Appendix

A. Graphs

Figure A1: Distributions of the cumulated minimum wage increase since the last price change

Note: black bars for traditional restaurants, dashed bars for fast-food restaurants. Decreases in employers’ social contributions are included in labor cost at minimum wage.
Figure A2: Distributions of durations and hazard functions

Note: Hazard functions are estimated using a simple piecewise-constant duration model.
B. The likelihood function

The contribution to the likelihood function of a constant price at date \( t \), given that the specific (random) characteristic is \( u_i \), is thus:

\[
l_{i,t}(u_i) = \Pr(\Delta_{\tau}p_{i,t} = 0) = \Pr(C_{it}^- < \Delta_{\tau}p_{i,t} < C_{it}^+)
\]

\[
= \Pr \left[ \epsilon_{i,t}^p - \epsilon_{i,t}^{c+} < X_{2,t} \beta_2^+ + u_i - (\beta_0 + \Delta_{\tau}X_{1,t} \beta_1) \right] - \Pr \left[ \epsilon_{i,t}^p - \epsilon_{i,t}^{c-} < X_{2,t} \beta_2^- - u_i - (\beta_0 + \Delta_{\tau}X_{1,t} \beta_1) \right]
\]

\[
= \Phi \left[ \frac{X_{2,t} \beta_2^+ + u_i - (\beta_0 + \Delta_{\tau}X_{1,t} \beta_1)}{\sqrt{\sigma_{c+}^2 + \sigma_p^2}} \right] - \Phi_2 \left[ \frac{X_{2,t} \beta_2^- - u_i - (\beta_0 + \Delta_{\tau}X_{1,t} \beta_1)}{\sqrt{\sigma_{c-}^2 + \sigma_p^2}}, \frac{X_{2,t} \beta_2^- - u_i - (\beta_0 + \Delta_{\tau}X_{1,t} \beta_1)}{\sqrt{\sigma_{c-}^2 + \sigma_p^2}}, \rho \right]
\]

where \( \Phi \) is the c.d.f of the Gaussian distribution and \( \Phi_2 \) is the c.d.f of the bivariate normal distribution. As idiosyncratic shocks on \( \Delta_{\tau}p_{i,t}^+ \) and \( C_{it}^- \) and \( C_{it}^+ \) are independent, this implies that \( \text{cov}(\epsilon_{i,t}^{c+}, \epsilon_{i,t}^p) = \text{cov}(\epsilon_{i,t}^{c-}, \epsilon_{i,t}^p) = 0 \), and that \( V(\epsilon_{i,t}^{c+} - \epsilon_{i,t}^p) = \sigma_{c+}^2 + \sigma_p^2 \) and \( V(\epsilon_{i,t}^{c-} - \epsilon_{i,t}^p) = \sigma_{c-}^2 + \sigma_p^2 \).

Consequently, \( \rho = \text{corr}(\epsilon_{i,t}^{c+} - \epsilon_{i,t}^p, \epsilon_{i,t}^{c-} - \epsilon_{i,t}^p) = \frac{\sigma_p^2}{\sqrt{(\sigma_{c+}^2 + \sigma_p^2)(\sigma_{c-}^2 + \sigma_p^2)}} \).

The contribution to the likelihood function of a price increase in restaurant \( i \) at date \( t \), given that the specific (random) characteristic is \( u_i \), is thus:

\[
l_{i,t}(u_i) = \frac{1}{\sigma_p} \phi \left( \frac{\Delta_{\tau}p_{i,t} - \beta_0 - \Delta_{\tau}X_{1,t} \beta_1}{\sigma_p} \right) \times \Pr \left[ \Delta_{\tau}p_{i,t}^+ > C_{it}^+ \mid \Delta_{\tau}p_{i,t} = \Delta_{\tau}p_{i,t}^+ \right]
\]

\[
= \frac{1}{\sigma_p} \phi \left( \frac{\Delta_{\tau}p_{i,t} - \beta_0 - \Delta_{\tau}X_{1,t} \beta_1}{\sigma_p} \right) \times \Phi \left[ \frac{\beta_0 + \Delta_{\tau}X_{1,t} \beta_1 - (X_{2,t} \beta_2^+ + u_i) + \Delta_{\tau}p_{i,t} - \beta_0 - \Delta_{\tau}X_{1,t} \beta_1}{\sigma_{c+}} \right]
\]

\[
= \frac{1}{\sigma_p} \phi \left( \frac{\Delta_{\tau}p_{i,t} - \beta_0 - \Delta_{\tau}X_{1,t} \beta_1}{\sigma_p} \right) \times \Phi \left( \frac{-X_{2,t} \beta_2^+ - u_i + \Delta_{\tau}p_{i,t}}{\sigma_{c+}} \right)
\]

(2)
where $\phi$ is the p.d.f of the Gaussian distribution. Let us remark that the correlation between the shocks of the two equations $\varepsilon_{i,t}^p - \varepsilon_{i,t}^c$ and $\varepsilon_{i,t}^p$ is equal to

$$\text{corr}(\varepsilon_{i,t}^p - \varepsilon_{i,t}^c, \varepsilon_{i,t}^p) = \frac{\sigma_p}{\sqrt{\sigma_{c-}^2 + \sigma_p^2}}$$

Price decreases are treated separately from price increases in order to take into account the asymmetry in price changes, which might reflect antagonization costs or other differences in the firm's pricing policy. The contribution to the likelihood function of a price decrease in restaurant $i$ at date $t$, is very similar to the one for price increase.

$$l_{i,t}(u_i) = \frac{1}{\sigma_p} \phi \left( \frac{\Delta_\tau p_{i,t} - \beta_0 - \Delta_\tau X_{1,t}\beta_1}{\sigma_p} \right) \times \Pr \left[ \Delta_\tau p_{i,t}^* < C_{it}^- | \Delta_\tau p_{i,t} = \Delta_\tau p_{i,t}^* \right]$$

$$= \frac{1}{\sigma_p} \phi \left( \frac{\Delta_\tau p_{i,t} - \beta_0 - \Delta_\tau X_{1,t}\beta_1}{\sigma_p} \right) \times \Phi \left[ \frac{-\beta_0 - \Delta_\tau X_{1,t}\beta_1 + X_{2,t}\beta_2^- - u_i - \Delta_\tau p_{i,t} + \beta_0 + \Delta_\tau X_{1,t}\beta_1}{\sigma_{c-}} \right]$$

$$= \frac{1}{\sigma_p} \phi \left( \frac{\Delta_\tau p_{i,t} - \beta_0 - \Delta_\tau X_{1,t}\beta_1}{\sigma_p} \right) \times \Phi \left( \frac{X_{2,t}\beta_2^- - u_i - \Delta_\tau p_{i,t}}{\sigma_{c-}} \right)$$

(3)

where $\phi$ is the p.d.f of the Gaussian distribution. As in the case of price increases, we have:

$$\text{corr}(\varepsilon_{i,t}^p - \varepsilon_{i,t}^c, \varepsilon_{i,t}^p) = \frac{\sigma_p}{\sqrt{\sigma_{c-}^2 + \sigma_p^2}}$$

The likelihood function for an i.i.d. sample of $n$ restaurants is thus:

$$\ln L = \sum_{i=1}^{N} \ln \left( \prod_{t=1}^{T} l_{i,t}(u_i) \phi(u_i) \sigma_u \, du_i \right)$$

The maximization of this likelihood function is performed using the GAUSS software $\text{maxlik}$ procedure. A Gauss-Hermite quadrature is used to approximate numerically the integral appearing in the log-likelihood function.$^1$

$^1$We use 40 points of integration on the interval $[-10; 10]$.  

4