Economic Integration and the Non-tradable Sector: the European Experience

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Motivation

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$\Rightarrow$ This paper analyzes the combined effects of tradable and financial market integration on the dynamics of the non-tradable sector

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$\Rightarrow$ Over 1995-2007, economic integration can explain up to 80% in Greece and 90% in Portugal of the increasing share of the N sector in total employment

Theoretical framework

A two-sector small open economy

Model of structural change Ngai and Pissarides (2007), 2 main departures:

- two-sector: a tradable (T) and a non-tradable (N) sector
  - N goods can only be consumed
  - T goods can be consumed, invested or traded, T price used as a numeraire

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$\Rightarrow$ two drivers of structural change: tradable market integration (TFP and markup) and financial and monetary integration (interest rate)

The representative household

The representative household derives his utility from consumption:

$$V_t = \sum_{s=t}^{\infty} [\beta(1+\nu)]^{s-t} \ln(c_s) \text{ , with } c_t = [\gamma^{\frac{1}{\theta}} c_t^{T\,\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} c_t^{N\,\frac{\theta-1}{\theta}}]^{\frac{\theta}{\theta-1}}$$

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s.t. his financial and human wealth (expressed in terms of tradables, and per capita):

$$p_t c_t = \omega_t + d_t + f_{t+1} - (R_t - \nu) f_t$$

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s.t. his financial and human wealth (expressed in terms of tradables, and per capita):

$$p_t c_t = \omega_t + d_t + f_{t+1} - (R_t - \nu) f_t$$

Proposition 1: the growth rate of consumption is a positive function of the wedge x_{t+1}

Proof: Euler equation, $\frac{c_{t+1}}{c_t} = \beta(1+r)(1+x_{t+1})\frac{p_t}{p_{t+1}}$

Firms

In each sector ($j = T, N$), firms are equity-financed:

- they maximize the present discounted value of dividends
- s.t. Cobb-Douglas production functions with α_j the capital intensity
- firms earn pure profits

The non-tradable sector is more labor intensive than the tradable sector, we have: $\alpha_N < \alpha_T$

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The relative (N/T) price depends only on technological conditions:

$$p_t^N = \frac{(A_t^T/\mu_t^T)^{\frac{1-\alpha_N}{1-\alpha_T}}}{(A_t^N/\mu_t^N)} U_t^{\frac{\alpha_N-\alpha_T}{1-\alpha_T}} \frac{[(1-\alpha_T)^{1-\alpha_T}\alpha_T^{\alpha_T}]^{\frac{1-\alpha_N}{1-\alpha_T}}}{(1-\alpha_N)^{1-\alpha_N}\alpha_N^{\alpha_N}}$$

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where U_t is the user cost of capital, $U_t = q_{t-1}(1+r)(1+x_t) - q_t(1-\delta)$

Dynamics of the relative price

Proposition 2: The relative price of non-tradable goods increases if:

(1) profit-adjusted productivity grows faster in the tradable than in the non-tradable sector (*long-term profit-adjusted Balassa-Samuelson effect*)

(2) the user cost of capital decreases (*long-term effect of financial integration*)

Proof:

$$\hat{p}_t^N = \underbrace{\left(\frac{1-\alpha^N}{1-\alpha^T}\right)\hat{a}_t^T - \hat{a}_t^N}_{\text{long-term profit-adjusted Balassa-Samuelson effect}} + \underbrace{\left(\frac{\alpha^N-\alpha^T}{1-\alpha^T}\right)\hat{U}_t}_{\text{long-term effect of financial integration}}$$

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Structural change

Let n_t^N be the share of the non-tradable sector in total employment, and $\tilde{n}_t^N$ a positive function of n_t^N:

$$\tilde{n}_t^N = \frac{n_t^N / s_{L,t}^N}{n_t^N / s_{L,t}^N + n_t^T / s_{L,t}^T} \quad \text{with} \quad s_{L,j,t} = \frac{1-\alpha^j}{\mu_t^j} \quad \forall j \in \{T, N\}$$

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Differentiating $\tilde{n}_t^N$, and rewriting $p_t(p_t^n)$, we get that the dynamics of $\tilde{n}_t^N$ satisfies:

$$\hat{\tilde{n}}_t^N = (1-\theta)(1-\psi_t)\hat{p_t^N} + \hat{\chi}_t$$

$$\text{where} \quad \psi_t = \frac{p_t^N c_t^N}{p_t c_t} \quad \text{and} \quad \chi_t = \frac{p_t c_t}{p_t y_t}$$

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$\Rightarrow$ **Structural change:** an increase in the share of the non-tradable sector in total employment

Drivers of structural change (1/2)

Proposition 3: There are 3 drivers of structural change:

(1) *long-term profit-adjusted Balassa-Samuelson effect*, through the relative price if $\theta < 1$

(2) *long-term effect of financial integration*, through the relative price if $\theta < 1$

(3) *short-term effect of financial integration*, by fueling a temporary demand boom if $\hat{c}_t > \hat{y}_t$

Proof:

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Drivers of structural change (2/2)

Absent markups and differences in capital intensities across sectors, it reduces to the expression found in Ngai and Pissarides (2007)

Proposition 4: There are then only 2 drivers of structural change:

(1) *standard Balassa-Samuelson effect*, through the relative price if $\theta < 1$

(2) *short-term effect of financial integration*, by fueling a temporary demand boom if $\hat{c}_t > \hat{y}_t$

Proof:

$$\hat{n}_t^N = (1-\theta)(1-\psi_t) \underbrace{\left(\hat{A}_t^T - \hat{A}_t^N\right)}_{\text{standard Balassa-Samuelson effect}} + \underbrace{\hat{\chi}_t}_{\text{short-term effect of financial integration}}$$

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(3) *short-term effect of financial integration*, since financial integration can fuel the consumption rate:

- non-tradable goods must be produced domestically, whereas tradable goods can be imported

$\Rightarrow$ the share of the non-tradable sector increases in total employment

Empirical evidence

Data

Methodology:

- step 1: growth accounting at a the industry-level
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Panel of 12 countries (EA12, countries which adopted the euro in 2001 and before) over 1995-2014

- Periphery: bottom third countries with the lowest GDP per capita (at purchasing power standards) in 1995 $\rightarrow$ EL, ES, IE, PT
- Core countries: AT, BE, DE, FI, FR, IT, LU, NL

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Data from Eurostat National Accounts in 19 sectors (NACE rev. 2)

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EU-KLEMS methodology, but allowing for profits (Fernald and Neiman, 2011):

- gross value added at factor costs = labor and capital compensations + a residual (the profit share)
- user cost of capital estimated using data on depreciation rates, investment prices and real long term nominal interest rates (Ameco)

Data: defining tradability

Most studies label the manufacturing sector as tradable and consider services sectors as non-tradable. But the share of services in total exports is increasing.

Need data on trade and production (19 sectors, NACE rev. 2):

- Production : National Accounts (Eurostat, 1995-2014)
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Classifying each sector as Tradable (T) or Non-tradable (N):

- openness ratio = trade (imports + exports) to production, by sector, for total EA12, on average over 1995-2014
- a sector is T if its openness ratio is larger than 10%

Threshold Other indices

Data: defining tradability

Sector		Openness ratio		
		1995	2014-1995, change in p.p.	1995-2014, average
B	Mining and quarrying	124.5	120.0	196.0
C	Manufacturing	74.6	42.8	99.0
I	Accommodation and food service activities	77.3	4.7	81.9
A	Agriculture, forestry and fishing	34.0	18.2	43.9
H	Transportation and storage	30.4	-1.4	33.1
N	Administrative and support service activities	19.5	-4.3	24.1
M	Professional, scientific and technical activities	11.9	15.5	19.1
J	Information and communication	7.3	19.5	14.9
K	Financial and insurance activities	8.5	10.3	14.7
D	Electricity, gas, steam and air conditioning supply	2.7	1.3	4.3
R	Arts, entertainment and recreation	3.5	1.7	4.2
G	Wholesale and retail trade	2.4	-0.2	3.8
O	Public administration and defence	3.2	-1.4	2.4
F	Construction	2.9	-0.7	2.4
S	Other service activities	1.1	0.8	1.8
E	Water supply and waste management	0.0	0.6	0.3
P	Education	0.0	0.2	0.1
Q	Human health and social work activities	0.0	0.1	0.1
L	Real estate activities	0.0	0.0	0.0

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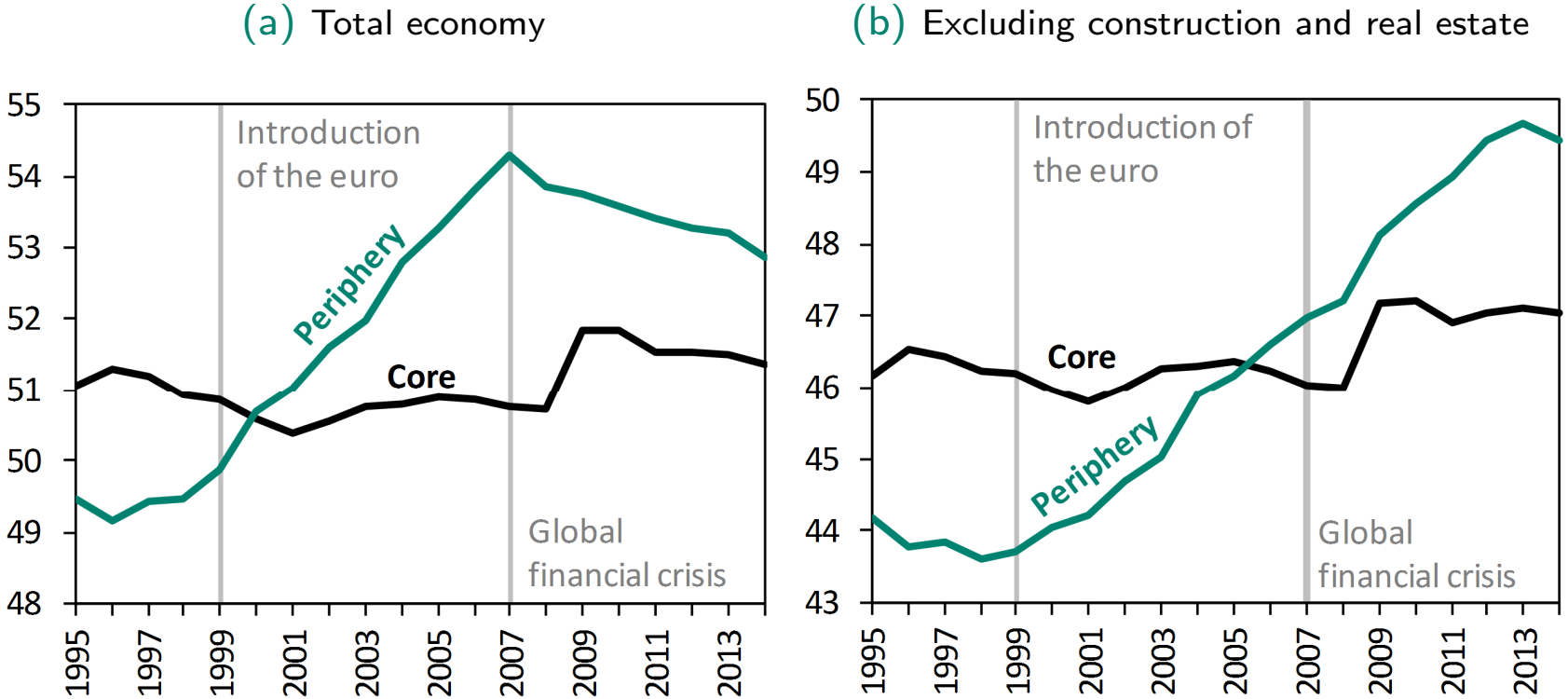
10% threshold

Non-tradable sector:
51% of employment
43% of production
52% of gross value added

Stylized facts: the dynamics of the non-tradable sector

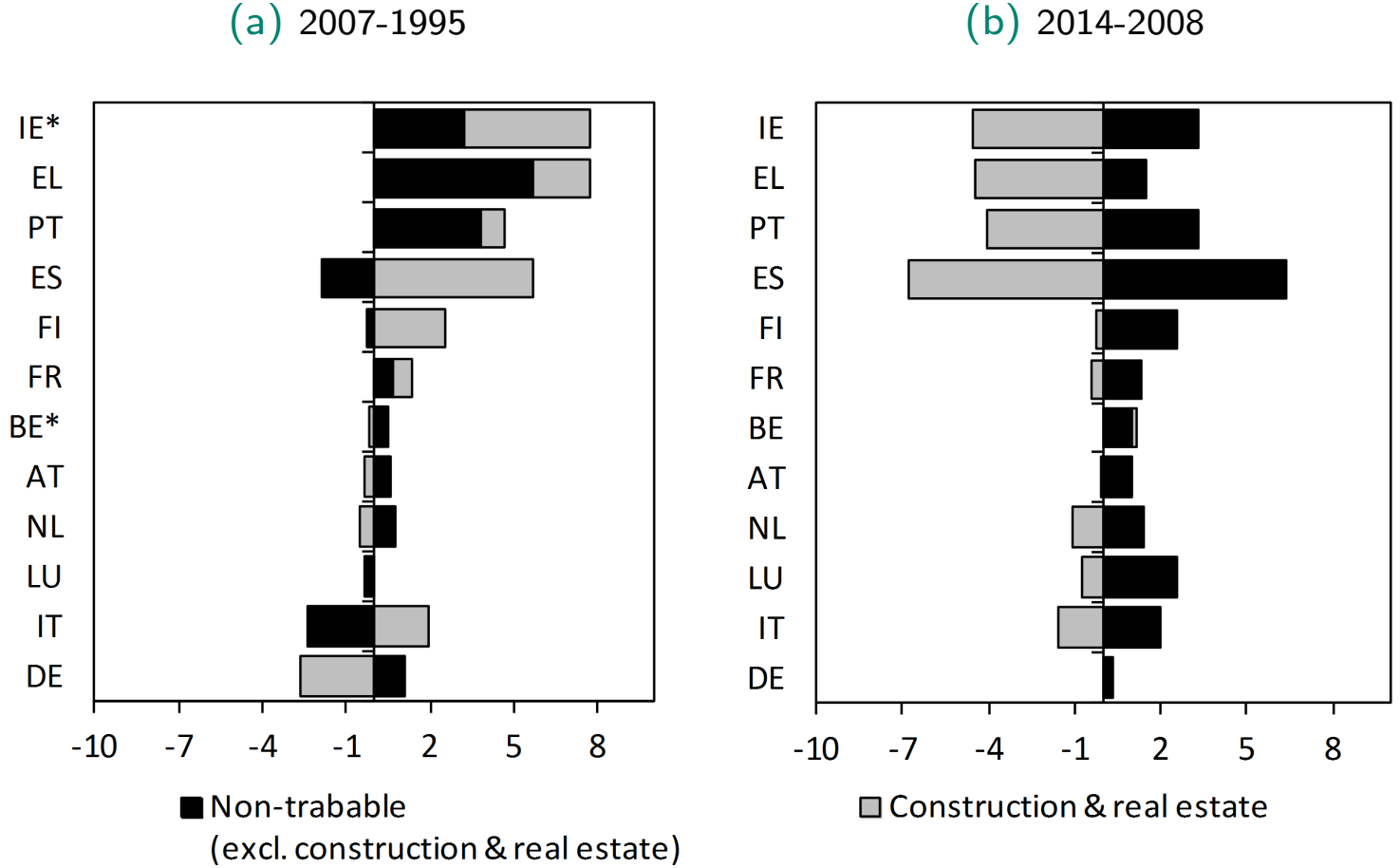
Figure: Share of the non-tradable sector in total hours worked, by country group, 1995-2014, in %



Source: author's calculations using Eurostat and BACI.
Note: Averages over countries weighted by the number of hours worked.
Periphery: EL, ES, IE, PT; core countries: AT, BE, DE, FI, FR, IT, LU, NL.

Stylized facts: the dynamics of the non-tradable sector is not only about housing bubbles

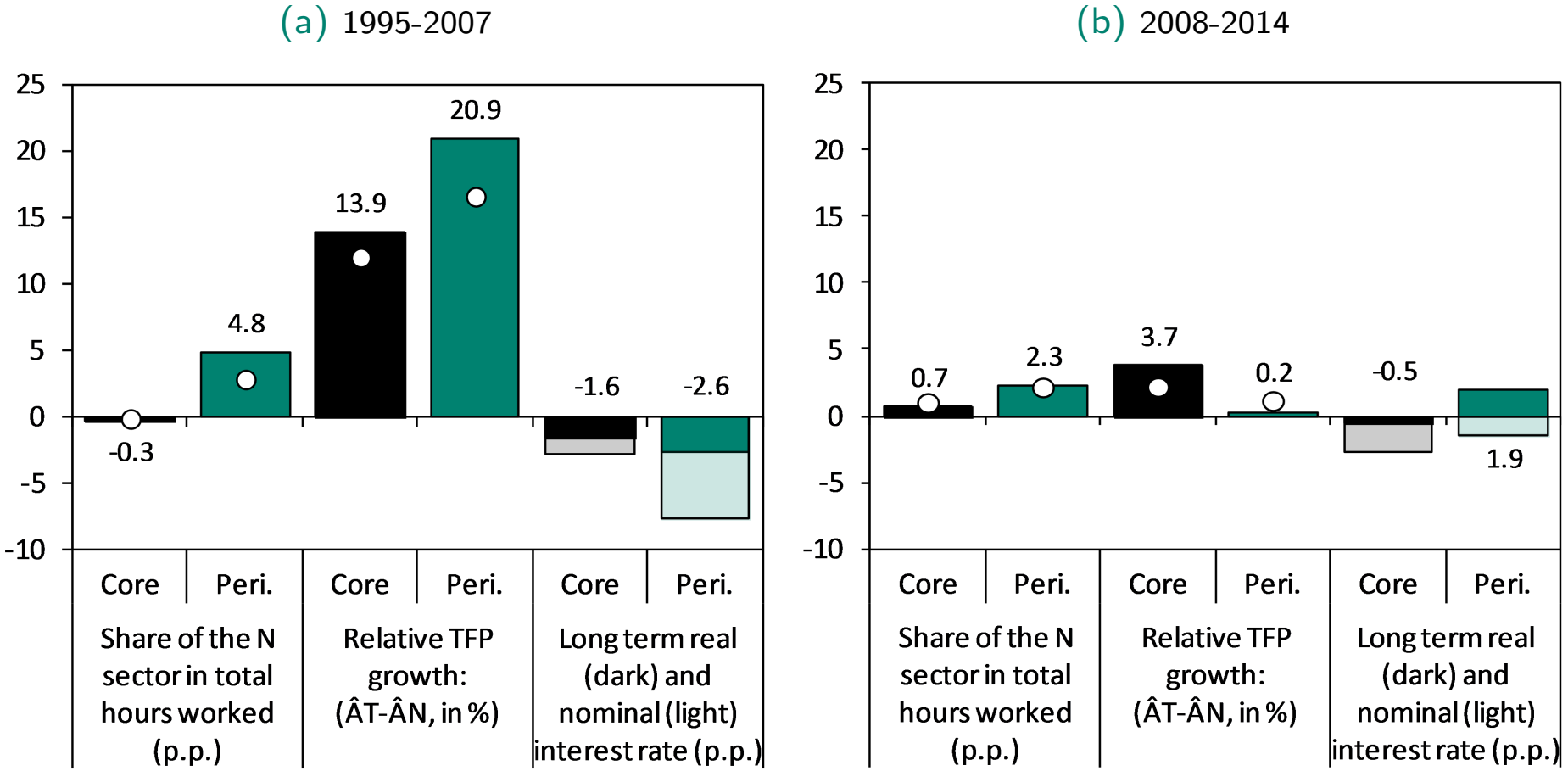
Figure: Change in the share of the non-tradable sector in total hours worked (p.p.)



Source: author's calculations using Eurostat and BACI. *For Belgium and Ireland, data start only in 1999.

Stylized facts: drivers of structural change

Figure: Change in the share of the N sector in total employment, relative (T/N) TFP and nominal long-term interest rates, total economy (dots: excl. construction & real estate)



Source: author's calculations using Eurostat and BACI. Note: The measure of TFP is adjusted for profits. Initial year for the periphery: 1997. Real interest rates: tradable GVA deflator.

Quantification

Quantifying how economic integration affects the dynamics of the N sector

Growth accounting exercise using an illustrative calibration. Important parameters:

(1) the share of non-tradables in total consumption

(2) the elasticity of substitution between the N and the T goods

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(2) For the elasticity, I use the following relationship:

$$\log\left(\frac{p_t^N c_t^N}{p_t c_t}\right) = \log(1-\gamma) + (1-\theta)\left[\log\left(\frac{p_t^N}{p_t}\right)\right]$$

Simple regression (hp filter and country FE): $\theta = 0.81 \quad [0.66; 0.97]$. Very close to Acemoglu and Guerrieri (2008): 0.76.

Decomposing the change in the share of the non-tradable sector in total employment (1/2)

$$(n_t^N \hat{+} n_t^H) = n^N(\hat{n}_t^{N-H} + (1 \hat{-} n_t^H)) + \underbrace{n^H \hat{n}_t^H}_{\text{Construction and real estate}}$$

with $n_t^N = \dfrac{L_t^N}{L_t^N + L_t^H + L_t^T}$ and $n_t^{N-H} = \dfrac{L_t^N}{L_t^N + L_t^T}$

Decomposing the change in the share of the non-tradable sector in total employment (2/2)

where $\hat{n}_t^{N-H}$ can be further decomposed:

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$$\hat{n}_t^{N-H} = \left[\left(\frac{1-n^{N-H}}{1-\tilde{n}^{N-H}}\right)\hat{\tilde{n}}_t^{N-H} + (1-n^{N-H})(\hat{s}_t^{L,N-H} - \hat{s}_t^{L,T})\right]$$

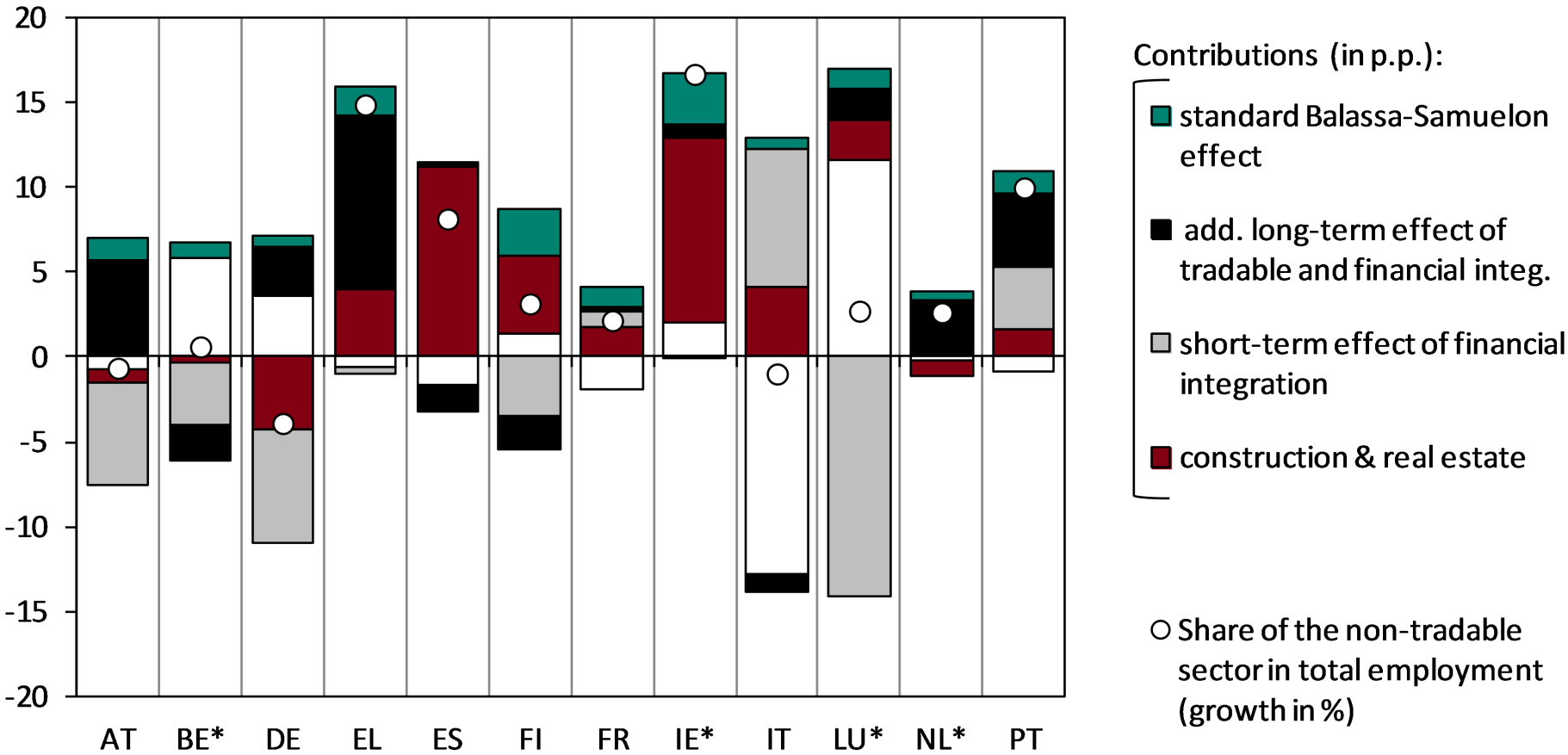
$$= \underbrace{(1-\theta)(1-\psi)(T\hat{F}P^T - T\hat{F}P_t^{N-H})}_{\text{Standard Balassa-Samuelson effect}} + \underbrace{\left(\frac{1-n^{N-H}}{1-\tilde{n}^{N-H}}\right)\hat{\chi}_t}_{\substack{\text{short-term effect} \\ \text{of financial integration}}}$$

$$+ \left(\frac{1-n^{N-H}}{1-\tilde{n}^{N-H}}\right)(1-\theta)(1-\psi)\left[\left(\frac{1-\alpha^{N-H}}{1-\alpha^T}\right)\hat{a}_t^T - \hat{a}_t^{N-H} + \left(\frac{\alpha^N-\alpha^T}{1-\alpha^T}\right)\hat{U}_t\right]$$

$$\underbrace{- \left[(1-\theta)(1-\psi)(T\hat{F}P^T - T\hat{F}P_t^{N-H})\right] + (1-n^{N-H})(\hat{s}_t^{L,N-H} - \hat{s}_t^{L,T})}_{\substack{\text{additional long-term effect of economic integration} = \\ \text{adjustment for profits} + \text{long-term effect of fin. integration}}}$$

Contributions to structural change

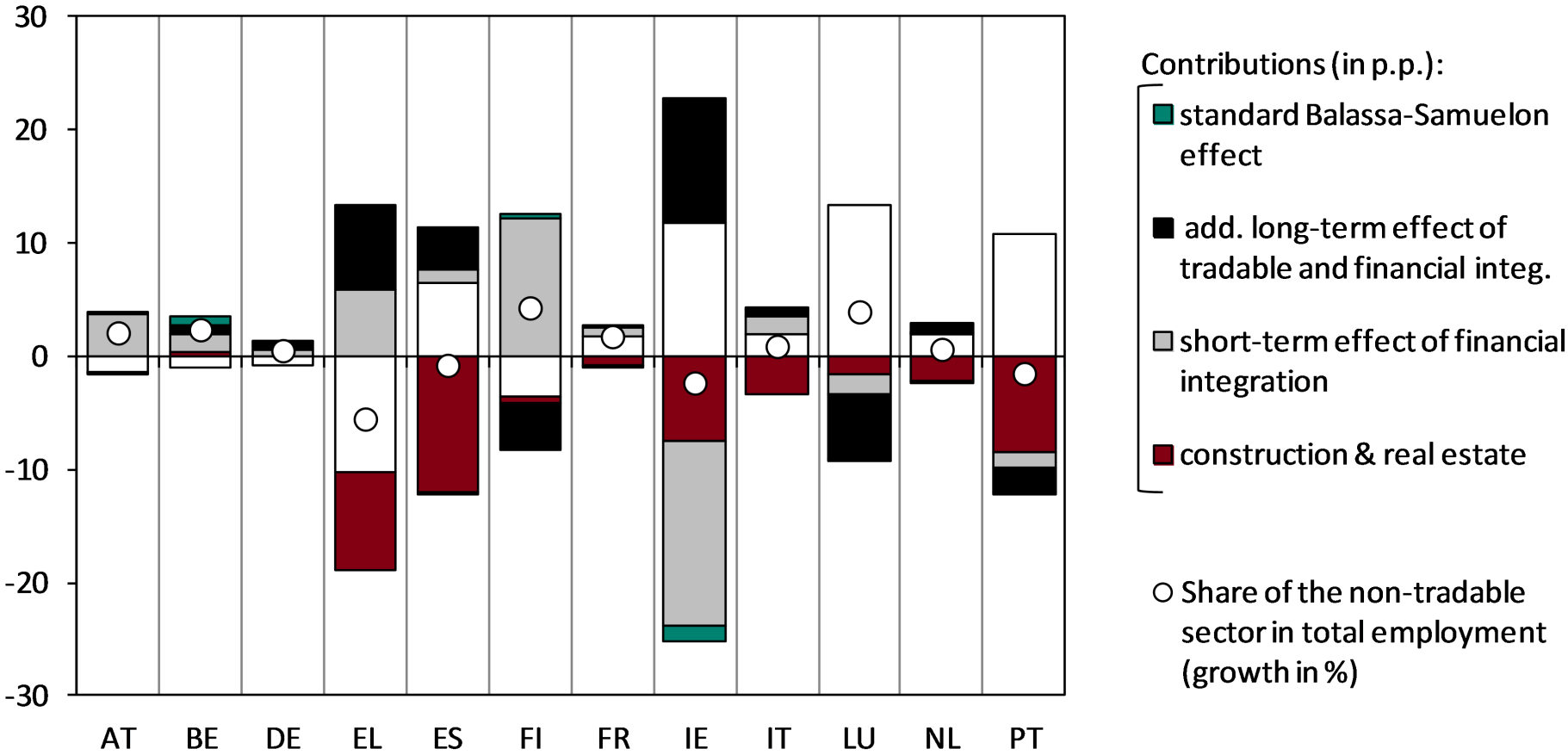
Figure: Contributions (in p.p.) to the change (in %) in the share of the non-tradable sector in total employment, 1995-2007



Source: author's calculations using Eurostat and BACI. For Ireland data start in 1998, for Belgium in 1999, for Luxembourg and the Netherlands in 2001.

Contributions to structural change

Figure: Contributions (in p.p.) to the change (in %) in the share of the non-tradable sector in total employment, 2008-2014



Source: author's calculations using Eurostat and BACI.

Concluding remarks

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Two main effects of economic integration on structural change:

- a relative price increase which can result in a relative expansion of the non-tradable sector
- a temporary demand boom, leading to an expansion of the non-tradable sector and an accumulation of current account deficits

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Growth decomposition using a novel data set for 12 countries of the Euro area:

- Over 1996-2007, economic integration can explain up to 80% in Greece and 90% in Portugal of the increasing share of the N sector in total employment
- Economic integration had a much larger impact than the sole standard Balassa-Samuelson effect (which explain resp. 11% and 13%)

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"Understanding the sources of divergence is essential to creating a eurozone that works" (Stiglitz, 2016, p.124)

Thank you!

The dynamics of χ_t:

We have: $\hat{\chi}_t = p_t\hat{c}_t - p_t\hat{y}_t$

Replacing $p_t\hat{c}_t$ using the Euler equation, and replacing $p_t\hat{y}_t$ using the FOCs in the tradable and non-tradable sector, we get:

$$\begin{aligned}\hat{\chi}_t =& x_{t+1} - (\hat{\omega}_t - \hat{s}_t^{L,T}) \\ &+ \left(\frac{1-\tilde{n}_t^N}{1-n_t^N} - 1\right)\left[(1-\theta)\left(\hat{p}_t^N - \hat{p}_t\right) + x_{t+1} - (\hat{\omega}_t - \hat{s}_t^{L,T})\right] \\ &+ \left(\frac{1-\tilde{n}_t^N}{1-n_t^N}\right)(\hat{s}_t^{L,N} - \hat{s}_t^{L,T})n_t^N\end{aligned}$$

Prop. 3

Biased TFP:

When there is no profit:

$$\begin{aligned} TFP_t^j &= \hat{A}_t^j \\ &= \hat{Y}_t^j - s_t^{L,j}\hat{L}_t^j - (1 - s_t^{L,j})\hat{K}_t^j \\ &= s_t^{L,j}(\hat{\omega}_t - \hat{p}_t^j) + (1 - s_t^{L,j})(\hat{U}_t - \hat{p}_t^j) \end{aligned}$$

When allowing for the existence of profits, standard TFP measure diverges from true technology:

$$\begin{aligned} \hat{TFP}_t^j &= \hat{Y}_t^j - s_t^{L,j}\hat{L}_t^j - (1 - s_t^{L,j})\hat{K}_t^j \\ &= \hat{A}_t^j + \underbrace{s_t^{L,j}(\mu_t^j - 1)(\hat{L}_t^j - \hat{K}_t^j)}_{\text{bias}} \end{aligned}$$

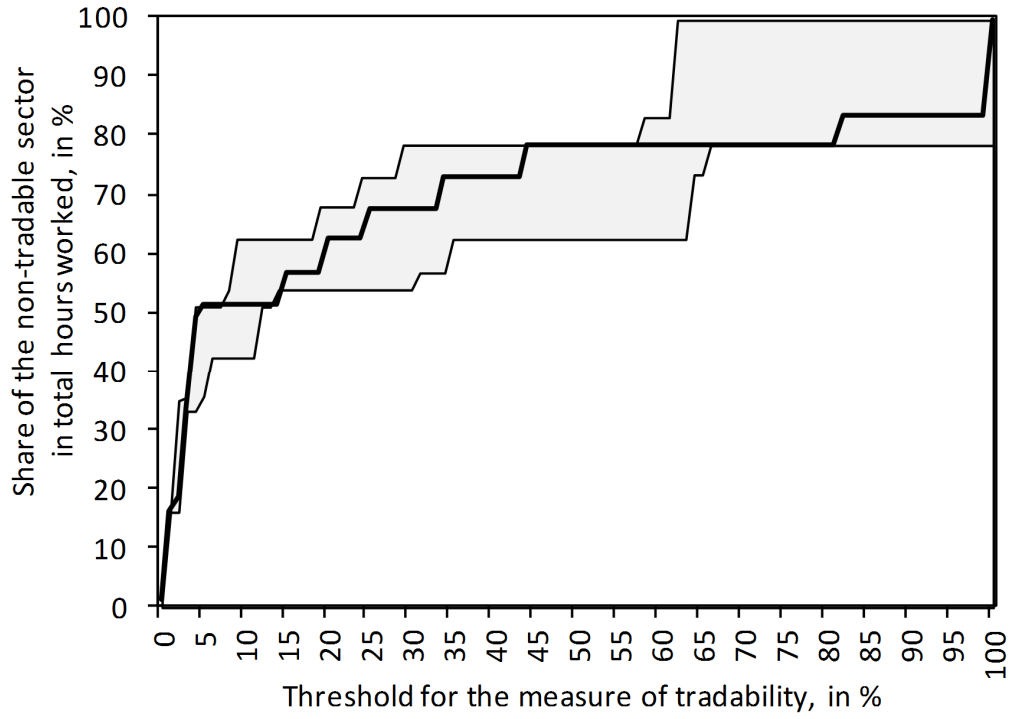
and diverges also from real factor payments (Fernald and Neiman, 2011):

$$\begin{aligned} \hat{TFP}_t^j &= s_t^{L,j}(\hat{\omega}_t - \hat{p}_t^j) + (1 - s_t^{L,j})(\hat{U}_t - \hat{p}_t^j) \\ &= \underbrace{\hat{A}_t^j - \hat{\mu}_t^j}_{\text{real factor payments} = \hat{a}_t^j} + \underbrace{s_t^{L,j}(\mu_t^j - 1)(\hat{L}_t^j - \hat{K}_t^j) + (1 - s_t^{L,j})(\hat{U}_t^{biased} - \hat{U}_t)}_{\text{bias}} \end{aligned}$$

Prop. 2 Prop. 3

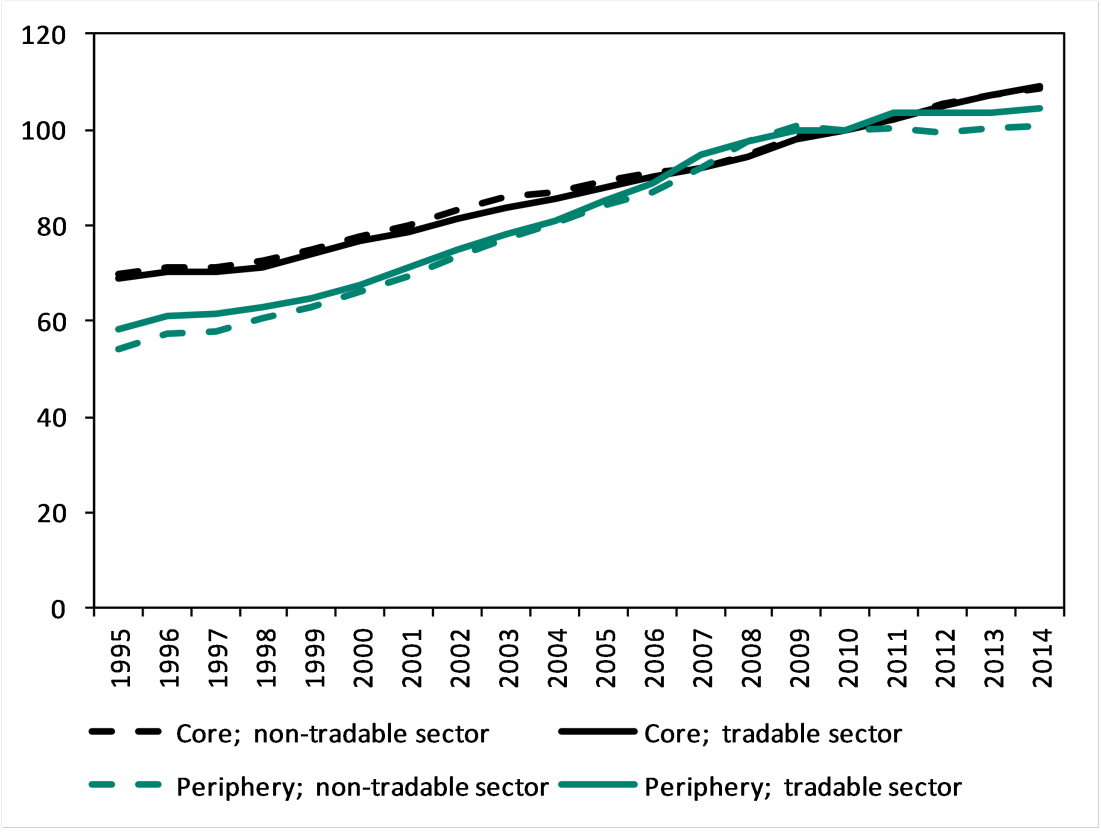
Sector		Average 1995-2014, 24 countries		
		Openness ratio: trade to production, in %	Mian & Sufi, 2014: trade per worker, in euros	Gregorio et al., 1994: exports to production, in %
B	Mining and quarrying	196.0	631,975	68.9
C	Manufacturing	99.0	168,903	50.6
I	Accommodation and food service activities	81.9	48,092	41.4
A	Agriculture, forestry and fishing	43.9	18,961	18.8
H	Transportation and storage	33.1	36,761	17.0
N	Administrative and support service activities	24.1	15,371	11.7
M	Professional, scientific and technical activities	19.1	19,460	9.3
J	Information and communication	14.9	25,560	8.7
K	Financial and insurance activities	14.7	27,348	9.1
D	Electricity, gas, steam and air conditioning supply	4.3	18,486	2.1
R	Arts, entertainment and recreation	4.2	3,052	2.5
G	Wholesale and retail trade	3.8	2,542	2.2
O	Public administration and defence	2.4	1,644	1.3
F	Construction	2.4	2,524	1.4
S	Other service activities	1.8	909	0.8
E	Water supply and waste management	0.3	486	0.2
P	Education	0.1	66	0.1
Q	Human health and social work activities	0.1	34	0.0
L	Real estate activities	0.0	0	0.0

Figure: Share of the non-tradable sector in total hours worked depending on the threshold used for the measure of tradability



Source: author's calculations using Eurostat and BACI.
Note: The black line measures the tradability indicator using the average openness ratio for the 24 countries. The grey area represents the measures of the tradability indicator using the most and least opened countries.

Figure: Hourly wages in the T and the N sector, in periphery and core countries, 1995-2014 (index 2010=100)



Source: author's calculations using Eurostat and BACI.
Note: a 10% threshold is used for the measure of tradability.