

# Productivity Spillovers, diffusion and public policies - a Portuguese perspective

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- 1 Some stylized facts on productivity in Portugal**
- 2 Multifactor productivity and policy implications for competitiveness**

**Lower productivity growth is associated with a dispersion of productivity gains between firms in the same sector:**

- Digital technologies and globalization seem to have led to **winner take-all dynamics** where global firms (at the frontier) kept an higher annual rate of productivity growth;
- Leading to a **breakdown in innovation diffusion** from firms in the productivity frontier to the remaining (non-frontier) firms;
- **Benefiting firms integrated into global value chains** and able to adopt new technologies and knowledge but **creating a gap to those that are not integrated**
- Causing **higher wage dispersion** between high and low skilled workers due to skill biased technology enhancements (job polarization)

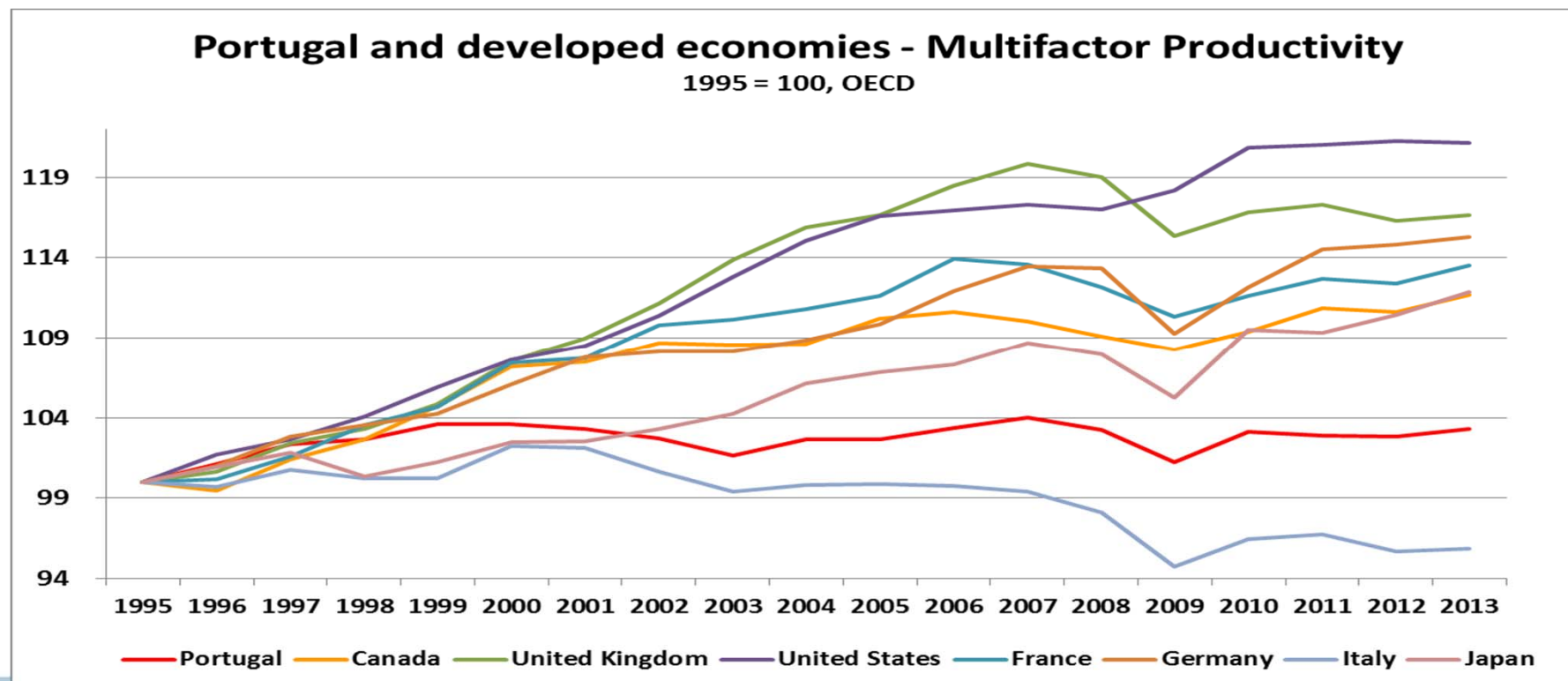
**These trends were amplified by the economic crisis (after 2008)**

**MF Productivity: Portugal needs to converge faster with more developed economies**

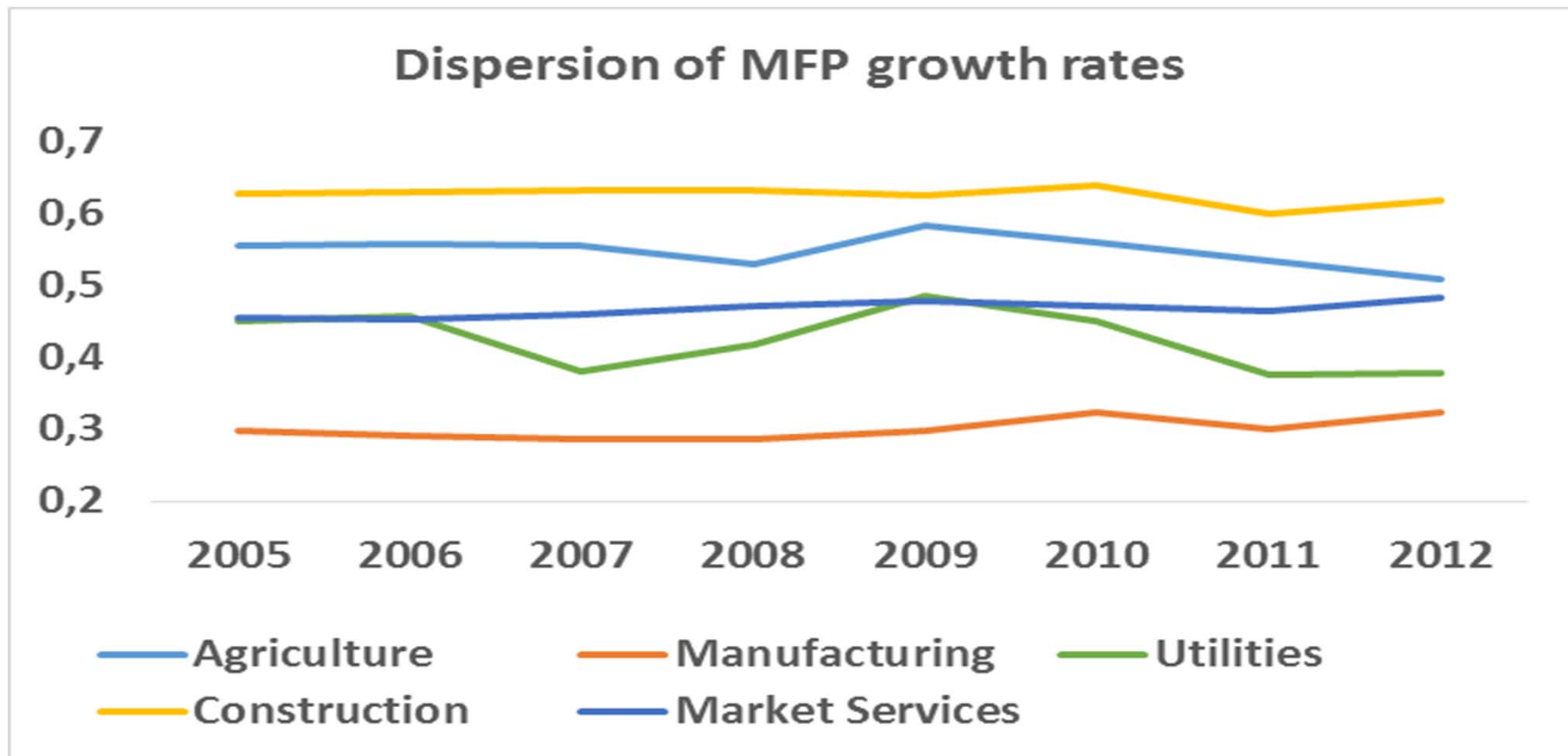
**Multifactor Productivity - yearly growth rates**

	1995-2000	2000-2010	2010-2014
Portugal	0,7%	0,0%	0,0%
Canada	1,4%	0,2%	0,5%
France	1,4%	0,4%	0,4%
Germany	1,2%	0,6%	0,7%
Italy	0,4%	-0,6%	-0,2%
Japan	0,5%	0,7%	0,5%
United Kingdom	1,5%	0,8%	0,0%
USA	1,5%	1,2%	0,1%

Source: OECD



**Portugal: lower productivity growth seems NOT to be associated with a dispersion of productivity gains between firms in the same sector**  
(work in progress – MFP computed as a Solow residual: Multiprod output)



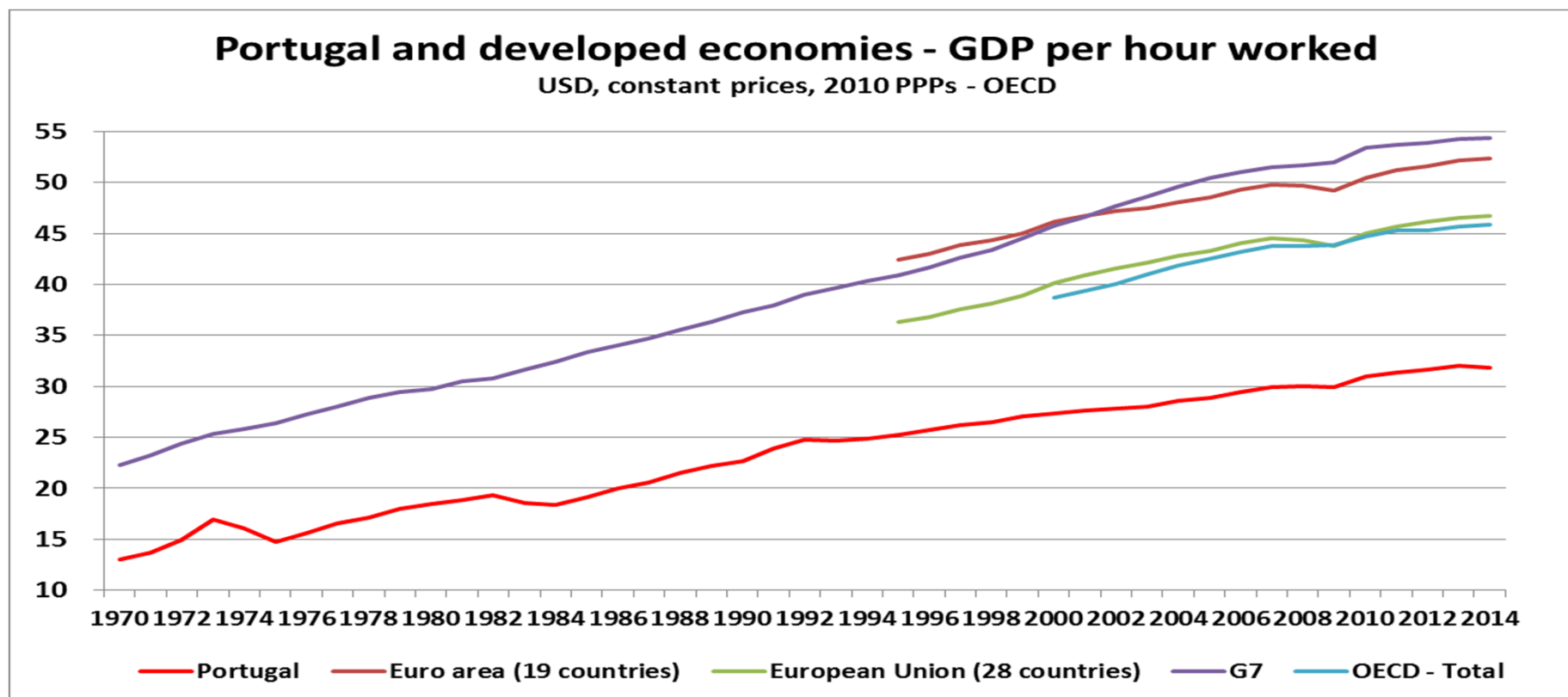
**Labour productivity: low growth due low growth of MFP and low capital labour ration**

**GDP per hour worked - yearly growth rates**

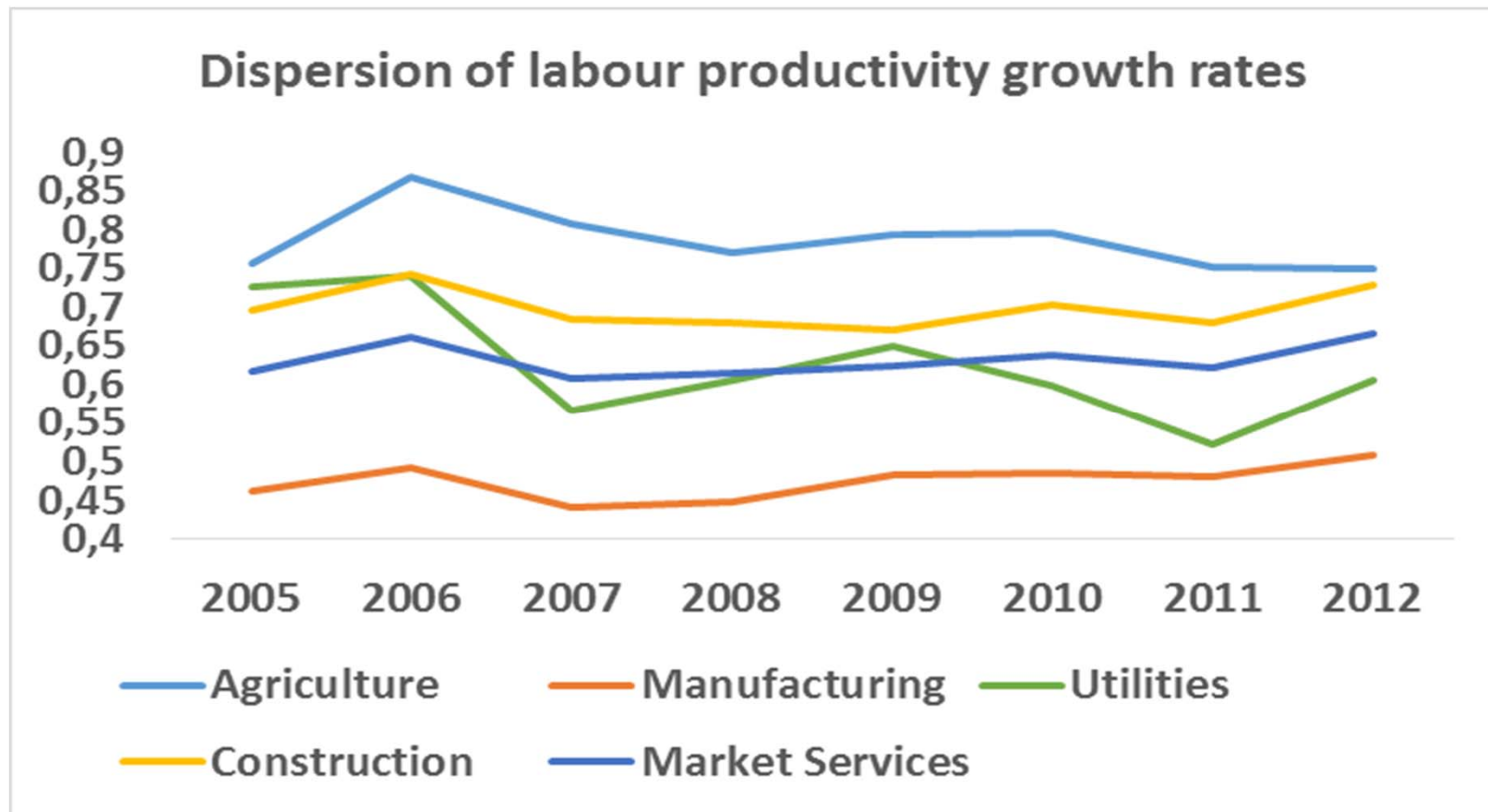
	1970-1980	1980-1990	1990-2000	2000-2010	2010-2014
Portugal	3,6%	2,1%	1,9%	1,2%	0,7%
Euro area 19	-	-	-	0,9%	0,9%
EU28	-	-	-	1,2%	0,9%
G7	2,9%	2,3%	2,1%	1,5%	0,5%
OECD	-	-	-	1,5%	0,6%

Source: OECD

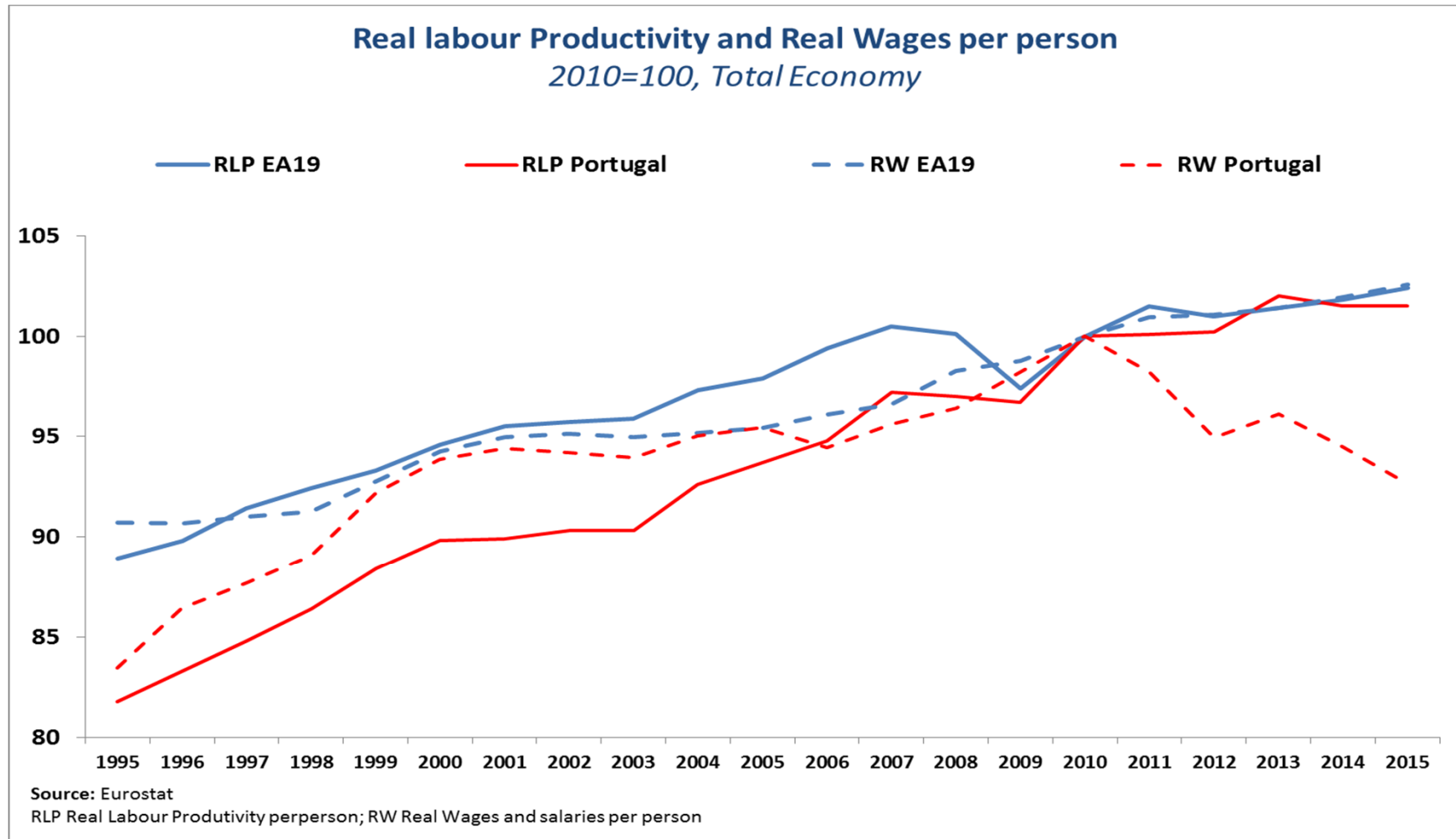
G7: Canada, France, Germany, Italy, Japan, UK and USA



**Portugal: lower productivity growth seems NOT to be associated with a dispersion of productivity gains between firms in the same sector**  
(work in progress - Multiprod output)

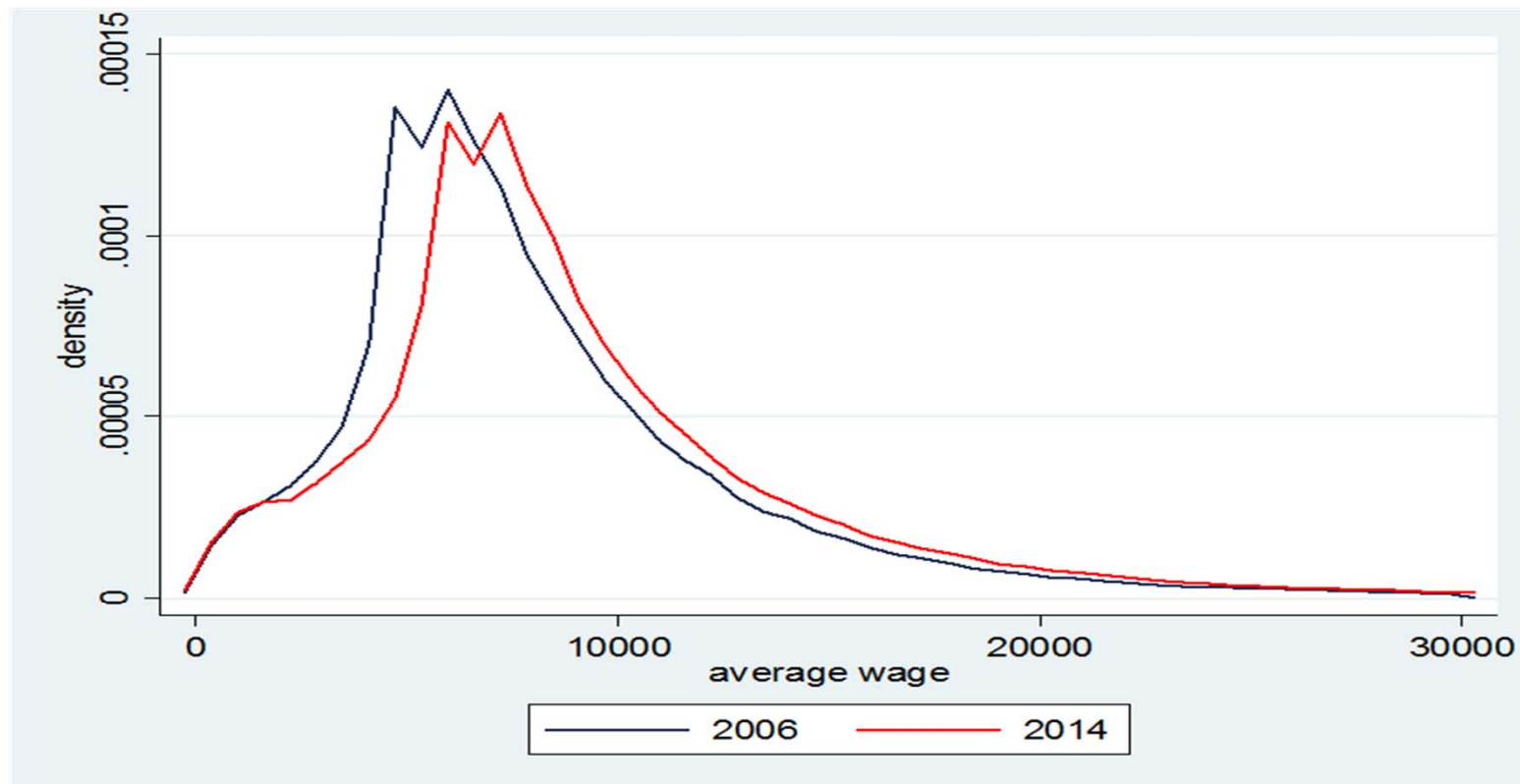


Labour productivity dispersion was not translated to higher wage dispersion due to wage decrease after 2010





## The distribution of the average wage (per worker) improved since 2006 2006 and 2014



## Portugal: lower productivity growth seems NOT to be associated with higher wage dispersion between high and low skilled workers due to skill biased technology enhancements

Dispersion measures of average wage (per worker)

Sectors	90/10 (2006)	90/10 (2014)	90/50 (2006)	90/50 (2014)	50/10 (2006)	50/10 (2014)	Gini Coef. (2006)	Gini Coef. (2014)
Agriculture	4,41	4,46	1,91	1,83	2,31	2,43	0,32	0,31
Mining	3,62	3,79	1,86	1,80	1,95	2,10	0,29	0,30
Manufacturing	3,17	3,12	1,88	1,82	1,69	1,71	0,29	0,27
Utilities	5,82	5,12	2,40	2,35	2,43	2,18	0,42	0,40
Construction	3,88	4,09	1,95	1,91	1,99	2,14	0,33	0,31
Market Services	4,64	4,66	2,23	2,17	2,08	2,14	0,36	0,35
<b>Total</b>	<b>4,24</b>	<b>4,41</b>	<b>2,12</b>	<b>2,06</b>	<b>2,00</b>	<b>2,14</b>	<b>0,34</b>	<b>0,33</b>

(1) Market Services: Wholesale and retail trade, transportation and storage, accommodation and food services, Publishing, audiovisual and broadcasting, telecommunications and IT; Real estate, Legal, accounting, head offices and management consultancy activities, technical, testing and analysis, advertising, market research, veterinary and administrative service activities, education, human health, repair of computers and household goods

- 1** Some Stylized facts on productivity in Portugal
- 2** Multifactor productivity and policy implications for competitiveness

**Productivity growth has been slowing since the beginning of the 2000s due to:**

- **Slowdown in human capital accumulation**
- **Decline in business dynamism**, namely the birth rate of innovative firms
- Weak aggregate demand and, **insufficient investment in R&D and innovation**
- **Low level of integration in global value chains**
- Increasing costs due to higher regulatory complexity in terms of safety, environmental and other issues
- Misallocation of capital and labour between sectors, including skills mismatches due to labour market rigidity
- The de-industrialization and the increasing weight of less productive state and services sectors

## Determinants of Multifactor Productivity - Fixed Effects Model (work in progress)

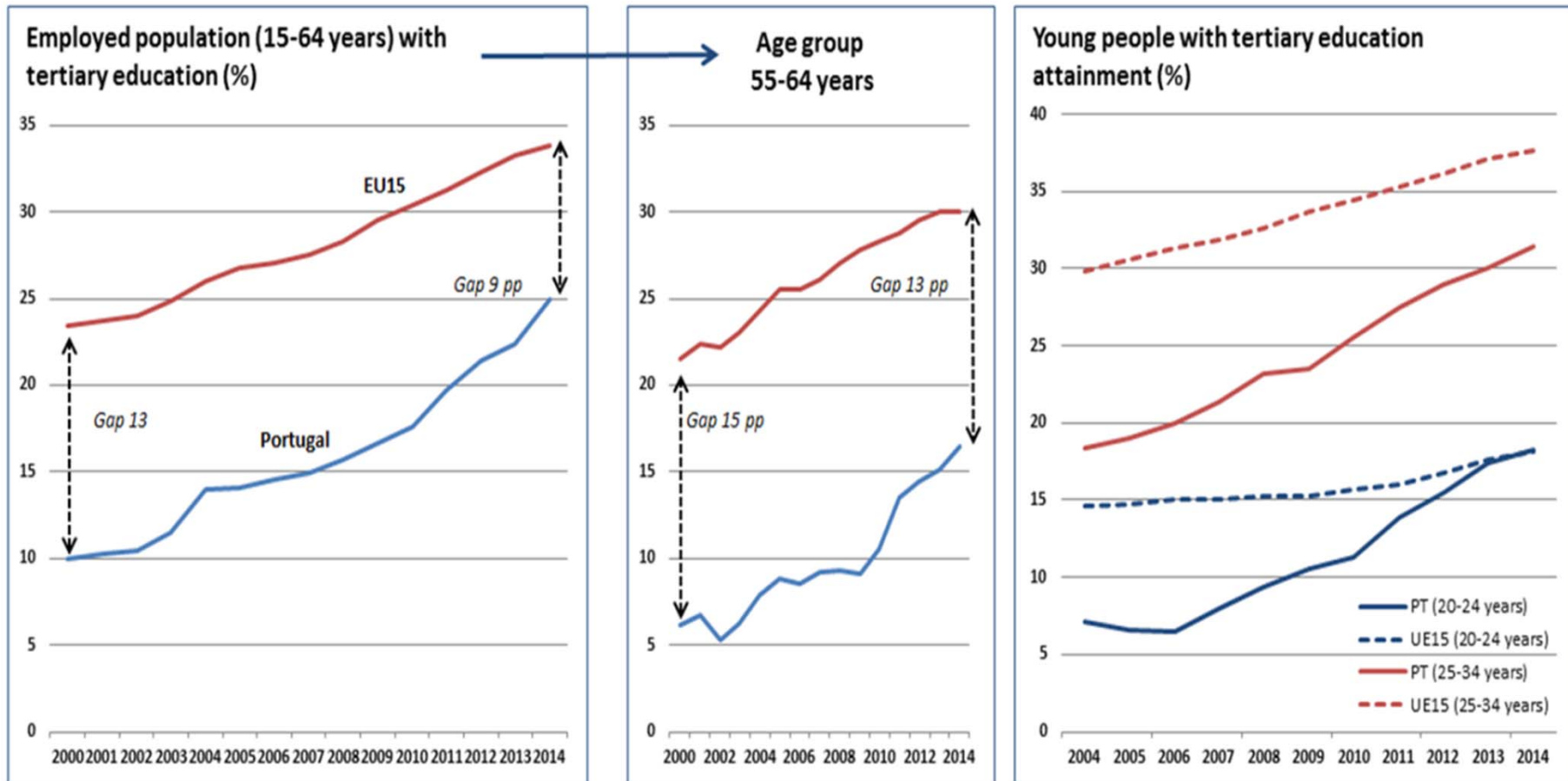
Variable	Coefficient	P-values	Association with MFP	Variable Description	
<b>Dimension</b>	2 - Small Firms	0.0526	0.0000*	+	Reference Firm Size is a Micro Firm
	3 - Medium Firms	0.1861	0.0000*	+	
	4 - Large Firms	0.2980	0.0000*	+	
<b>Age</b>	-0.007	0.0000*	-		
<b>Export Status</b>	0.0689	0.0000*	+	1- Export Status 0- No Export Status	
<b>Training</b>	0.3686	0.002*	+	Training expenses/Personnel Global Costs	
<b>Leverage</b>	-0.0247	0.0000*	-	Logarithm of Total Liabilities/Total Assets	
<b>Share of R&amp;D Workers</b>	-0.0503	0.062**	-	Total R&D Workers/Total Workers	
<b>Internal Financing Capacity</b>	0.1004	0.0000*	+	EBITDA/Total Assets	
<b>Average Annual Gross Wages</b>	0.2518	0.0000*	+	Logarithm of Wages/Nr. Workers	

\*Significant at 1%; \*\*Significant at 10%

R<sup>2</sup>=88%; Controlled for heteroscedasticity with robust standard errors

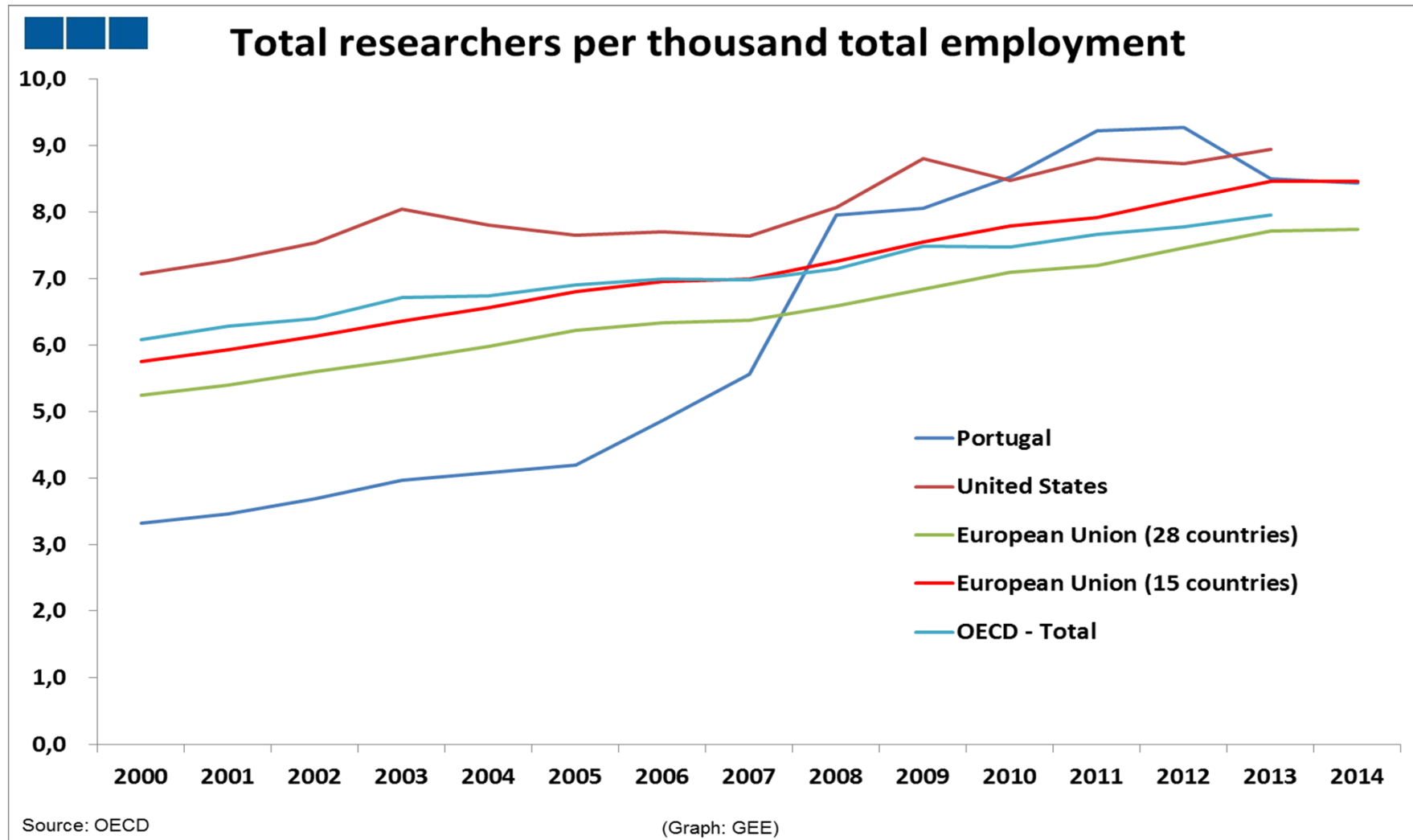
- **Determinants of Multifactor Productivity - Fixed Effects Model (work in progress)**
  - MFP estimation based on Levinsohn-Petrin (2003)
  - Manufacturing firms
  - Period: 2010-2014
  - 25,096 firms (46% of total)
  - 91,770 total observations
  - NACE 2 digit considered: 10 to 33
  - Firms with less than 5 workers excluded from sample
  - Data Source: Informação Empresarial Simplificada
  
- **Focus on 4 determinants of MFP in the model and in the literature:**
  - 1 - Human capital accumulation
  - 2 – Business dynamics: firm age and size
  - 3 – Investment in R&D and innovation
  - 4 – Integration in global markets

## 1 - Human capital accumulation: remarkable catching-up with the more developed economies in formal education (and is in line in STEM graduates)



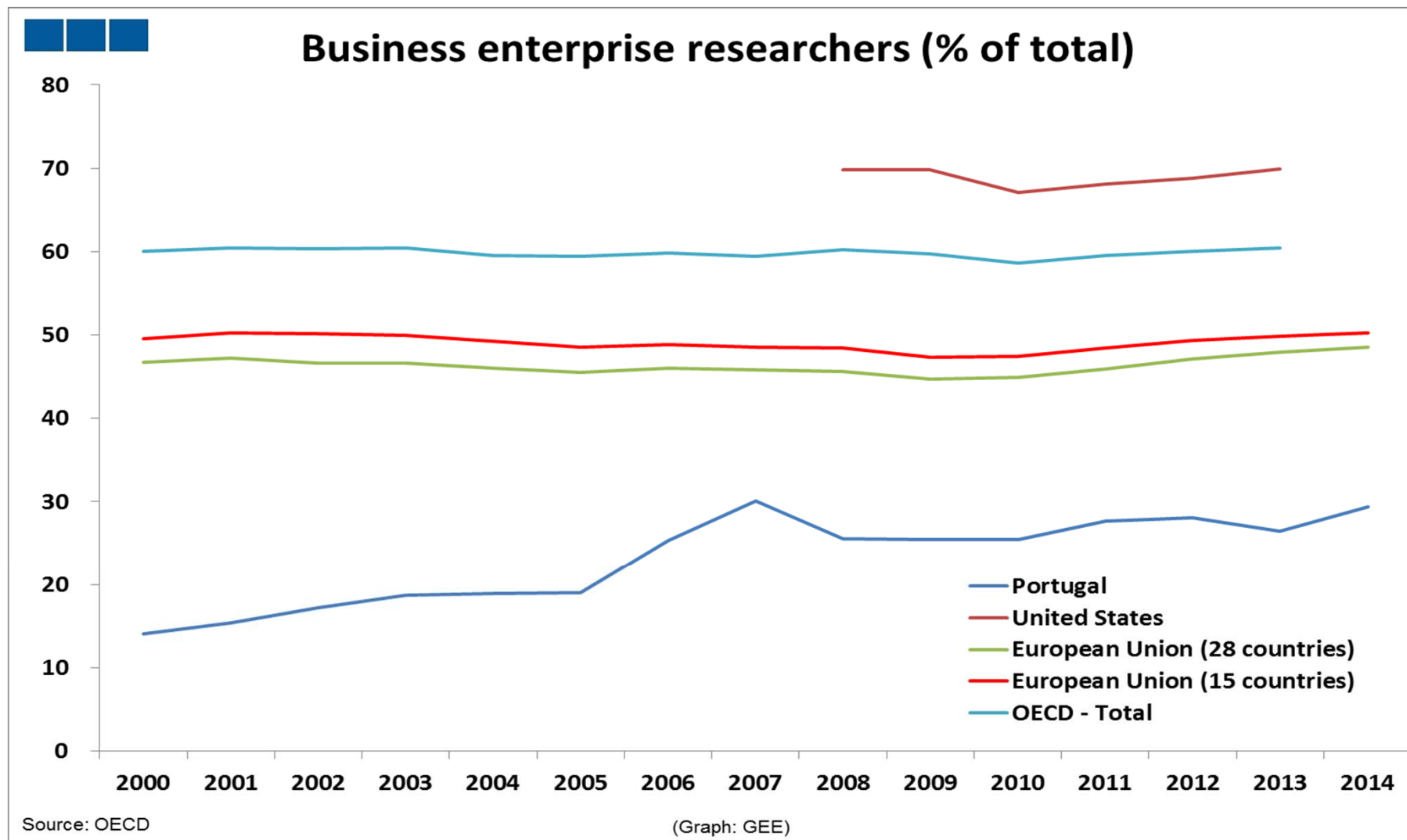
\*STEM – Science, Technology, Engineering and Mathematics

## 1 - Human capital accumulation: similar number of researchers





## 1 - Human capital accumulation: but low number of researchers in businesses

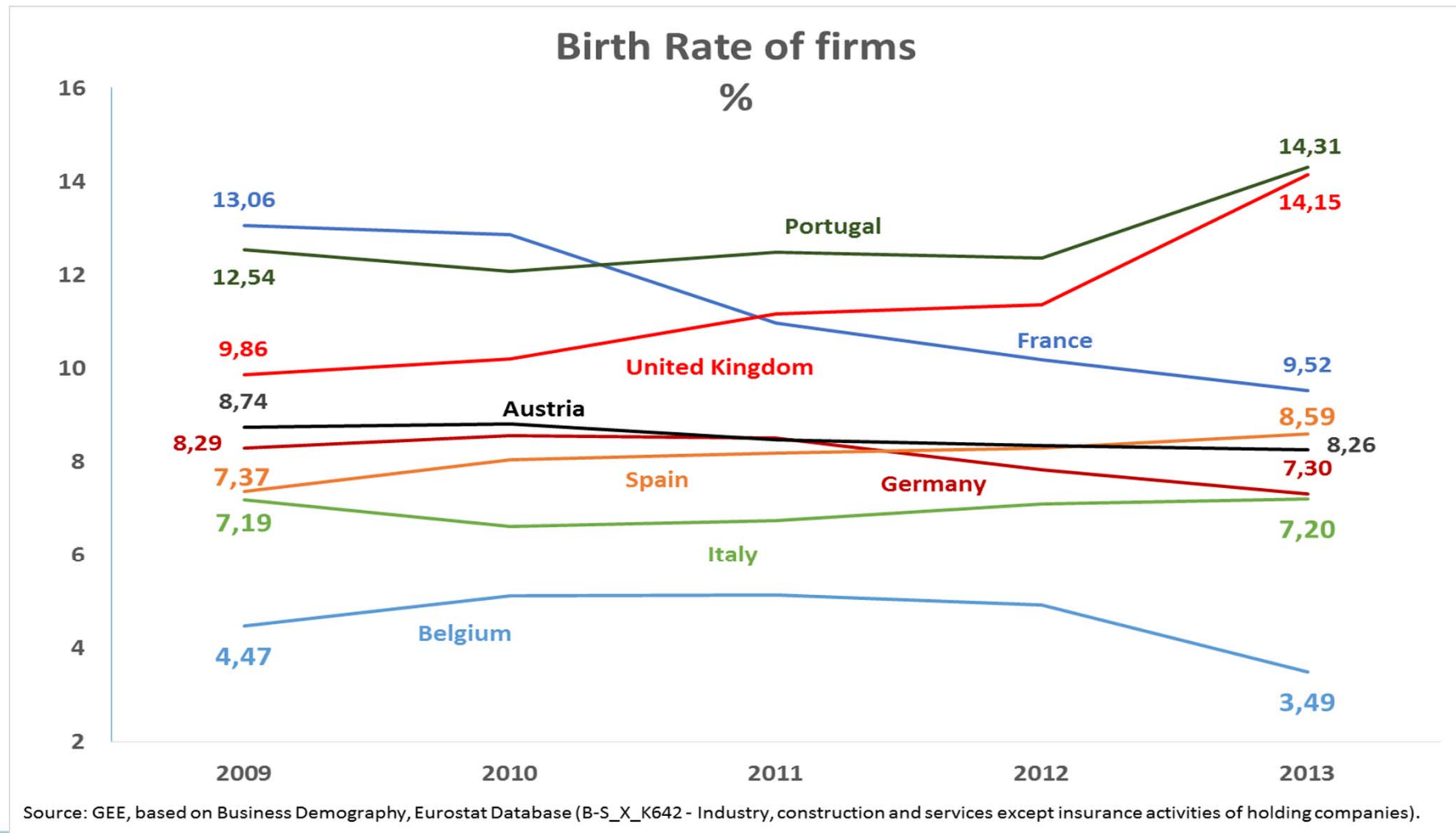


## 1 - Human capital accumulation – policy implications

**Human capital is a very important source of productivity growth** and thus an important way to improve the wellbeing of the population.

- **Improvements in formal education** and lifelong learning to continue
- **Coordination with employers** for the definition of specific training and oriented for labour market needs so that the matching of skills is improved.
- **Incentives to place researchers** (Phd students, professors) **in businesses** by developing flexible contractual links with universities and technological centers and by using appropriated funds, grants and scholarships
- **Improving managerial skills in clustering and internationalization** by linking mentors, universities and firms, and facilitating traineeships abroad.
- **Empowerment of human capital** in different areas: in exporting firms, in technological entities, in business associations

## 2 – Business dynamism: high birth rate

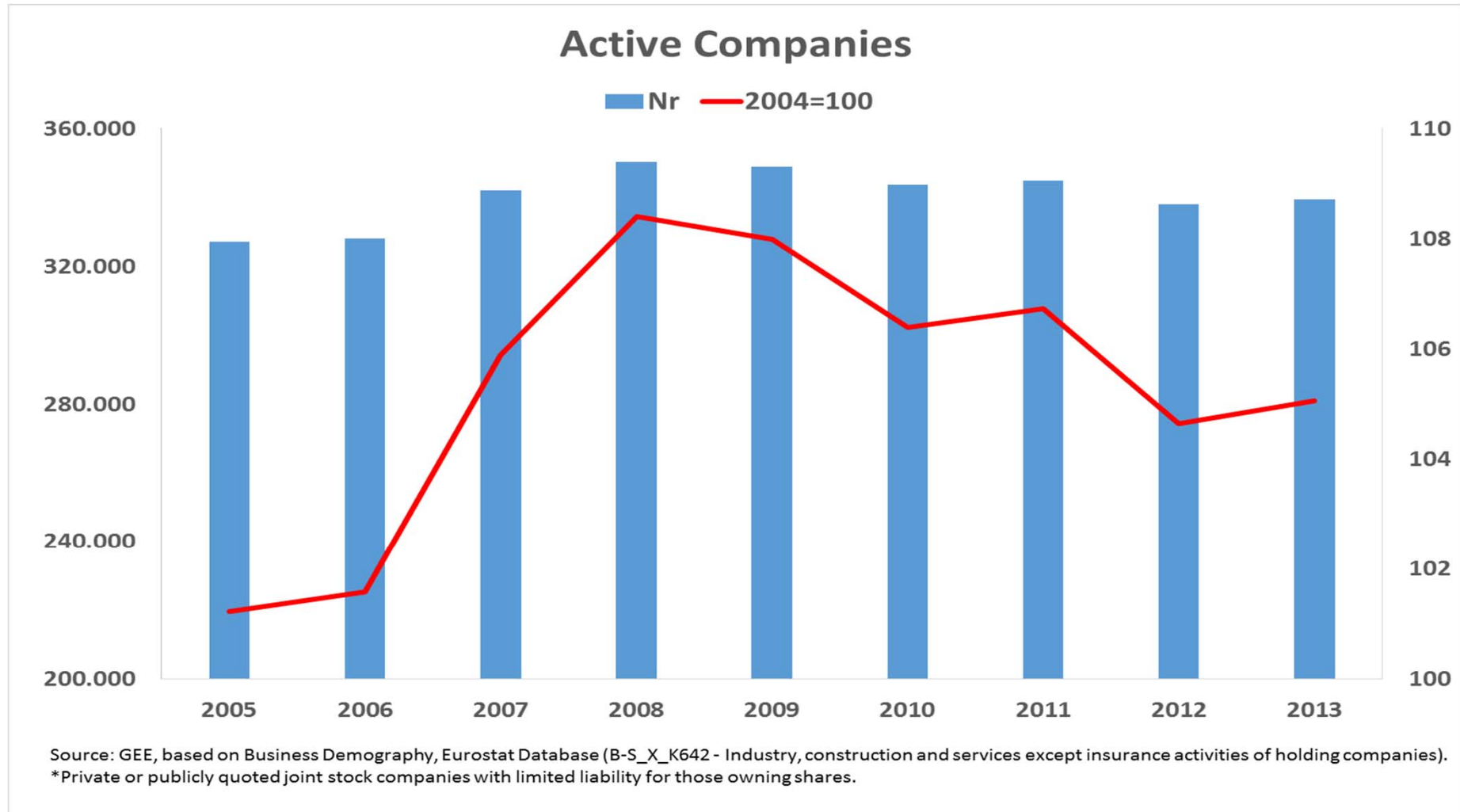


## 2 - Business dynamism: ICT, Consultancy and Scientific activities – growth in the number of firms

Sector	Number of firms	Number of firms	Variation	Share of total
	(2006)	(2014)	number firms (%)	in 2014 (%)
61. Telecommunications	197	469	138	0,17
62. Computer Programming	2.432	4.085	68	1,52
63. Information service activities	243	435	79	0,16
70. Management consultancy	3.571	5.773	62	2,14
72. Scientific Research and development	164	308	88	0,11
74. Other consultancy and scientific and activities	1.795	3.337	86	1,24
<b>Total</b>	<b>8.402</b>	<b>14.407</b>	<b>71</b>	<b>5,34</b>

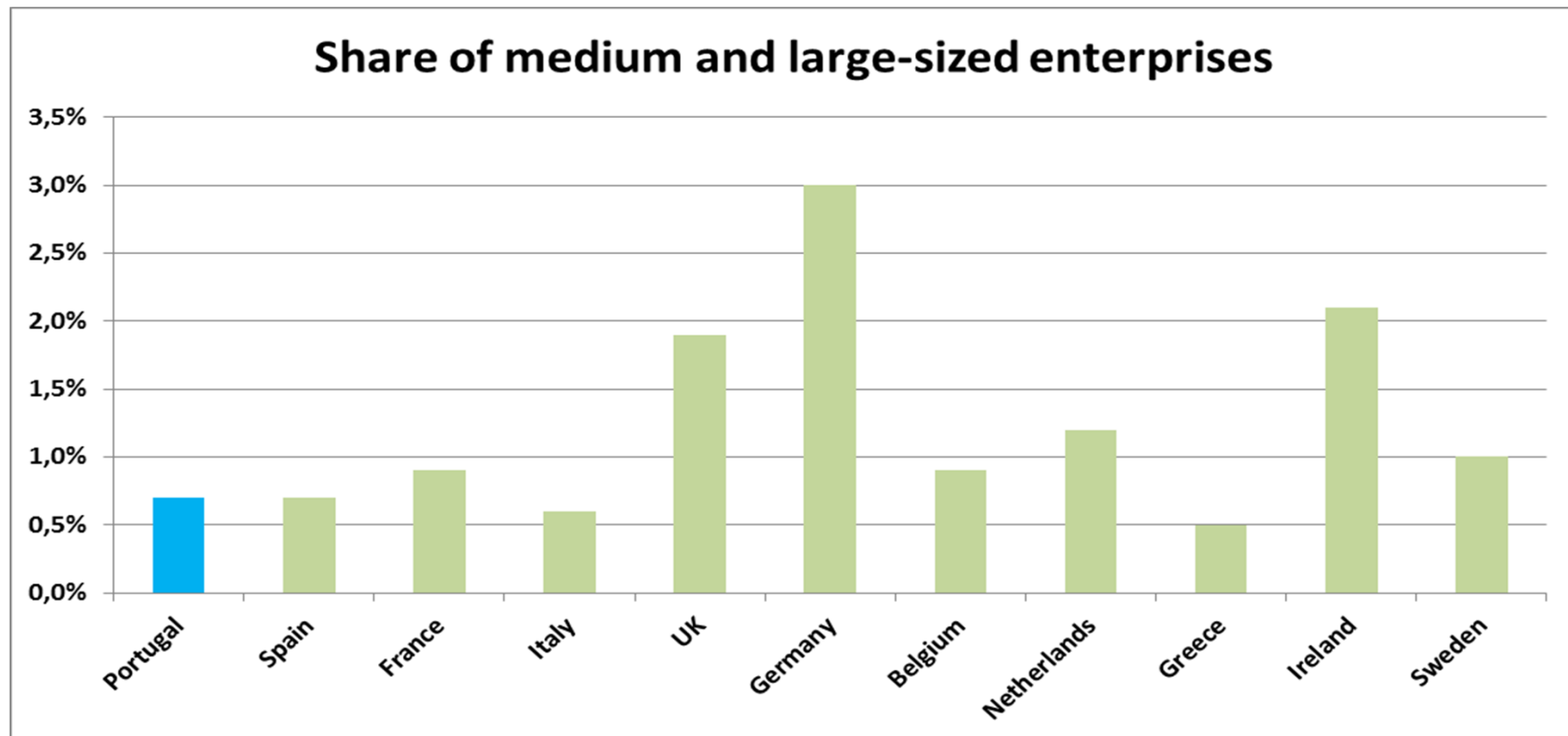
Total nr. firms: 269,306

## 2 – Business dynamism: high birth rate compensated by an high mortality rate



## 2 - Business dynamism: Portuguese firms need to grow bigger

	PT	UE28
○ More than 250 employees:	0,1%	0,2%
○ > 50 $\wedge$ < 250 employees:	0,6%	1,0%
○ > 10 $\wedge$ < 50 employees:	4,8%	7,2%

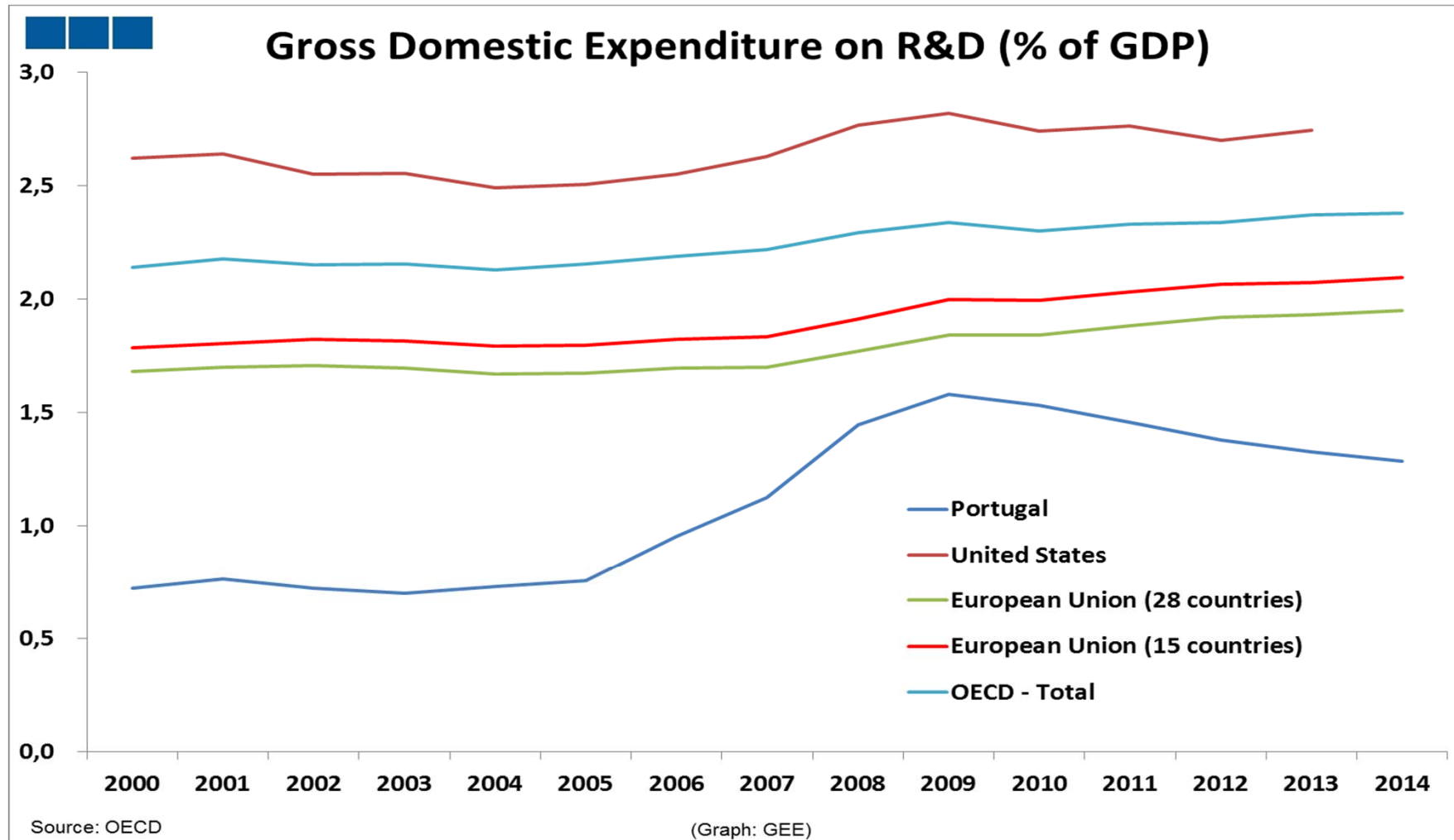


## 2 - Business dynamism - policy implications

**Business dynamism needs to be associated with the scaling-up of firms** so that scale economies generate a higher rate of productivity growth.

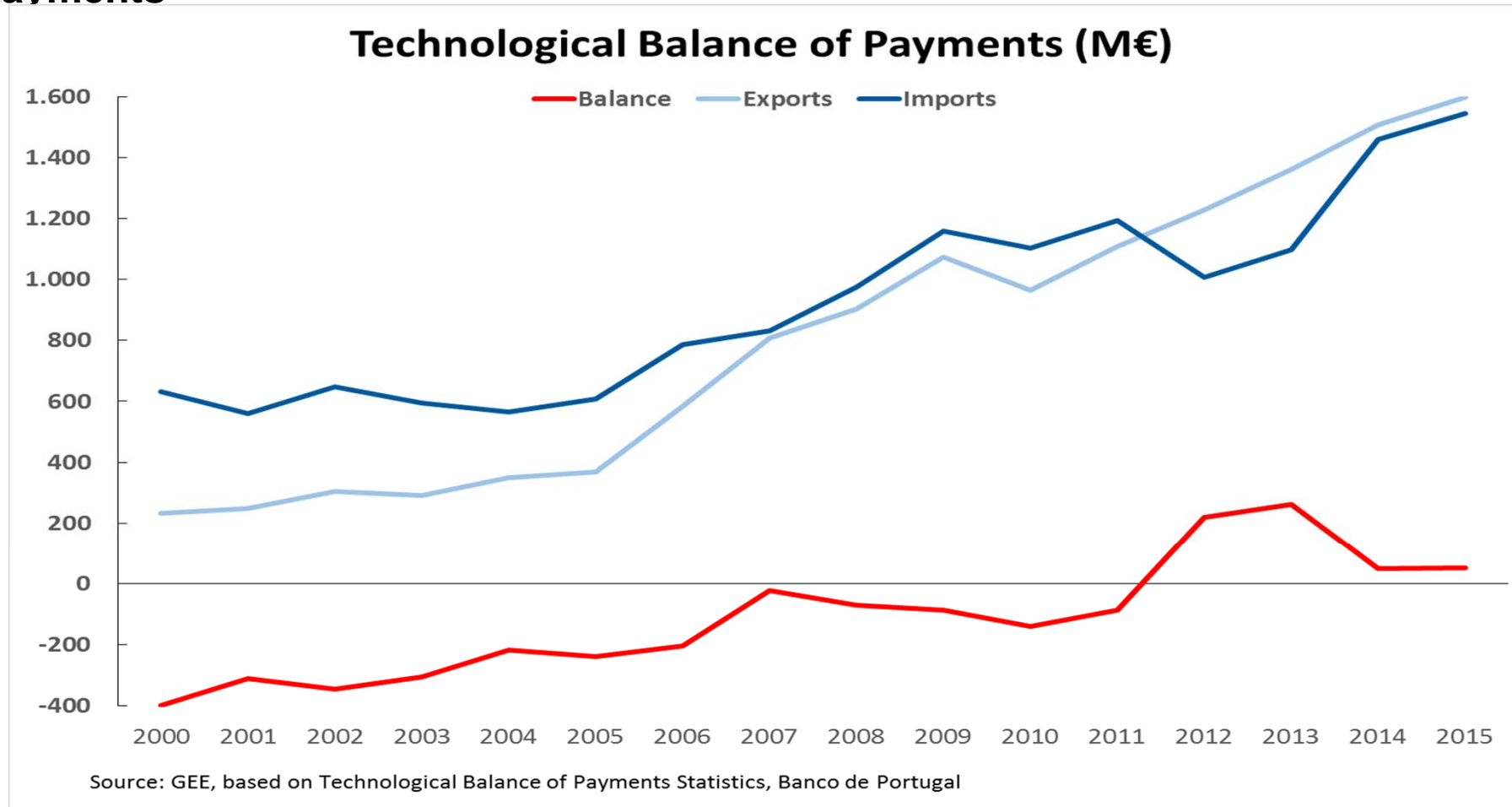
- Promote a **favourable start-up environment** by reducing barriers to entry (e.g. excessive regulation) and establishing a network of business incubators and accelerators, in liaison with existing firms, universities and other stakeholders
- Develop tools **to help firms testing new products and services** in the market **and in the internationalization** of their activities
- **Adapt financing to the specific situation of each firm** and mitigate market failures associated with the lack of historical records: firms need to have access to finance at different stages and from different sources - seed, business angels, venture capital, crowdfunding, capital markets
- **Improve tax conditions to favour equity** instead of credit in order to ensure a balanced capital structure in firms while growing

## 3 - Investment in R&D and innovation: convergence delayed by the economic crisis



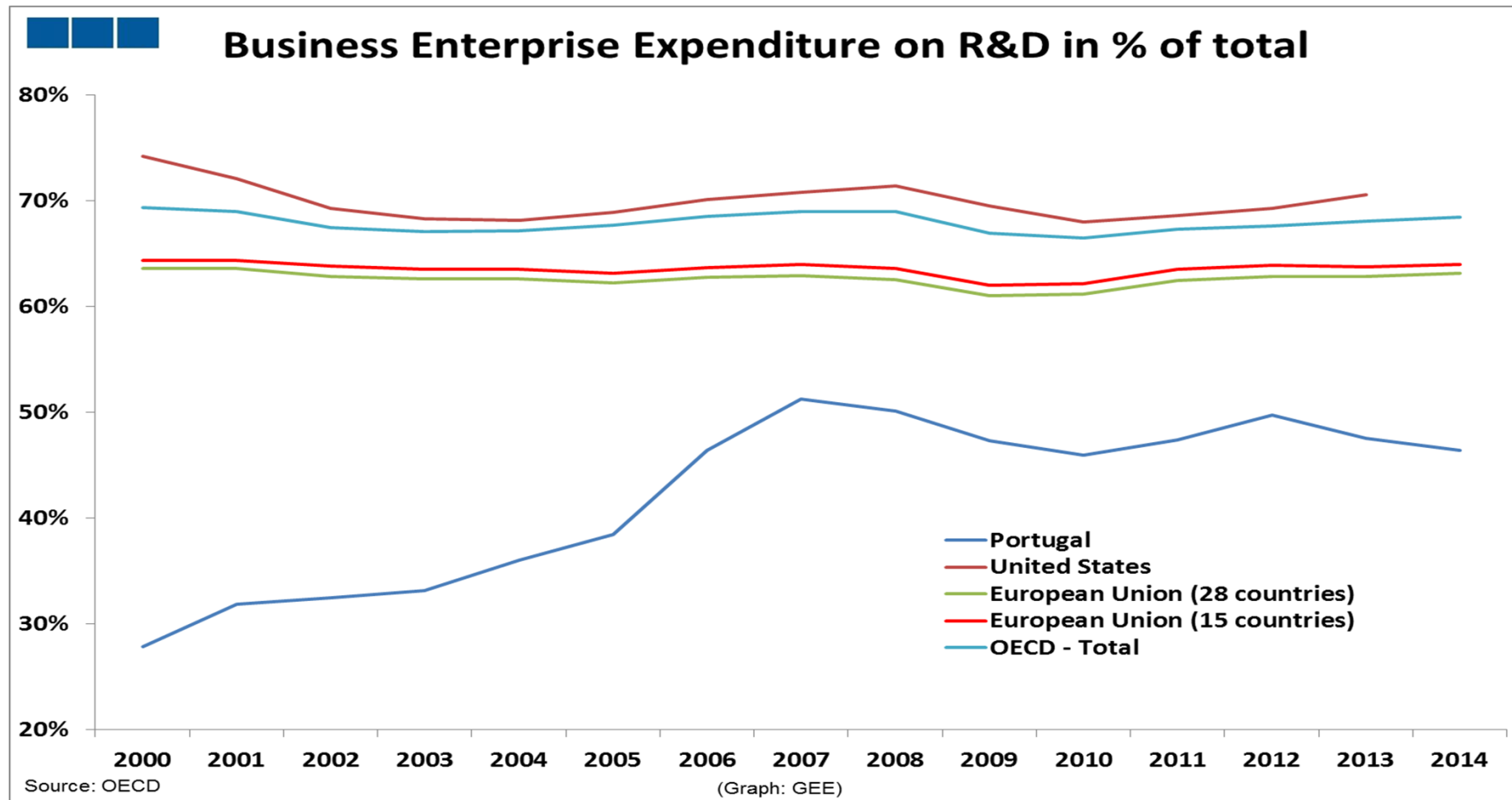


## 3 - Investment in R&D and innovation: surplus in technological related payments

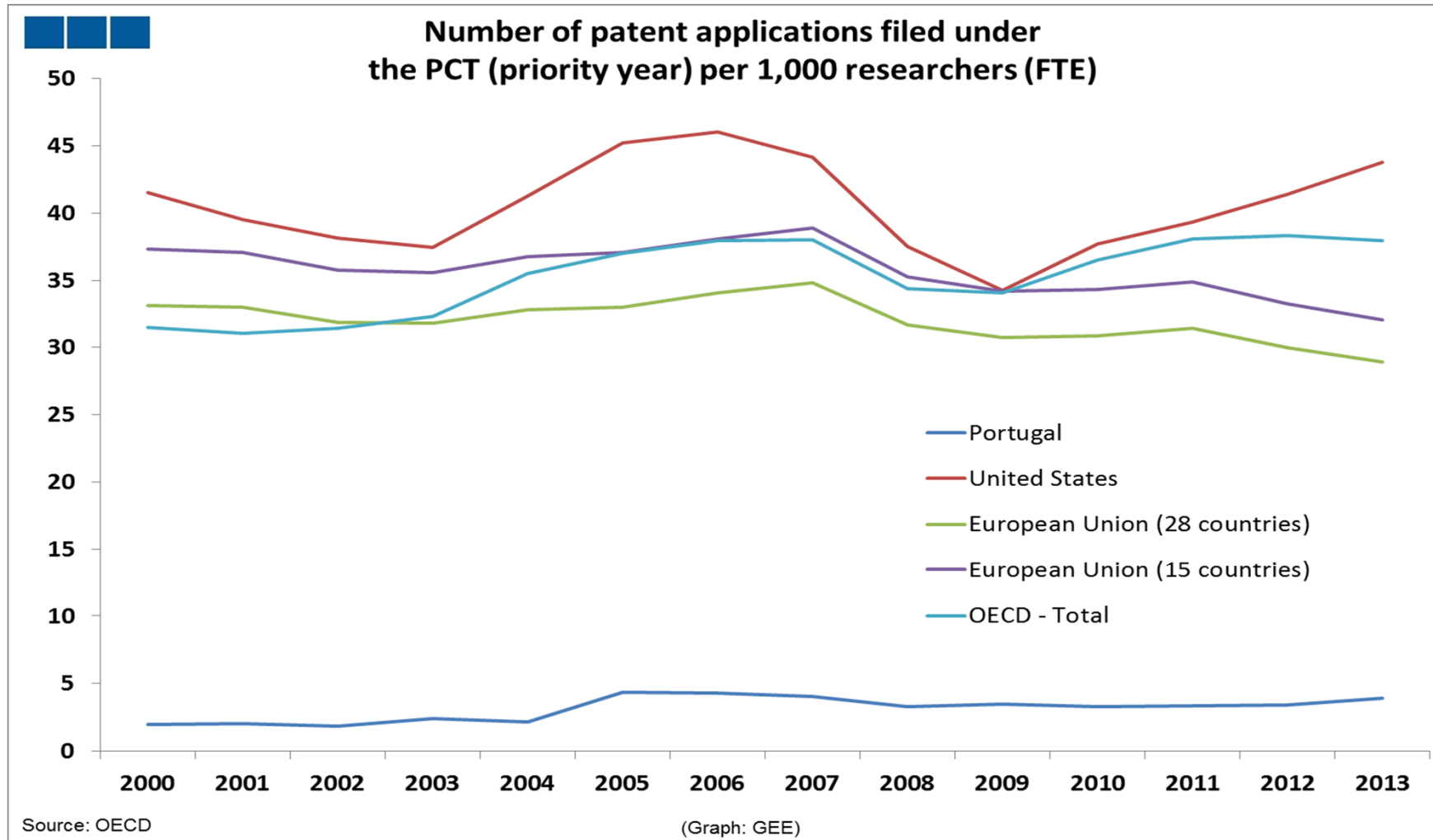


Operations between residents and non-residents on the purchase, sale and use of patents; non patented knowledge; drawings and models; brands (including franchising); technical services, financing of industrial research and development; and other transactions associated with the provision of hardware and software consulting services and other services).

## 3 - Investment in R&D and innovation: too focused on non-businesses Businesses represent 47% of total R&D in Portugal and 70% in the USA



## 3 - Investment in R&D and innovation: patent applications need to improve



## 3 - Investment in R&D and innovation - policy implications

**The application of R&D and innovation to market usage is key** to ensure a higher rate of productivity growth and **the diffusion of innovation** is needed to protect a levelled market competition and a better resource allocation

- Portugal had the highest annual growth rate in innovation performance within the Moderate Innovators (IUS 2015). It is currently 17th among the EU28.
- **Increase the market usage of innovation and science through people and business links** by:
  - **Valuing the stock of knowledge** produced in the scientific community by giving incentives to knowledge and technology transfer
  - **Strengthening the role of interface entities** (e.g. technological centers) between universities, laboratories and companies by placing funds and researchers.
  - **Facilitate the diffusion of technology** through a widespread digitalization of processes along production chains (not sectorial perspective)
  - **Promote scientific and technological activities** associated with clusters and foreign investment

## 4 – Integration on global markets: exports grew in the last 10 years from 27% to 40% of GDP



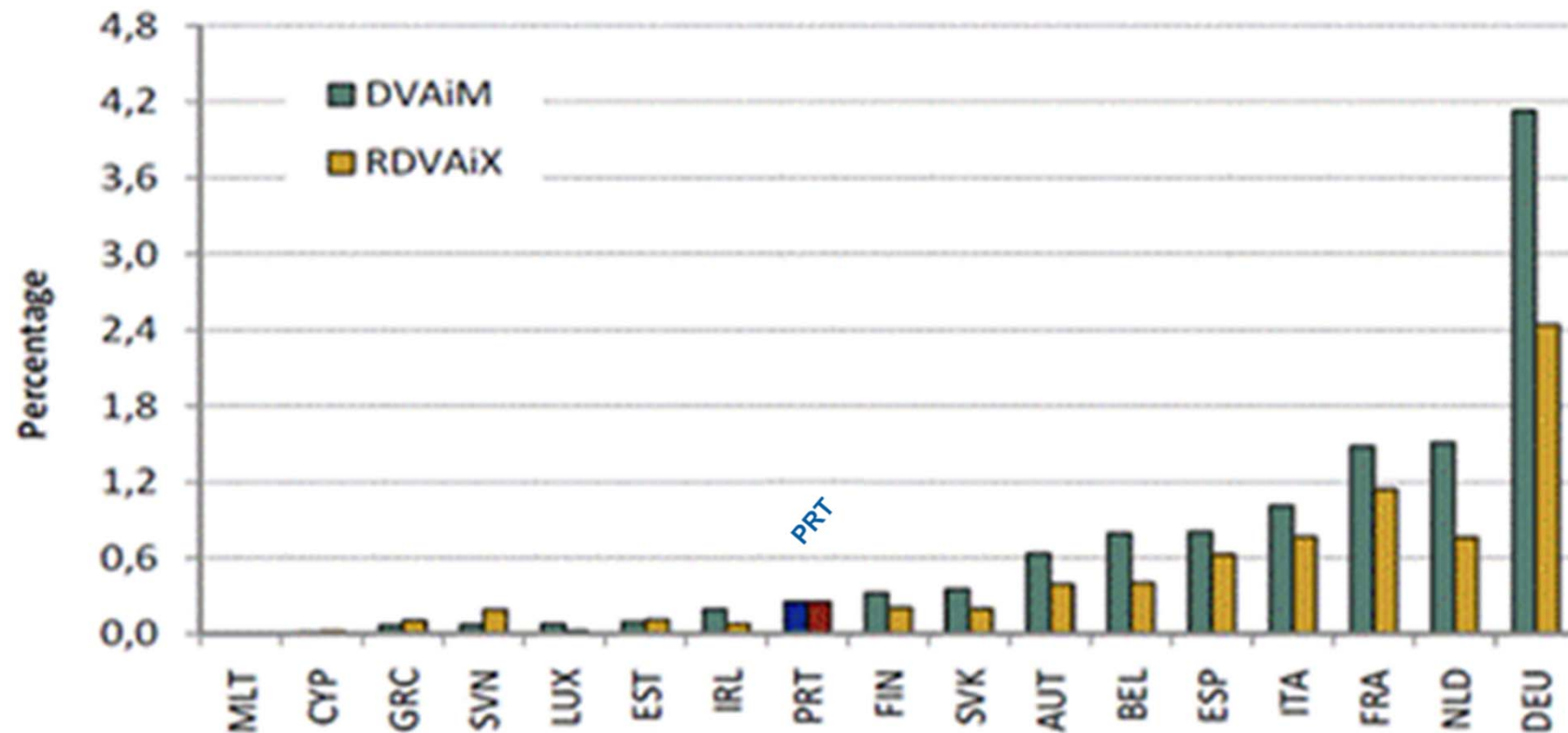
Source: Eurostat

## 4 – Integration on global markets

- A significant number of Portuguese firms are taking advantage of free trade and increasing the internationalization of their activities.
- There are a significant number of Portuguese firms with a large economic potential that are gaining market shares and looking for new markets.
- **Nr. of Portuguese firms exporting is growing**
  - 2007: 39,800 (14,8% of the total)
  - 2009: 40,500 (15,1% of the total)
  - 2011: 46,600 (17,1 % of the total)
  - 2013: 49,000 (18,1% of the total)
    - of which 40,000 (15%) regularly
- **Nr. of Portuguese firms with investments abroad: 730**  
(approximately)

## 4 – Integration on global markets: but integration in Global Value Chains and an higher value added are need

Domestic Value Added in Imports and Re-Exportation of Domestic Value Added (2011)  
(Amador and Stehrer, 2014)



Source: Amador and Stehrer (2014), BdP April

## 4 – Integration on global markets - policy implications

It is not just about selling abroad. **An appropriated capital per employee ration is needed for up-scaling and value added creation.**

- The fragmentation of international trade demands that **Portuguese firms are more integrated in global value chains** and thus improve the value added of their production.
- Support to **capital intensive activities** such as business investment in R&D and in the innovation of products and processes is key.
- **Cooperation between firms, research centers and universities**, domestic and abroad, within partnerships, networks or clusters is a needed first step for a better integration on global markets.
- **Working with suppliers** to improve competitiveness must be promoted (e.g. wine)
- **SMEs on board to take advantage of global value chains** by creating links to supply larger exporting companies and adjusting their activity to external demand.





**Thank you!**