A Coordination and Transmission Tale about Labor Market Reforms During Global Financial Crisis

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Outline

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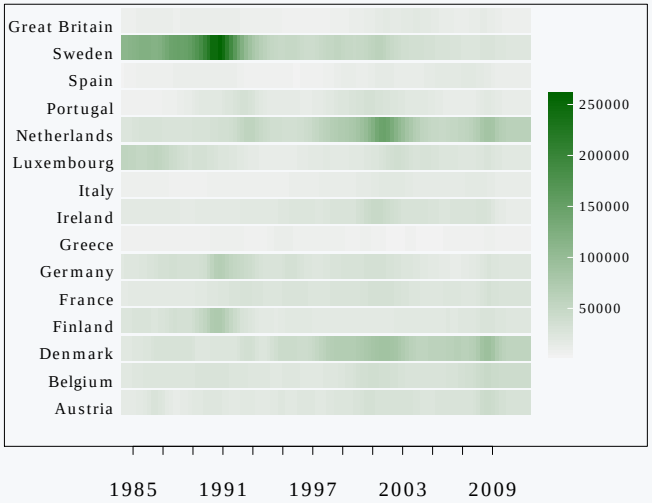
Motivation

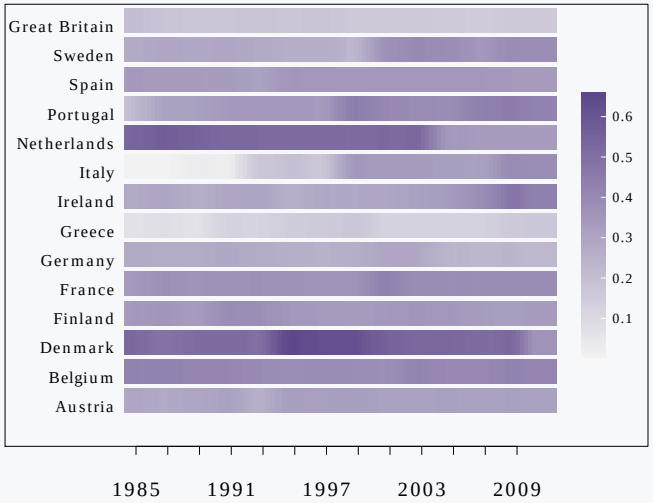
‘**Within a single market and major trading bloc like the EU, it makes good sense to co-ordinate national economic policies. This enables the EU to act rapidly when faced with challenges such as the current economic and financial crisis**.’ (European Commission, 2012)

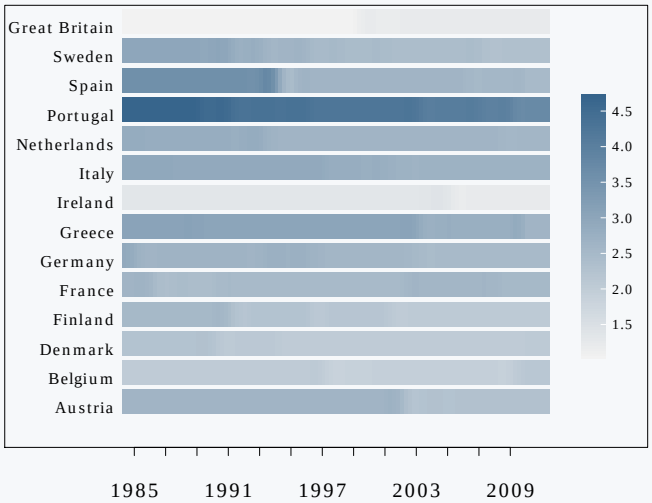
Motivation

- Global financial crisis
  - Spread of shocks and synchronisation of business cycles (di Mauro et al., 2010 among others).
    - ★ International trade and sector specialisation turned out to be crucial.
  - What if different policies at the outset of the global financial crisis?
    - ★ Policy intervention in an interdependent world.
    - ★ Spillovers and unintended effects.
    - ★ Labor reforms of utmost importance when monetary policy seems to have reached its efficacy limits.
- Theoretical considerations of long-run and data-driven short-run effects of labor market reforms.
  - Business cycle frequency is usually disregarded in labor studies.

Spatial Distribution of Expenditure on ALMP, Replacement Rates and EPL







Contribution

1. A stochastic multi-country model with frictional labor market and trade in final and intermediate goods.
    1. Theory for the long run, data for the short run.
2. Theory-consistent channels, shedding new light on the policy transmission mechanisms.
    1. Failure to account for supply-side trade would miss the first-order effects on output, over and above price effects.
    2. Price network accounts for wages and interest rates (capital price).
    3. Wage cost is part of the international prices – however, unlike traditional demand-side stories, inputs trade also affect output through the production part.
    4. A global input-output network
3. Spilling policies and "importing back" the feedback effects.
4. Labor market policies – endogenous and weakly exogenous (discretionary choices by policy makers).

Questions

1. What is the connection between different labor market institutions and main macro variables, once interdependencies are taken into account?
2. What is the very nature of those interdependencies, i.e. is the final goods trade, a standard practice in the global macroeconometric literature, a good choice in the labor market context?
3. What responses would have been observed had there been a joint decision on labor market policies at the outset of GFC?

Findings

- Employment protection may actually be not as detrimental as previously thought.
  - Short-run positive effects from rigidity in firing and positive demand effects during the GFC.
- Similarly, replacement rates may initially deliver positive (demand boost) effects at the outset of GFC.
- ALMP, however, does not help as much with easier job finding or reallocation as it delivers negative fiscal effects during the GFC.
- Substantial difference between **restricted** and **unrestricted** versions of the model (crucial for ALMP and EPL's effect on the real economy) and **theory-consistent** (input-output) weights and **trade-weighted** versions (particularly relevant for medium- to longer-run results).
- From a policy perspective, the very *source of interdependencies*, i.e., the channels how reforms get "exported" and potentially "imported back" as a higher-order effect, are important for any design of coordinated policy.

Review: Theoretical Environment

- Macro model with final and inputs trade, augmented with the labor market subject to search-and-matching frictions.
  - Inputs trade is modelled drawing from King et al. (1988), Holly and Petrella (2012), Acemoglu et al. (2012), among others.
  - Labor market is borrowed from Mortensen and Pissarides (1994) and Boeri (2011).
  - Three labor market policies:
    - ★ Unemployment benefits.
    - ★ Employment-conditional incentive (active labor market policy).
    - ★ Worker's bargaining power (employment protection, as in Cacciatore et al., 2016a).

Related Research - Theory

- Macro and input-output networks: Atalay et al. (2011), Holly and Petrella (2012), Acemoglu et al. (2012), Pesaran and Yang (2017), among many others.
- Global macroeconometric modelling: Pesaran et al. (2004); Garratt et al. (2006); Dees et al. (2007).
- Labor market policies: Blanchard (2006), Bassanini and Duval (2006), Boeri (2011), Bentolila et al. (2012).
- Macro-labor studies with business cycles and trade linkages: Stähler and Thomas (2012), Cacciatore and Fiori (2016), Cacciatore et al. (2016a), among others.

Related Research - Empirics

- Replacement rates generally have a positive effect on unemployment (Bassanini and Duval, 2006; Nickell et al., 2005).
- Estimated effect of expenditure on active labor market policies (hereafter ALMP) is rather mixed.
  - Orlandi (2012) finds ALMP are effective in helping to reduce unemployment.
  - Bassanini and Duval (2006) obtain statistically significant estimates only for ALMP interactions with other variables, also stating that expenditure on some ALMP categories (such as training) is more effective than others.
- Liberalisation of employment protection may have short-run recessionary effects (Cacciatore et al., 2016b; Cacciatore and Fiori, 2016).

Outline

Demand Side

- Trade in final and intermediate goods.
- Trade is costly: 'iceberg' type trade costs imply that $\tau_{ij} - 1$ of the product 'melts' on the way.
- For simplicity, assume Cobb-Douglas aggregator for the final goods.

Supply Side

- Suppose that output of each good denoted by Y_{it} depends on the measure of workers hired (H_{it}), capital stock (K_{it}), the output in home and foreign sectors, $d_{ji,t}$ and $m_{\ell i,t}$, respectively, the world's general productivity ($\mathcal{A}_t$), a country-specific access to the global technology, λ_i, and an idiosyncratic component ε_{it} :

$$Y_{it} = \left(\mathcal{A}_t^{\lambda_i} H_{it}^{\alpha_i} K_{it}^{1-\alpha_i}\right)^{1-\omega_i-\varpi_i} \prod_{j=1}^{J} d_{ji,t}^{\omega_{ji}} \prod_{\ell=1}^{L} m_{\ell i,t}^{\varpi_{\ell i}} \exp\left(\varepsilon_{it}\right), \omega_i \equiv \sum_j \omega_{ji},\ \varpi_i \equiv \sum_\ell \varpi_{\ell i}. \tag{1}$$

- We can interpret ω_i as the share of domestic intermediate goods used in production and ϖ_i as the share of foreign intermediate goods in final goods production.
- The productivity term $\ln \mathcal{A}_{it} \equiv \lambda_i \ln \mathcal{A}_t$ is a useful summary of many sources that can affect global technology and is particularly relevant for interlinked economies as considered in our sample.

Supply Side

- Under perfect competition, and taking prices and exogenous parameters as given, firms solve the following problem:

$$\max_{\{d_{\ell i,t},\, m_{\ell i,t},\, K_{it},\, H_{it}\}} \left\{ P_{it} \left(A_t^{\lambda_i} H_{it}^{\alpha_i} K_{it}^{1-\alpha_i} \right)^{1-\omega_i-\varpi_i} \prod_{j=1}^{N} d_{ji,t}^{\omega_{ji}} \prod_{j=1}^{N} m_{ji,t}^{\varpi_{ji}} \right.$$
$$\left. - \sum_{\ell}^{N} P_{\ell i,t} d_{\ell i,t} - \sum_{\ell}^{N} \tau_{\ell i} P_{\ell t} m_{\ell i,t} - r_{it} K_{it} - w_{it} H_{it} \right\},$$

  where $\mathbb{E} \exp(\varepsilon_{it}) = 1$, so firms optimise over expected revenues.

- The first order conditions yield

$$d_{ji,t} = \omega_{ji} Y_{it}; \qquad r_{it} K_{it} = (1-\omega_i-\varpi_i)(1-\alpha_i) P_{it} Y_{it};$$
$$m_{ji,t} = \frac{\varpi_{ji} P_{it} Y_{it}}{\tau_{ji} P_{jt}} = RER_{ij,t} \frac{\varpi_{ji} Y_{it}}{\tau_{ji}}; \qquad w_{it} H_{it} = (1-\omega_i-\varpi_i) \alpha_i P_{it} Y_{it},$$

  where real exchange rate is given by $RER_{ij,t} \equiv P_{it}/P_{jt}$.

- Wages are not equal to marginal product and marginal cost – frictional labor market, so employment adjusts (produces unemployment).
- Later, perfect reversibility will imply that capital is not featured in wages.

Price Network

- The price mechanism captures complex interdependencies and can be recovered by substituting the first order conditions into the production function:

$$(1-\omega_i)\,p_{it} = \ln\Phi_i - \lambda_i\,(1-\omega_i-\varpi_i)\ln\mathcal{A}_t + \alpha_i\,(1-\omega_i-\varpi_i)\ln w_{it} + (1-\alpha_i)\,(1-\omega_i-\varpi_i)\ln r_{it} + \sum\nolimits_j \varpi_{ji}\tau_{ji}p_{jt} - \varepsilon_{it},$$

  where Φ_i is a composite parameter and lower case denotes a natural logarithm of the variable, e.g. $p_{it} \equiv \ln P_{it}$. See Pesaran and Yang (2020) for econometric analysis of price networks, .

- We require equations that determine interest rates and wages that are taken as given in the FOCs before.
  - Wage rate will be pinned down using wage bargaining idea in the frictional labor market. Deviation from the marginal product will generate unemployment.
  - We assume perfectly competitive (domestic) capital markets, using CRS production function (Lucas, 1990),

$$r_{it} = \Upsilon_i \mathcal{A}_t^{\frac{\lambda_i}{1-\alpha_i}} H_{it}^{\frac{\alpha_i}{1-\alpha_i}} P_{it} Y_{it}^{-\frac{\alpha_i}{1-\alpha_i}} \left(\prod\nolimits_{j=1}^{N} \left(\varpi_{ji} RER_{ij,t}\right)^{\varpi_{ji}}\right)^{\frac{1}{(1-\alpha_i)(1-\omega_i-\varpi_i)}}.$$

Price Network

- Labor market policies (LMP) transmit across countries via home wages, home interest rates and prices of inputs:

$$
\begin{aligned}
(1-\omega_i)\,\tfrac{d\ln p_{it}}{d\mathrm{LMP}_{it}} &= (1-\omega_i)\,\tfrac{d\ln p_{it}}{dp_{it}}\,\tfrac{dp_{it}}{d\mathrm{LMP}_{it}} \\
&= \underbrace{\alpha_i\,(1-\omega_i-\varpi_i)\,\frac{d\ln w_{it}}{d\mathrm{LMP}_{it}} + (1-\alpha_i)\,(1-\omega_i-\varpi_i)\,\frac{d\ln r_{it}}{d\mathrm{LMP}_{it}}}_{\text{home market effect}} \\
&+ \underbrace{\sum \varpi_{ji}\,\frac{d\ln p_{jt}}{d\mathrm{LMP}_{it}}}_{\text{import-back (inward-linkage) effect}}.
\end{aligned}
\tag{2}
$$

- Foreign market reforms get imported through inputs trade & shared (global) technology (which can then drive local prices).
- Need to develop a labor market part.

Labor Market

- The continuation valuation by workers in the status of unemployment:

$$\bar{r}_i J_{it}^U = b_{it} + \theta_{it} q\left(\theta_{it}\right)\left(J_{it}^E - J_{it}^U\right). \tag{3}$$

The flow yield from the valuation of the state of unemployment at the long run average of interest rate $\bar{r}_i$ is equated to unemployment benefit $b_{it} \in (0, 1)$ and an expected "capital gain" stemming from finding new employment (which depends on labor market tightness θ_{it}).

- The HJB equation for employees

$$\bar{r}_i J_{it}^E = \left(1 + e_{it}\right) w_{it} + \delta_i\left(J_{it}^U - J_{it}^E\right). \tag{4}$$

The value of employment is equal to the current wage, proportionally augmented by the employment-conditional incentive e plus the expected capital gain on the employment relationship.

- At the firm level, the value function is given by

$$\begin{aligned} &\left(\bar{r}_i + \delta_i\right) J_{it}^F \\ &= \alpha_i\left(1 - \omega_i - \varpi_i\right) \frac{P_{it} Y_{it}}{H_{it}} - w_{it}, \end{aligned} \tag{5}$$

where the first term denotes the value generated by labor in total output. The firm's value is discounted using the effective discount rate is $\bar{r}_i + \delta_i$, accounting for both time preference and the destruction rate.

Labor Market

- We abstract from the firm choice regarding its vacancy posting strategy. The value of a new vacancy is given by

$$\bar{r}_i J_{it}^V = -\sigma_{it} + q(\theta_{it}) \left(J_{it}^F - J_{it}^V \right) \tag{6}$$

- Equation (6) governs the valuation of an unfilled vacancy. Under the job creation condition, $J^V = 0$,

$$J_{it}^F = \frac{\sigma_{it}}{q(\theta_{it})} = \frac{\alpha_i (1 - \omega_i - \varpi_i) P_{it} (Y_{it}/H_{it}) - w_{it}}{\bar{r}_i + \delta_i}.$$

- This leads to

$$w_{it} = \alpha_i (1 - \omega_i - \varpi_i) P_{it} (Y_{it}/H_{it}) - \frac{\bar{r}_i + \delta_i}{q(\theta_{it})} \sigma_{it}.$$

Labor Market

- Wage equation under the Nash bargaining rule should solve:

$$
\begin{aligned}
w_{it} &= \arg\max \left(J_{it}^{E} - J_{it}^{U}\right)^{\kappa_i} \left(J_{it}^{F} - J_{it}^{V}\right)^{1-\kappa_i} \\
&= \arg\max \left(\frac{(1+e_{it})w_{it} - b_{it}}{\bar{r}_i + \theta_{it} q(\theta_{it}) + \delta_i}\right)^{\kappa_i} \left(\frac{\alpha_i (1-\omega_i-\varpi_i)\frac{P_{it}Y_{it}}{H_{it}} - w_{it}}{\bar{r}_i + \delta_i}\right)^{1-\kappa_i}
\end{aligned} \tag{7}
$$

with the first-order necessary condition yielding equilibrium wage:

$$
w_{it}/P_{it} = \frac{\kappa_i \alpha_i \left(1 - \omega_i - \varpi_i\right)}{\kappa_i + \left(1-\kappa_i\right)\left(1 + e_{it} - b_{it}\right)\left(\frac{\bar{r}_i + \delta_i}{\bar{r}_i + \delta_i + \theta_{it} q(\theta_{it})}\right)} \left(Y_{it}/H_{it}\right).
$$

Labor Market

- Combination of wage and job creation equations delivers a relationship that describe a labor market tightness:

$$\frac{\bar{r}_i+\delta_i}{q(\theta_{it})}\sigma_{it}/P_{it} = \left(\frac{(1-\kappa_i)(1+e_{it}-b_{it})\left(\frac{\bar{r}_i+\delta_i}{\bar{r}_i+\delta_i+\theta_{it}q(\theta_{it})}\right)}{\kappa_i+(1-\kappa_i)(1+e_{it}-b_{it})\left(\frac{\bar{r}_i+\delta_i}{\bar{r}_i+\delta_i+\theta_{it}q(\theta_{it})}\right)}\right) \times\alpha_i\left(1-\omega_i-\varpi_i\right)\left(Y_{it}/H_{it}\right).$$

- Labor market tightness varies with the GVC structure, productivity, and labor market institutions (bargaining, vacancy posting, benefits and subsidies).
- The wage rate is given by

$$w_{it} = \frac{\kappa_i}{1-\kappa_i}\frac{\left(\bar{r}_i+\delta_i+\theta_{it}q\left(\theta_{it}\right)\right)}{1+e_{it}-b_{it}}\frac{\sigma_{it}}{q\left(\theta_{it}\right)},$$

  identical across firms but different across countries. In equilibrium, wages are determined solely by deep parameters and labor market variables – it is, therefore, sufficient to condition analysis on them without a need to account for wages directly unless wage elasticity was of interest.
- Effects of regulation ultimately depend on the endogenous response of θ_{it} (ex-ante ambiguous) & whether LMP are discretionary or endogenous.

Estimating Representation

$$
\begin{aligned}
y_{it} &= \Upsilon_i^y + \lambda_i a_t + h_{it} - \left(\tfrac{1-\alpha_i}{\alpha_i}\right) \ln r_{it} + \tfrac{1}{\alpha_i(1-\omega_i-\varpi_i)} reer_{it} + \tfrac{1}{\alpha_i(1-\omega_i-\varpi_i)} \varepsilon_{it}, \\
h_{it} &= \Upsilon_i^h + y_{it} - \ln w_{it}, \\
\ln r_{it} &= \Upsilon_i^r + \lambda_i \tfrac{\alpha_i}{1-\alpha_i} a_t - \tfrac{\alpha_i}{1-\alpha_i} \ln w_{it} + \tfrac{1}{1-\alpha_i} \tfrac{1}{(1-\omega_i-\varpi_i)} reer_{it}, \\
reer_{it} &= \Upsilon_i^{reer} - \alpha_i \lambda_i (1-\omega_i-\varpi_i) a_t + \alpha_i (1-\omega_i-\varpi_i) \ln w_{it} \\
&\quad + (1-\alpha_i)(1-\omega_i-\varpi_i) \ln r_{it}, \\
\ln w_{it} &= \Upsilon_i^w + \ln\left((\bar{r}_i + \delta_i) q^{-1}(\theta_{it}) + \theta_{it}\right) - \ln(1 + e_{it} - b_{it}) + \ln \sigma_{it}.
\end{aligned}
$$

- A model consists of *endogenous* variables (real GDP, employment, long interest rate, real effective exchange rate), wages (labor market tightness and *labor policy* variables).
- If one assumes that labor market policies are endogenous, then the set of *endogenous* variables is expanded by three additional variables.

Digression

- Let $q(\theta_{it}) = \theta_{it}^{\eta_i - 1}$, then

$$\frac{d \ln w_{it}}{d \ln e_{it}} = -\frac{e_{it}}{1+e_{it}-b_{it}} < 0 \quad \text{if LMP exogenous,}$$

$$\frac{d \ln w_{it}}{d \ln e_{it}} = \left(\eta_i \frac{\theta_{it}^{\eta_i}}{\bar{r}_i+\delta_i+\theta_{it}^{\eta_i}} + (1-\eta_i)\right) \frac{d \ln \theta_{it}}{d \ln e_{it}} - \frac{e_{it}}{1+e_{it}-b_{it}} \lesseqgtr 0 \quad \text{if LMP endogenous.}$$

- Recall a price network equation (2): diffusion of LMP effects depends on adjustment in local inputs and import-back effects as well as shared technology.
  - Global technology is unobservable: how to account for it?

Estimating Representation

- Transmission depends on observable channels through input-output linkages and unobserved linkages, subsumed within a dynamic technology factor $\mathcal{A}_t$.
- Projection space of unobserved factors approximated by cross-sectional averages.
  - Apart of granularity, little guidance on 'optimality'.
- Multiply-out the above system as follows:

$$\begin{gathered}
\alpha_i\left(1-\omega_i-\varpi_i\right) y_{it}=\alpha_i\left(1-\omega_i-\varpi_i\right) \Upsilon_i^y+\left(\alpha_i\left(1-\omega_i-\varpi_i\right) \lambda_i\right) a_t \\
+\alpha_i\left(1-\omega_i-\varpi_i\right) h_{it}-\left(1-\omega_i-\varpi_i\right)\left(1-\alpha_i\right) \ln r_{it}+reer_{it}+\varepsilon_{it}, \\
\alpha_i\left(1-\omega_i-\varpi_i\right) h_{it}=\alpha_i\left(1-\omega_i-\varpi_i\right) \Upsilon_i^h+\alpha_i\left(1-\omega_i-\varpi_i\right) y_{it} \\
-\alpha_i\left(1-\omega_i-\varpi_i\right) \ln w_{it}, \\
\left(1-\alpha_i\right)\left(1-\omega_i-\varpi_i\right) \ln r_{it}=\left(1-\alpha_i\right)\left(1-\omega_i-\varpi_i\right) \Upsilon_i^r+\lambda_i\left(1-\omega_i-\varpi_i\right) \alpha_i a_t \\
-\alpha_i\left(1-\omega_i-\varpi_i\right) \ln w_{it}+reer_{it}.
\end{gathered}$$

- Note that average output and average employment uses the labor share (accounted for the inputs share) $LS_i \equiv \alpha_i\left(1-\omega_i-\varpi_i\right)$, interest rate uses capital share (accounted for the inputs share) $KS_i \equiv \left(1-\alpha_i\right)\left(1-\omega_i-\varpi_i\right)$.

Estimating Representation

- Average once again using the intermediate inputs trade (known as MRT in the trade gravity literature), e.g.

$$\sum_{j\neq i}^{N}\varpi_{ji}LS_j y_{jt}=\sum_{j\neq i}^{N}\varpi_{ji}LS_j\Upsilon_j^{y}+\left(\sum_{j\neq i}^{N}\varpi_{ji}LS_j\lambda_j\right)a_t$$
$$+\sum_{j\neq i}^{N}\varpi_{ji}LS_j h_{jt}-\sum_{j\neq i}^{N}\varpi_{ji}LS_j\ln r_{jt}+\sum_{j\neq i}^{N}\varpi_{ji}LS_j reer_{jt}+\sum_{j\neq i}^{N}\varpi_{ji}LS_j\varepsilon_{jt}.$$

- Recall that

$$\begin{aligned}\varpi_{ji}LS_j&=\varpi_{ji}\alpha_j\left(1-\omega_j-\varpi_j\right), && \text{Labor share in imported input,}\\ \varpi_{ji}KS_j&=\varpi_{ji}\left(1-\alpha_j\right)\left(1-\omega_j-\varpi_j\right) && \text{Capital share in imported input.}\end{aligned}$$

- Using starred variables to denote cross-sectional averages, we can ease notation:

$$\begin{aligned}y_{it}^{\star}&=\Upsilon_i^{\star y}+\lambda_i^{\star}a_t+h_{it}^{\star}-\ln r_{it}^{\star}+reer_{it}^{\star}+\bar{\varepsilon}_{it},\\ h_{it}^{\star}&=\Upsilon_i^{\star h}+y_{it}^{\star}-\ln w_{it}^{\star},\\ \ln r_{it}^{*}&=\Upsilon_i^{*r}+\lambda_i^{*}a_t-\ln w_{it}^{*}+reer_{it}^{*}.\end{aligned}$$

Estimating Representation

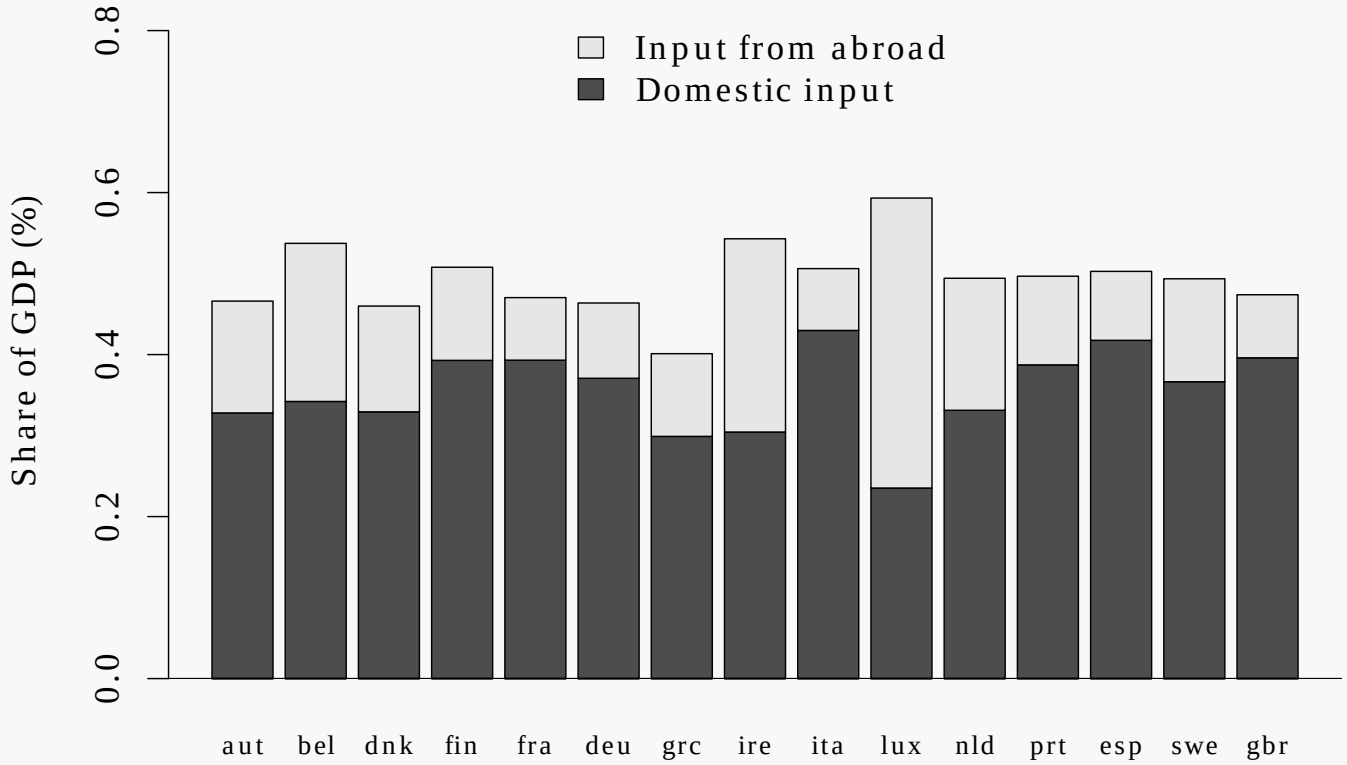
- Note that $\star$ denotes inputs trade weighted labor shares whereas $*$ stands for the inputs trade weighted capital shares. Those cross-sectional averages will be used to consistently account for the space spanned by the unobserved dynamic factor (Dees et al., 2007; Chudik and Pesaran, 2016).

Remark

A change in labor market institutions affect non-reforming economies through terms of trade (REER).

- The effect on interest rates depends on capital shares whereas on output and employment on labor shares in total income, all weighted by the import share of inputs trade. **Spillover of the reform depends on the share of foreign labor and capital used in the imported input good**.
- Increasingly important aspect of cyclical macro wherein cross-country spillovers in the domestic market depend on the elasticity of substitution with respect to foreign inputs (see Boehm et al. (2015), di Giovanni et al. (2016), among others).

Domestic and Foreign Inputs as a share of GDP



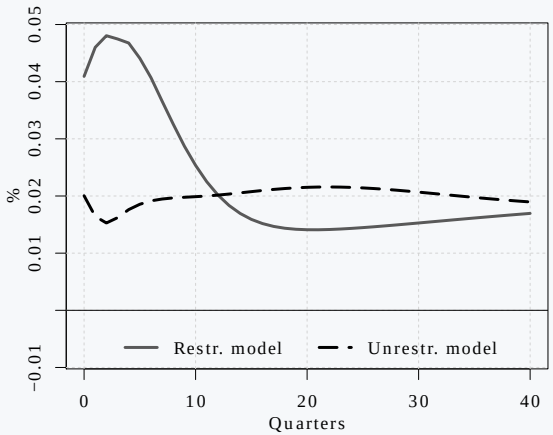
Theory Restrictions

- ***Representation 1***: Given that time preference is represented by the time-varying real interest rates and (real) wage is a function of labor productivity, we allow real interest rates as well as output and employment enter all the equations that contain wages with a non-zero parameter, albeit with opposite signs for the output and employment. Full-rank long-run parameter matrix (LRPM).
- ***Representation 2***: Given that time preference is a deep parameter that is either time-invariant or pre-determined, rank of LRPM is 3.
- ***Representation 3***: If separability, put forward by Felbermayr et al. (2011), holds, then the labor market tightness is pre-determined by the equilibrium in the goods market. Rank of LRPM collapses to 2.
- ***Representation 4***: A further assumption of a small open economy would detach the real interest rate from the developments of the domestic economy, reducing rank to 1.

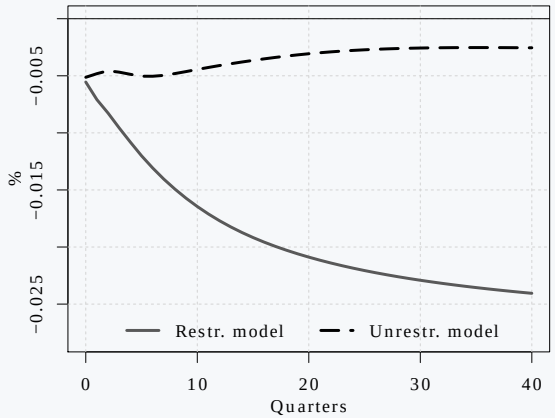
Outline

GDP (PPP) weighted responses of **employment** to a 1% shock in LMPs

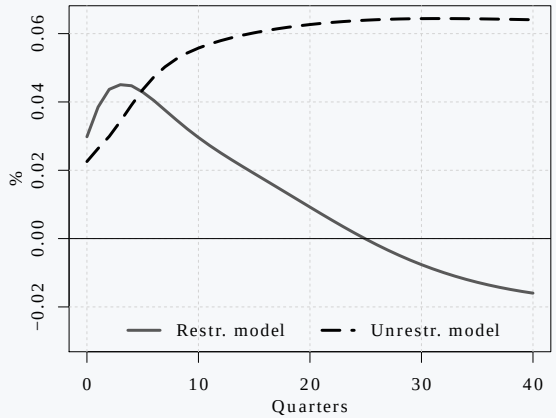
Replacement rate



Spending on ALMP

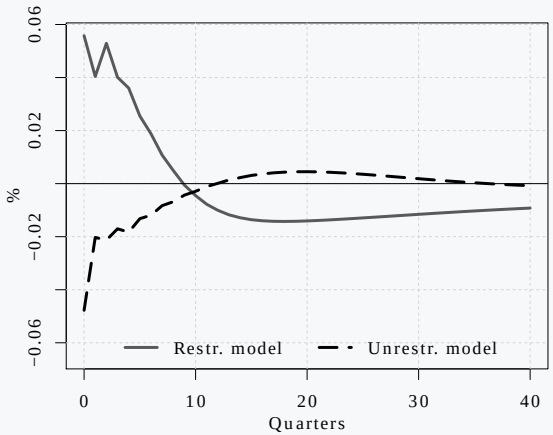


EPL

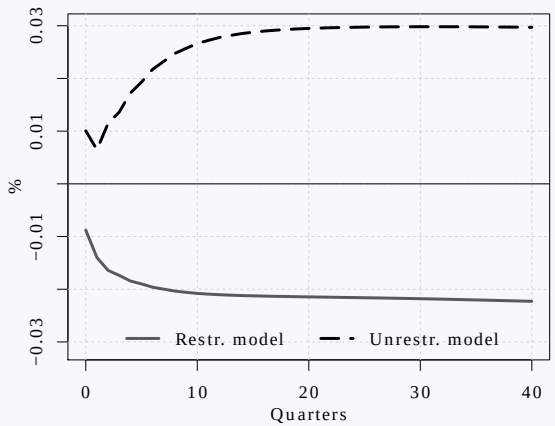


GDP (PPP) weighted responses of **real GDP** to a 1% shock in LMPs

Replacement rate



Spending on ALMP



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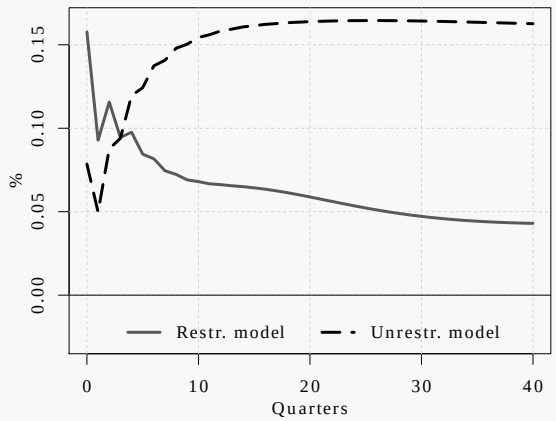
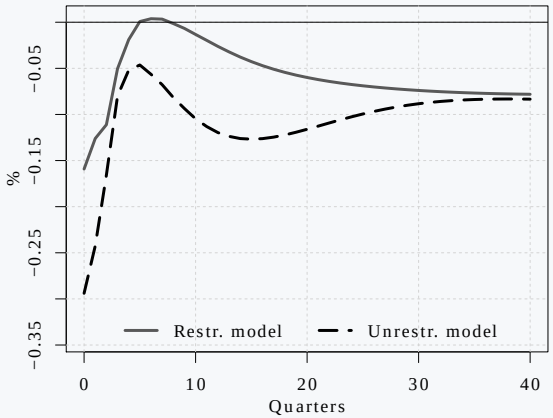
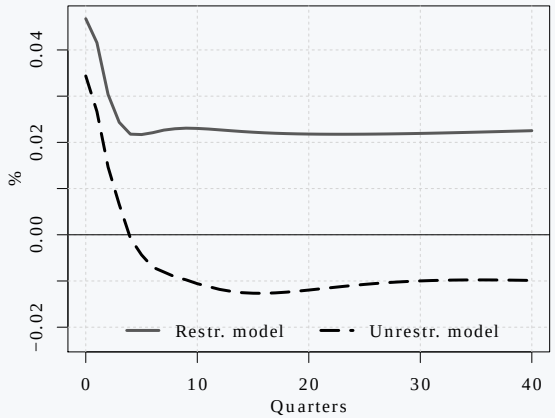


GDP (PPP) weighted responses of **REER** to a 1% shock in LMPs

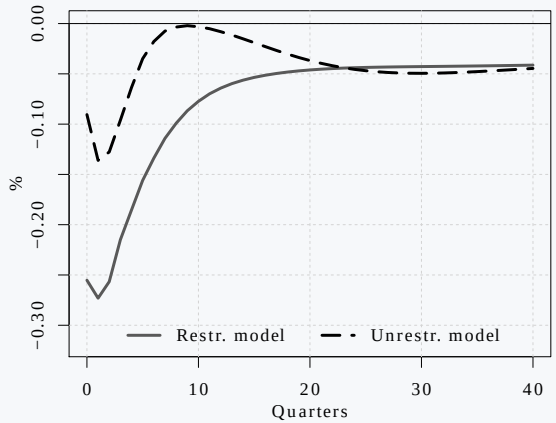
Replacement rate



Spending on ALMP

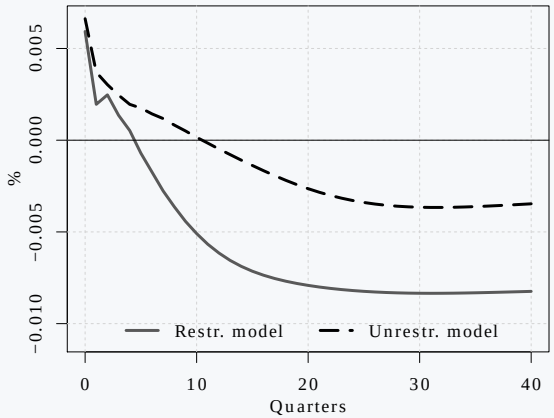


EPL

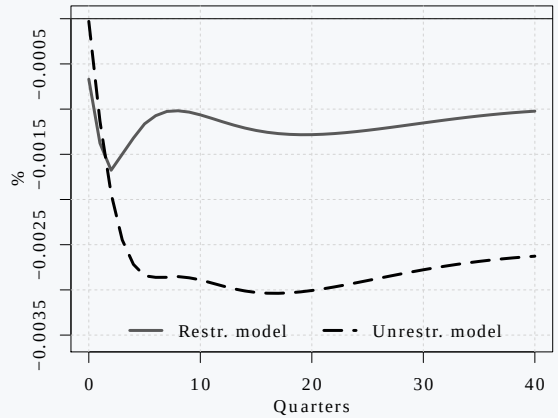


GDP (PPP) weighted responses of **Long-Interest Rate** to a 1% shock in LMPs

Replacement rate



Spending on ALMP



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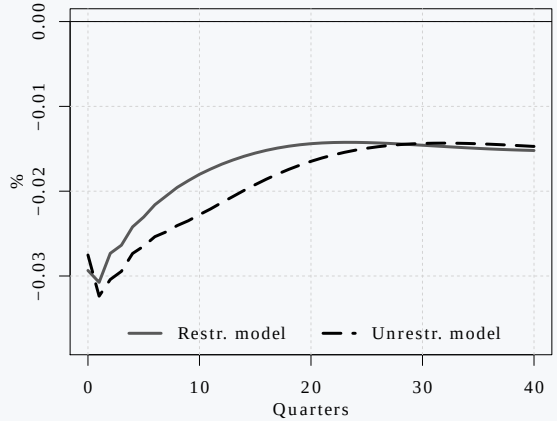
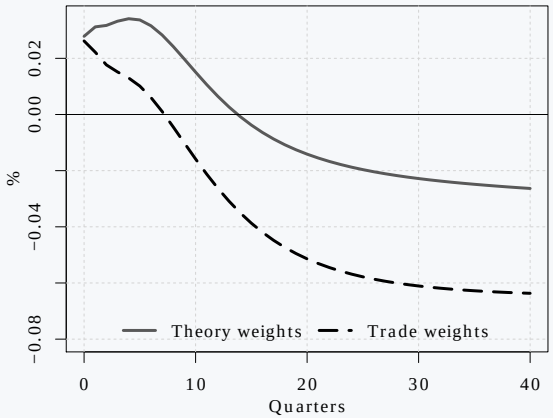
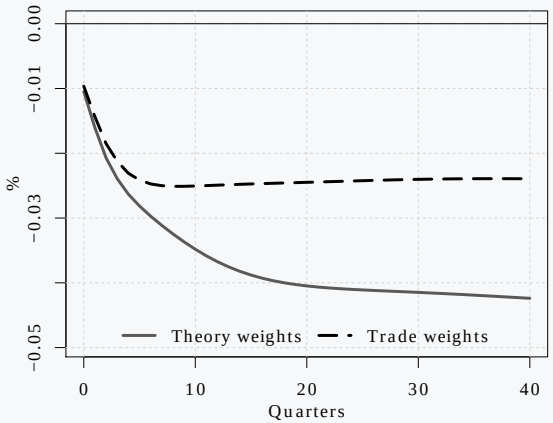


GDP (PPP) weighted responses of **employment** to a 1% shock in LMPs

Replacement rate



Spending on ALMP



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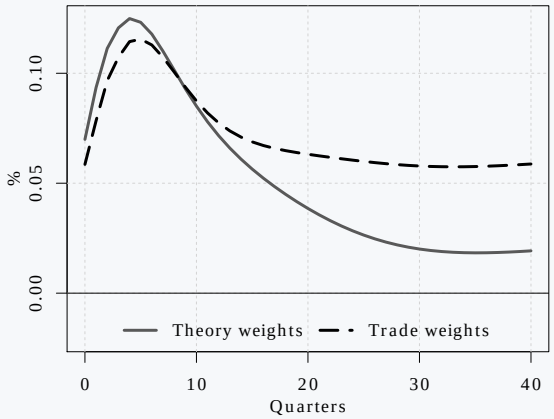
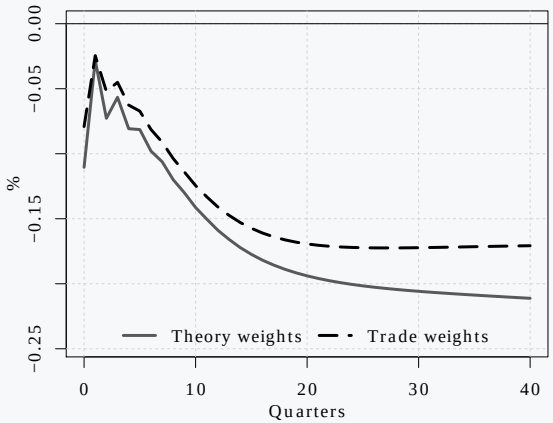
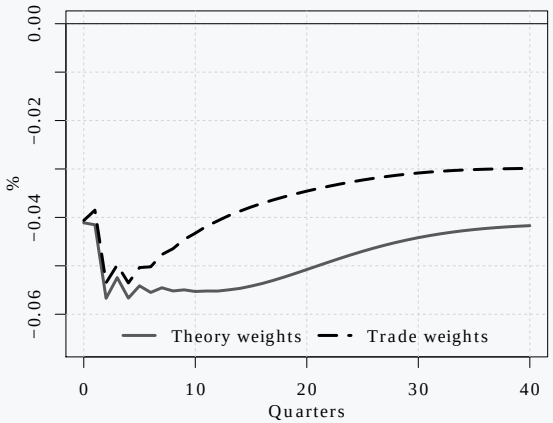


GDP (PPP) weighted responses of **real GDP** to a 1% shock in LMPs

Replacement rate



Spending on ALMP



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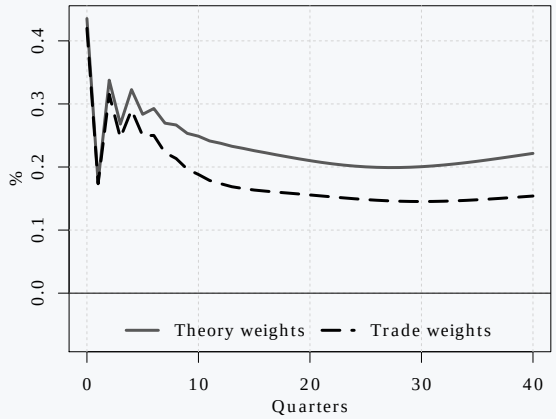
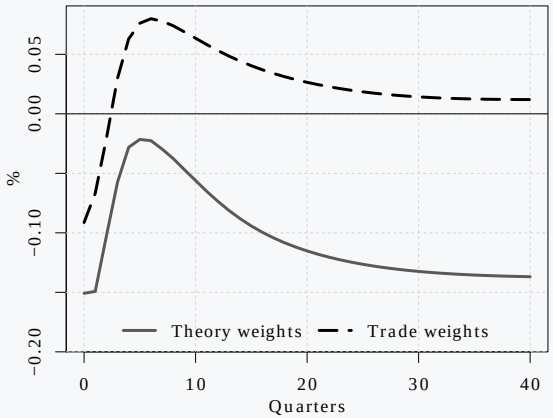
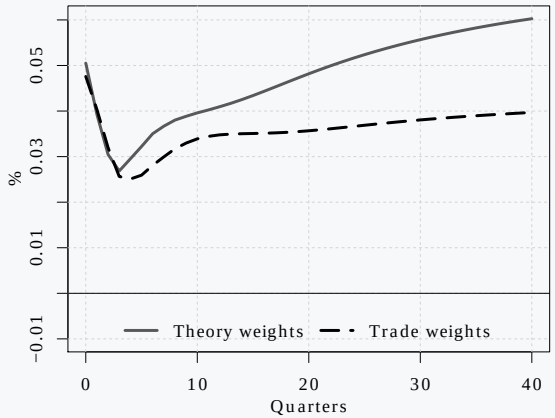


GDP (PPP) weighted responses of **REER** to a 1% shock in LMPs

Replacement rate



Spending on ALMP



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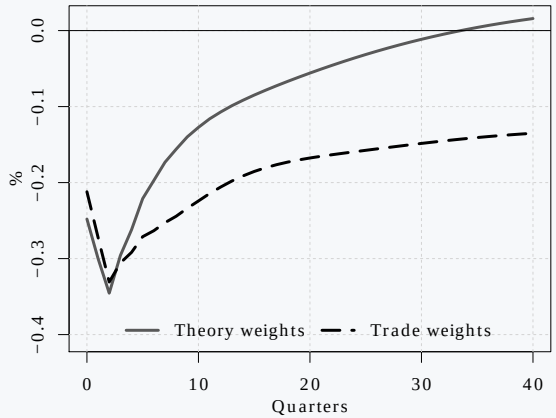
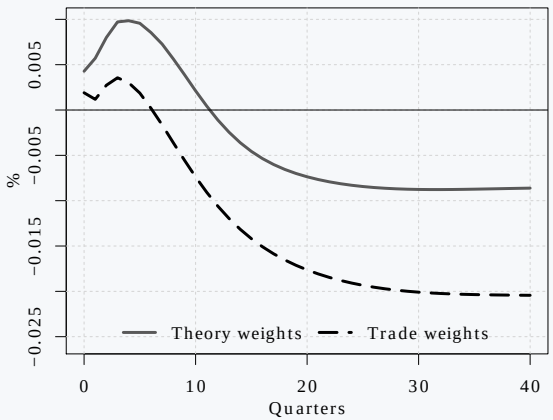
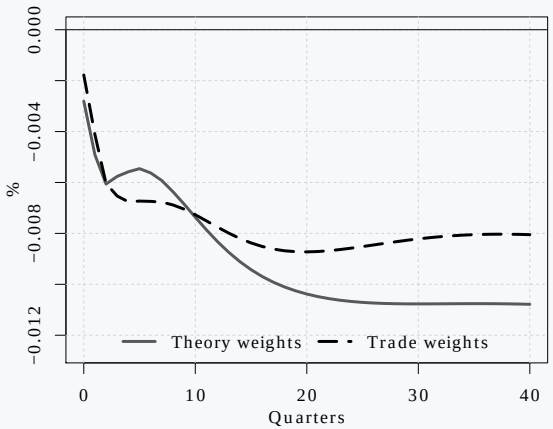


GDP (PPP) weighted responses of **Long-Interest Rate** to a 1% shock in LMPs

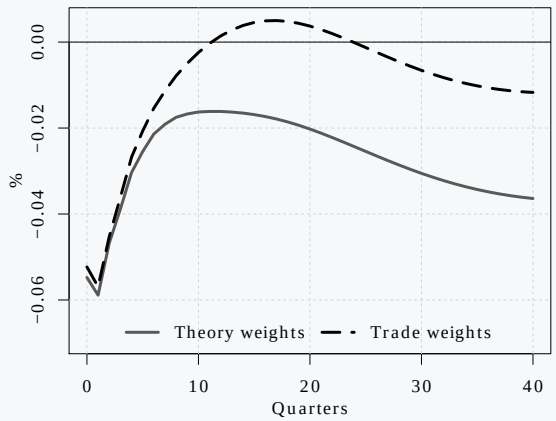
Replacement rate



Spending on ALMP



EPL



Outline

Conclusion

- Main take-aways:
  - Substantial difference between **restricted** and **unrestricted** versions of the model (crucial for ALMP and EPL's effect on the real economy) and **theory-consistent** (input-output) weights and **trade-weighted** versions (particularly relevant for medium- to longer-run results).
  - **Coordinated LMPs at the outset of the global financial crisis**:
    - ★ Higher rigidity may not be as detrimental as previously thought but may in fact have short-term positive effects (firms engage in other adjustments but firing; joint action reinforces positive demand spillovers in the short-run).
    - ★ ALMPs negative fiscal impact and spillovers cancelling each other out, with no significant effect.
    - ★ Replacement rates important to sustain positive demand/fiscal spillovers in the monetary union (amplification of the effects of individual reforms in line with Cacciatore et al. 2016).
    - ★ Labor market reforms travel through **cross-country linkages**, affect trade partners, and can be 'imported' back via input-output networks. Matter for employment, competitiveness (REER), long interest rates.

Future Research

- Analyse other transmission channels: capital flows, migration, ideas, technology diffusion.
- Labor market compositional effect (data availability).
- An industry level analysis with a fuller account of input-output structure
- Long run growth through productivity changes (as in Helpman and Itskhoki (2010) where worker's productivity affects total factor productivity which can then be mapped into technical progress), interaction between technology and the labor force.
- A more global approach, beyond Europe, thus capturing fuller effects of reallocations and structural changes.

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Demand Side

- The real consumption index for the country i (Q_{it}) is defined as

$$Q_{it} = \prod_j Q_{ji,t}^{\beta_j}, \sum_j \beta_j = 1, \tag{8}$$

  where $Q_{ij,t}$ denotes consumption of country i that originates from a country j, and β_j controls the share of the consumption good from country j in the final consumption.
- It follows that $\sum_{j \neq i} \beta_j = 1 - \beta_i$ is the share of imported final goods in consumption.
- Under standard 'iceberg' type trade costs, such that $\tau_{ij} - 1$ of the product 'melts' on the way, we are dealing with the prices $P_{ij,t} = \tau_{ij} P_{it}$.

Demand Side

- Value of trade is then given by

$$M_{ji,t} = \tau_{ji} P_{jt} Q_{ji,t} = \beta_j P_{it} Q_{it},$$

  and demand function is simply given by

$$Q_{ji,t} = \frac{P_{it}}{\tau_{ji} P_{jt}} \beta_j Q_{it}.$$

- It follows that a share of spending on final goods from j in total expenditure over the ratio of goods from ℓ in total spending is equal to β_j / β_ℓ.
- Note that total expenditure on final goods is given by

$$E_{jt} = \sum_\ell P_{j\ell,t} Q_{j\ell,t} = \sum_\ell \tau_{j\ell,t} P_{jt} Q_{j\ell,t}.$$

- Trade balancedness implies that total exports, including own final goods, shall equal to nominal expenditure, $\sum_\ell M_{j\ell,t} = E_{jt} = \beta_j \sum_\ell P_{\ell t} Q_{\ell t}$, thus yielding

$$\beta_j = \frac{E_{jt}}{\sum_\ell P_{\ell t} Q_{\ell t}} = \frac{E_{jt}}{\sum_\ell E_{\ell t}}.$$

- Total exports of final goods are equal to total imports under balanced trade, i.e. $\beta_i E_{it}$.

Accounting

- The goods could be either consumed at home, exported abroad (as final goods or inputs) or used as inputs from home sectors (so that the prices are the same):

$$\beta_i Q_{it} + (1 - \beta_i) Q_{it} + \sum_{\ell} m_{i\ell,t} + \sum_{j} d_{ji,t} = Y_{it}.$$

- The condition effectively splits the production into final consumption and intermediate production.
- There is also another constraint that links home and foreign use of the goods: everything that has not been consumed at home could have been exported. Under balanced trade condition, the exports of intermediates, denoted by X_{it} is equal to

$$X_{it} = \sum_{\ell=1}^{L} \tau_{i\ell} P_{it} m_{i\ell,t},$$

where we assume that goods are priced identically across sectors but vary with the country.

- It thus follows:

$$\begin{aligned} &P_{it} Q_{it} + P_{it} \textstyle\sum_j d_{ji,t} + \sum_{\ell=1}^{L} \tau_{i\ell} P_{it} m_{i\ell,t} \\ &= P_{it} Q_{it} + P_{it} \textstyle\sum_j d_{ji,t} + X_{it} = P_{it} Y_{it}. \end{aligned}$$

Trade of Consumption Goods

- These relationships have implications for the final goods trade, as it depends on the global input-output structure:

Remark

Simple Cobb-Douglas preference structure combined with the production of intermediate goods network yields a gravity-type relationship that depends on the global input-output structure:

$$M_{ji,t} = \frac{E_{it}E_{jt}}{\sum_{\ell} E_{\ell t}}$$
$$= \frac{(1-\omega_i-\varpi_i)\left(1-\omega_j-\varpi_j\right)P_{it}Y_{it}P_{jt}Y_{jt}}{\sum_{\ell}(1-\omega_\ell-\varpi_\ell)P_{\ell t}Y_{\ell t}} = \beta_j\left(1-\omega_i-\varpi_i\right)P_{it}Y_{it}.$$

- Real bilateral openness is defined as

$$\frac{Q_{ji,t}+m_{ji,t}}{Y_{it}} = \left(\beta_j\left(1-\omega_i-\varpi_i\right)+\varpi_{ji}\right)\frac{P_{it}}{\tau_{ji}P_{jt}}.$$

- Aggregate openness is given by

$$\sum_{j\neq i}\frac{Q_{ji,t}+m_{ji,t}}{Y_{it}} = P_{it}\sum_{j\neq i}\left(\beta_j\left(1-\omega_i-\varpi_i\right)+\varpi_{ji}\right)\frac{1}{\tau_{ji}P_{jt}}.$$

Lemma

Overall openness is a weighted average of a share of domestic and global value chains in domestic production, with the weights represented by openness of final goods $(1 - \beta_{ii})$ *and a home bias,* β_{ii}.

- Clearly, if there is no home bias ($\beta_{ii} = 0$), all production is traded, except for domestic inputs (so the openness is equal to $1 - \omega_i$).
- With no trade in final goods, $\beta_{ii} = 1$, the overall trade is equal to trade of inputs, ϖ_i.
- Failure to account for inputs trade leads to $1 - \beta_{ii}$ which is an underestimate of the overall openness if $\beta_{ii} > 0.5$.