

Motivation and Background
Data
Econometric results
Final remarks

Foreign Investments and Productivity

Evidence from European regions

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Conference on
Italy's External Competitiveness,
Rome 24-25 November 2009



Outline

- ▶ **Motivation and Background**
- ▶ **Data**
- ▶ **Econometric results**
- ▶ **Final remarks**

Motivation

- ▶ Economic integration (e.g. within the EU) makes national boundaries more blurred
 - ▶ regions (within countries) become key actors in such integrated economic areas
 - ▶ are key targets of national and supranational policies
 - ▶ 35% of the EU budget 2007-2013 is devoted to social and economic cohesion
- ▶ Large heterogeneity/polarization of regional productivity in the EU (both East/West and within those macro-areas)

Motivation

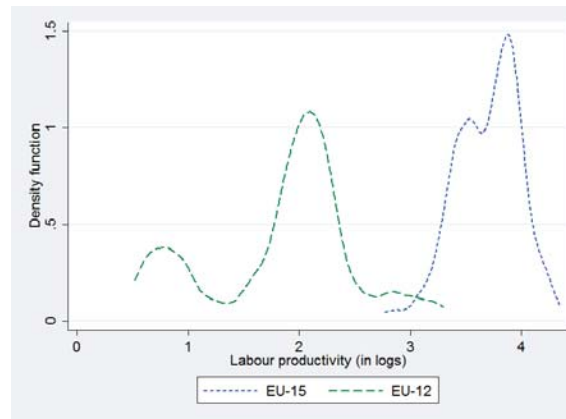


Figure: Labour productivity density

Motivation

- ▶ Productivity differences across regions are usually associated with agglomeration economies, technological capabilities, human capital
- ▶ Very little is known of internationalisation/openness of regions and how this relates to productivity
 - ▶ data availability
 - ▶ what do REGIONS have to do with interNATIONALisation?

Motivation

In this paper

- ▶ we believe that the region is an interesting level of analysis where **compositional and indirect effects** of foreign investments would best be analyzed
- ▶ we exploit information on international investment projects to build **unique measures of inward and outward investments** in EU regions
- ▶ we establish to what extent **regional differences in productivity** are associated with different involvement in foreign investments

Synopsis

- ▶ we build measures of **inward and outward investment counts** in 273 NUTS-2 regions of the EU-27 (plus Norway and Switzerland)
- ▶ we regress **labour productivity on foreign investments** (controlling for capital intensity, agglomeration economies, technological capabilities, human capital, industry structure)
- ▶ main findings:
 1. regional productivity is positively associated with **outward investments** are positively, while the association with inward investments is captured by other regional characteristics
 2. the effect of other regional characteristics disappears (but not outward investments), once we control for industry composition
 3. differences **EU-15 vs EU-12** regions
 4. **Italy** has a 'peculiar pattern'
 5. differences according to the **type of activities** involved in inward investments

Background: Inward FDI and productivity

- ▶ **Direct effect:**
 - ▶ foreign multinationals tend to be more productive than domestic ones and contribute to changing the industry composition
- ▶ **Indirect ('spillover') effect:**
 - ▶ positive pecuniary and technological externalities - due to labour mobility, backward and forward linkages, imitation - but also business stealing effects
- ▶ **Empirical evidence**
 - ▶ is rather strong on direct effects and more mixed on indirect ones
 - ▶ work mainly within individual countries or cross-countries, but no econometric study on regions across countries
- ▶ This is at odds with the stiffer competition among territories (across countries) to attract FDI

Background: Outward FDI and productivity

- ▶ Firms investing abroad can **improve their productivity** at home
 - ▶ benefiting from economies of scale, higher efficiency due the international fragmentation of production and learning of foreign technologies (from competitors and business partners abroad)
- ▶ **Indirect effects** may occur
 - ▶ if these productivity gains are transferred to local partners and competitors
- ▶ Positive effects on **aggregate productivity** may occur
 - ▶ if the higher productivity of the investing firms, forces domestic competitors out of the market (but also due to substitution of local suppliers with foreign ones)
- ▶ **Reverse causality** from productivity to outward investments
 - ▶ if more productive firms are more likely to invest abroad, a higher share of productive firms (which determines a higher average productivity in the region) would be associate with more outward investments
- ▶ **Empirical evidence** on the links between outward FDI and productivity is scant

Data

- ▶ **Data on FDI** (outward and inward) come from fDI Markets, an online database monitoring crossborder greenfield investment covering all sectors and countries worldwide
 - ▶ over 60,000 projects worldwide in the period 2003-2008
 - ▶ for each project information on: name of the investor, country/state/city of origin (of the investor)/destination (of the project), sector, business activity involved in the project (see list)
- ▶ Information on **regional value added**, investments in **physical capital** (which allow us to build measures of capital, using PIM) and employment for 273 NUTS 2 regions of the EU-27 (plus Norway and Switzerland) come from Cambridge Econometrics database (up to 2004)
- ▶ Data on **regional characteristics** - such as employment density, tertiary schooling rate, employment in S&T, and industry distribution of employment are drawn from Eurostat's Regio. To reduce missing values we compute averages 2000-2004
- ▶ a measure of **regional innovation** is obtained from the Regional Innovation Scoreboard

Number of investment projects, by year

	N.projects	Area of destination			Area of origin		
		RoW	EU-27	Total	RoW	EU-27	Total
2003	8,235	70.3	29.7	100	60.2	39.8	100
2004	8,768	66.9	33.1	100	58.0	42.0	100
2005	8,937	63.4	36.6	100	56.8	43.2	100
2006	10,492	62.4	37.6	100	56.4	43.6	100
2007	10,421	62.8	37.2	100	52.6	47.4	100
2008	13,448	68.8	31.2	100	55.8	44.2	100
Total	60,301	65.8	34.2	100	56.4	43.6	100

Source: Authors' elaborations on fDI Markets database

Outward and inward international investment projects in Europe, by business activity, 2003-2008

	Area of destination			Area of origin		
	EU-12	EU-15	Total	EU-12	EU-15	Total
Manufacturing	61.2	38.8	100	4.0	96.0	100
R&D	21.2	78.8	100	1.2	98.8	100
Sales	27.1	72.9	100	5.4	94.6	100
Business Services	23.8	76.2	100	5.5	94.5	100
Headquarters	7.7	92.3	100	0.8	99.2	100
Construction and other industries*	49.0	51.1	100	6.5	93.5	100
Logistics and other services	32.6	67.4	100	3.4	96.6	100
Total	33.8	66.2	100	4.7	95.3	100

Source: Authors' elaborations on fDI Markets database

* Construction, extraction, electricity and recycling

Inward investment projects in Europe, 2003-2008

Destination Country	BS	HQ	MAN	CON	LOGI	R&D	SAL	Total
UK	19.9	32.9	5.7	11.4	13.2	17.3	18.0	15.6
France	10.6	8.7	5.7	6.1	10.8	11.5	11.5	9.7
Germany	10.9	10.0	6.6	6.2	8.8	10.9	9.2	8.8
Spain	6.2	7.1	7.2	7.8	7.5	9.4	7.8	7.5
Romania	6.6	2.4	10.7	12.5	4.9	4.2	5.7	7.0
Poland	3.5	1.2	15.2	10.1	8.5	4.8	4.2	6.9
Hungary	3.3	1.4	8.6	6.4	5.1	3.8	3.5	4.7
Italy	5.0	1.3	2.2	5.4	3.0	5.3	4.6	4.0
Bulgaria	2.7	0.0	5.4	9.9	3.2	1.9	3.4	4.0
Czech Republic	2.2	0.7	8.3	3.2	4.2	4.5	2.6	3.7
Ireland	3.7	6.6	1.6	2.8	3.6	5.5	3.8	3.5
Netherlands	3.4	8.4	1.7	1.1	5.7	2.6	3.1	3.2
Belgium	3.0	4.5	2.1	1.4	5.8	3.3	2.9	3.1
Sweden	3.1	3.2	1.3	1.4	1.9	4.1	3.3	2.6
Slovakia	1.4	0.6	6.9	1.9	2.3	1.1	1.4	2.4
Austria	2.5	2.5	1.5	1.4	2.2	2.3	2.6	2.2
...
Total	100	100	100	100	100	100	100	100

BS: Business services, HQ: Headquarters, MAN: Manufacturing, CON: Construction, Extraction and other ind.,
 LOGI: Logistics and Other svcs., R&D: Research and Development, SAL: Sales

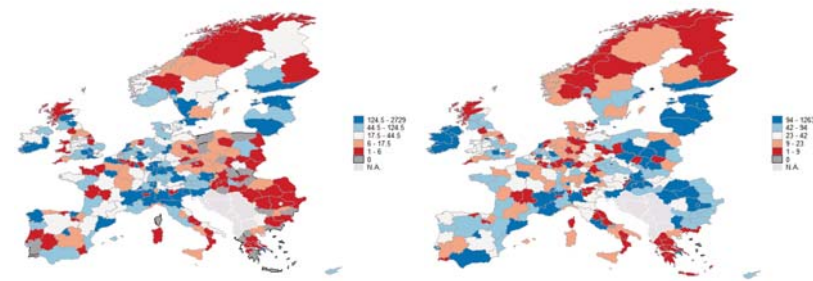


Outward investment projects in Europe, 2003-2008

Source Country	BS	HQ	MAN	CON	LOGI	R&D	SAL	Total
Germany	10.7	28.9	26.5	10.0	29.0	27.0	21.1	21.0
UK	37.1	24.0	11.8	20.9	16.8	20.1	17.2	19.4
France	10.2	11.3	13.1	12.8	13.1	21.9	16.0	14.0
Italy	4.3	5.7	8.9	3.5	2.9	3.0	8.0	6.4
Spain	5.5	3.4	5.7	14.3	3.6	2.4	6.2	6.3
Netherlands	5.4	6.1	6.6	7.0	9.5	6.5	4.1	5.8
Sweden	4.0	4.7	4.4	2.4	5.7	4.9	7.1	5.3
Austria	6.3	2.1	5.3	8.2	3.7	1.4	3.6	4.7
Finland	0.6	2.5	4.2	1.7	3.3	3.9	3.2	2.9
Belgium	3.3	2.7	3.0	3.2	2.0	1.7	2.5	2.7
Denmark	1.7	3.9	3.1	1.3	2.5	3.5	2.9	2.6
Ireland	2.2	2.2	1.0	3.5	1.4	1.4	0.8	1.4
Greece	1.4	0.1	1.0	1.2	0.7	0.4	1.3	1.1
Portugal	1.1	0.8	1.1	2.8	0.5	0.3	0.4	0.9
Slovenia	0.4	0.0	0.9	1.9	1.0	0.2	0.6	0.8
Luxembourg	0.7	0.7	0.5	0.8	1.8	0.3	0.4	0.7
...
Total	100	100	100	100	100	100	100	100

BS: Business services, HQ: Headquarters, MAN: Manufacturing, CON: Construction, Extraction and other ind.,
 LOGI: Logistics and Other svcs., R&D: Research and Development, SAL: Sales

Data

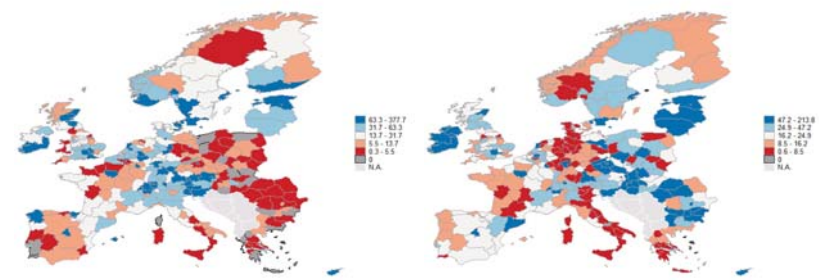


(a) Outward

(b) Inward

Figure: # investment projects by NUTS2

Data

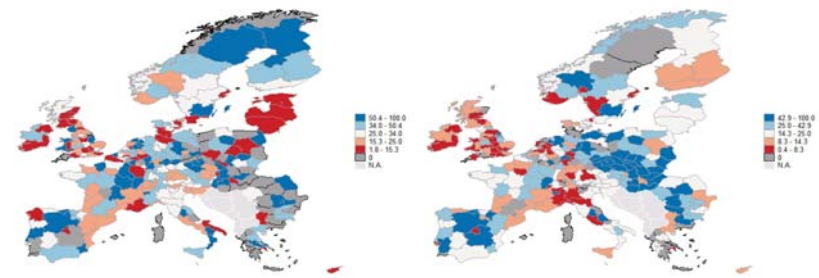


(a) Outward

(b) Inward

Figure: # investment projects by NUTS2, per million inhabitants

Data



Data

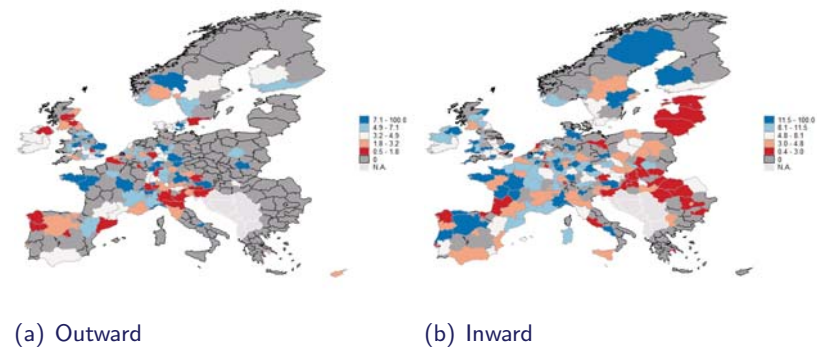
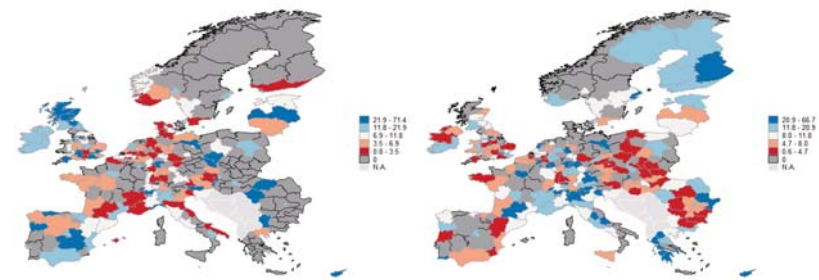


Figure: % projects in R&D activities

Data



(a) Outward

(b) Inward

Figure: % projects in Business Service activities

Data

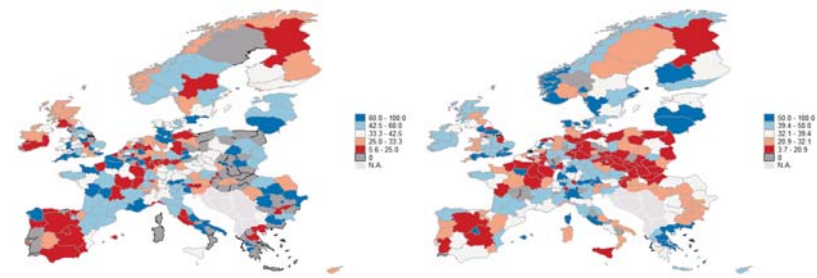
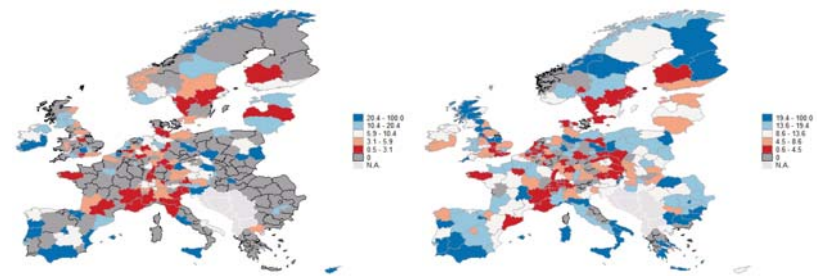


Figure: % projects in Sales activities

Data

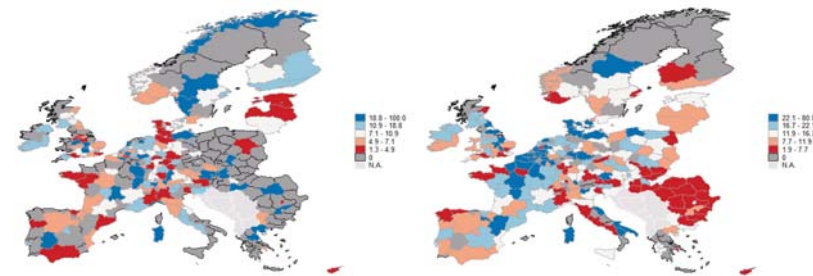


(a) Outward

(b) Inward

Figure: % projects in Construction, Extraction and other industry

Data

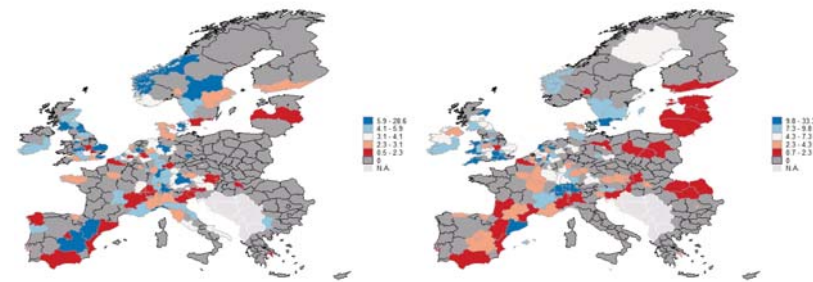


(a) Outward

(b) Inward

Figure: % projects in Logistics and other svcs. activities

Data

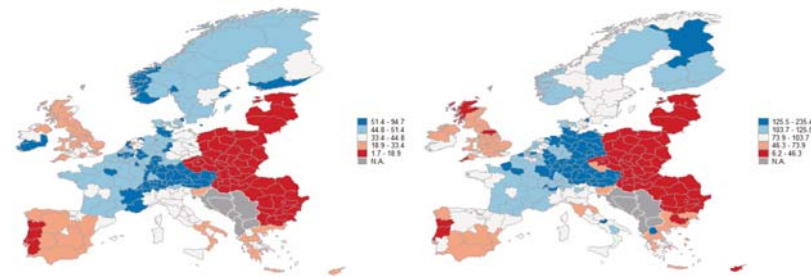


(a) Outward

(b) Inward

Figure: % projects in HQ activities

Data



(a) Labour productivity

(b) Capital intensity

Descriptive statistics, 2003-2004

Variable	sum	N.obs.	mean	sd	p10	p25	p50	p75	p90
Labor productivity (log)		546	3.35	(0.86)	2.04	3.28	3.64	3.89	4.03
Capital per worker (log)		546	4.24	(0.78)	2.94	3.94	4.46	4.78	4.95
Employment density (log)		536	-2.84	(1.21)	-4.17	-3.52	-2.94	-2.17	-1.39
Empl. in S&T (log)		540	3.44	(0.28)	3.14	3.30	3.47	3.63	3.74
Tertiary education (log)		526	3.10	(0.40)	2.48	2.83	3.17	3.38	3.54
Inv. in physical capital (log)		546	8.21	(1.08)	6.78	7.44	8.38	8.97	9.49
Total population (log)		546	7.22	(0.80)	6.16	6.79	7.26	7.71	8.21
Regional Innovation Score (log)		478	3.71	(0.51)	3.18	3.47	3.81	4.04	4.22
Share of Other industry		518	0.09	(0.02)	0.07	0.07	0.08	0.10	0.12
Share of High-tech man.		518	0.07	(0.03)	0.03	0.05	0.06	0.08	0.11
Share of Low-tech man.		518	0.13	(0.05)	0.07	0.09	0.12	0.16	0.19
Share of KI Svcs.		518	0.31	(0.09)	0.21	0.25	0.30	0.37	0.43
Share of Less KI Svcs.		518	0.33	(0.05)	0.28	0.31	0.33	0.36	0.39

Econometric specification

- ▶ We regress labor productivity on counts of foreign investment from/to each NUTS 2 region
- ▶ we are forced to use only two years of data (2003 and 2004) due to an imperfect overlap between productivity and FDI data
- ▶ Due to a high number of zeros in the FDI variables - i.e. regions that do not receive/originate any investment project in 2003 and/or 2004 - we introduce both a dummy and a continuous variable

$$\text{fdi (dummy)}_{rt}^j = \begin{cases} = 1 & \text{if \# of projects } j_{rt}^j > 0 \\ = 0 & \text{if \# of projects } j_{rt}^j = 0 \end{cases}$$

$$\text{fdi (log)}_{rt}^j = \begin{cases} = \log(\# \text{ of projects } j_{rt}^j) & \text{if \# of projects } j_{rt}^j > 0 \\ = 0 & \text{if \# of projects } j_{rt}^j = 0 \end{cases}$$

- ▶ j denotes either the overall number of investments or the number by business activity (MAN,SAL,BS,RD,LOGI,HQ,LOGI,CON)
- ▶ r denotes each of the 258 NUTS 2 regions
- ▶ t is either 2003 or 2004.

Econometric results: Baseline (OLS)

Dep. Var: Labour productivity	(1)	(2)	(3)	(4)	(5)	(6)
Outward inv. (dummy)	0.313***	0.012	0.007	-0.002	0.002	-0.001
Inward inv. (dummy)	-0.120	-0.064***	-0.051***	-0.031	-0.038*	-0.022
Outward inv. (log of n. inv)	0.329***	0.039***	0.028***	0.029***	0.040***	0.052***
Inward inv. (log of n. inv)	-0.347***	0.045***	0.008	-0.003	0.005	0.006
Capital per worker (log)			0.357***	0.274***	0.292***	0.329***
Employment density (log)			0.060***			
Employment in S&T (log)				0.508***		
Tertiary education (log)					0.289***	
Regional Innov. Scoreboard						0.031
Constant	3.328***	3.949***	2.426***	0.950***	1.710***	2.205***
Year 2003 (dummy)	-0.023	-0.007*	-0.014***	-0.017***	-0.014***	-0.010***
Country dummies	No	Yes	Yes	Yes	Yes	Yes
N. observations	544	544	534	538	524	476
N. regions	272	272	267	269	262	238

* p<0.1, ** p<0.05, *** p<0.01

Econometric results: Baseline (OLS)

Dep. Var: Labour productivity	(7)	(8)	(9)
Outward inv. (dummy)	-0.000	-0.002	-0.003
Inward inv. (dummy)	-0.029	-0.011	-0.012
Outward inv. (log of n. inv)	0.018**	0.017**	0.012*
Inward inv. (log of n. inv)	-0.004	-0.002	-0.001
Capital per worker (log)	0.298***	0.178***	0.152***
Employment density (log)	0.029***	0.027***	0.002
Employment in S&T (log)	0.880***	0.650***	-0.019
Tertiary education (log)	-0.376**	-0.318**	-0.078
Inv. in physical capital (log)		0.233***	0.245***
Total population (log)		-0.247***	-0.270***
Share of Other industry			-1.352*
Share of High-tech man.			1.364***
Share of Low-tech man.			1.189***
Share of KI Svcs.			2.019***
Share of Less KI Svcs.			1.421***
Constant	0.770**	1.631***	2.117***
Year 2003 (dummy)	-0.020***	-0.013***	-0.014***
Country dummies	Yes	Yes	Yes
N. observations	518	518	496
N. regions	259	259	248

* p<0.1, ** p<0.05, *** p<0.01

Econometric results: preliminary comments

We find a positive correlation between outward investments and regional productivity, even controlling for 'the usual suspects' (while the correlation with inward FDI is not robust)

But we need to :

1. control for other important regional characteristics, such as infrastructure and 'openness'
2. control for spatial dependence
3. deal with reverse causality

Econometric results: EU-15 vs. EU-12 (OLS)

	EU-27	EU-15	EU-12
Outward inv. (dummy)	-0.017	-0.006	-0.023
Outward inv. (d) * EU15 (d)	0.006		
Outward inv. (log)	0.044**	0.020***	0.019
Outward inv. (log) * EU15	-0.026		
Inward inv. (dummy)	-0.062**	-0.006	-0.026
Inward inv. (d) * EU15 (d)	0.063**		
Inward inv. (log)	0.047***	-0.001	0.026*
Inward inv. (log) * EU15	-0.058***		
Capital per worker (log)	0.122***	0.166***	0.188***
Employment density (log)	0.000	0.001	0.058***
Employment in S&T (log)	-0.020	0.157	-0.386
Tertiary education (log)	-0.093	-0.284***	0.366**
Inv. in physical capital (log)	0.221***	0.168***	0.062
Total population (log)	-0.248***	-0.190***	-0.107*
Share of Other industry	-1.286*	-2.500***	-0.363
Share of High-tech man.	1.349***	0.633*	1.813***
Share of Low-tech man.	1.087***	0.309	1.693***
Share of KI Svcs.	2.038***	1.279***	2.400***
Share of Less KI Svcs.	1.273***	0.433	1.468***
Constant	2.415***	2.987***	0.587
Year 2003 (dummy)	-0.013***	-0.012***	-0.024***
Country dummies	Yes	Yes	Yes
N. observations	496	372	124
N. regions	248	186	62

Econometric results: Italy (OLS)

	EU-27	EU-15
Outward inv. (dummy)	-0.006	-0.012
Outward inv. (d) * Italy (d)	0.003	0.020
Outward inv. (log)	0.016**	0.024***
Outward inv. (log) * Italy (d)	-0.048***	-0.048***
Inward inv. (dummy)	-0.017	-0.008
Inward inv. (d) * Italy (d)	0.066*	0.035
Inward inv. (log)	-0.001	-0.002
Inward inv. (log) * Italy (d)	0.019	0.029**
Constant	2.138***	2.998***
Year 2003 (dummy)	-0.012***	-0.010***
Regional controls	Yes	Yes
Industry structure	Yes	Yes
Country dummies	Yes	Yes
N. observations	496	372
N. regions	248	186

* p<0.1, ** p<0.05, *** p<0.01

Econometric results: Type of investments (OLS)

	dummy	log	dummy	log	dummy	log
<i>Outward inv. in</i>						
Business svcs	0.012	-0.008	0.013	0.005	-0.008	0.020
Headquarter	-0.019	0.041	-0.013	0.028	0.018	0.000
Manufacturing	-0.004	0.000	-0.001	-0.009	0.011	-0.004
Constr. & other ind.	-0.014	-0.006	0.012	0.017*	0.037	0.065
Logistics & other svcs.	0.001	0.004	0.019*	0.023***	-0.013	0.109*
R&D	0.002	0.005	0.003	-0.020*	-0.029	0.165*
Sales	0.003	0.009	-0.004	0.011	-0.006	-0.004
<i>Inward inv. in</i>						
Business svcs	-0.021	-0.032*	-0.013	-0.003	0.012	-0.002
Headquarter	-0.012	0.004	0.004	0.004	-0.050	-0.134
Manufacturing	-0.005	-0.006	-0.002	-0.023**	0.002	0.016
Constr. & other	-0.007	0.034*	-0.005	-0.011	0.013	0.020
Logistics & other svcs.	0.008	0.020**	0.018**	0.003	-0.004	-0.009
R&D	0.021*	0.025	0.022*	0.024	-0.028	0.039*
Sales	0.004	0.008	0.004	0.001	0.010	0.033**
Year 2003 (dummy)	-0.011***		-0.011**		-0.010	
Constant	2.335***		3.079***		1.684***	
Regional controls	Yes		Yes		Yes	
Industry structure	Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes	
N. observations	496		372		124	
N. regions	248		186		62	

We provided a preliminary assessment of how differences in internationalisation across regions correlate with regional differences in productivity

- ▶ We find that - even controlling for differences in agglomeration economies, technological capabilities, human capital and sectoral composition - regions with a higher number of outward investments exhibit higher productivity
- ▶ On the contrary, inward investments are not correlated with productivity, once other regional characteristics are accounted for.
- ▶ Further robustness checks are needed to control for other sources of regional heterogeneity in productivity (including spatial dependence) and for reverse causality
- ▶ Results also suggest that
 - ▶ the model for EU-12 and EU-15 may be different
 - ▶ in Italy inward investments are positively correlated with productivity, while outward investments are negatively correlated with productivity.