Quantifying the Benefits of Labor Mobility in a Currency Union

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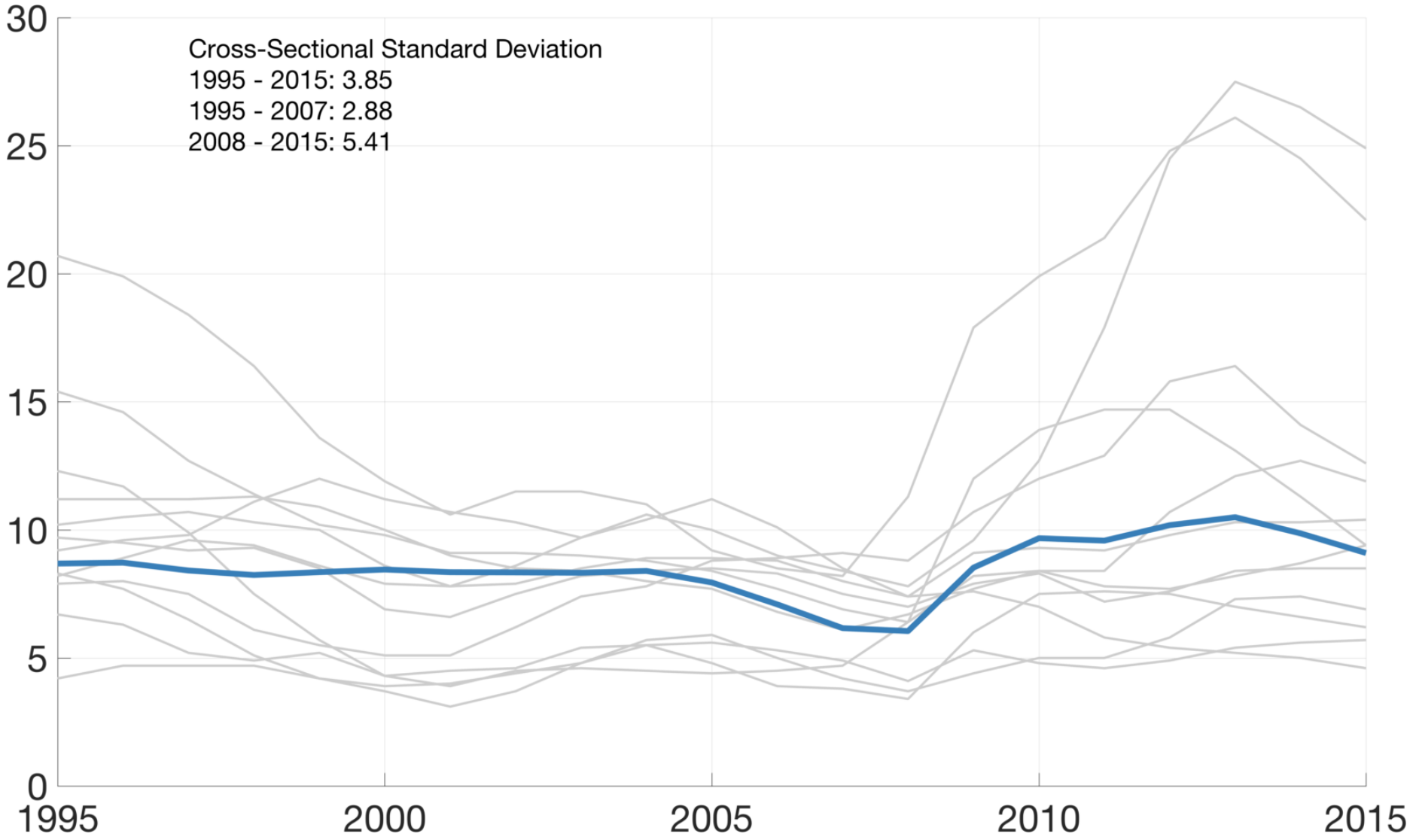
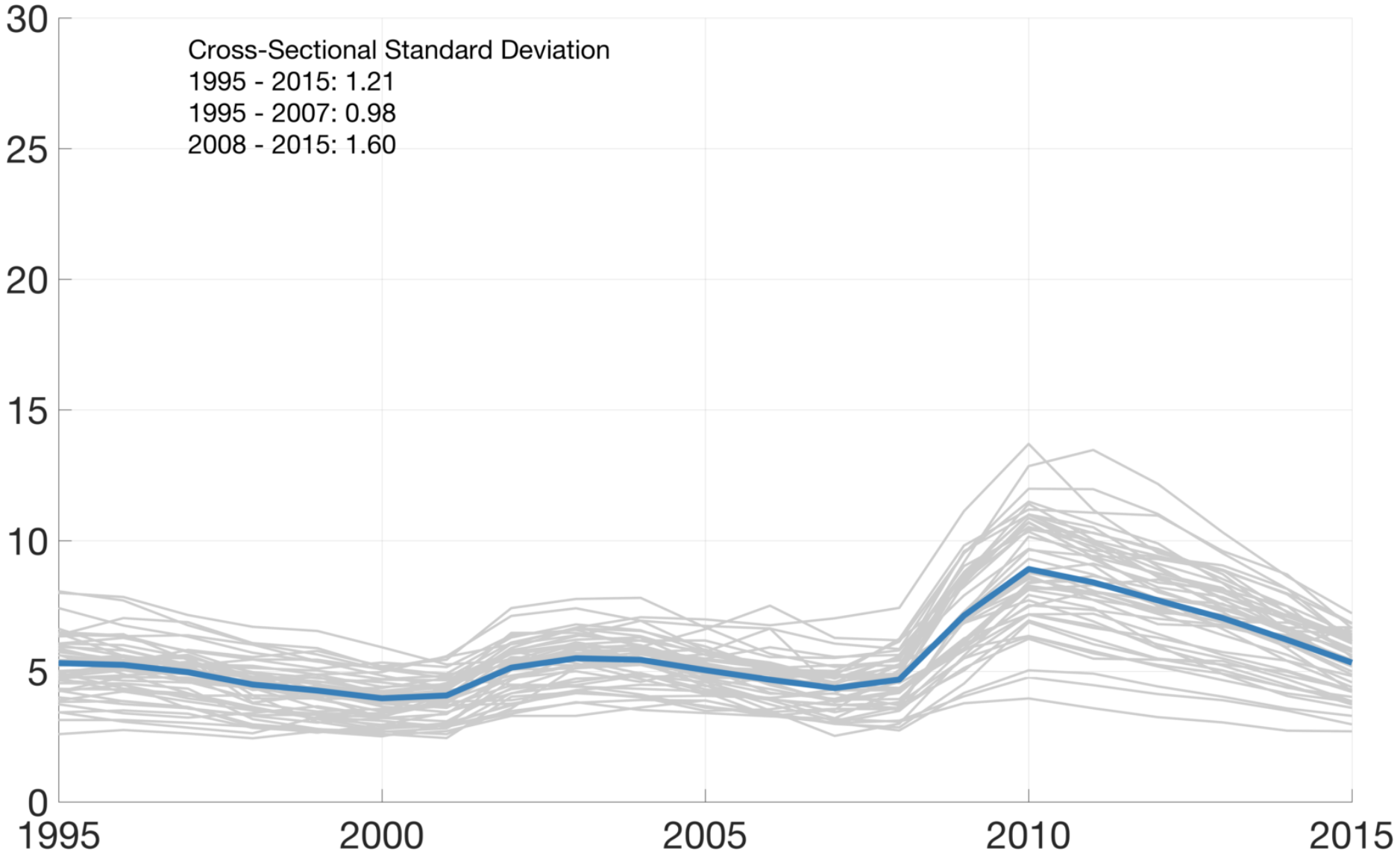
Dispersion of Unemployment Rates: Euro Area



Dispersion of Unemployment Rates: U.S. States



This Paper

To what extent does labor mobility...

... differ between the US and Europe? Over time?

... reduce variation in unemployment rates across countries / states?

... reduce variation in wages across countries / states?

1. Characterize migration and unemployment in North America and Europe
2. DSGE model with labor mobility, search and unemployment
3. Generate model-based counterfactuals:
   e.g. What would have been Europe's experience if labor mobility had been at U.S. levels?

Literature

Optimal currency areas

- Mundell (1961); Friedman (1953); Kenen (1969)

Determinants of migration

- Borjas (1987); Anderson (2011); Molloy, Smith and Wozniak (2011); Ortega and Peri (2009); Beine, Bricongne and Bourgeon (2013)

Labor mobility and regional shocks

- Blanchard and Katz (1992); Yagan (2014); Beyer and Smets (2015); Jauer et al. (2014)

Labor mobility in GE models

- Farhi and Werning (2014); Sterk (2015); Redding (2016)

Cross-regional differences

- Beraja, Hurst and Ospina (2016); Nakamura and Steinsson (2014); House, Proebsting and Tesar (2017)

Labor Mobility in Europe

The internal market in the European Economic Community is defined as "an area without internal frontiers in which the **free movement of** goods, **persons**, services and capital is ensured."

Single European Act, 1986

Unrestricted labor mobility across most Western European countries since 1986 (Finland and Sweden since 1994).

New member countries granted mobility since 2004 (2007-2011).

What is a Migrant?

An international migrant is defined as "a person who moves to a country other than that of his or her **usual residence** for a period of at least a year."

United Nations, *Recommendations on Statistics of International Migration*, 1998.

→ Irrespective of their nationality or their country of birth.

Data

United States

- Internal Revenue Service, # tax returns that migrate
- 48 States, 1977 - 2015

Canada

- Statistics Canada
- 10 provinces, 1977 - 2015

Europe

- Eurostat, National data sources
- 2 samples (1995 - 2015, unbalanced)
  - 12 Euro core countries: Belgium, Denmark*, Germany, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Portugal, Finland
  - 29 Countries: Euro core + Bulgaria, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, Slovak Republic, Sweden, United Kingdom, Iceland, Norway, Switzerland

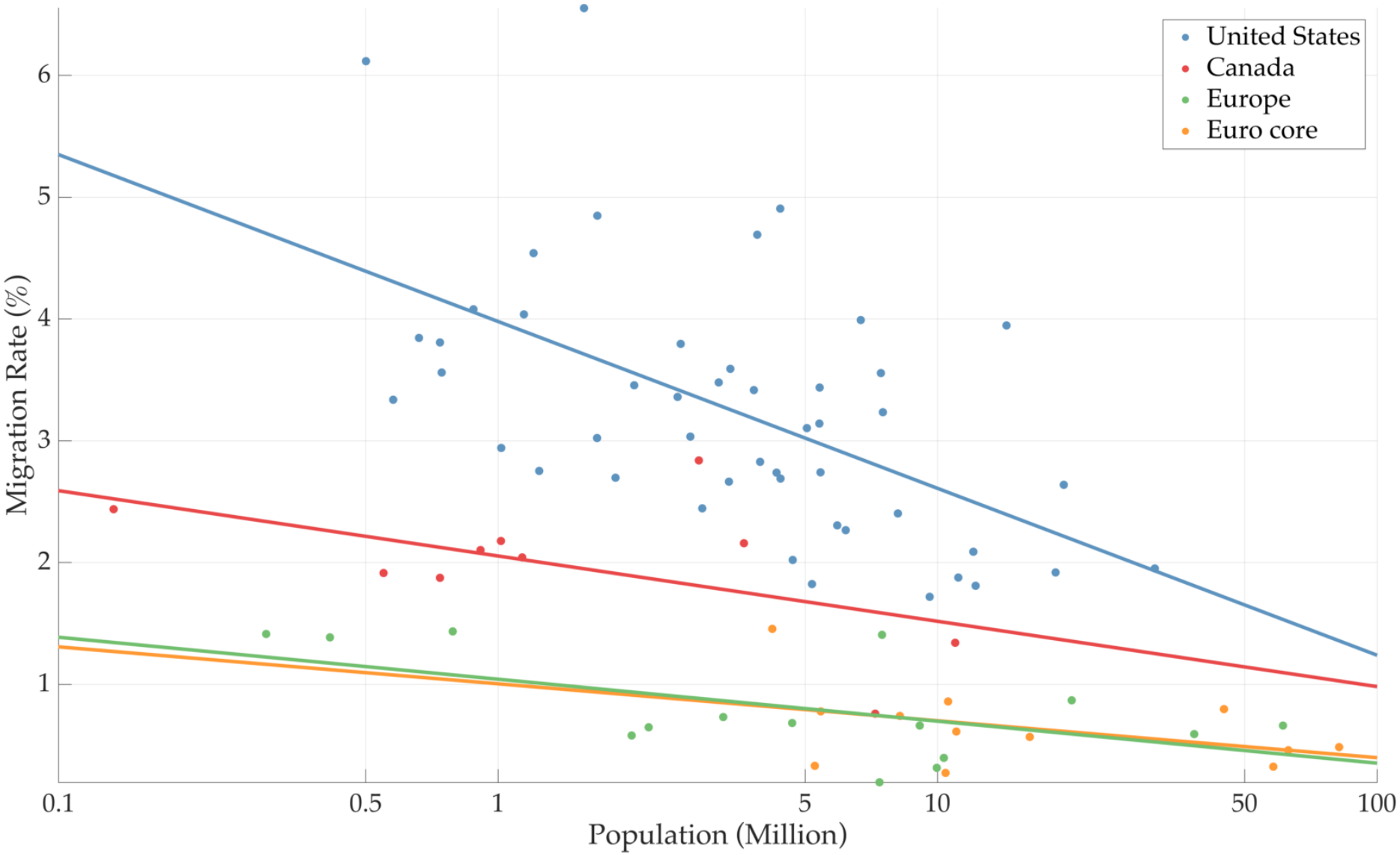
Migration Rates

Migration rate for state i at time t

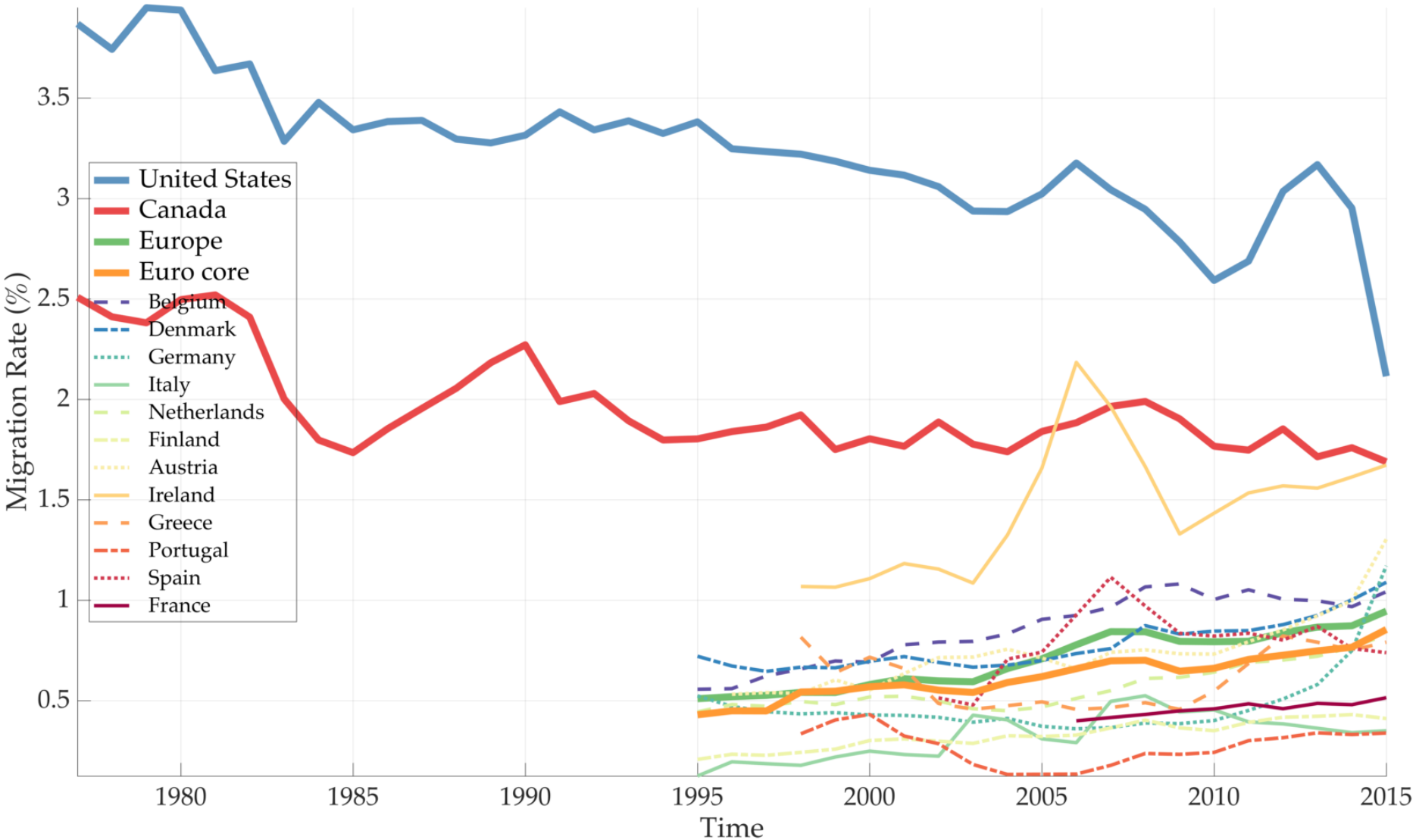
$$\text{Migration rate}_{i,t} = \frac{1}{2}\frac{\text{In-Migr}_{i,t} + \text{Out-Migr}_{i,t}}{\text{Pop}_{i,t}},$$

	Unit	US	Canada	Europe	Euro
Regions	#	48	10	29	12
Population	m	5.57	2.94	17.30	26.28
Migration rate	%	3.23	1.96	0.73	0.64

Migration Rates in Cross Section



Migration Rates over Time



Migration Rates

Internal migration for state i at time t

$$\text{Internal migration}_{i,t} = \frac{1}{2} \frac{\sum_{j \in \mathcal{N}} \left(\text{Migr}^{j}_{i,t} + \text{Migr}^{i}_{j,t} \right)}{\text{Pop}_{i,t}}$$

$$\mathcal{N} \in \text{US, Canada, Europe}$$

	Unit	US	Canada	Europe	Euro
Regions	#	48	10	29	12
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Migration rate	%	3.23	1.96	0.73	0.64
Internal migration	%	3.11	1.53	0.46	0.34

Migration Rates

Net migration rate

$$\text{Net migration rate}_{i,t} = \frac{\text{In-Migr}_{i,t} - \text{Out-Migr}_{i,t}}{\text{Pop}_{i,t}}.$$

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Regions	#	48	10	29	12
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Internal migration	%	3.11	1.53	0.46	0.34
SD(Net migration rate)	%	0.48	0.48	0.32	0.30

Cross-Sectional Dispersion in Unemployment Rates

How much do unemployment rates co-move over the business cycle?

Define

$$\hat{u}_{i,t} = u_{i,t} - u_i - (u_t - \bar{u}),$$

where

$$u_i = \frac{1}{T}\sum_{t=1}^{T} u_{i,t}$$

$$u_t = \frac{1}{N}\sum_{i=1}^{N} \frac{pop_i}{pop} u_{i,t}$$

$$\bar{u} = \frac{1}{T}\sum_{t=1}^{T} u_t$$

Cross-Sectional Dispersion in Unemployment Rates

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country i's average unemployent rate

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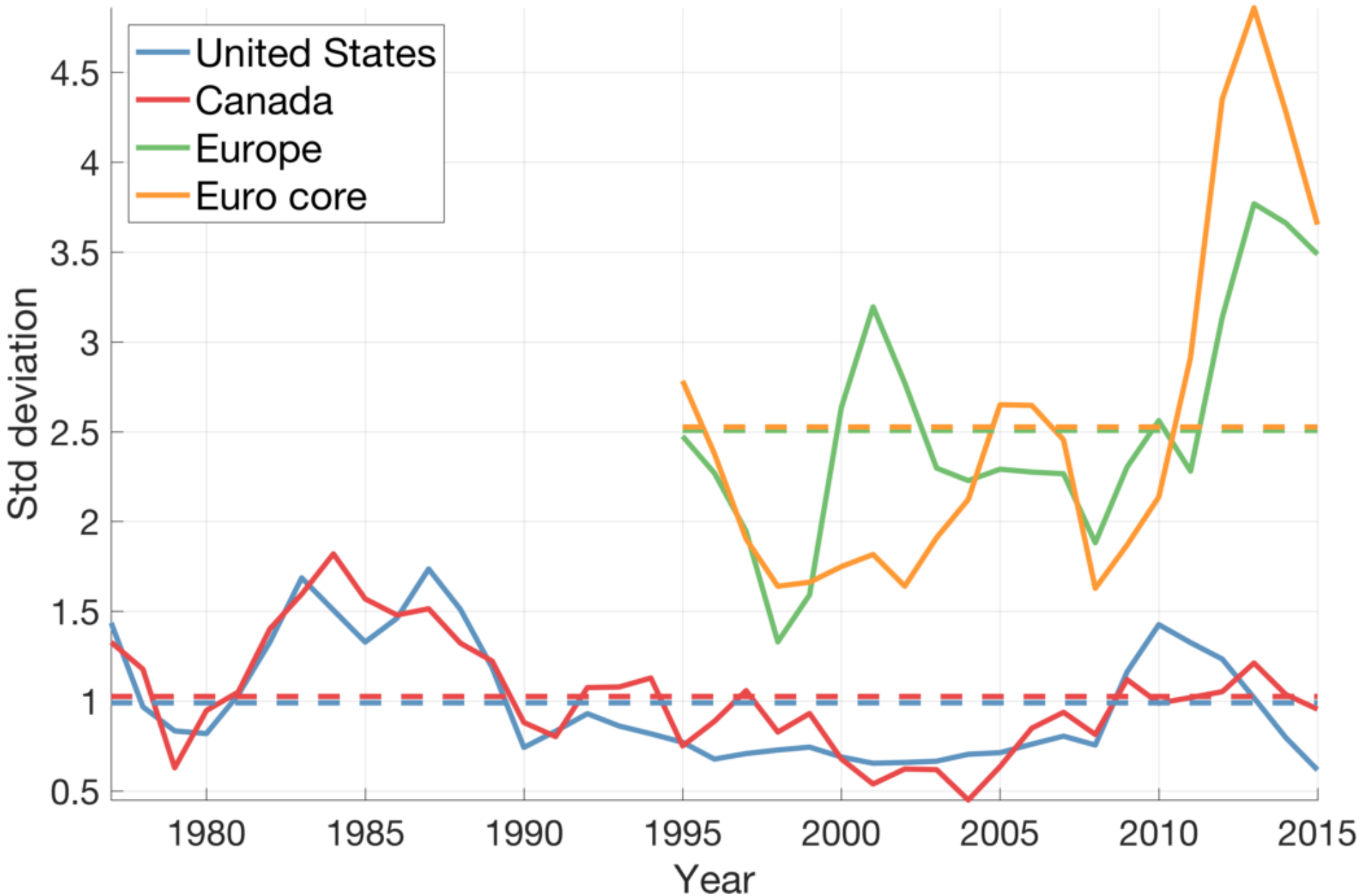
$$u_t = \frac{1}{N}\sum_{i=1}^{N} \frac{pop_i}{pop} u_{i,t}$$

mean UE in year t relative to other years

$$\bar{u} = \frac{1}{T}\sum_{t=1}^{T} u_t$$

Cross-Sectional Dispersion in Unemployment Rates



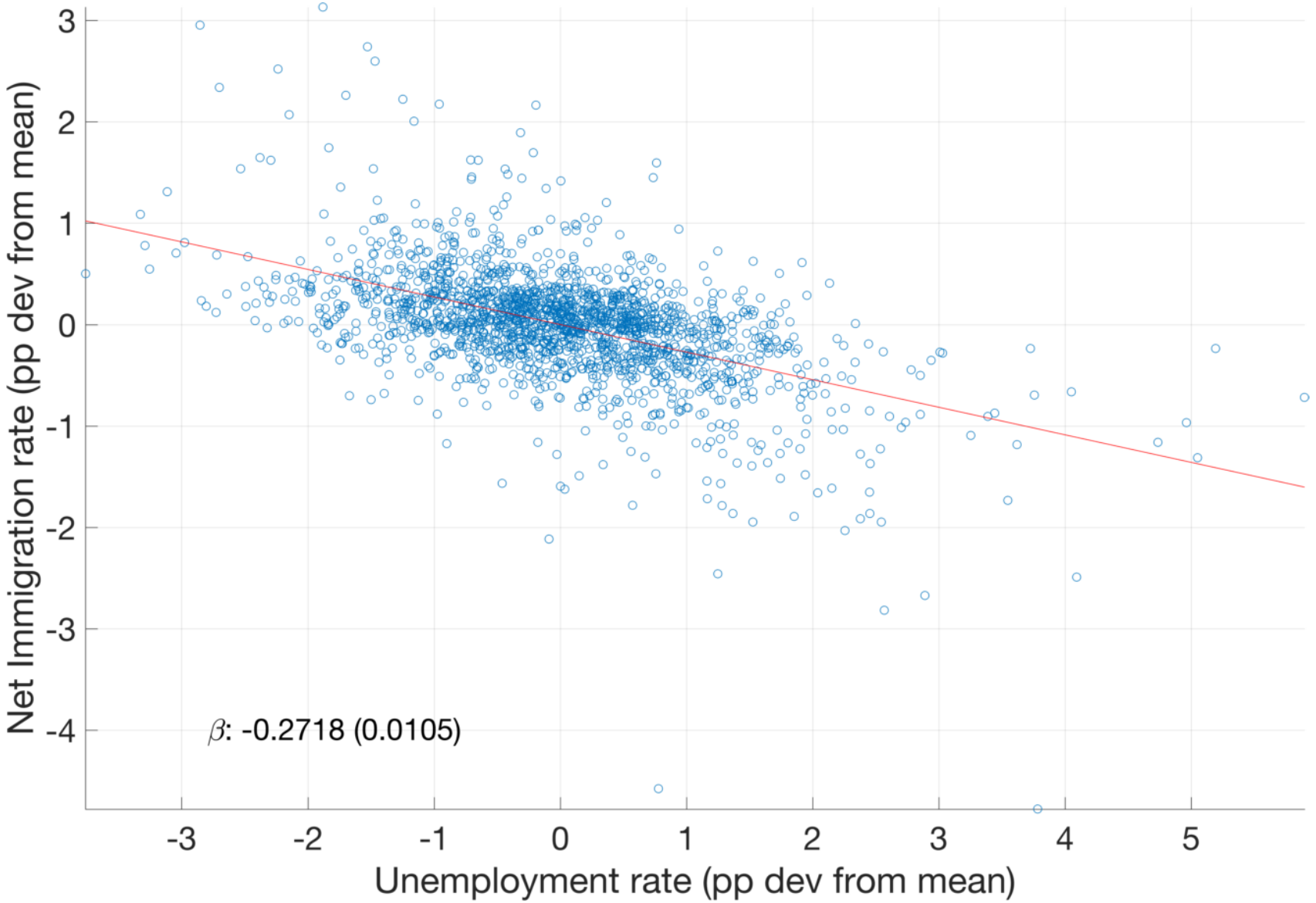
Does Migration Respond to Economic Conditions?

$$\widehat{netm}_{i,t} = \beta_0 + \beta \hat{u}_{i,t} + \epsilon_{i,t},$$

Why demeaning?

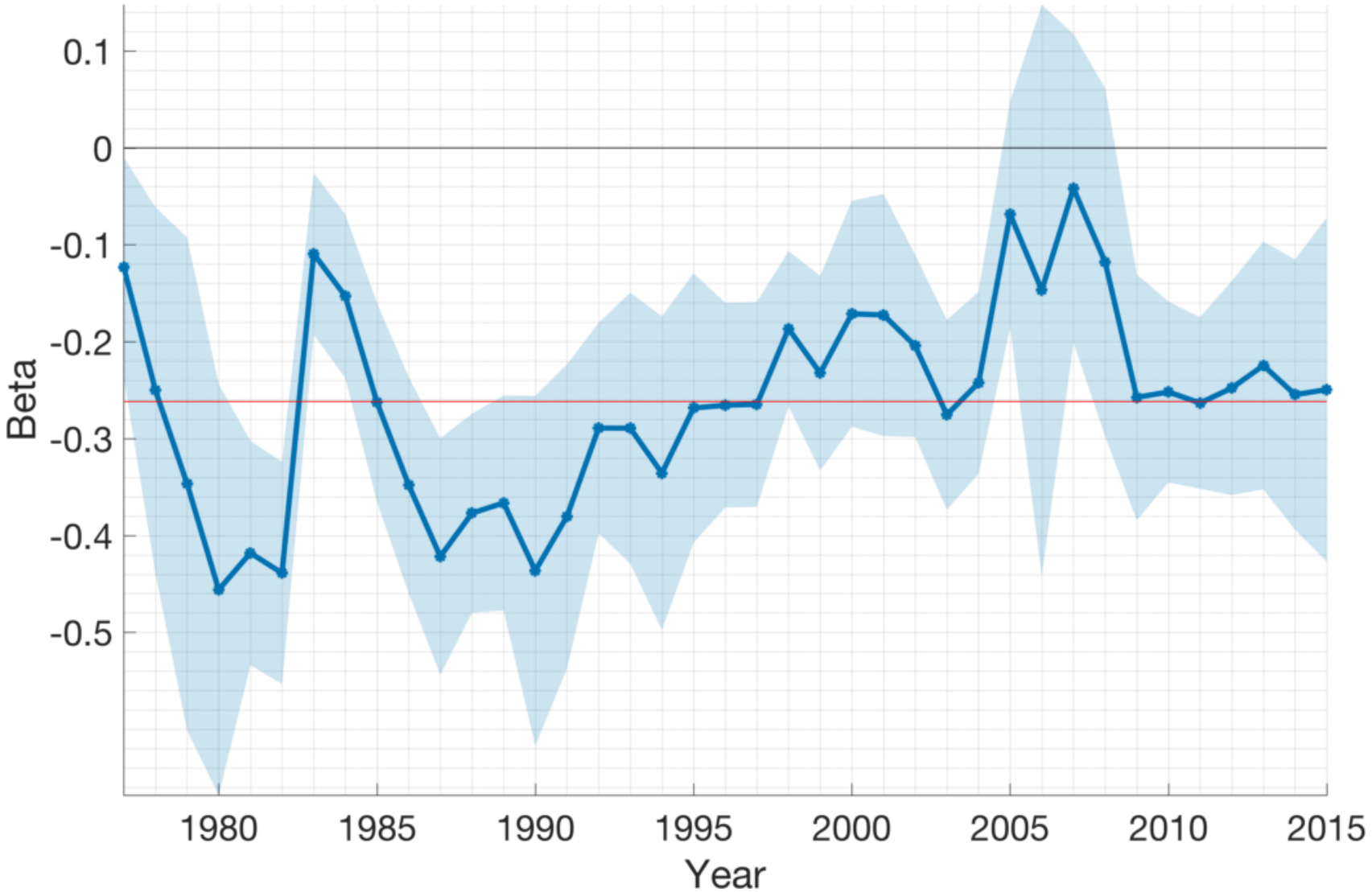
Does Migration Respond to Economic Conditions?

U.S.: 1977 - 2015



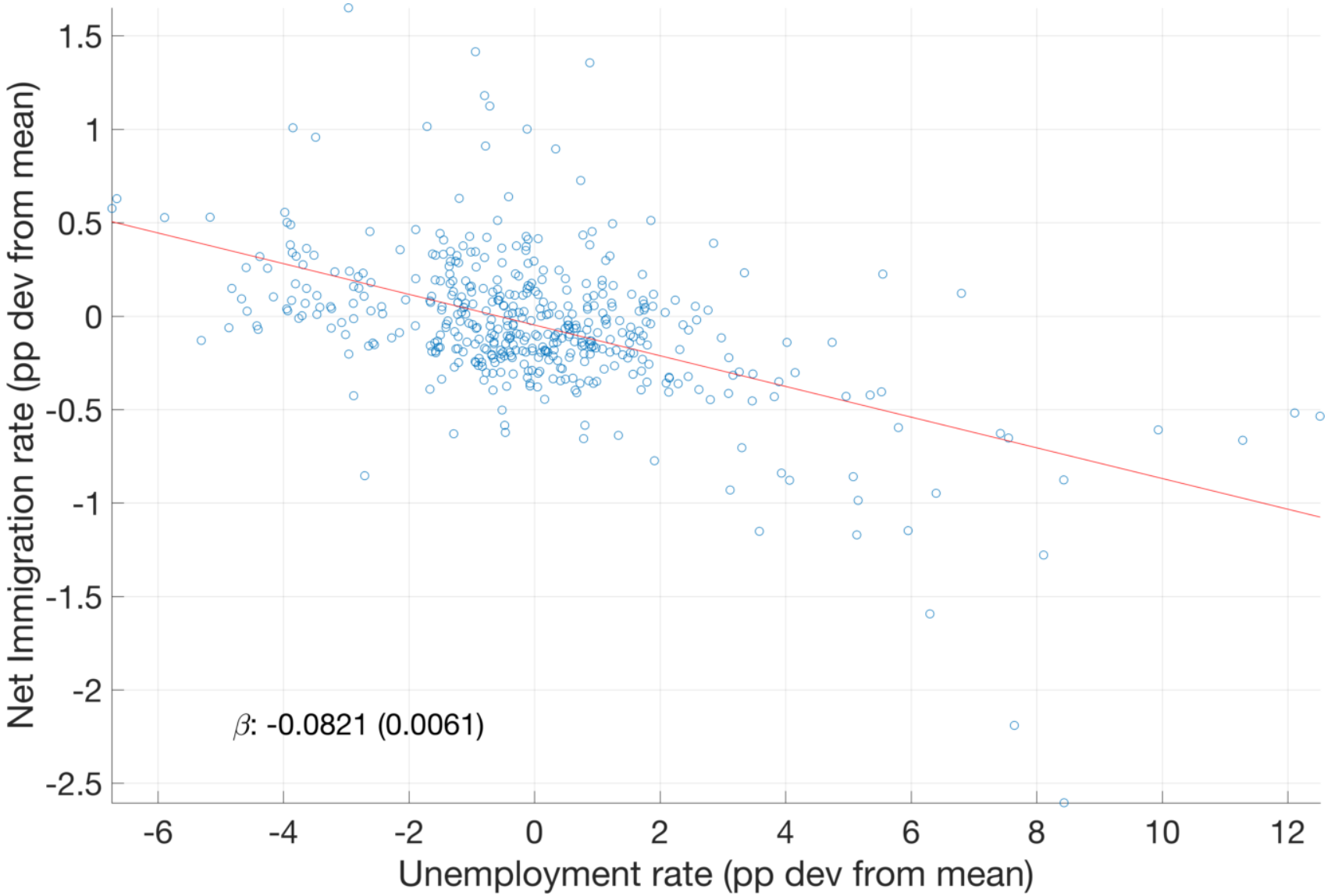
Does Migration Respond to Economic Conditions?

U.S.: Repeated Cross Section



Does Migration Respond to Economic Conditions?

Europe: 1995 - 2015



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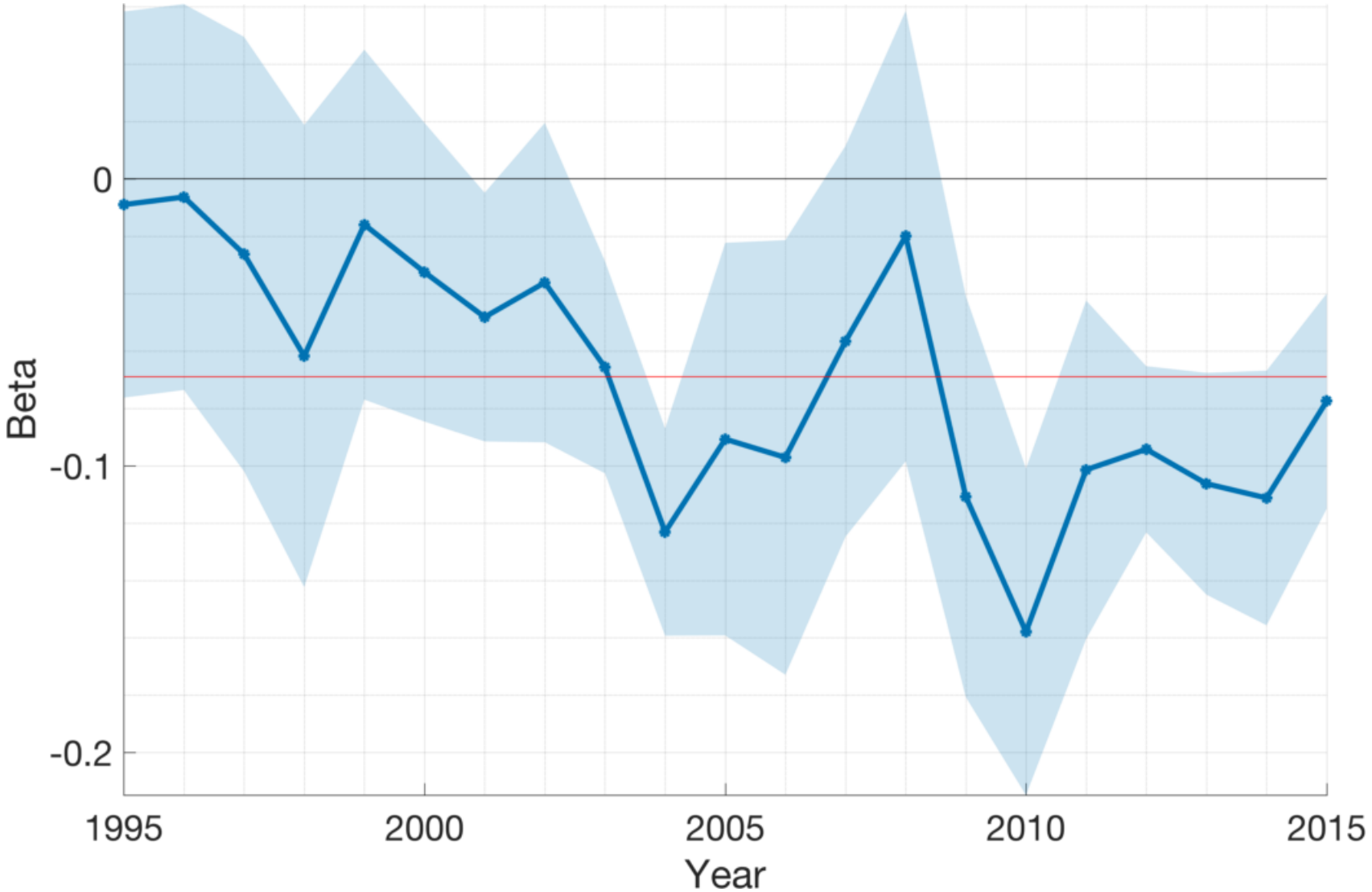
Europe: Repeated Cross Section



Does Migration Respond to Economic Conditions?

Baseline:

$$\widehat{netm}_{i,t} = \beta_0 + \beta_1 \hat{u}_{i,t} + \epsilon_{i,t},$$

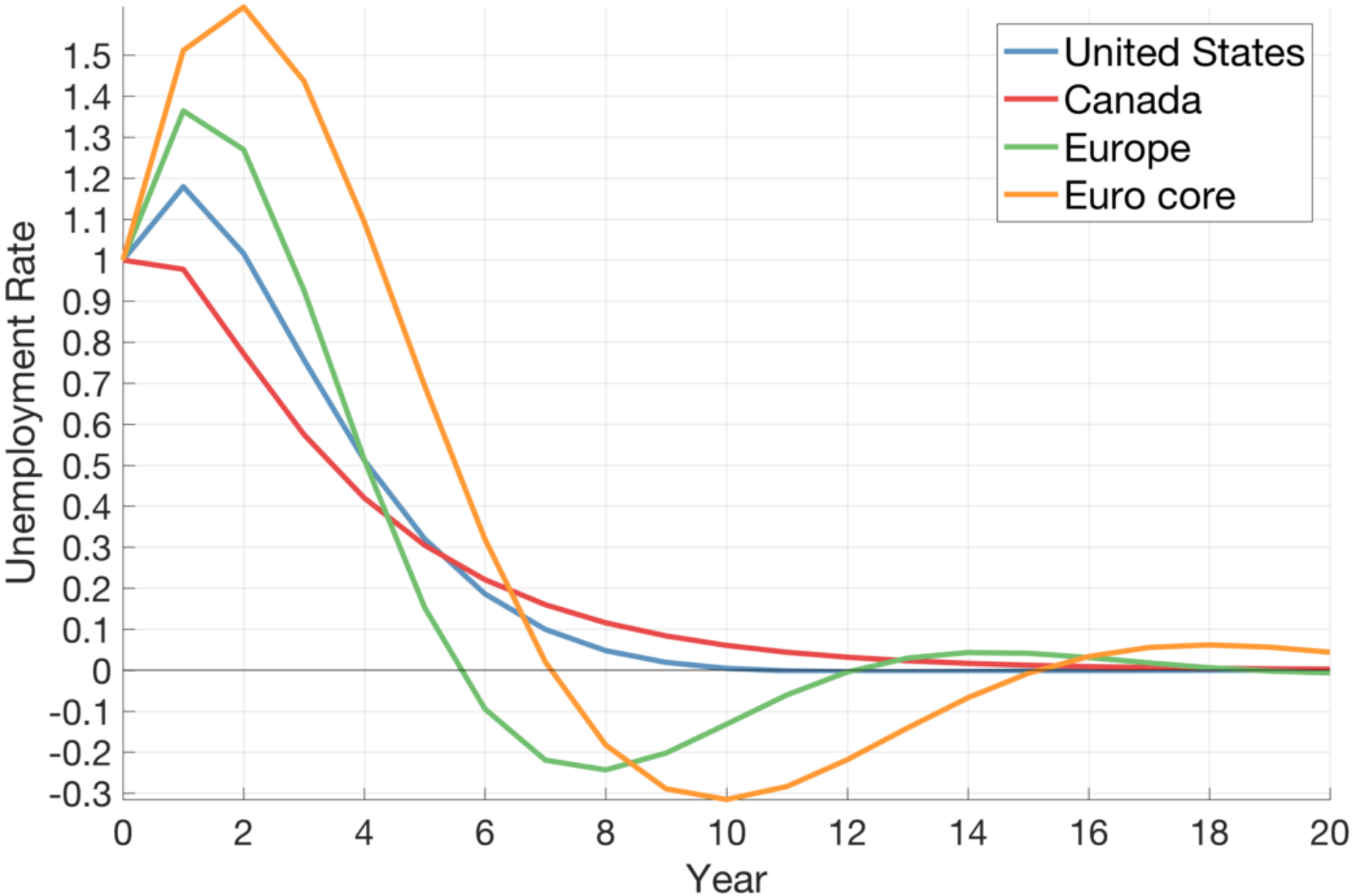
Including wage differentials:

$$\widehat{netm}_{i,t} = \beta_0 + \beta_1 \hat{u}_{i,t} + \beta_2 \hat{w}_{i,t} + \epsilon_{i,t},$$

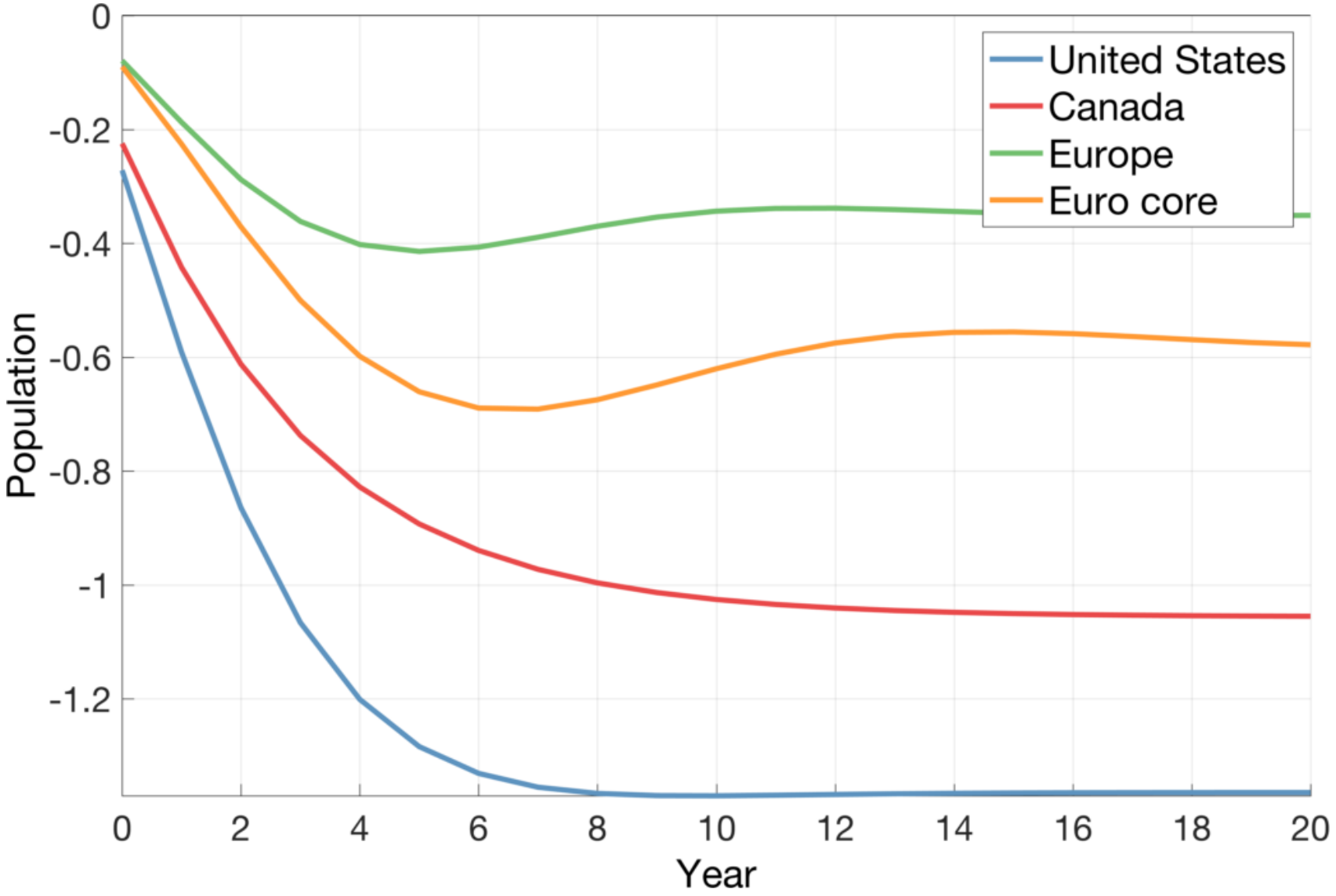
	Baseline		Including Wages	
	US	Europe	US	Europe
β_1	−0.272	−0.082	−0.256	−0.081
	(0.011)	(0.006)	(0.011)	(0.006)
β_2			0.015	0.006
			(0.011)	(0.005)
R^2	0.26	0.28	0.27	0.29
No. Obs.	1,872	460	1,872	458

Cumulative Effect of Migration

$$\hat{u}_{i,t} = \beta_i + \beta_1 \hat{u}_{i,t-1} + \beta_2 \hat{u}_{i,t-2} + \varepsilon^u_{i,t}$$



Cumulative Effect of Migration



Summary

More migration in U.S. than Europe

But difference has become smaller

More dispersion in unemployment rates in Europe than U.S.

Migration flows respond to unemployment rates

Cumulative impact seems significant

Research Strategy

1. Model

   Multi-country monetary union with nominal price rigidity
   Unemployment (DMP)
   Cross-border labor mobility

2. Calibration

   2 versions: 'US states', **'Europe'**
   Recover shocks that exactly replicate time series of $\hat{u}_{i,t}$ for every state /country
   Adjust degree of labor mobility to match the response of net migration rates observed in the data

3. Given those shocks, we can pose counterfactuals

   Dispersion of unemployment rates under...

   (i) ...floating exchange rate
   (ii) ...labor mobility as high as in the U.S.

Key Components of the Model (House, Proebsting, Tesar "Austerity")

Multi-country model

Fraction of households are hand-to-mouth consumers

Firms produce tradable intermediate good

Price rigidities for intermediate goods

Governments impose taxes and spend on final goods

Monetary authority follows a Taylor rule

Some countries are in a currency union

Financial accelerator can affect the cost of investment

This paper

- workers can choose to work in another country
- DMP model of search and unemployment

Extending the Model

Labor Mobility and Unemployment

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Labor Mobility and Unemployment

1. Base Population : $\mathbb{N}^i$

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1. Base Population : $\mathbb{N}^i$
2. Share of workers / locations : $\sum_j n^i_{j,t} = 1$

Extending the Model

Labor Mobility and Unemployment

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Home nation

Work location

Extending the Model

Labor Mobility and Unemployment

1. Base Population : $\mathbb{N}^i$
2. Share of workers / locations : $\sum_j n^i_{j,t} = 1$
3. Labor supply to *j* per household member : l^i_j

Extending the Model

Labor Mobility and Unemployment

1. Base Population : $\mathbb{N}^i$
2. Share of workers / locations : $\sum_j n^i_{j,t} = 1$
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4. Working population in *j* : $\mathbb{N}_{j,t} = \sum_i n^i_{j,t} \mathbb{N}^i$

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5. Labor supply in *j* : $l_{j,t} \mathbb{N}_{j,t} = \sum_i n^i_{j,t} l^i_{j,t} \mathbb{N}^i$

Extending the Model

Labor Mobility and Unemployment

1. Utility differential from working abroad : $A_j^i - \gamma \ln\left(n_{j,t}^i\right)$

2. Household utility

$$\sum_{t=0}^{\infty} \beta^t \left\{ \sum_j n_{j,t}^i u\left(c_{j,t}^i, l_{j,t}^i\right) + \sum_{j \neq i} n_{j,t}^i \left(A_j^i - \gamma \ln\left(n_{j,t}^i\right)\right) \right\}$$

3. Labor income earned in country of residence\ Capital income is earned from country of birth

4. Wages and prices are determined by country of residence

Extending the Model

Labor Mobility and Unemployment

Regional amenity

1. Utility differential from working abroad : $A_j^i - \gamma \ln\left(n_{j,t}^i\right)$

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3. Labor income earned in country of residence\ Capital income is earned from country of birth

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5. Unemployment via DMP

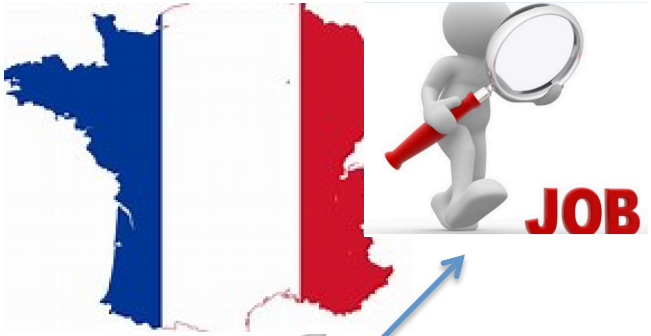
$$\mathbb{N}_{i,t} H_{i,t} = \mathbb{N}_{i,t-1} U_{i,t-1} + d \cdot \mathbb{N}_{i,t-1} L_{i,t-1} + \mathbb{N}_{i,t} l_{i,t} - \mathbb{N}_{i,t-1} l_{i,t-1}$$

6. Wage rigidity as in Shimer (2010)

Labor market and net migration

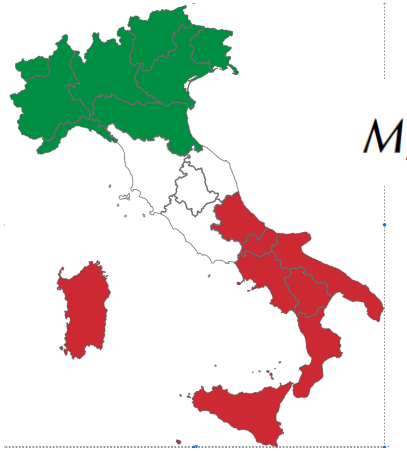
HR firms post vacancies, *V*

Firm pays w^f per hour to HR firm for every matched worker



Employment agency hires job hunters, *H*, at w^h per hour

Job hunter



Matching function

$$M_{i,t} = \bar{m} H_{i,t}^{\zeta} V_{i,t}^{1-\zeta}$$

Employed worker gets *w*

Unemployed worker gets *b*

Simulation

Recover 'trade preference shocks' that exactly replicate time series of $\hat{u}_{i,t}$ for every country, 1995:1 - 2015:4

Adjust degree of labor mobility (γ) to match slope coefficient of net migration observed in the data (-0.082)

Given these shocks, do counterfactuals: What if...

1. all countries had floating exchange rate?
2. labor mobility would be as high as in U.S.?

Calibration

29 countries + RoW

Shares:

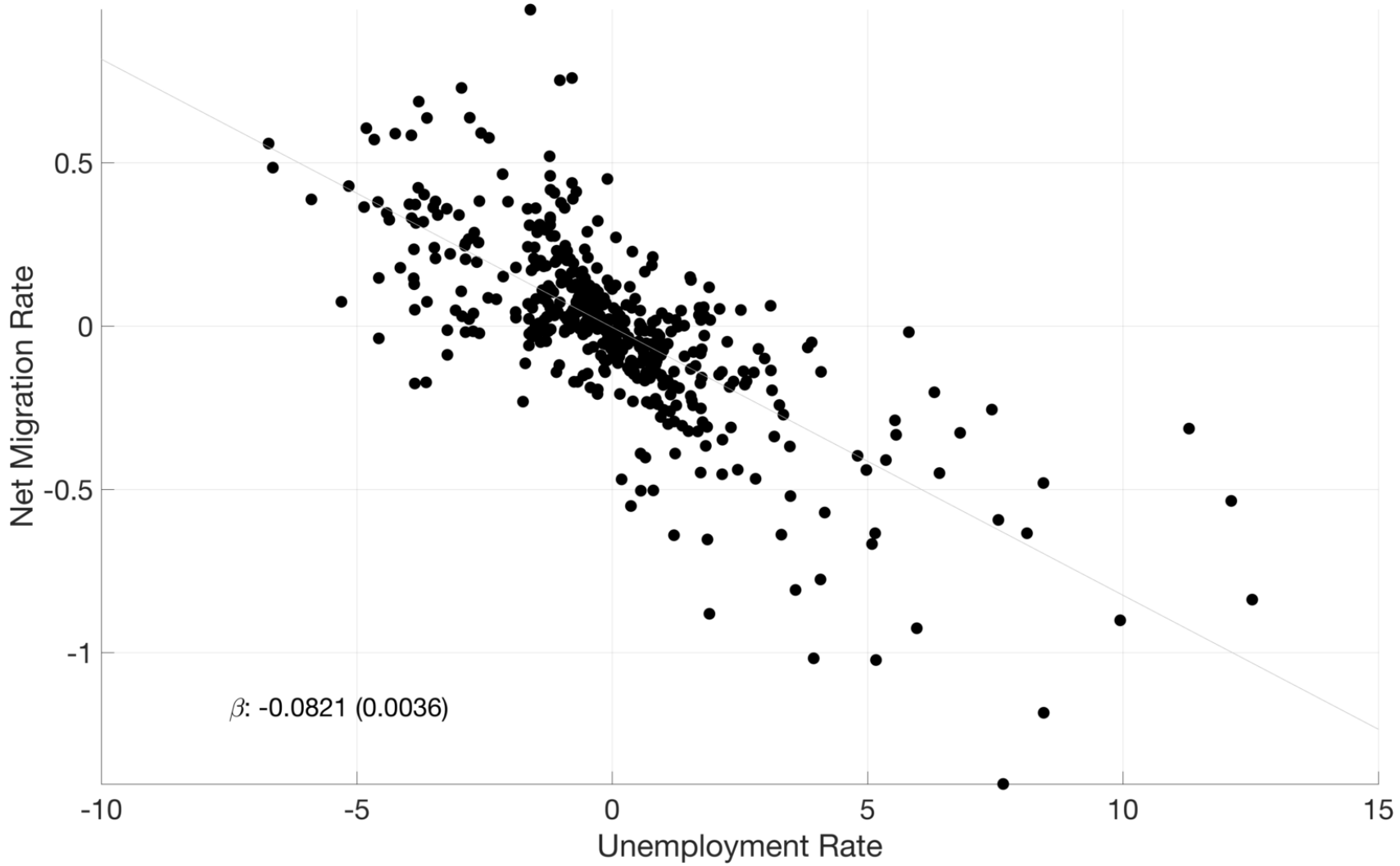
- GDP, population, exchange rate regime
- Bilateral trade shares ω_j^i: Ave. import share: 40%
- Bilateral migration shares n_j^i: Ave. expat share: 8.3%
- Unemployment rate, u_i: Ave. 8.6%
- Unemployment benefits: $b = 0.59 w_i$
- Separation rate: $d = 0.06$

Elasticities

- Trade elasticity, $\psi_y = 2$
- Sticky prices, $\theta_p = 0.77$
- Real wage rigidity, $\theta_w = 0.89$
- Labor mobility, $\gamma = 2.72$

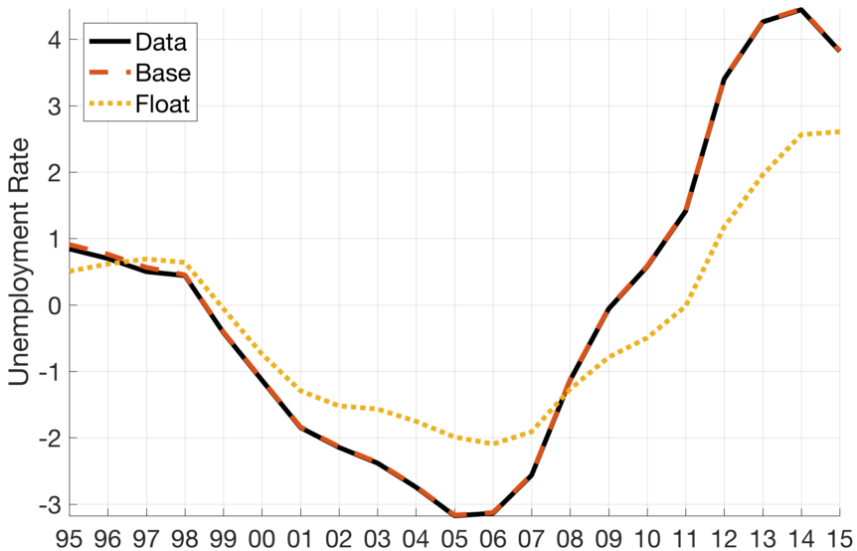
Details

Simulated Migration and Unemployment

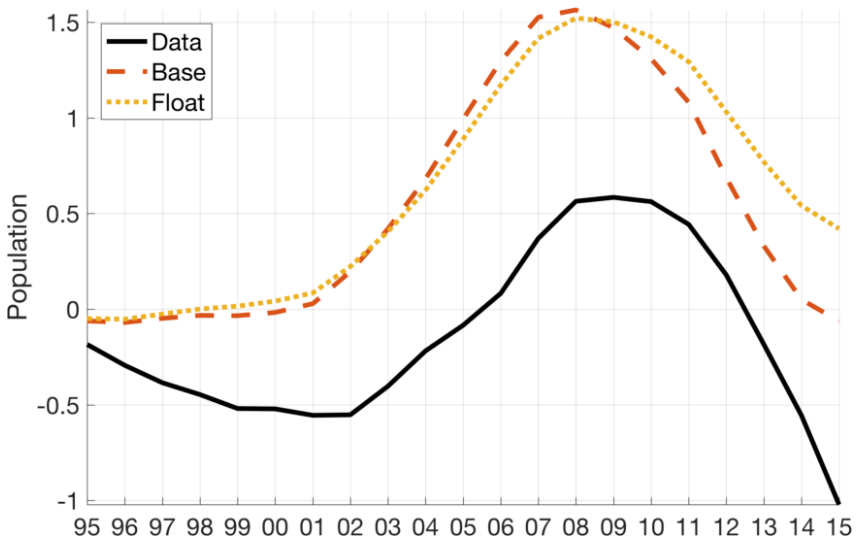


GIIPS: Floating Exchange Rate

All fixed exchange rate countries abandon euro / peg

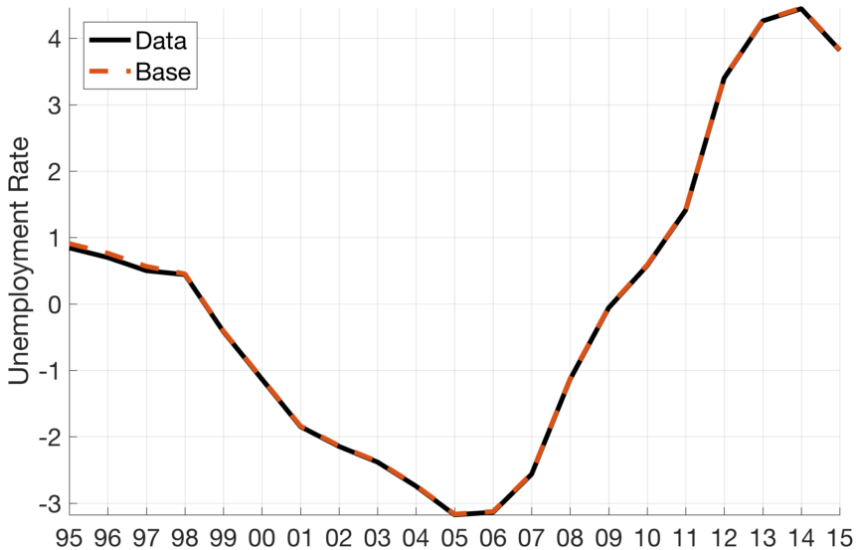


(c) Unemployment Rate

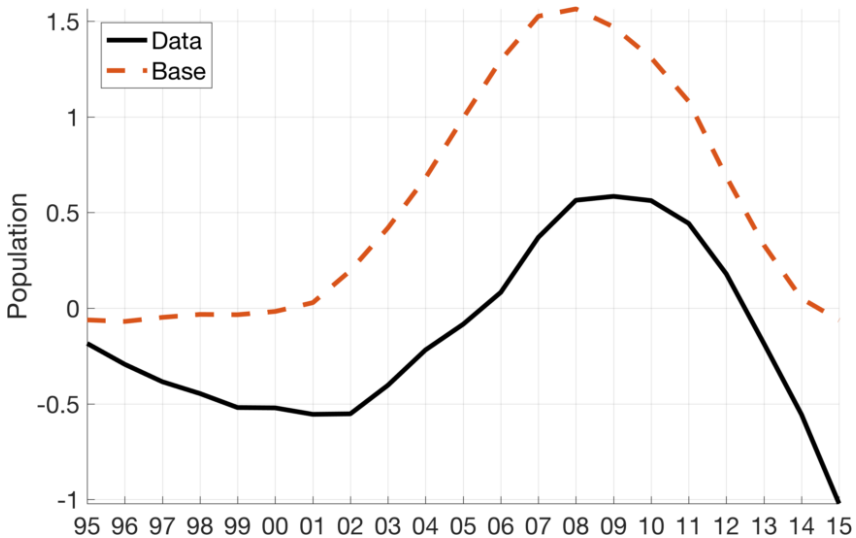


(d) Population

GIIPS: Baseline Model



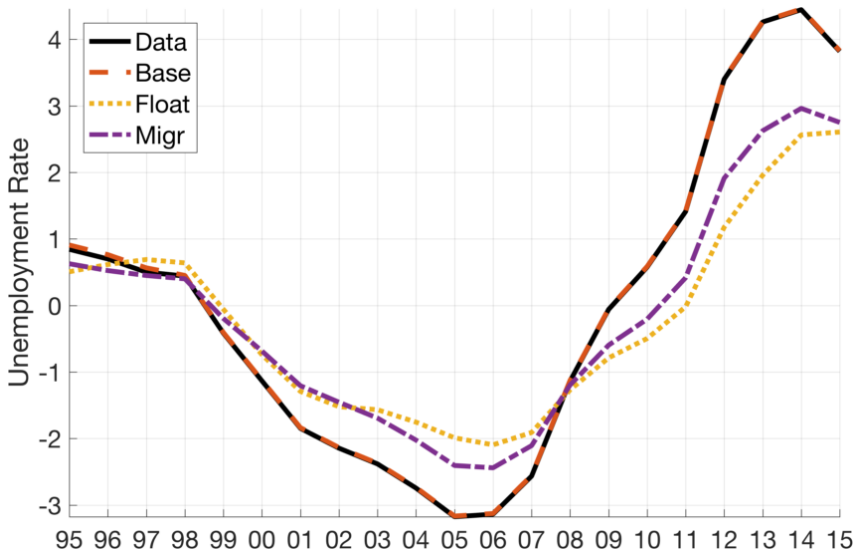
(a) Unemployment Rate



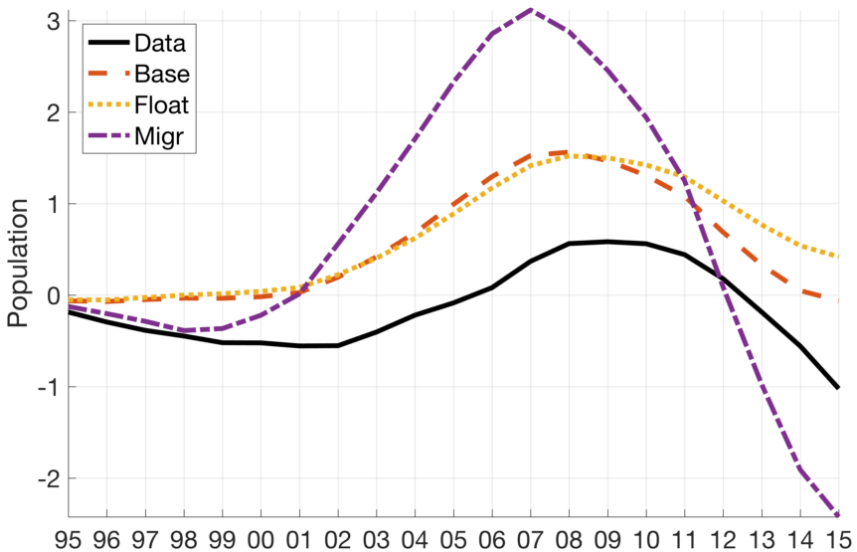
(b) Population

GIIPS: Higher Labor Mobility

Lower γ to match the U.S. slope (-0.272)

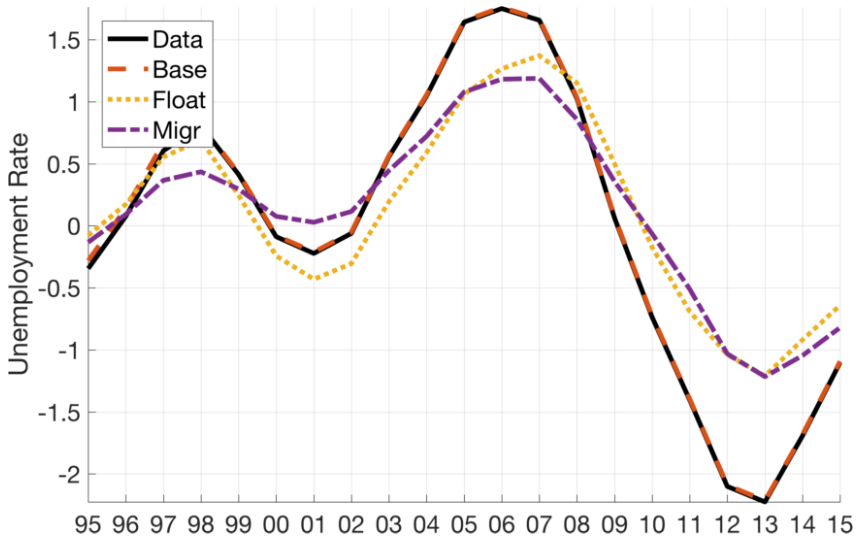


(e) Unemployment Rate

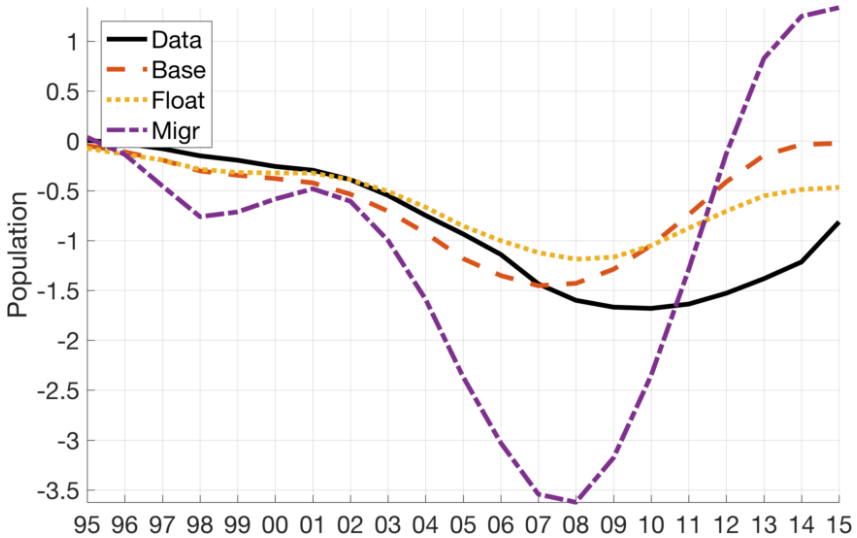


(f) Population

EU10



(g) Unemployment Rate



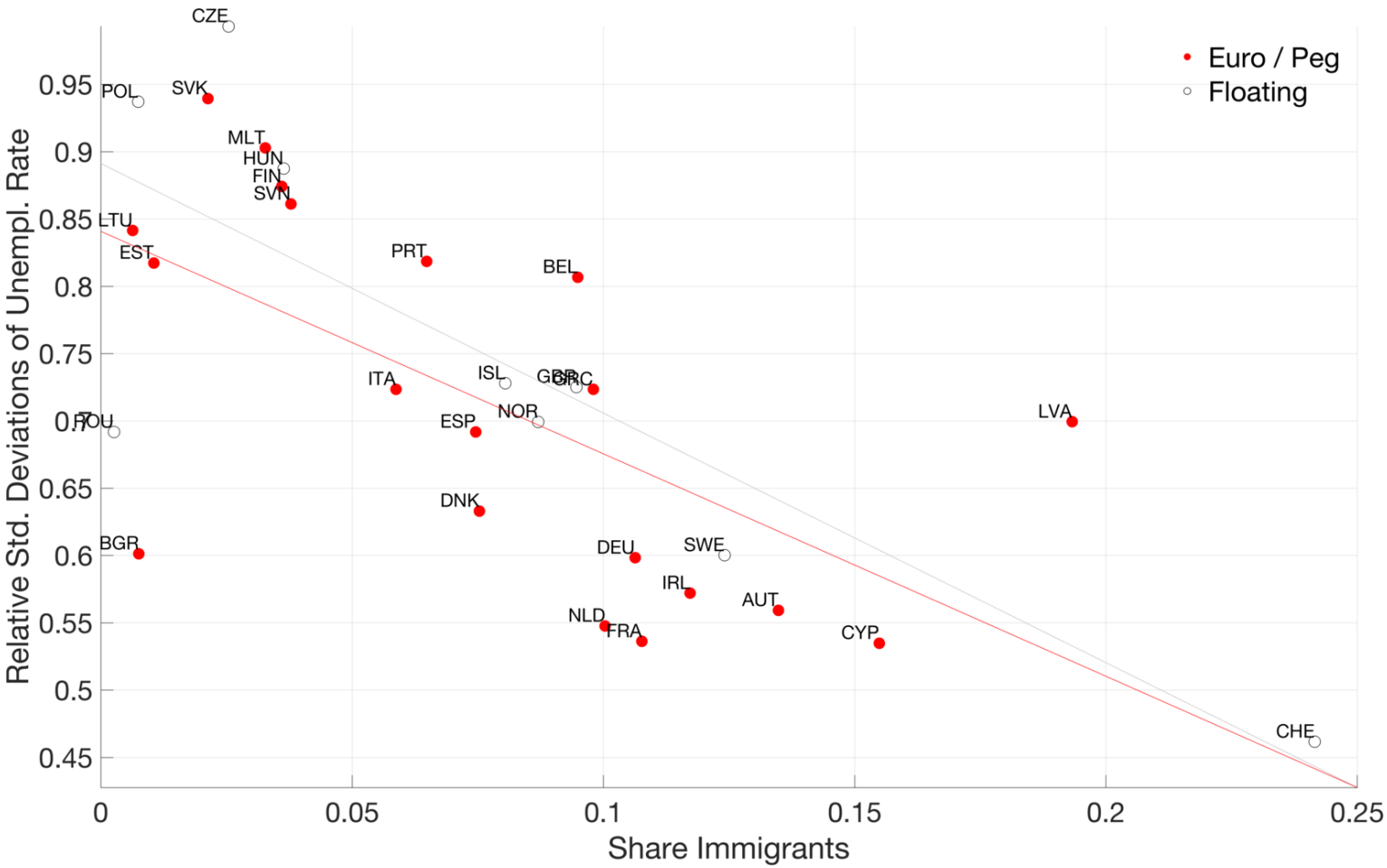
(h) Population

Counterfactual Experiments

	Data	Bench	Float	Migr
Cross-Sect. Std. Deviation Unempl. Rate				
Europe	2.59	2.59	1.89	1.93
Euro Area	3.08	3.08	1.85	1.98
Average Unempl. Rate '09-'14				
GIIPS	3.15	3.15	1.49	1.49
EU10	−0.55	−0.55	−0.13	−0.31
Cumulative Pop. Change '09-'14				
GIIPS	−2.37	−2.13	−1.30	−7.97
EU10	0.48	0.52	0.05	2.39
Average Exchange Rate '09-'14				
GIIPS	0.00	0.00	−204.00	0.00
EU10	0.00	0.00	74.33	0.00

Not All Countries "Benefit" in the Same Way

Time-series standard deviation in unemployment rates relative to baseline as function of immigration share



Conclusion

Renewed interest in cross-sectional questions:

- Spillovers from fiscal policy
- Transfer union, bail outs
- Banking union
- ...
- **Migration as substitute for monetary policy**

Tackling an old question (Mundell, 1961) with new, quantitative methods

Still to do:

- Welfare analysis
- Sensitivity to underlying shock

References I

Alvarez, Luis J, Emmanuel Dhyne, Marco Hoeberichts, Claudia Kwapil, Hervé Bihan, Patrick Lünnemann, Fernando Martins, Roberto Sabbatini, Harald Stahl, Philip Vermeulen, et al. 2006. "Sticky Prices in the Euro Area: A Summary of New Micro Evidence." *Journal of the European Economic Association*, 4(2-3): 575–584.

Anderson, James E. 2011. "The Gravity Model." *Annual Reviev of Econonomics*, 3(1): 133–160.

Backus, David K., Patrick J. Kehoe, and Finn E. Kydland. 1992. "International Real Business Cycles." *Journal of Political Economy*, 100(4): 745–775.

Backus, David K., Patrick J. Kehoe, and Finn E. Kydland. 1994. "Dynamics of the Trade Balance and the Terms of Trade: The J-Curve?" *American Economic Review*, 84(1): 84–103.

References II

Basu, Susanto, and John G Fernald. 1995. "Are Apparent Productive Spillovers a Figment of Specification Error?" *Journal of Monetary Economics*, 36(1): 165–188.

Basu, Susanto, and Miles S Kimball. 1997. "Cyclical Productivity with Unobserved Input Variation." National Bureau of Economic Research.

Beine, Michel AR, Jean Charles Bricongne, and Pauline Bourgeon. 2013. "Aggregate Fluctuations and International Migration." , (453). Working Paper.

Beraja, Martin, Erik Hurst, and Juan Ospina. 2016. "The Aggregate Implications of Regional Business Cycles."

Beyer, Robert CM, and Frank Smets. 2015. "Labour Market Adjustments and Migration in Europe and the United States: How Different?" *Economic Policy*, 30(84): 643–682.

References III

Blanchard, Olivier Jean, and Lawrence F Katz. 1992. "Regional Evolutions." *Brookings papers on economic activity*, 1992(1): 1–75.

Borjas, George J. 1987. "Self-Selection and the Earnings of Immigrants." National Bureau of Economic Research Cambridge, Mass., USA.

Burda, Michael, and Charles Wyplosz. 1994. "Gross Worker and Job Flows in Europe." *European Economic Review*, 38(6): 1287–1315.

Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans. 2005. "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy." *Journal of Political Economy*, 113(1): 1–45.

Del Negro, Marco, Stefano Eusepi, Marc Giannoni, Argia Sbordone, Andrea Tambalotti, Matthew Cocci, Raiden Hasegawa, and M. Henry Linder. 2013. "The FRBNY DSGE Model." Federal Reserve Bank of New York Staff Report No. 647.

References IV

Engen, Eric M, and Jonathan Gruber. 2001. "Unemployment Insurance and Precautionary Saving." *Journal of Monetary Economics*, 47(3): 545–579.

Farhi, Emmanuel, and Iván Werning. 2014. "Labor Mobility Within Currency Unions." National Bureau of Economic Research.

Friedman, Milton. 1953. "The Case for Flexible Exchange Rates." *Essays in Positive Economics*, 157–203. University of Chicago Press.

Galí, Jordi, and Mark Gertler. 1999. "Inflation Dynamics: A Structural Econometric Analysis." *Journal of Monetary Economics*, 44(2): 195–222.

Hobijn, Bart, and Ayşegül Şahin. 2009. "Job-Finding and Separation Rates in the OECD." *Economics Letters*, 104(3): 107–111.

References V

House, Christopher L., Christian Proebsting, and Linda L. Tesar. 2017. "Austerity in the Aftermath of the Great Recession?" National Bureau of Economic Research.

Jauer, Julia, Thomas Liebig, John P Martin, and Patrick A Puhani. 2014. "Migration as an Adjustment Mechanism in the Crisis? A Comparison of Europe and the United States." *OECD Social, Employment and Migration Working Papers*, , (155).

Karabarbounis, Loukas, and Brent Neiman. 2013. "The Global Decline of the Labor Share." *The Quarterly Journal of Economics*, 129(1): 61–103.

Kenen, Peter. 1969. "The Theory of Optimum Currency Areas: An Eclectic View." *Monetary Problems of the International Economy*, , ed. R.A. Mundell and A.K. Swoboda, 41–60. University of Chicago Press.

References VI

Molloy, Raven, Christopher L Smith, and Abigail Wozniak. 2011. "Internal Migration in the United States." *The Journal of Economic Perspectives*, 25(3): 173–196.

Mundell, Robert A. 1961. "A Theory of Optimum Currency Areas." *The American Economic Review*, 51(4): 657–665.

Nakamura, Emi, and Jón Steinsson. 2008. "Five Facts About Prices: A Reevaluation of Menu Cost Models." *Quarterly Journal of Economics*, 123(4): 1415–1464.

Nakamura, Emi, and Jon Steinsson. 2014. "Fiscal Stimulus in a Monetary Union: Evidence from US Regions." *The American Economic Review*, 104(3): 753–792.

Ortega, Francesc, and Giovanni Peri. 2009. "The Causes and Effects of International Migrations: Evidence from OECD Countries 1980-2005." National Bureau of Economic Research. Working Paper.

References VII

Petrongolo, Barbara, and Christopher A. Pissarides. 2001. "Looking Into the Black Box: A Survey of the Matching Function." *Journal of Economic Literature*, 39(2): 390–431.

Redding, Stephen J. 2016. "Goods Trade, Factor Mobility and Welfare." *Journal of International Economics*, 101: 148–167.

Shimer, Robert. 2005. "The Cyclical Behavior of Equilibrium Unemployment and Vacancies." *American Economic Review*, 95(1): 25–49.

Shimer, Robert. 2010. *Labor Markets and Business Cycles.* Princeton University Press Princeton, NJ.

Sterk, Vincent. 2015. "Home Equity, Mobility, and Macroeconomic Fluctuations." *Journal of Monetary Economics*, 74: 16–32.

Yagan, Danny. 2014. "Moving to Opportunity? Migratory Insurance over the Great Recession." *Job Market Paper.*

Microfoundation of Utility Gain

Assume that each household can be partitioned into $\mathcal{N} - 1$ subunits, each consisting of a continuum of household members indexed by $\iota_j^i \in (0, 1]$.
Each subunit is assigned a specific foreign country. Members of subunit $j \neq i$ have to choose whether to either live at home (i.e. in i) or abroad (i.e. in j).
Utility gain for member ι_j^i from living in country j

$$A_j^i - \gamma \left(\ln(\iota_j^i) + 1 \right), \qquad \gamma > 0$$

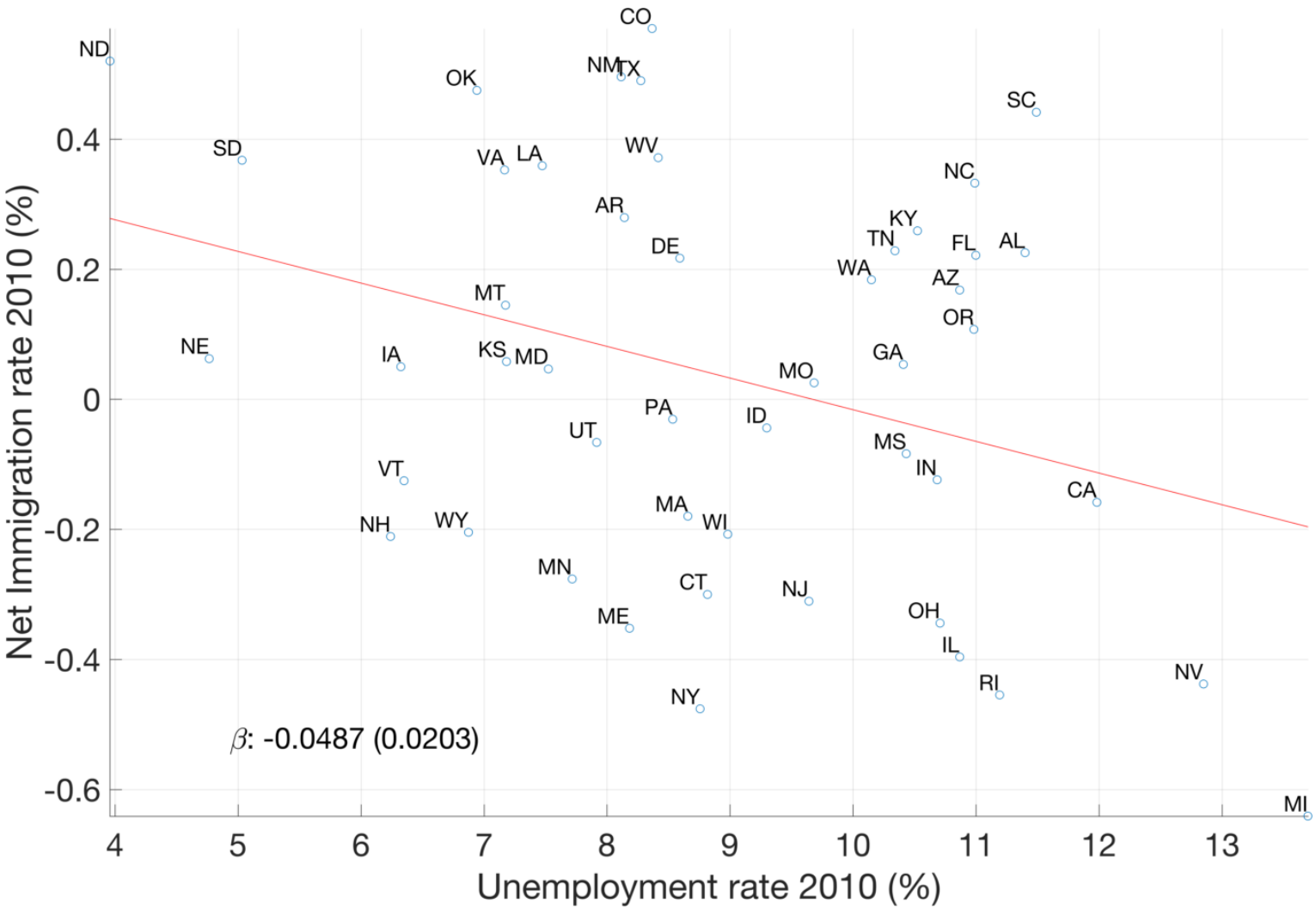
Members with a larger ι_j^i incur a larger loss from living in j.
Sum of country i's household members' utility gain from living in country j:

$$\int_{\varepsilon}^{n_{j,t}^i} \left(A_j^i - \gamma \left(\ln(\iota_j^i) + 1 \right) \right) d\iota_j^i = n_{j,t}^i \left(A_j^i - \gamma \ln(n_{j,t}^i) \right) - \varepsilon \left(A_j^i - \gamma \ln(\varepsilon) \right),$$

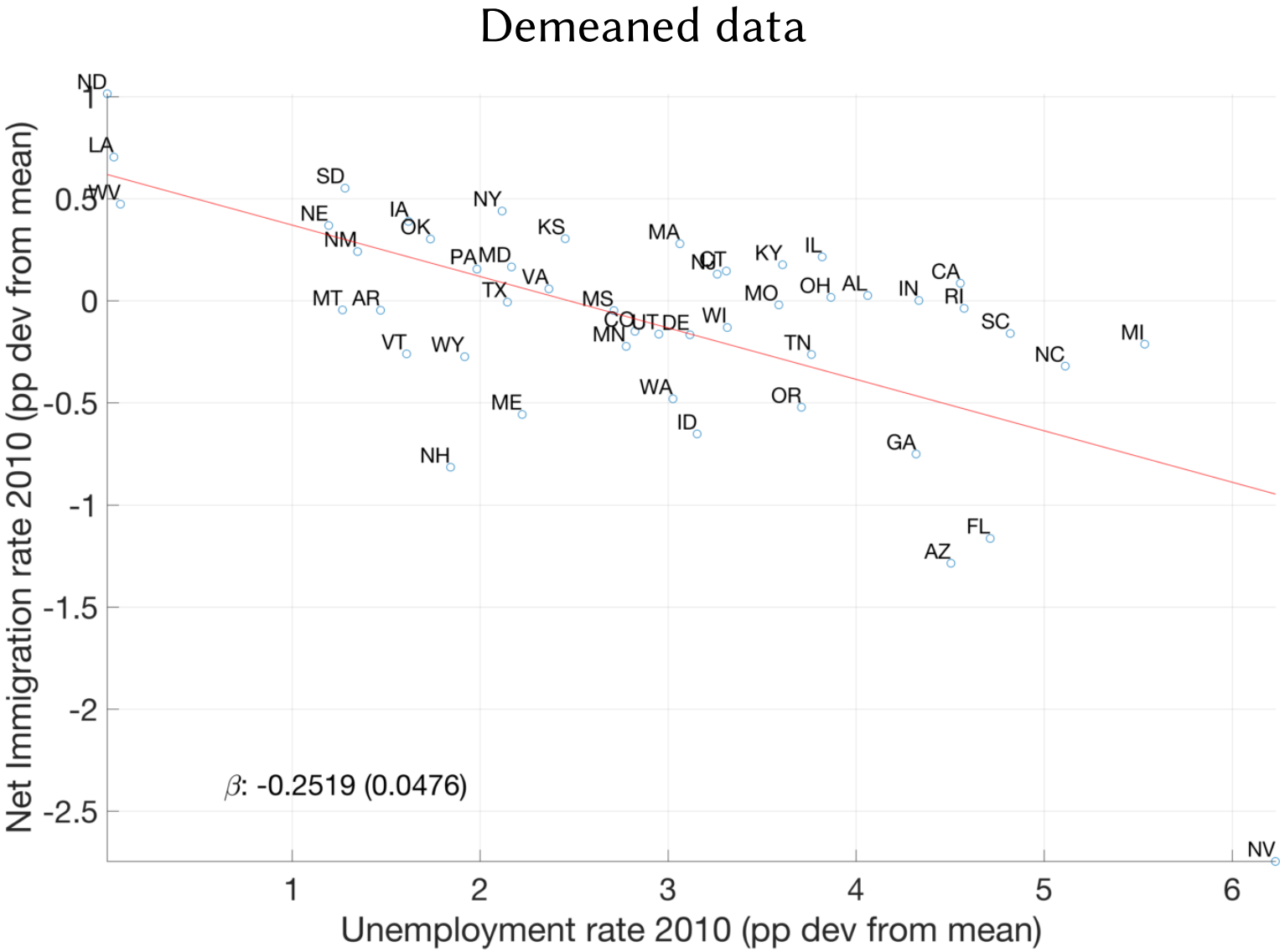
where ϵ is a small positive number that ensures that the integral is finite. Back

Net Migr Rate ’09-’10 vs. Unempl. Rate ’09-’10

Raw data



Migration Rates over Time



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Description	Parameter	US	Europe	Target / Source
Preferences				
Discount factor	β	0.99		4% real interest rate
Coefficient of relative risk aversion	$\frac{1}{\sigma}$	2		e.g. Backus, Kehoe and Kydland (1992)
Persistence of preference shock	ρ	0.95		-
Trade and Country Size				
Trade demand elasticity	ψ_y	2		e.g. Backus, Kehoe and Kydland (1994)
Trade preference weights	ω_i^j	x	x	Share of imports from j; US: FAF (1997); Europe: OECD TiVA (2005)
Country's absorption	$\mathbb{N}_n Y_n$	x	x	Nominal GDP; US: BEA (1997), Europe: Eurostat (2005)
Technology				
Curvate of production function	α	0.30		Labor income share of 0.63, US and Germany (Karabarbounis and Neiman (2013))
Depreciation rate	δ	0.021		Annual depreciation rate of 10 percent
Utilization cost	a''	0.286		Del Negro et al. (2013)
Investment adjustment cost	Λ''	2.48		Christiano, Eichenbaum and Evans (2005)
Elasticity of substitution bw. varieties	ψ_q	10		e.g. Basu and Fernald (1995), Basu and Kimball (1997)
Nominal Price Rigidity				
Sticky price probability	θ_p	0.70	0.77	Price duration: 10 months (US, Nakamura and Steinsson (2008)), 13 months (Europe, Alvarez et al. (2006))
Migration				
Population	$\mathbb{N}^j$	x	x	US: US Census (1990, 2000), Europe: Eurostat ('95-'15)
Migrant stock	n_i^j	x	x	Share of residents born in j; US: US Census (1990, 2000), Europe: Eurostat ('95-'15)
Migration propensity	γ	1.72	2.72	Elasticity of net migr. to unempl. (US: 0.272, Europe: 0.082); See text
Labor Markets				
Unemployment rate	ur	x	x	US: BLS ('77-'15), Europe: Eurostat ('95-'15)
Separation rate	d	0.10	0.06	US: Shimer (2005), Europe: Hobijn and Şahin (2009)
Matching elasticity to tightness	ζ	0.72		Shimer (2005), Burda and Wyplosz (1994), Petrongolo and Pissarides (2001)
Bargaining power of workers	ϱ	0.72		Shimer (2005)
Real wage rigidity	θ_w	0.89	0.89	Std. dev. of GDP to unemployment rate: 1.78 (US, BEA, '77-'15)
Unemployment benefits	bw^h	0.44	0.59	Net replacement rate, US: Engen and Gruber (2001), Europe: OECD "Benefits and Wages"
Fiscal and Monetary Policy				
Gov't purchases over final demand	$\frac{G_i}{Y_i}$	0.19	x	US: BEA ('77-'15), Europe: Eurostat ('95-'15)
Taylor rule persistence	ϕ_i	0.75		US: Galí and Gertler (1999)
Taylor rule GDP coefficient	ϕ_{GDP}	0.50		US: Galí and Gertler (1999)
Taylor rule inflation coefficient	ϕ_π	1.50		US: Galí and Gertler (1999)

U.S. Steady-State Values

Country	GDP	Import share	Pop	Expat share	Unem rate	Country	GDP	Import share	Pop	Expat share	Unem rate
Alabama	1.7%	58.9%	1.6%	34.9%	7.4%	Nevada	2.6%	70.7%	0.6%	39.1%	6.6%
Arizona	2.1%	52.0%	1.7%	32.2%	6.4%	New Hampshire	2.2%	78.6%	0.4%	40.2%	4.4%
Arkansas	1.6%	60.6%	1.0%	45.5%	6.7%	New Jersey	2.6%	66.7%	3.1%	33.2%	6.4%
California	2.3%	27.8%	12.1%	18.3%	7.4%	New Mexico	2.2%	52.0%	0.6%	42.2%	6.8%
Colorado	2.5%	47.5%	1.4%	40.8%	5.6%	New York	2.6%	37.3%	7.0%	33.4%	6.7%
Connecticut	2.9%	64.8%	1.3%	33.8%	5.5%	North Carolina	2.2%	50.3%	2.8%	27.0%	5.9%
Delaware	3.2%	77.9%	0.3%	38.4%	5.5%	North Dakota	1.7%	44.0%	0.2%	57.5%	4.0%
Florida	1.9%	32.1%	5.5%	24.8%	6.3%	Ohio	2.1%	56.0%	4.2%	30.9%	6.9%
Georgia	2.3%	56.4%	2.8%	28.8%	6.1%	Oklahoma	1.6%	48.1%	1.3%	43.7%	5.2%
Idaho	1.8%	42.5%	0.4%	48.1%	6.2%	Oregon	2.2%	43.4%	1.2%	35.6%	7.3%
Illinois	2.4%	52.3%	4.5%	33.9%	7.1%	Pennsylvania	2.0%	59.0%	4.6%	32.8%	6.6%
Indiana	2.0%	63.3%	2.2%	33.0%	6.4%	Rhode Island	1.9%	72.0%	0.4%	38.8%	6.6%
Iowa	2.0%	54.0%	1.1%	43.4%	4.7%	South Carolina	1.8%	62.5%	1.4%	32.7%	6.7%
Kansas	2.0%	59.9%	1.0%	46.3%	4.7%	South Dakota	1.8%	56.1%	0.3%	53.6%	3.8%
Kentucky	1.8%	67.2%	1.5%	36.7%	7.0%	Tennessee	2.0%	62.7%	2.0%	31.9%	6.6%
Louisiana	1.8%	44.4%	1.7%	30.4%	7.4%	Texas	2.2%	37.3%	7.2%	20.4%	6.2%
Maine	1.7%	56.3%	0.5%	35.3%	6.0%	Utah	2.0%	55.1%	0.8%	31.7%	5.0%
Maryland	2.2%	59.3%	1.9%	30.7%	5.4%	Vermont	1.8%	75.8%	0.2%	42.7%	4.8%
Massachusetts	2.6%	54.1%	2.3%	32.9%	5.6%	Virginia	2.2%	59.5%	2.5%	33.2%	4.8%
Michigan	2.1%	46.5%	3.7%	27.6%	8.2%	Washington	2.5%	48.4%	2.0%	30.8%	7.2%
Minnesota	2.3%	47.3%	1.8%	30.8%	5.0%	West Virginia	1.5%	69.0%	0.7%	49.8%	8.4%
Mississippi	1.5%	65.0%	1.0%	42.8%	7.7%	Wisconsin	2.1%	56.2%	2.0%	28.5%	5.7%
Missouri	2.1%	61.4%	2.0%	36.9%	6.1%	Wyoming	2.1%	52.0%	0.2%	59.0%	5.0%
Montana	1.5%	40.0%	0.3%	49.9%	5.9%	RoW	3.3%	59.8%	0.9%	58.1%	6.9%
Average	-	55.2%	-	36.9%	6.1%						

Europe Steady-State Values

Country	GDP	Import share	Pop	Expat share	Unem rate	Country	GDP	Import share	Pop	Expat share	Unem rate
Austria	4.9%	37.3%	1.6%	6.7%	4.8%	Latvia	0.7%	33.1%	0.5%	12.6%	12.8%
Belgium	4.5%	39.1%	2.1%	4.4%	8.2%	Lithuania	1.3%	59.0%	0.6%	11.8%	11.2%
Bulgaria	0.5%	63.0%	1.6%	10.0%	11.6%	Malta	3.2%	65.9%	0.1%	22.1%	6.5%
Cyprus	4.3%	65.8%	0.1%	21.1%	6.7%	Netherlands	5.0%	36.3%	3.2%	5.3%	5.4%
Czech Republic	1.2%	42.1%	2.1%	5.1%	6.6%	Norway	7.4%	44.2%	0.9%	3.8%	3.6%
Denmark	6.0%	35.8%	1.1%	4.3%	5.6%	Poland	0.9%	23.9%	7.6%	6.8%	12.7%
Estonia	1.0%	48.9%	0.2%	11.7%	9.9%	Portugal	2.3%	23.9%	2.1%	16.9%	9.4%
Finland	4.8%	37.4%	1.1%	5.4%	9.4%	Romania	0.6%	57.1%	4.3%	8.4%	7.0%
France	4.4%	24.9%	12.5%	2.9%	9.3%	Slovak Republic	0.8%	44.7%	1.1%	4.5%	14.3%
Germany	4.8%	26.8%	16.3%	4.7%	7.9%	Slovenia	2.2%	42.1%	0.4%	6.0%	7.1%
Greece	2.4%	21.9%	2.2%	8.8%	13.5%	Spain	2.8%	25.9%	8.5%	3.1%	16.2%
Hungary	0.9%	43.4%	2.0%	4.6%	8.2%	Sweden	5.7%	37.9%	1.8%	3.2%	7.5%
Iceland	5.6%	33.4%	0.1%	9.4%	4.0%	Switzerland	7.6%	39.8%	1.5%	7.6%	3.6%
Ireland	5.0%	55.9%	0.8%	18.8%	8.5%	United Kingdom	5.1%	24.6%	12.1%	7.0%	6.3%
Italy	3.9%	25.7%	11.6%	5.2%	9.5%	RoW	1.0%	4.7%	1176.3%	0.4%	6.0%
Average	-	40.0%	-	8.3%	8.5%						

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