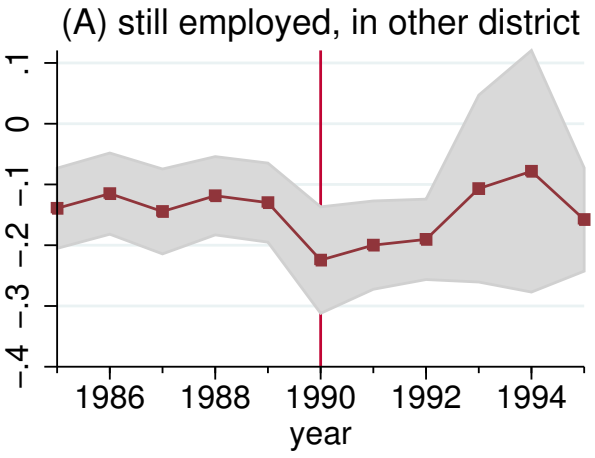
Native employment: Outflows

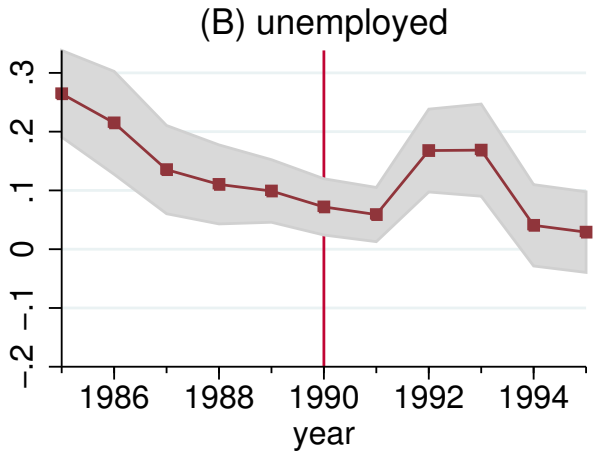
Table: Outflow categories

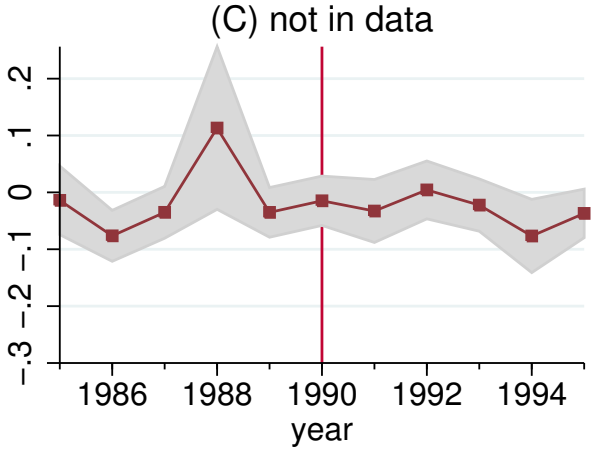
	Subsequent status of previously employed workers	
	shares, Inland	shares, Border
still employed, same district	0.847	0.844
still employed, other district	0.046	0.048
unemployed	0.034	0.039
not in data (not in labour force)	0.073	0.069

Yearly native outflow estimates, categories

on municipality level

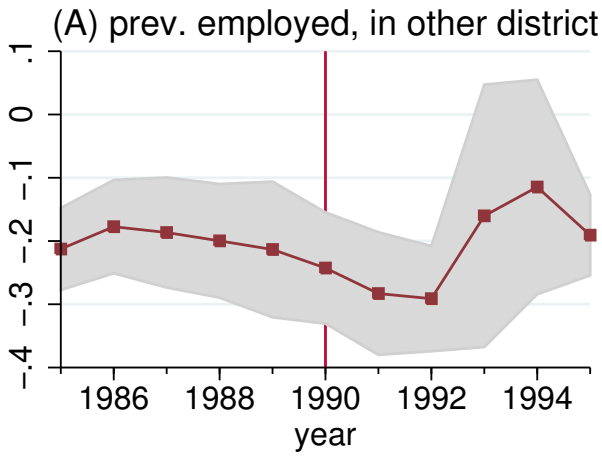


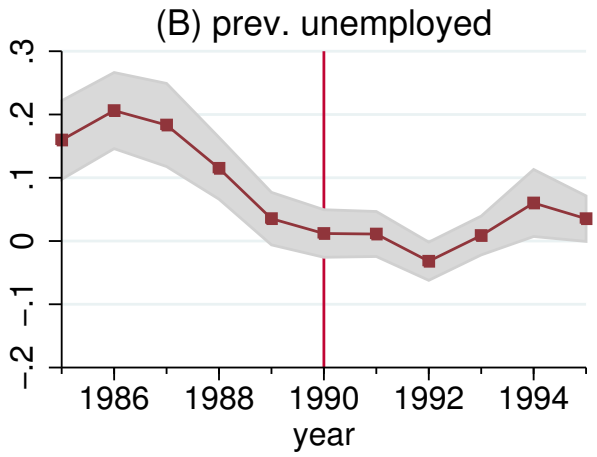


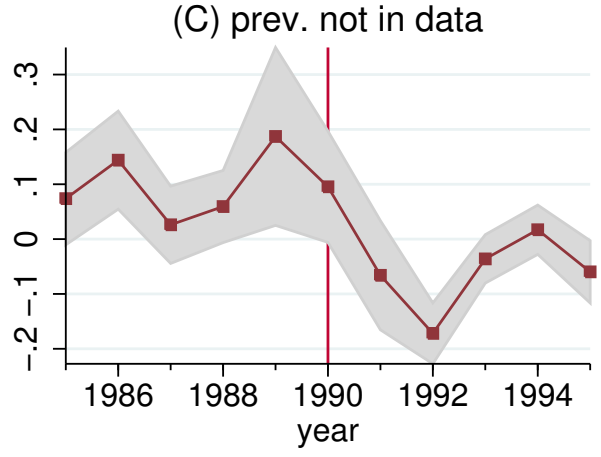


Yearly native inflow estimates, categories

on municipality level







entrant share

Native employment: Inflows and Outflows

Results:

- outflows less affected than inflows
  natives who *have been employed* in affected areas before the shock less affected than natives who *would have been employed* in these areas
- inflows are more immediately affected
  the strong role of changes in inflows might explain why the response in local native employment is so rapid

Further results

Evidence not shown today or still on the to-do list:

- more evidence across subgroups
  by education, sex, age, across native wage distribution
- inflows and outflows split into individual channels
  unemployment, out of the labour force, employment in other regions (native in-/outmigration)
- impact across industries
  adjustment process in affected industries
- labour market entrants
  for example, responses in terms of human capital investments?

...

Summary

The main three problems in the literature and how we addressed them:

1. the selection problem
   - natural experiment and distance-to-border instrument
2. general equilibrium adjustments
   - microdata allows us to follow individuals, to distinguish subgroups
3. statistical uncertainty on aggregate outcomes
   - exploit panel data to estimate aggregate uncertainty

Summary and conclusions

Summary of our empirical results:

- immigration has a strong impact on local native employment
  displacement is almost one-to-one
- the response occurs very rapidly
  wage changes are not very informative, even shortly after the LS shock
- the impact on native wages is instead relatively small
  presumably as of the large response in native employment
- natives who are more similar to migrants are more strongly, and more immediately affected
  however, all subgroups considered were negatively affected (short-run)
- response occurs mostly through changes in inflows, not outflows
  relative importance differs across subgroups (e.g. old vs. young)

Thus, while **the impact of immigration on native employment is large**, the **welfare implications are likely less dramatic** when we consider the underlying channels of native adjustments.

Appendix.

Control Districts: Matching Procedure

Matching procedure:

- measure distance between district b in border region and district i in inland by

$$D_{ib} = \sum_{x \in X} \frac{(x_i - x_b)^2}{\sigma_x^2}$$

  where X is a set of district characteristics, and σ_x^2 is the variance of characteristic x across all West-German districts.
- select inland district with smallest distance
- various specifications with differing sets of characteristics

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Appendix: A simple model.

A simple model

A model of wage determination and displacement:
(based on Borjas, 1999)

Labour demand in geographic area j ($j = 1, ..., J$) at time t given by

$$w_{jt} = X_{jt} L_{jt}^{\eta},$$

where w_{jt} is the wage in region j at time t; X_{jt} is a demand shifter; L_{jt} gives the total number of employed workers (sum of immigrants, M_{jt}, and natives, N_{jt}); and η is the factor price elasticity of the local demand for labour ($\eta < 0$).

- assume $X_{jt} = X_j$ is fixed (capital fixed in the short-run)
- assume $w_{j0} = w_0$ (local markets were in equilibrium)
- consider a one-time immigration shock at time $t = 1$.

A simple model

Then log wages at time t are given by

$$\begin{aligned} log\, w_{jt} &= log\, X_j + \eta\, log\, L_{jt} \\ &= log\, X_j + \eta\, log(N_{j0} + M_{j1} + \Delta N_{j1} + ... + \Delta N_{jt}) \\ &\approx log\, w_0 + \eta(m_{j1} + v_{j1} + ... + v_{jt}) \end{aligned}$$

where $m_{j1} = M_{j1}/N_{j0}$ and $v_{j1} = \Delta N_{jt}/N_{j0}$.

Describe the **lagged native supply response**to wage changes as

$$v_{jt} = \sigma(log w_{j,t-1} - log\, \bar{w})$$

where $\bar{w}$ is the long-run equilibrium wage in the national economy (or the wage in non-affected regions) that region j will eventually attain, and σ is the local labour supply elasticity ($\sigma > 0$). For simplicity assume that the immigrant inflow is small in national terms, such that the equilibrium wage is not affected ($\bar{w} = w_0$).

A simple model

Solved recursively.

Net displacement of native workers from employment is given by

$$v_{jt} = \eta\sigma(1+\eta\sigma)^{t-1} m_{j1}.$$

Total displacement of natives is given by

$$V_{jt} = \sum_{\tau=1}^{t} v_{j\tau} = \frac{\Delta N_{j,t-t_0}}{N_{j0}} = -[1-(1+\eta\sigma)^t] m_{j1}.$$

Log wage changes in region j at time t then equal

$$logw_{jt} - logw_0 = \eta(1+\eta\sigma)^t m_{j1}.$$

A simple model

-> Native displacement (from employment) regression

$$\frac{\Delta N_{j,t-t_0}}{N_{j0}} = \underbrace{-[1-(1+\eta\sigma)^t]}_{\delta_t} m_{j1}.$$

-> Wage regression

$$logw_{jt} - logw_0 = \underbrace{\eta(1+\eta\sigma)^t}_{\beta_t} m_{j1}.$$

Equations are of the "before-and-after" type, with migrant employment share m_{j1} as explanatory variable. Factor price elasticity given by

$$\eta = \frac{\beta_t}{1+\delta_t},$$

and can be derived by "blowing up" the coefficient from the wage regression using the coefficient from the native displacement regression.

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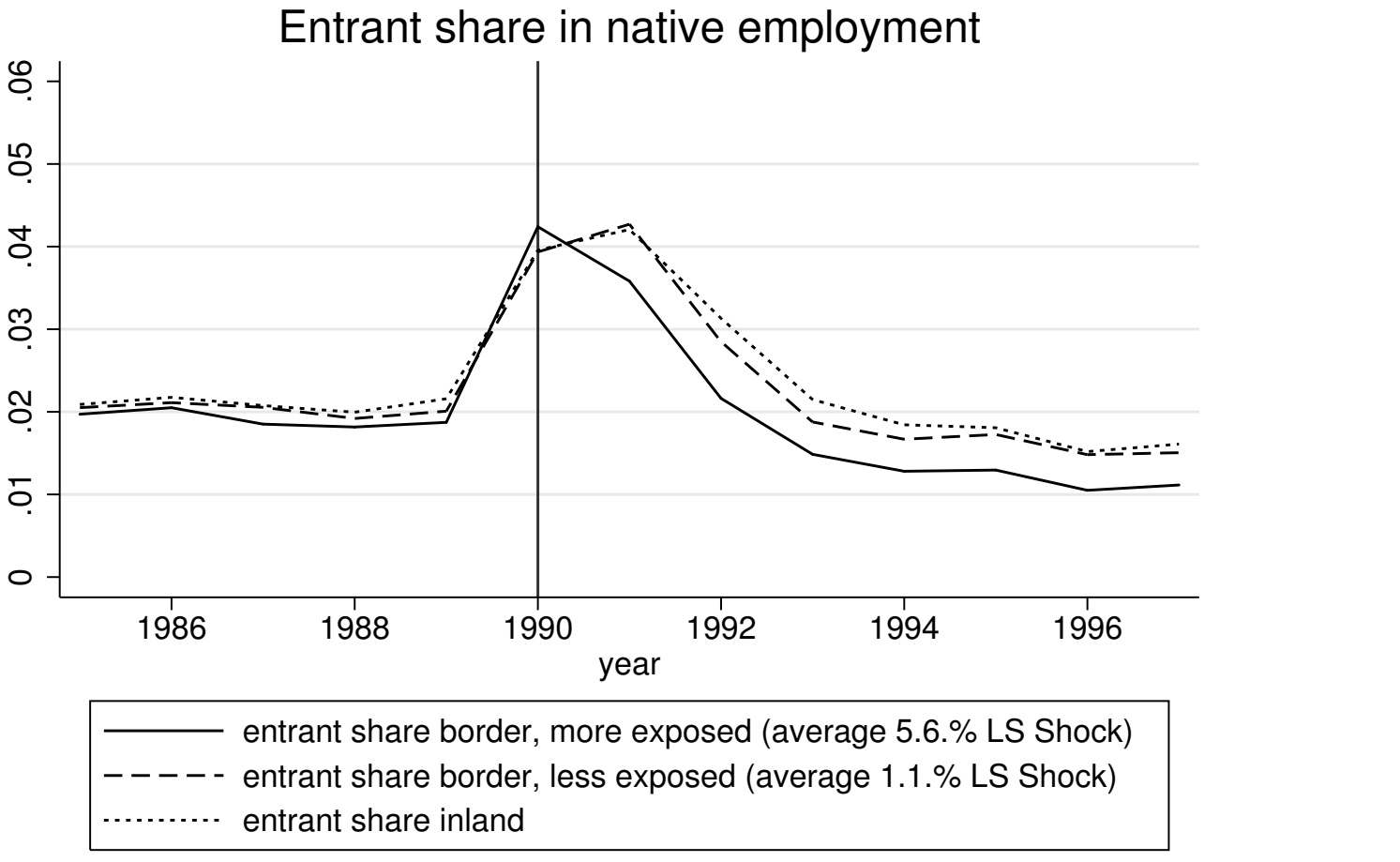
Labour market entrants



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