Local Labor Demand Shocks

UC3M, Labor Economics
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Labor demand shocks

Shocks in local labor demand:

- How do *area-level* employment, wages or prices respond to a temporary change in local labor demand? Are those effects transitory or persistent?
- Via which mechanisms do local labor markets adjust? Are population movements between areas the main adjustment mechanism?
- How are *individual* workers, and different groups of workers affected by local demand shocks?
Classic evidence on the area-level response to local demand shocks:

- Bartik (1991)
- Blanchard and Katz (1992)

A model of local labor markets:

- Moretti (2012)

Response to specific demand shocks:

- Construction of the Trans-Alaska Pipeline System
- The Great Recession (U.S., plus some evidence for Spain)

Evidence on the mechanisms via which local labor markets and workers adjust to local shocks.

Bartik studies the response of local labor markets (MSAs) in U.S. to local demand shocks. Conceptual points:

- Measures size of demand shock by local employment growth, regardless of source of demand shock (motivated in Appendix 4.1)
- Alternatively, construct “Bartik instrument” to isolate variation in employment growth due to demand shocks (explained in Appendix 4.2)
- But notes that transitory variation in local employment mostly caused by shifts in labor demand (not shifts in labor supply)
Estimating equation

$$\Delta Y_{mt} = \mu_t + \beta_0 \Delta E_{mt} + \beta_1 \Delta E_{mt-1} + \ldots + \beta_8 \Delta E_{mt-8} + \varepsilon_{mt}$$

where $\Delta Y_{mt}$ is change in outcome in region $m$ at time $t$, $\mu_t$ are time fixed effects, $\Delta E_{mt}$ is employment growth, $\varepsilon_{mt}$ is an error term,

- In some specifications, instruments for local employment change $\Delta E_{mt}$ with “Bartik instrument”
- Studies response in local unemployment rate, employment rate, prices and real wages (→ more in Bartik’s book)
Figure 4.1
Estimated Cumulative Effects of a 1 Percent Shock to Local Employment on Average Local Unemployment Rate, Using Aggregate Data

Effects of Growth on Unemployment 91

Cumulative Reduction in Unemployment Rate

Number of Years After Shock

Best Point Estimate

/+2 Std. Errors

Reported estimates are for specification that minimizes AIC. Long-run effect in 8-lag specification is .054 (.026).

As mentioned in notes to chapter 4, the cumulative effect after the number of lags included in the optimal AIC specification is an implied long-run effect. Minimizing the AIC after k lags implies no significant change thereafter. The figures here only carry this long-run effect out to eight years after the shock, as the empirical work never tested whether this long-run effect might decay after eight years. For comparison, the notes at the bottom of each table also report the estimated long-run effect in a specification with eight lagged employment variables. These long-run effects, as one would expect, are always quite similar to the optimal AIC long-run effects.
Figure 4.2
Estimated Cumulative Effects of a 1 Percent Shock to Local Employment on Local Employment Rate, Using Micro Data

<table>
<thead>
<tr>
<th>Number of Years After Shock</th>
<th>Cumulative Increase Employment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>+0.60 +/- 0.02</td>
</tr>
<tr>
<td>1</td>
<td>+0.25 +/- 0.02</td>
</tr>
<tr>
<td>2</td>
<td>+0.11 +/- 0.02</td>
</tr>
<tr>
<td>3</td>
<td>+0.11 +/- 0.02</td>
</tr>
<tr>
<td>4</td>
<td>+0.06 +/- 0.02</td>
</tr>
</tbody>
</table>

NOTES:
Standard errors of estimated cumulative effects are in parentheses. Bold line in figure shows best point estimate of cumulative effect of growth shock. Two dotted lines show two standard errors to either side of best point estimate; this interval has 95 percent probability of including true effect.

Reported estimates are for specification that minimizes AIC. Long-run effect in 8-lag specification is +0.064 (+0.030).
Figure 5.1
Estimates of the Cumulative Percentage Effects of a 1 Percent
Once-and-for-All Local Employment Shock
on the MSA Shelter Price Index
Figure 6.1
Percentage Effects of Demand-Induced 1 Percent Once-and-for-All Local Employment Shock on Real Wages, Micro Sample

Cumulative Effect After:
Immediate effect = 0 years -1.748 (1.241)
1 year = 0.272 (1.751)
2 years = 0.4.417 (1.526)
Long-run effect = 3 years -0.035 (0.314)
Bartik (1991)

Argues that short-run local employment changes are mostly due to demand shocks

Main findings:

- Strong short-run impact
- Quick recovery of local labor markets
- But persistent (small) effects in employment rate, unemployment rate, prices. For example, 1-percent employment change reduces area’s long-run unemployment rate by 0.07 percent.

Question:

▶ How do U.S. states adjust to adverse economic shocks – more specifically, local demand shocks?
▶ Considers joint movement of employment, unemployment, wages and prices

Empirical approach:

▶ Vector auto-regressions (VAR) on state-year level
▶ Assume that most of transitory variation in employment are caused by shifts in labor demand (not shifts in labor supply)
▶ Alternatively, construct observable demand shocks (defense spending or Bartik instrument)
Estimate vector auto-regressions (VAR) on state-year level

\[ \Delta e_{it} = \alpha_{i10} + \alpha_{i11}(L)\Delta e_{i,t-1} + \alpha_{i12}(L)le_{i,t-1} + \alpha_{i13}(L)lp_{i,t-1} + \varepsilon_{iet} \]

\[ le_{it} = \alpha_{i20} + \alpha_{i21}(L)\Delta e_{it} + \alpha_{i22}(L)le_{i,t-1} + \alpha_{i23}(L)lp_{i,t-1} + \varepsilon_{iut} \]

\[ lp_{it} = \alpha_{i30} + \alpha_{i31}(L)\Delta e_{it} + \alpha_{i32}(L)le_{i,t-1} + \alpha_{i33}(L)lp_{i,t-1} + \varepsilon_{ipt} \]

where \( \Delta e_{i} \) is first-differenced of log employment in state \( i \) (as deviation from U.S. aggregate employment), \( le_{i} \) is log ratio of employment to labor force, \( lp_{i} \) is log ratio of labor force to population (can indirectly characterize other employment outcomes).
Figure 7. Response of Employment, Unemployment, and Labor Force Participation to an Employment Shock

Effect of shock (percent)

Source: Authors’ calculations based on the system of equations described in the text, using data described in the appendix. All 51 states are used in the estimation. The shock is a −1 percent shock to employment. Bands of one standard error are shown around each line.
Figure 11. Response of Employment and Manufacturing Wages to an Employment Shock

Effect of shock (percent)

Source: Authors’ calculations using data described in the appendix. The shock is a −1 percent shock to employment. Bands of one standard error are shown around each line.
Blanchard and Katz (1992)

Blanchard finds similar short-run effects as Bartik (1991), but much slower adjustment in local wages:

- Shocks in local employment are permanent (growth recovers, but not levels)
- Shocks in local unemployment rates are not permanent (recovery within half a decade)
- Shocks in local wages are semi-permanent (recovery within a decade)

Main mechanism: Labor mobility

“The conclusion favoring perfectly elastic long-run labor supply is inevitable, given the behavior of the three variables. If employment in a state can change a great deal and tends to remain at the new level, but unemployment and labor force participation return to normal, then no other possible conclusion exists but that the population has changed to accommodate the higher employment.”

- Compare role of job creation vs. labor mobility in local recovery process

- Note that local demand shocks are serially correlated:
  
  “If the structural shocks identified in the empirical model are persistent—in the sense that the economic shock occurs over several time periods—it is difficult to disentangle the increase in employment due to the endogenous labor demand response from the ongoing exogenous decrease in employment due to the original downturn.”

- Estimates by Blanchard and Katz (1992) then partly reflect ongoing job destruction from original downturn (Jäger, Ruist and Stuhler 2018, make similar argument in migration context)
Greenaway-McGrevy and Hood (2016) consider similar data as Blanchard and Katz (1992), but

- Use Bartik instrument to isolate labor demand shocks
- Parametrize serial dependence in demand shock in their empirical model

Main findings:

- Find only limited population response. Instead, local job creation (i.e., a labor demand response on the firm side) is main driver of local recoveries in the U.S.
- Find slower local recovery than Blanchard and Katz, extending over more than 20 years.
- Because the migration response is limited and the labor demand response is protracted, local policies and shocks can have large and long-lasting effects on local residents
Fig. 5. Responses to a serially uncorrelated –1% labor demand shock using Bartik shift shares. Error bands represent 90% confidence intervals.
A model of local labor markets


A model of local labor markets. Consider two “cities”:

- Each city is a competitive economy that produces a single internationally traded good using labor, land and a local amenity, with constant returns to scale
- Workers’ indirect utility depends on nominal wages, cost of housing and local amenities
- Labor is perfectly mobile so that the local labor supply is infinitely elastic
- Land is the only immobile factor and its supply is fixed

Difference to Rosen-Roback (1979, 1982) framework:

- Idiosyncratic locational preferences, housing supply not fixed, shocks not fully capitalized into house prices
Indirect utility of worker $i$ locating in city $c$:

$$U_{ic} = w_c - r_c + A_c + e_{ic}$$

where $w_c$ is nominal log wage, $r_c$ housing costs, $A_c$ local amenities, $e_{ia} - e_{ib} \sim U[-s, s]$ are idiosyncratic preferences between city $a$ and city $b$.
Relative labor supply:

In eq. marginal worker needs to be indifferent between cities, \( e_{ia} - e_{ib} = (w_b - r_b) - (w_a - r_a) + (A_b - A_a) \). So relative labor supply given by

\[
    w_b - w_a = (r_b - r_a) + (A_a - A_b) + s \frac{N_b - N_a}{N}
\]

where \( N_c \) is log of number of workers in city \( c \), \( N = N_a + N_b \) assumed fixed.
Production

Production function of tradable good (assume price $P=1$):

$$y_c = x_c n_c^h k_c^{1-h}$$

with capital perfectly elastic. In logs ...

$$\ln y_c = X_c + h N_c + (1 - h) K_c$$

Labor demand:

Perf. competition, capital infinitely supplied at price $i$, factor labor receives marginal productivity:

$$w_c = X_c - (1 - h) N_c + (1 - h) K_c + \ln h$$
Equilibrium conditions

<table>
<thead>
<tr>
<th>Relative housing demand:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assume each worker consumes one unit of housing, so (relative) housing demand is equal to (relative) labor supply.</td>
</tr>
<tr>
<td>$r_b = r_a + (w_b - w_a) + (A_b - A_a) - s \frac{N_b - N_a}{N}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Housing supply:</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r_c = z + \lambda_c N_c$</td>
</tr>
<tr>
<td>If $\lambda_c = 0$ then housing supply is perfectly elastic.</td>
</tr>
</tbody>
</table>
Labor Demand Shock

Increase in productivity in city $b$ of $X_{b2} - X_{b1} = \Delta > 0$.

- **Change in nominal wages** in city $b$:

  $$w_{b2} - w_{b1} = \Delta$$

  is independent of employment or housing response

- **Change in employment**:

  $$N_{b2} - N_{b1} = \frac{N}{N(\lambda_b + \lambda_a) + 2s} \Delta \geq 0$$

  because some workers are attracted by higher wages

- **Change in house prices**:

  $$r_{b2} - r_{b1} = \lambda_b \frac{N}{N(\lambda_b + \lambda_a) + 2s} \Delta \geq 0$$

  so incidence of shock shared between workers and landowners.
Labor Demand Shock

Because nominal wages increase more than housing costs, real wages increase. Real wage increase more in city $b$ than in city $a$:

- **Change in real wage in city $b$:**

  $$(w_{b2} - w_{b1}) - (r_{b2} - r_{b1}) = \frac{\lambda_a N + 2s}{N(\lambda_a + \lambda_b) + 2s} \Delta$$

  if $s = 0$ and $k_a = 0$ then shock does not increase real wages

- **Change in real wage in city $a$:**

  $$(w_{a2} - w_{a1}) - (r_{a2} - r_{a1}) = \frac{\lambda_a N}{N(\lambda_a + \lambda_b) + 2s} \Delta$$

- Due to labor mobility, wage increase also in city $a$. But with locational preferences ($s > 0$), the effect of the demand shock will be concentrated in the area where it occurs.
Labor Demand Shock

Since city b offers higher real wages in period 2, the new marginal worker in period 2 has stronger preferences for city a:

\[(e_{a2} - e_{b2}) - (e_{a1} - e_{b1}) = \frac{2s\Delta}{N(\lambda_a + \lambda_b) + 2s} \geq 0\]

Interesting special cases (see Moretti Section 3.1.3):

1. If labor is completely immobile \((s = \infty)\)
2. If labor is perfectly mobile \((s = 0)\)
3. If housing supply is fixed \((\lambda_b = \infty)\)
4. If housing supply is infinitely elastic \((\lambda_b = 0)\)

Extensions in Moretti (2011):

▸ Heterogeneous labor
▸ Agglomeration effects
Blanchard and Katz (1992)

Transitory aggregate shocks have persistent negative local impacts?

- Blanchard and Katz (1992) find quick local recovery of employment rate and wages
- Greenaway and Hood, 2016 find slower adjustment

Many other literatures find persistent effect of area- or firm-level shocks on individual outcomes. Examples:

- Impact of mass layoffs on worker-level outcomes (→ Slides on imperfect competition)
- Impact of trade on worker-level outcomes (e.g. Autor, Dorn, Hanson and Song 2014)

Consider two specific shocks here:


Background:

- After oil discovery, construction of Trans-Alaska Pipeline System (TAPS) between 1975 and 1977
- Interpret TAPS as a major positive shock in local labor demand

Method:

- Simple differences over time (no control group)
Carrington (1996)

Main findings:

- Large temporary positive effect on earnings, employment,
- Employment and population returned quickly to pre-97 trend

Interpretation:

- Local labor supply is quite elastic (both intensive and extensive margin)
- But only modest short-run interindustry elasticity. Some workers unwilling or unable to change industries in response to large temporary changes in industry relative wages.
Carrington (1996)

Fig. 3.—Employment and earnings: all industries

While I shall shortly present a more formal test, figure 4 also presents evidence on the nature of adjustment costs. The convex adjustment cost model predicts that employment should be high and wages low in the quarters immediately before and after TAPS. The triangles in figure 4 represent the data for 1973 (before TAPS) and 1978 (after TAPS). There is little to suggest that these points lie off what is otherwise a traditional supply curve. This in turn suggests that there was little of the building in advance that is predicted by convex adjustment cost models. However, the smoothness of the within-TAPS employment series exhibited in figure 3 suggests that adjust-

21 Employment took off again with the second oil price shock, but this was essentially a separate boom.
FIG. 5.—Population and employment/population percent in the summer of 1973 to roughly 50 percent in the summers of 1975 and 1976. One can decompose the 1973-76 change in employment into the following three components:

\[
A_{\text{emp}} = A_{\text{pop}} + A_{\text{pp}} + (\text{np})A_{\text{pp}}
\]

which are the change in population, the change in employment/population ratios, and the interaction of the changes, respectively. For Alaska in these years, these components account for 31 percent, 59 percent, and 10 percent of the aggregate change, so that increased employment was met primarily by an increased employment/population ratio. To some extent, the increased employment/population ratio may result from a very high employment rate among new migrants. But employment growth was so rapid that the employment/population ratio of the pre-TAPS population must have risen by at least 5 percent even if every new migrant had a job.

While the model of Section III included no role for unemployment, the effect of TAPS on Alaskan unemployment is of interest from other perspectives. Figure 6 graphs the time-series path of unemployment for the state. We should note in advance that the data are not

\[
24 \text{ In this decomposition, emp is employment, pop is population, and both emp and pop are measured as of the summer of 1973; the changes are the differences between the summers of 1976 and 1973.}
\]

“This paper uses U.S. local areas as a laboratory to test for long-term impacts of the Great Recession”

Studies labor market outcomes of workers over time, distinguishing between those located in an area that did badly during the Great Recession and those located in areas that did less badly.
A. Employment Rate Convergence

Notes:
Panel A divides states into severely (below-median) and mildly (above-median) shocked states based on the sum of 2008 and 2009 employment growth forecast errors as described in Figure 1B and repeats the process for the early-1980s recessions (1980-1982, treated as a single recession) and the early-1990s (1990-1991) recession. Then for each recession and year relative to the recession, it plots the unweighted mean LAUS employment rate in severely shocked states, minus the same mean in mildly shocked states. Each series is demeaned relative to its pre-recession mean. For comparability across recessions, year 0 denotes the last recession year (1982, 1991, or 2009) while year 1 denotes the last pre-recession year (1979, 1989, or 2007); intervening years are not plotted.
Figure 2: Great Recession Local Adjustment in Comparison to History

A. Employment Rate Convergence

Notes:
Panel A divides states into severely (below-median) and mildly (above-median) shocked states based on the sum of 2008 and 2009 employment growth forecast errors as described in Figure 1B and repeats the process for the early-1980s recessions (1980-1982, treated as a single recession) and the early-1990s (1990-1991) recession. Then for each recession and year relative to the recession, it plots the unweighted mean LAUS employment rate in severely shocked states, minus the same mean in mildly shocked states. Each series is demeaned relative to its pre-recession mean. For comparability across recessions, year 0 denotes the last recession year (1982, 1991, or 2009) while year 1 denotes the last pre-recession year (1979, 1989, or 2007); intervening years are not plotted.


C. Employment, Population, and Employment Rate after −1% Shock
Notes: This map depicts unweighted octiles (divisions by increments of 12.5 percentiles) of Great Recession local shocks across Commuting Zones (CZs). CZs span the entire United States and are collections of counties that share strong commuting ties. Each CZ’s shock equals the CZ’s 2009 LAUS unemployment rate minus the CZ’s 2007 LAUS unemployment rate. In the individual-level analysis, I assign each individual to the Great Recession local shock of the individual’s January 2007 CZ.
Estimate worker-level event study

\[ y_{i2015} = \beta \text{SHOCK}_{c(i2007)} + \theta_g(i2006) + \epsilon_{i2015} \]

where \( y_{i2015} \) is some outcome in year 2015, \( \text{SHOCK}_{c(i2007)} \) is the “recession shock” to individual \( i \) living in area \( c \) in 2007, \( \theta_g(i2006) \) are fixed effects for groups \( g \) defined based on year-2006 individuals

- Argues \( \text{SHOCK}_{c(i2007)} \) is one-time shock in labor demand (not serially correlated local shocks as in Greenaway et al 2017)
- \( \beta \) is the causal effect of Great Recession local shocks and their underlying causes on individual outcomes in 2015

Extensions:

- Event-study design with different coefficients for each period
- Main, retail chain and mass layoff samples
Why consider individual- instead of area-level outcomes?

▶ Area-level evidence may reflect post-2007 sorting of workers (→ see paper)
▶ Can control for age-earnings-industry fixed effects

Extensions:

▶ Event-study design with different coefficients for each period
▶ Main, retail chain and mass layoff samples
Figure 4: Employment and Earnings Impacts of Great Recession Local Shocks

A. Employment Impact of Great Recession Local Shocks

Panel A plots regression estimates of the effect of Great Recession local shocks on relative employment controlling for 2006 age-earnings-industry fixed effects in the main sample. Each year $t$'s outcome is year-$t$ relative employment: the individual's year-$t$ employment (indicator for any employment in $t$) minus the individual's mean 1999-2006 employment. 95% confidence intervals are plotted around estimates, clustering on 2007 state. For reference, the 2015 data point (the paper's main estimate) implies that a 1-percentage-point higher Great Recession local shock caused individuals to be 0.393 percentage points less likely to be employed in 2015. Panel B non-parametrically depicts the relationship underlying the main estimate. It is produced by regressing Great Recession local shocks on 2006 age-earnings-industry fixed effects, computing residuals, adding back the mean shock level for interpretation, and plotting means of 2015 relative employment within twenty equal-sized bins of the shock residuals. Overlaid is the best-fit line, whose slope equals 0.393. Panel C replicates Panel A for the outcome of relative earnings: the individual's year-$t$ earnings minus the individual's mean 1999-2006 earnings.
Subgroup Migration Rate

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Migration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>16%</td>
</tr>
<tr>
<td>Earnings $0</td>
<td>16%</td>
</tr>
<tr>
<td>Earnings $1-$15k</td>
<td>20%</td>
</tr>
<tr>
<td>Earnings $15k-$45k</td>
<td>16%</td>
</tr>
<tr>
<td>Earnings $45k+</td>
<td>15%</td>
</tr>
<tr>
<td>No LF attachment</td>
<td>18%</td>
</tr>
<tr>
<td>Low LF attachment</td>
<td>21%</td>
</tr>
<tr>
<td>High LF attachment</td>
<td>14%</td>
</tr>
<tr>
<td>Age 30-34</td>
<td>21%</td>
</tr>
<tr>
<td>Age 35-39</td>
<td>17%</td>
</tr>
<tr>
<td>Age 40-44</td>
<td>14%</td>
</tr>
<tr>
<td>Age 45-49</td>
<td>13%</td>
</tr>
<tr>
<td>Men</td>
<td>17%</td>
</tr>
<tr>
<td>Women</td>
<td>16%</td>
</tr>
<tr>
<td>Single</td>
<td>19%</td>
</tr>
<tr>
<td>Married</td>
<td>14%</td>
</tr>
<tr>
<td>0 kids</td>
<td>20%</td>
</tr>
<tr>
<td>1 kid</td>
<td>15%</td>
</tr>
<tr>
<td>2+ kids</td>
<td>13%</td>
</tr>
<tr>
<td>Mortgage holder</td>
<td>13%</td>
</tr>
<tr>
<td>Non-mortgage-holder</td>
<td>18%</td>
</tr>
</tbody>
</table>

Notes:
Panel A plots coefficients and 95% confidence intervals (clustering by 2007 state) of the impact of Great Recession local shocks on 2015 relative employment—overall and by subgroup. All estimates derive from the specification underlying Figure 4A's 2015 data point, corresponding here to the overall row. Subgroup estimates restrict the sample to the specified subgroup defined by 2006 earnings, 2003-2006 labor force attachment, 2007 age, gender, 2006 marital status, 2006 number of kids, or 2006 mortgage holding. Non-1040-filers are classified here as single and childless. Subgroup migration rates are superimposed on the right. Migration is defined as one's 2015 CZ being different from one's 2007 CZ. Panel B replicates panel A for 2015 earnings expressed in multiples of mean annual earnings 1999-2006: 2015 earnings divided by mean annual 1999-2006 earnings. This quantity is top-coded at the 99\textsuperscript{th} percentile, and individuals with zero 1999-2006 earnings are assigned the top code if 2015 earnings were positive and assigned 0 otherwise. The overall estimate is -3.55 (standard error 0.94), implying that a 1-percentage-point-higher Great Recession local shock reduced the average individual's 2015 earnings by 3.55% of her pre-recession earnings.
Main findings

- Local and individual employment rates do not recover from local impact of Great recession (“hysteresis”)
- Area-level conditions have large and persistent effects on individual employment outcomes

Implications

1. “Naive extrapolation” of local-shock-based estimate would suggest that the Great Recession caused more than half of the 2007-2015 decline in U.S. employment
2. Unemployment rate (as considered in matching models) is not a reliable indicator for economic recovery. Consider labor force participation.

- Similar setup as in Yagan (2018), but uses Bartik instrument to instrument local demand shocks
- Local effect of Great Recession has long-lasting effects on workers’ earnings and employment
- Workers did not respond to the local shock by transitioning to other regions, industries or occupations
- Persistence caused by combination of (i) low individual mobility and (ii) persistent contraction in local labor demand?
Figure 1: Characterization of the Spanish Great Recession.

Panel A depicts quarterly observations for the p.p. change in the activity, employment and unemployment rates with respect to their 2007Q4 values; and Panel B depicts the yearly change in the logarithm of employment by economic sector with respect to 2007. Data from the Spanish National Institute of Statistics.

This persistent shift in unemployment took place despite policy efforts devoted to reduce labor market rigidities and discourage the destruction of employment. In particular, in order to cope with the Recession, two labor market reforms were implemented in Spain in 2010 and 2012. The key changes imposed by these reforms were aimed at reducing duality, by encouraging firms to use permanent instead of temporary job contracts, and at favoring wage adjustments by allowing firms in distress to opt out from collective industry agreements. Moreover, in line with the austerity measures recommended by the European Commission in the aftermath of the Recession, the Spanish Government reduced the magnitude of Unemployment Insurance benefits (UI) as a share of labor earnings by 10 p.p. Even though these policies were national, they might have affected Spanish regions differently according to how exposed they were to the aggregate shock. If that is the case, the effects of Great Recession local shocks that are presented later in this paper would also capture the effects of regional differences in the exposure to policy changes that were implemented in response to the national shock.
There are two additional features of the Recession that are key to the question studied in this paper. First of all, as shown in Figure 1b, the decline in employment was not the same for all economic sectors. In particular, employment in the construction sector experienced a decline much larger than the aggregate economy, in line with its procyclical nature and the preceding boom in the sector. Second, as shown in Figure 2, the incidence of the Recession varied greatly across Spanish geographical regions. The increase in the unemployment rate during 2008-2010 ranged from 1.5 p.p. (Segovia) to 13.2 p.p. (Castello). Figure 2b also shows

This excludes Ceuta and Melilla, the two Spanish provinces located in Africa.

**Figure 2:** Regional variation in the Spanish Great Recession

((a)) 2008-2010 unemployment rate changes, by Spanish provinces
Figure 7: Subgroup analysis of 2016 earnings and employment effects of the Great Recession local shocks

Overall
Female
Male
22–27
28–33
34–39
40–44
45–49
50–55

Very high
High
Medium–high
Medium–low
Low

Permanent contract
Fixed term contract

Notes: The results are obtained by estimating the 2SLS specification of columns 4 and 9 in Table 2, separately for every subgroup. All the subgroups are constructed considering 2007 individual characteristics. For the analysis by 2007 earnings quintile, I consider individuals whose 2016 earnings were below the earnings censoring point. 95% confidence intervals plotted around the point estimates are constructed using standard errors clustered at the 2007 province level.

Additionally, I analyze heterogeneity in the impacts of the Recession with respect to workers’ earnings at the start of it. Because of the censoring in social security earnings, it may not be