Migrations, Long-run Fiscal Sustainability and Economic Unions

Sergii Kiiashko (KSE and NBU), Paweł Kopiec (NBP)

Introduction: labor mobility in currency unions

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  - mitigates the adverse impact of local shocks
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- Short run (Mundell [1961]):
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  - compensates for the absence of local monetary authorities
- Long run (currency union $\rightarrow$ economic union):
  - challenges social security systems in sending countries
  - increases public debt burden per capita
  - rises the old-age dependency ratio
  - decreases the marginal productivity of capital
  - the opposite holds for receiving countries

This paper

- Issues covered in our work:
  - labor mobility and optimal fiscal policy
  - economic impact of migrations at the union-wide level

- Gap in the literature: no theoretical works on the long-run fiscal effects of labor mobility in currency unions
- Related papers: ▸ Literature

Framework

- Starting point - the model by Song, Storesletten and Zilibotti [2012]:
    - continuum of countries
    - two overlapping generations: young and old
    - production factors: capital and labor
    - fiscal rules set by governments
    - time-consistent fiscal policy

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- Our extensions:
  - cross-country labor mobility
  - country-level productivity shocks
  - debt renegotiation

Model: demography and migration

- Number of old agents at the beginning of the period: n^o
- Every old agent delivers one young agent
- Survival rate: $\sigma \in (0,1)$
- Only young agents can migrate (a once and for all decision)

Model: agent preferences

- Maximization problem:

$$U^y = \max_{c^y,\, c^{o'},\, a'} \log c^y + \sigma \cdot \left[\log c^{o'} + \theta^o \cdot \mathbb{E}\left(\log g'\right) \right]$$

subject to:

$$c^y + a' = (1 - \tau) \cdot w$$

$$c^{o'} = R^h \cdot a'$$

- Optimal policy rule:

$$c^y\left(\tau,\, w\right) = \frac{1}{1 + \sigma} \cdot (1 - \tau) \cdot w$$

Model: migration process

- Two stages of the individual migrations process:
  1. Assignment: every young agent draws a migration opportunity $\hat{\mathcal{C}}$ from the distribution with c.d.f. $\Phi \circ F$ (with $\Phi' > 0$, $\Phi'' > 0$)
  2. Decision: migration decision is positive with probability $\Psi\left(\frac{\hat{\mathcal{C}}-\mathcal{C}}{\hat{\mathcal{C}}}\right)$ where $\Psi' > 0$

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- Number of emigrants: E
- Number of immigrants: I
- Number of young agents who live in a given country (produce and consume):

$$n^y\left(n^o, U^y, F\right) = n^o + I\left(n^o, U^y, F\right) - E\left(n^o, U^y, F\right)$$

- Formulas for E and I: details
- Gross migration rate:

$$\eta \equiv \frac{n^y}{n^o}$$

Model: production

- Country-level productivity: y
- Debt renegotiation: $d \in [0, 1]$
- Aggregate productivity: $\chi(d) \cdot y$ with $\chi' < 0$ and $\chi'' < 0$

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- Firm's maximization problem:

$$\max_{K,\,N} \chi(d)\, y \cdot K^{\alpha} N^{1-\alpha} - wN - R^{f} K$$

- Capital: perfect cross-border mobility, depreciates at rate 100% after one period
- Local labor market clearing: $n^{y} = N$

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- Country-level wage:

$$w = (1-\alpha)\left(\frac{\alpha}{R^f}\right)^{\frac{\alpha}{1-\alpha}} \cdot (\chi(d) \cdot y)^{\frac{1}{1-\alpha}}$$

Model: government

Government problem:

$$\max_{\tau,\, g,\, b',\, d} \left\{\alpha^y \cdot U^y + \alpha^o \cdot U^o\right\}$$

where

$$U^y = \log c^y\left(\tau, w\left(d, y\right)\right) + \sigma \cdot \log c^{o'}\left(\tau, w\left(d, y\right)\right) + \sigma \cdot \theta^o \cdot \mathbb{E} \log \Gamma\left(b', y'\right)$$

$$U^o = \log c^o\left(\tau_{-1}, w_{-1}\right) + \theta^o \cdot \log\left(g\right)$$

α^y and α^o are Pareto weights, proportional to population size

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s.t.

$$\underbrace{\sigma \cdot g}_{\text{public spending}} + \underbrace{(1-d) \cdot (-b)}_{\text{outstanding debt}} = \underbrace{\tau \cdot w\left(d, y\right) \cdot \eta\left(U^y\right)}_{\text{tax revenues}} + \underbrace{q\left(b', y\right) \cdot \left(-b'\right) \cdot \eta\left(U^y\right)}_{\text{issued debt}}$$

Model: competitive financial intermediaries and equilibrium

- Trade all types of assets
- Risk neutral, exogenous interest rate R
- Maximization problem details: details
- Consistency conditions: details
- MPE definition: details

Model: migration and optimal fiscal policy

1. Redistribution from old to young (governments compete for labor force!)
   - from public spending to private consumption

$$g = \underbrace{\theta^o \cdot c^y}_{g \text{ when no migration}} - \underbrace{\frac{\eta'}{\eta} \cdot \theta^o \cdot \left[\tau \cdot w - q \cdot b'\right]}_{\text{fiscal benefits from labor inflows}}$$

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2. Optimal debt renegotiation:

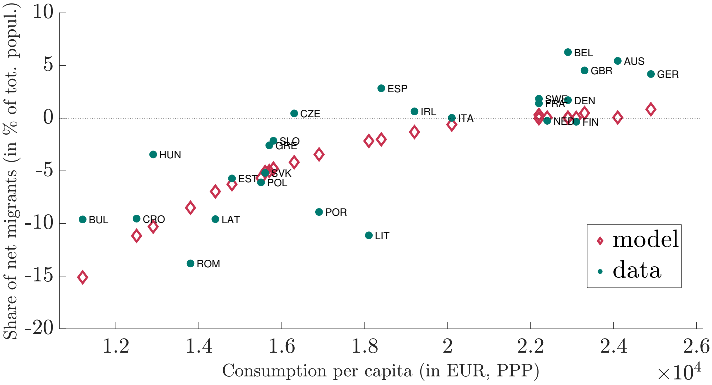
$$d = \text{argmax } (1-d) \cdot b + w(d,y) \cdot \eta\left(U^y\right)$$

   - it is less costly to default for sending countries and more costly to default for receiving countries

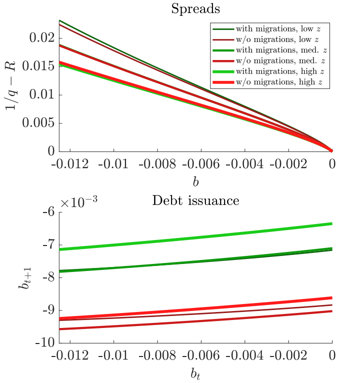
Calibration (for $T = 30$ years)

Parameter	Description	Value	Calibration target
σ	Survival rate	0.30	Old age dependency ratio
α	Output elasticity of capital	0.33	Standard value in the literature
R	Riskless interest rate	3.24	Annual real interest rate of 4%
ρ_T	Persistence of the AR(1) process	0.61	Country-level productivity process
$\sigma_{\epsilon, T}$	Std. error of the AR(1) process	0.08	Country-level productivity process
χ_0	Parameter of default penalty	0.05	Mean debt to GDP ratio of 72%
χ_1	Parameter of default penalty	2.35	Mean spread over riskless rate of 1.2%
θ^o	Preferences for public goods	1.00	Public goods for the elderly to GDP of 12%
ψ_1	Parameter of matching technology	0.20	Intra-EU migrations
ψ_2	Parameter of matching technology	2.57	Intra-EU migrations
ϕ	Parameter of matching technology	1.09	Intra-EU migrations

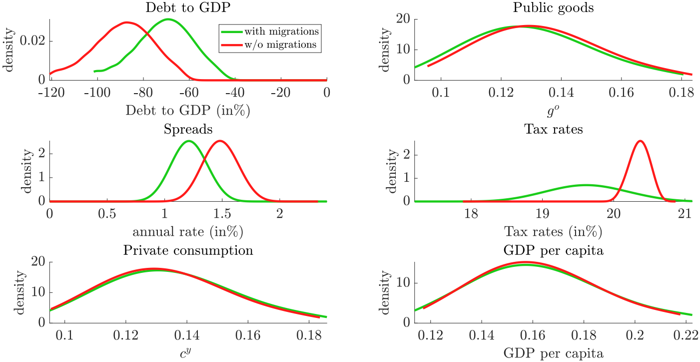
Calibration: matching process



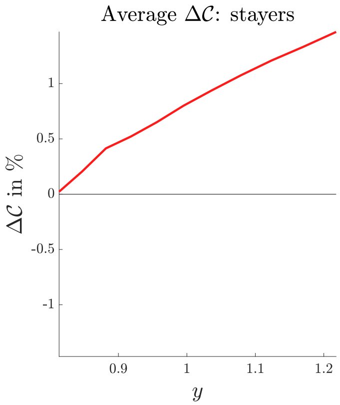
Results: optimal policies at the country level

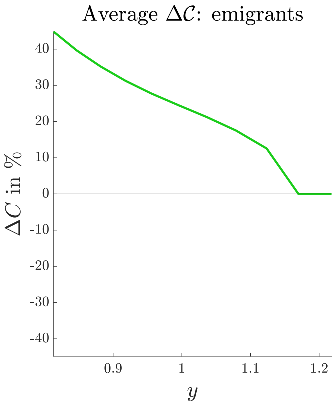


Results: distributions of countries over variables and policies

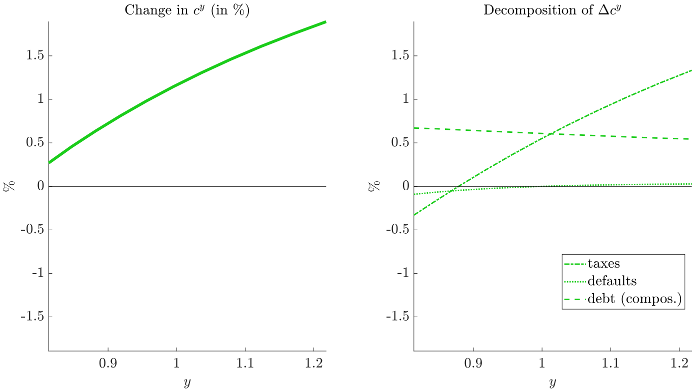


Results: welfare





Results: decomposition of c^y



Summary

- Optimal government policies and migrations
  - less public goods for the old
  - lower debt levels
  - amplification of defaults
- Labor mobility and economic union
  - important general equilibrium effects of fiscal discipline
  - lower average debt - lower spreads
  - + lower taxes - higher private consumption
  - welfare gains even for less productive economies

The end

Thank you for your attention!

References

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Related literature

- Heterogeneous labor markets in currency unions: Dolls et al. [2018], Abraham et al. [2019], Moyen et al. [2019]
- Social security, fiscal policy and migrations: Storesletten [2000], Bandeira et al. [2018]
- Migrations and allocation of resources: Klein and Ventura [2009], Kennan [2013], Tombe and Zhu [2019], Walerych [2020]
- Labor mobility in currency unions (short-run analysis): Farhi and Werning [2014], Hauser and Seneca [2019]
- Migrations, trade and labor heterogeneity: Iranzo and Peri [2009], Giovanni et al. [2015]
- Labor mobility and sovereign default: Alessandria et al. [2019]

back

Formulas for E and I i

Country-level number of emigrants:

$$E\left(n^{o},U^{y},\Omega\right)=n^{o}\cdot\left[\sum_{\hat{B},\hat{y},\hat{n^{o}}}\mathbb{P}_{\Phi}\left(U^{y}\left(\hat{n^{o}},\hat{B},\hat{y}\right)|\Omega\right)\right.$$

$$\times\frac{\mu\left(\hat{n^{o}},\hat{B},\hat{y}\right)\cdot\hat{n^{o}}}{\sum_{\tilde{B},\tilde{y},\tilde{n^{o}}}\mathbb{I}_{\left\{U^{y}\left(\tilde{n^{o}},\tilde{B},\tilde{y}\right)=U^{y}\left(\hat{n^{o}},\hat{B},\hat{y}\right)\right\}}\cdot\mu\left(\tilde{n^{o}},\tilde{B},\tilde{y}\right)\cdot\tilde{n^{o}}}$$

$$\left.\times\Psi\left(\frac{\mathcal{C}\left(U^{y}\left(\hat{n^{o}},\hat{B},\hat{y}\right)\right)-\mathcal{C}\left(U^{y}\left(n^{o},B,y\right)\right)}{\mathcal{C}\left(U^{y}\left(n^{o},B,y\right)\right)}\right)\right].$$

Immigrants arriving to the analyzed economy:

$$I\left(n^{o},U^{y},\Omega\right)=\sum_{\hat{B},\hat{y},\hat{n^{o}}}\left[\mu\left(\hat{n^{o}},\hat{B},\hat{y}\right)\cdot\hat{n^{o}}\cdot\mathbb{P}_{\Phi}\left(U^{y}|\Omega\right)\right.$$

Formulas for E and I ii

$$\frac{1 \cdot n^o}{\sum_{\tilde{B},\tilde{y},\tilde{n^o}} \mathbb{I}_{\left\{U^y\left(\tilde{n^o},\tilde{B},\tilde{y}\right)=U^y\right\}} \cdot \mu\left(\tilde{n^o},\tilde{B},\tilde{y}\right) \cdot \tilde{n^o}}$$

$$\Psi\left(\frac{\mathcal{C}\left(U^y\right) - \mathcal{C}\left(U^y\left(\hat{n^o},\hat{B},\hat{y}\right)\right)}{\mathcal{C}\left(U^y\left(\hat{n^o},\hat{B},\hat{y}\right)\right)}\right)\Bigg] .$$

Probability $\mathbb{P}_\Phi\left(\hat{U^y}|\Omega\right)$ of drawing opportunity $\hat{U^y}$ from distribution characterized with c.d.f. $\Phi \circ F$:

$$\mathbb{P}_\Phi\left(\hat{U^y}|\Omega\right) = \lim_{\epsilon\to 0}\left\{\Phi \circ F\left(\hat{U^y}+\epsilon\right) - \Phi \circ F\left(\hat{U^y}-\epsilon\right)\right\}$$

back

Intermediary: maximization problem i

Similar to Chatterjee et al. [2007] (financial intermediaries sell the amount $\bar{K}_{t+1}$ of capital, choose the number A of type (b', y) sovereign loan/deposit contracts at price q and A^P of private loan/deposit contracts signed with households populating a country indexed with (b, y) traded at price q^P, to maximize the discounted sum of profits):

$$\sum_{t=0}^{+\infty} R^{-t} \cdot \Pi_t$$

where:

$$\Pi_t = \left(1 - \delta + R^f\right) \cdot \bar{K}_t - \bar{K}_{t+1}$$
$$+ \sum_{b_{t+1}, y_t} q\left(b_{t+1}, y_t\right) \cdot A\left(b_{t+1}, y_t\right) \cdot b_{t+1} - \sum_{b_t, y_{t-1}} \left(1 - d\left(b_t, y_{t-1}\right)\right) \cdot A\left(b_t, y_{t-1}\right) \cdot b_t$$

Intermediary: maximization problem ii

$$+\sum_{b_t,y_t} A^P(b_t,y_t)\cdot a_{t+1}(b_t,y_t) - \sum_{b_{t-1},y_{t-1}} \sigma\cdot R^h\cdot A^P(b_{t-1},y_{t-1})\cdot a_t(b_{t-1},y_{t-1}).$$

back

Markov Perfect Equilibrium i

Definition: A Stationary Markov Perfect Competitive Equilibrium (SMPCE) consists of prices R^f, R^h, debt contracts $q(b', y)$, wages w, household policies c^y, $c^{o'}$, a', government policies τ, d, b', g, choices of financial intermediaries A, A^P, $\bar{K}'$, distribution μ^* and function η, such that:

1. *Policies c^y, $c^{o'}$, a' solve household problem given τ, g', R^h and w,*
2. *Policies τ, d, b', g solve government's problem given Γ, w, q, η,*
3. *First order conditions associated with financial intermediaries problem hold*
4. *Markov Perfect Equilibrium condition holds*
5. *Consistency conditions hold*
6. *Pareto weights satisfy $\alpha^y = \eta$ and $\alpha^o = \sigma$*

back

Consistency conditions i

Law of motion of countries across states:

$$\mu'\left(n^{o'}, b', y'\right) = \sum_{n^o, b, y} \left[\pi\left(y'|y\right) \cdot \mathbb{I}_{\left\{\eta\left(U^y(b,y),\Omega\right)\cdot n^o = n^{o'}\right\}}\right.$$

$$\left. \cdot \mathbb{I}_{\{b'(b,y)=b'\}} \cdot \mu\left(n^o, b, y\right)\right]$$

Markov Perfect Equilibrium condition:

$$\forall_{b,y}\; g\left(b, y\right) = \Gamma\left(b, y\right)$$

◂ back

Results: distributions of countries over variables and policies

	Migration	No migration
Union output	0.3265	0.3235
Mean debt-to-GDP ratio	71.2%	89%
Std.dev. of debt-to-GDP	12.5%	12.9%
Mean spread over R	1.21%	1.43%