Online Appendices to "Deciphering the Macroeconomic Effects of Internal Devaluations in a Monetary Union"

Javier Andrés,[a] Óscar Arce,[b] Jesús Fernández-Villaverde,[c] and Samuel Hurtado[b]
[a]Universidad de Valencia
[b]Banco de España
[c]University of Pennsylvania, NBER, and CEPR

Appendix A. Labor Market

We now provide further details regarding how the labor market works in our model. Following Galí (2011), we assume that each representative household consists of a unit squared of individuals indexed by $(i, j) \in [0,1] \times [0,1]$, where i represents the variety of labor service provided by the individual and j indexes her disutility from working, given by χj^{φ}. Let $n_t^x(i)$ denote the number of variety-i workers in household $x = u, c$ employed at time t. Total household disutility from working is given by

$$\chi \int_0^1 \int_0^{n_t^x(i)} j^{\varphi} dj di = \chi \int_0^1 \frac{n_t^x(i)^{1+\varphi}}{1+\varphi} di.$$

Given the type-specific wage $W_t(i)$, the number of type-i workers that each household would like to send to work is

$$\arg\max_{n_t^x(i)} \left\{ \lambda_t^x \frac{W_t(i)}{P_t} n_t^x(i) - \zeta_t \chi \frac{n_t^x(i)^{1+\varphi}}{1+\varphi} \right\} = \left(\frac{\lambda_t^x}{\zeta_t \chi} \frac{W_t(i)}{P_t} \right)^{1/\varphi} \equiv l_t^x(i),$$

where $\lambda_t^x \equiv 1/c_t^x$. Unemployment in the market for type-i labor is the number of workers willing to work at the going wage minus effective labor demand: $u_t(i) \equiv \sum_{x=u,c} l_t^x(i) - \sum_{x=u,c} n_t^x(i)$.

Let

$$l_t^x \equiv \int_0^1 l_t^x(i)\,di = \left(\frac{\lambda_t^x}{\zeta_t\chi}\frac{W_t}{P_t}\right)^{1/\varphi}\int_0^1\left(\frac{W_t(i)}{W_t}\right)^{1/\varphi}di$$

$$= \left(\frac{\lambda_t^x}{\zeta_t\chi}\frac{W_t}{P_t}\right)^{1/\varphi}\Delta_t^{w,l},$$

$$N_t^x \equiv \int_0^1 n_t^x(i)\,di = n_t^x\int_0^1\left(\frac{W_t(i)}{W_t}\right)^{-\varepsilon_w}di = n_t^x\Delta_t^{w,n},$$

denote total household-specific labor supply and labor demand, respectively, where $\Delta_t^{w,l} \equiv \int_0^1 (W_t(i)/W_t)^{1/\varphi}\,di$ and $\Delta_t^{w,n} \equiv \int_0^1 (W_t(i)/W_t)^{-\varepsilon_w}\,di$ are indices of wage dispersion. Then, aggregate unemployment is

$$u_t \equiv \int_0^1 u_t(i)\,di = l_t - N_t,$$

where $l_t \equiv \sum_{x=u,c} l_t^x$ and $N_t \equiv \sum_{x=u,c} N_t^x$ are aggregate labor supply and labor demand, respectively. The unemployment rate is $u_t^{rate} \equiv u_t/l_t$.

Finally, the nominal wage income earned by each type-x household equals $\int_0^1 W_t(i)\,n_t^x(i)\,di = W_t n_t^x$, where $n_t^x \equiv n_t^{e,x} + n_t^{h,x}$.

Appendix B. Additional Experiments

We present here results from a set of alternative exercises:

- Figure B.1 plots the effects of a goods market reform in the case with the baseline degree of nominal rigidities and the case of near full price and wage rigidity.
- Figure B.2 repeats the same exercise for a labor market reform.
- Figures B.3 and B.4 replicate the same exercises as Figures B.1 and B.2 except that now the economy is at the ZLB.
- Figures B.5 shows the effects of a labor market reform when the elasticities of substitution in the goods and labor markets are the same.
- Figures B.6 replicates Figure B.5 when the economy is at the ZLB.

Figure B.1. Internal Devaluations: Goods Market Reform

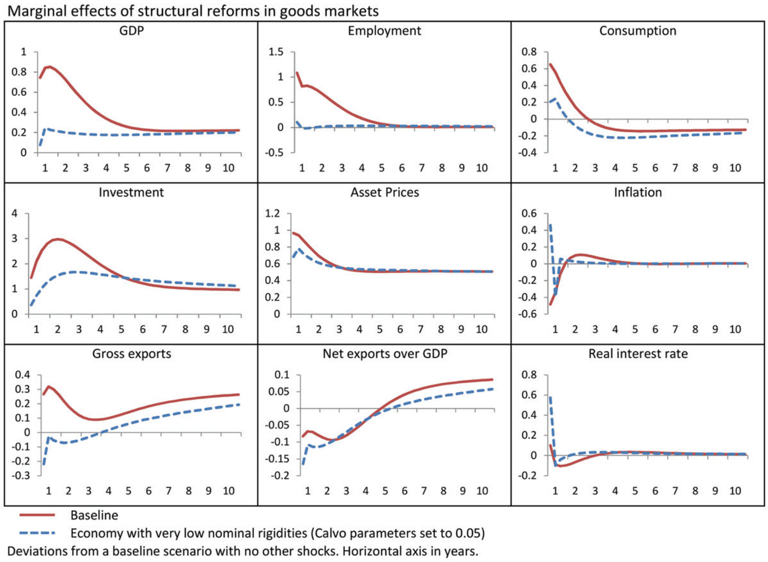


Figure B.2. Internal Devaluations: Labor Market Reform

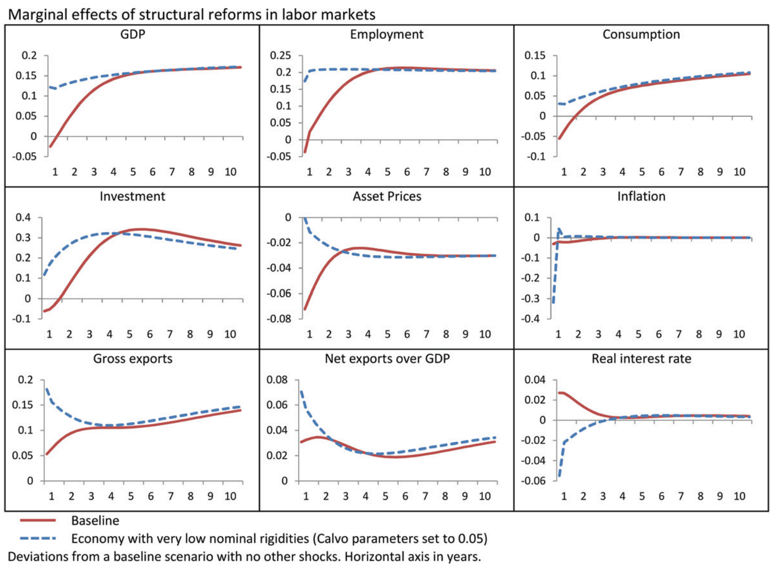
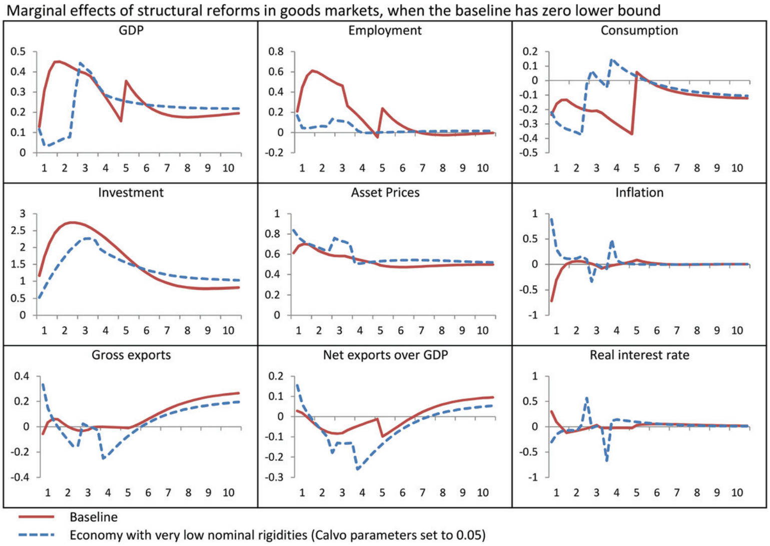
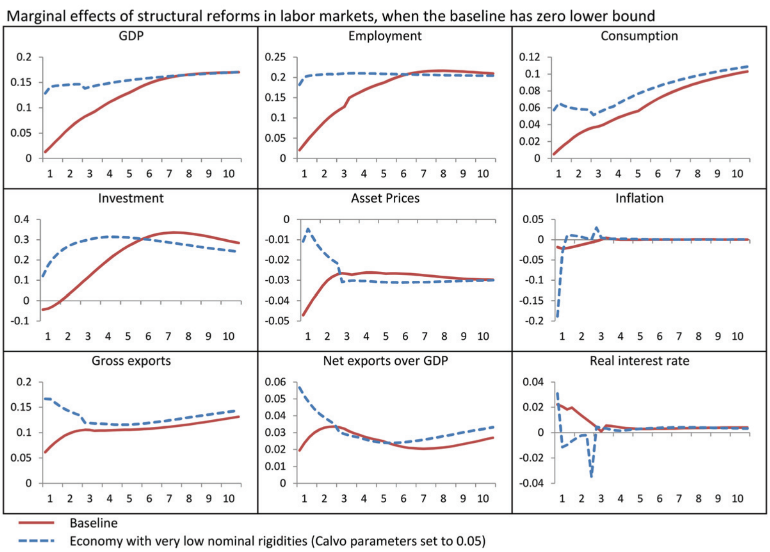


Figure B.3. Internal Devaluations: Goods Market Reform at the ZLB



Deviations from a baseline scenario with deleveraging and negative demand shocks that have taken interest rates to the ZLB.

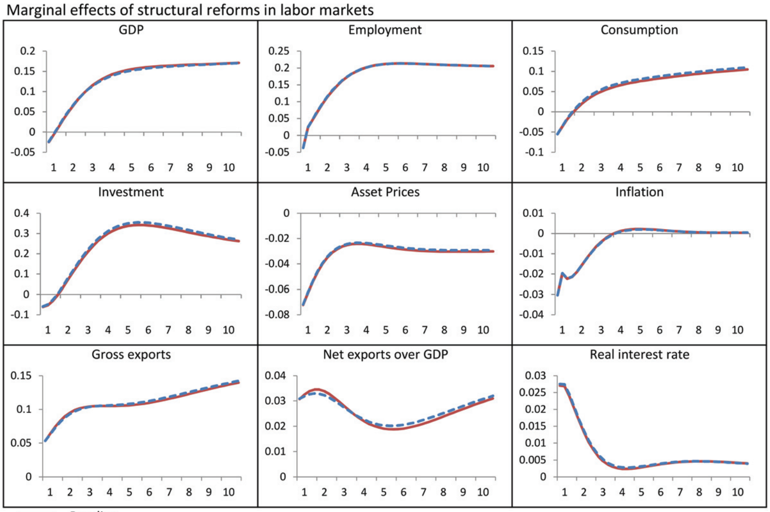
Figure B.4. Internal Devaluations: Labor Market Reform at the ZLB



Deviations from a baseline scenario with deleveraging and negative demand shocks that have taken interest rates to the ZLB.

Figure B.5. Different Elasticities of Substitution: Baseline vs. $\varepsilon_p = 3.31$. Labor Market Reform

Marginal effects of structural reforms in labor markets



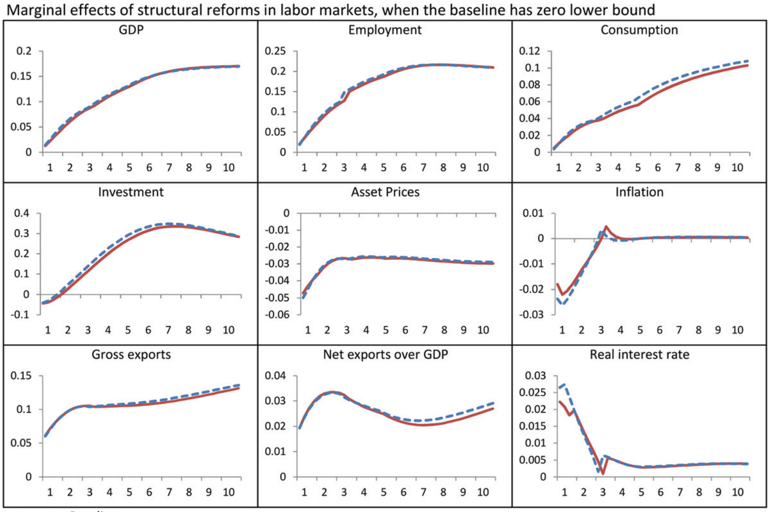
Baseline

Economy with equal margins in goods and labor markets (calibration with a lower epsilon)

Deviations from a baseline scenario with no other shocks. Horizontal axis in years.

Figure B.6. Different Elasticities of Substitution at the ZLB: Baseline vs. $\varepsilon_p = 3.31$. Labor Market Reform

Marginal effects of structural reforms in labor markets, when the baseline has zero lower bound



Baseline

Economy with equal margins in goods and labor markets (calibration with a lower epsilon)

Deviations from a baseline scenario with no other shocks. Horizontal axis in years.