Bank of Greece Research Seminar

Does FDI promote regional development?

Evidence from local and regional productivity spillovers in Greece

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Motivation

- **A central question for (reg'l/nati'l) development, esp. under econ integration**

- **A burgeoning and well published literature with truly global coverage**
  - Published in AER, EER, RES, JDE, JIE; From Siberia to Chile and Canada to NZ

- **But very little research on Greece (bar Louri and Dimelis)**

- **Research has moved beyond measurement (Q: when do FDI spillovers matter?)**
  - Origin of FDI and types of parent firms and affiliate activities (vertical-horizontal)
  - Local participation and foreign control (fully-owned versus partial ownership)
  - Firm characteristics (size, age, technological gap and "absorptive capacity")
  - Sectoral char/stics (K-intensity, tech-content, products, X-orientation, competition)
  - Level of skills / education of the domestic workforce; overall level of development
  - Extent of corruption, bureaucratic red tape, institutions, levels of development

- **But research on the spatial dimension/manifestation of spillovers is LIMITED**
  - Despite the analytical foundation of spillovers firmly in SpEcon/RegSci/NEG
    (MAR externalities: Henderson/Venables 2000; Duranton/Puga 2004; Henderson/al, 2004)
  - Despite the fact that some of the key spillovers identified with FDI have a clear spatial dimension (sharing resources, physical interaction, imitation, etc)

A brief literature review

- **FDI studies mainly a-spatial**
  - -Unlike the –very similar– agglomeration studies (Rosenthal & Strange, 2002)
  - -Haddad/Harrison (JDE 1993); Blomström/Sjoholm (EER 1999); Javorcik (AER 04)

- **Some use spatial detail almost merely to boost their sample**
  - -Aitken/Harrison (AER 1999); Blalock/Gertler (JIE 2008)

- **A few have looked at role of clusters/agglomeration (but not space)**
  - -Driffield/Munday (RS 2001); Jordaan (WD 2005); De Propris/Driffield (CJE 2006)

- **Three have examined the process of diffusion across space**
  - -Halpern/Muraközy (ET 2007); Haskel/al (RES 2007); Jordaan (EPA 2008)

- **Only one examined specifically the issue of differentiation in the direction & magnitude of FDI spillovers across space**
  - -Mullen and Williams (RURDS 2007)

Aims

- **Examine the extent of horizontal FDI spillovers in Greece**
  - -Add to the limited volume of research examining this
  - -Provide unique evidence from one of the most utilised international datasets
- **Examine their spatial manifestation and differentiation across different geographical areas and spatial scales**
  - -Are estimated spillovers different when we take into account the location of FDI?
  - -How localised are these spillovers?
  - -Is the direction of the effects different across different spatial scales?
  - -What is the geography of FDI spillovers – and is it systematic?
- **Say something about issues of selection and conditionality**
  - -Does FDI self-select into high/low productivity regions and/or sectors?
  - -Are spillovers conditioned on firm, sector and regional characteristics?
- **Say something about regional development and policy**
  - -What are the implications for regional development? Is FDI good or bad?
  - -What are the implications for (FDI-promoting and regional) policy?

Structure

- **Some theoretical notes**
  - -Impact of FDI and the relevance of spillovers
  - -Factors conditioning the extent/direction of FDI spillovers

- **FDI in Greece and its regions**
  - -Volume and type
  - -Geographical and sectoral distribution
  - -Spatial clustering

- **Econometric analysis**
  - -The model
  - -Specification issues
  - -Empirical results: impact and its functional and spatial variation

- **Conclusions**
  - -Links to policy questions about FDI-promotion and development policies

Theoretical considerations

Is FDI good?

- Positive effects unquestioned by policy=> large incentives (subsidies, tax breaks)
  - •And, for the macroeconomy, probably rightly so
  - •Not least due to BoP arguments (see Thirlwall's constrained growth thesis)
  - •But see also Christodoulakis' take on Rybczynski theorem

- But empirics not really in line with theory; not supporting this optimism
  - •Aggregate studies find robust effects of FDI flows on national growth
  - •But (more accurate but also partial) firm-level studies find often negative effects!!

- Empirical findings from micro-studies
  - •For developed countries
  - •Mainly positive (Blomström et al, 2001; Girma et al, 2001; and Haskel et al, 2007)
  - •For emerging/developing/transition economies
  - •Often negative (Haddad/Harrison, 1993; Aitken/Harrison, 1999; Blomström/Sjoholm, 1999; Djankov/Hoekman 2000; Damijan et al, 2001; Bosco, 2001; Kugler, 2006)
  - •But also positive (Javorcik et al, 2004; Copenhagen Economics, 2006; Jordaan, 2005; Görg and Strobl, 2005; and Blomström and Sjoholm, 1999)

Theoretical considerations

How does FDI affect domestic economies?

- **Overall effects**
  - -Currency reserves and CA surpluses
  - -Currency appreciation and trade balance deficits
  - -Economic restructuring and product modernisation / diversification
  - -Externalities: productivity spillovers and demand-supply linkages

- **Spillover effects**
  - -Direct effects (intra-firm)
    - accrue directly to the firms acquired by an MNE and are almost always positive, as the local affiliates benefit from the new technologies, capital, management and knowledge introduced by the foreign firm (who has strong incentives to transfer these to its affiliate)
  - -Intra-industry effects (horizontal)
    - accrue to all firms within the sector in which the foreign firm operates but their direction is ambiguous (for a number of theoretical and empirical reasons discussed below)
  - -Inter-industry effects (vertical)
    - accrue to firms and sectors linked vertically to the foreign affiliate, i.e., through demand and/or supply linkages, with effects which are generally positive, but not always so (Javorcik et al, 2004)

Theoretical considerations

Types of spillover effects

-By mechanism

- **Pecuniary:** linked to demand / market transactions (income / wage / employment effects, expansion of export base, new products / new market niches)
- **Technological:** linked to technology copying (imitation effect, managerial gains) and capacity upgrading (training / HC effect, capital-base modernisation)
- **Competition:** either substantive (through efficiency improvements) or statistical (through exit of the least productive firms)
- **Export spillovers:** e.g., through information concerning export markets/distribution networks

-By effect

- **Positive spillovers:** training ground (labour turnover), imitation, competition
- **Negative externalities:** creative destruction / market stealing; monopolisitc position; price squeeze; rising price of capital; lower domestic efficiency if increasing returns

-By channel

- **Upstream:** triggering improvements in the quality of suppliers' products
- **Downstream:** providing more advanced / 'productive' intermediate goods
- **Horizontal:** mainly about transferable skills & methods and strengthening the sectoral market

Theoretical considerations

What conditions the extent and direction of spillovers?

-**Spillovers (esp. horizontal) are *endogenously constrained***

- -Incentive to restrict extent of own spillovers: offer higher wages to reduce turnover; protect own advantages & foreign markets (weaken 'demo' effects / info spillovers)
- -Ability of local firms to benefit from tech spillovers (absorptive capacity / 'gap'): educated workforce, high R&D, firm size, diverse products, non-unionised, etc
- -Extent of competition/openness of domestic sector: if already exposed to competition
- -Size of market and technology of production: extent to which scale economies matter
- -Reason for the investment (market- v efficiency-seeking) and extent of ownership: local participation raises spillovers; fully-owned bring more innovation/technology

-**Thus, the technological content of foreign investment matters**

- -Investments that are too advanced technologically
  - - may create more significant spillovers
  - - may create non-absorbable spillovers
- -Investments that are too similar in technology
  - - may create too little spillovers to be absorbed
  - - may create spillovers that can be absorbed without costs

Theoretical considerations

When are spillovers maximised? – some empirical literature

- **International evidence (here: transition countries)**
  - -With distance: local sourcing for more distant investors (Javorcik et al, 2004)
  - -With partial ownership: more interaction with local managers (Javorcik, 2004; Javorcik and Spatareanu, 2006; Merlevede and Schoors, 2007):
  - -With capital intensity and technical content of the local firms: more absorptive (Kippenberg, 2005; Bosco, 2001; Merlevede and Schoors, 2007)
  - -With the scale of foreign presence in a sector: 'threshold' effects (Merlevede and Schoors, 2005; Gersl et al, 2007)
  - -With the size of domestic firms (Aitken and Harrison, 1999)
  - -With *less* competitive market-structures: monopolist advantages (Kinoshita, 2000)
  - -With good host-country institutions (Gorodnichenko et al, 2007)
  - -With time (hysterisis hypothesis) (Monastiriotis and Alegria, 2011)

- **Evidence for Greece**
  - -Louri & Dimelis (2002): positive spillovers but only for minority-ownership FDI
  - -Barrios et al (2004): as above, but not robust to controls for sectoral heterogeneity
  - -Fotopoulos & Louri (2004): FDI raises domestic firm growth, esp. for medium-sized
  - - …and that's it.

Theoretical considerations

Why look at space?

- **Our starting premise** is that FDI spillovers are heterogeneous across space
  Not least because FDI itself tends to be particularly concentrated, especially in locations of high productivity, accessibility and industrial agglomeration

- **The scant existing empirical evidence seems to support this claim**
  Showing that industrial clustering (agglomeration) is significant both for attracting foreign firms and for determining the size of the realised productivity spillovers

- **There are also good theoretical reasons** to expect FDI spillovers to take a heterogeneous geographical manifestation –but effects can go eitherway
  - **Absorptive capacity**: FDI may be less able to generate positive spillovers in less developed regions because their technological distance to local firms does not allow for potential spillovers to be absorbed
  - **Scope for spillovers**: FDI may produce larger spillovers in less developed regions, as firms there are typically less exposed to international competition and have thus more to 'learn' from the foreign-owned firms

FDI in Greece and its regions

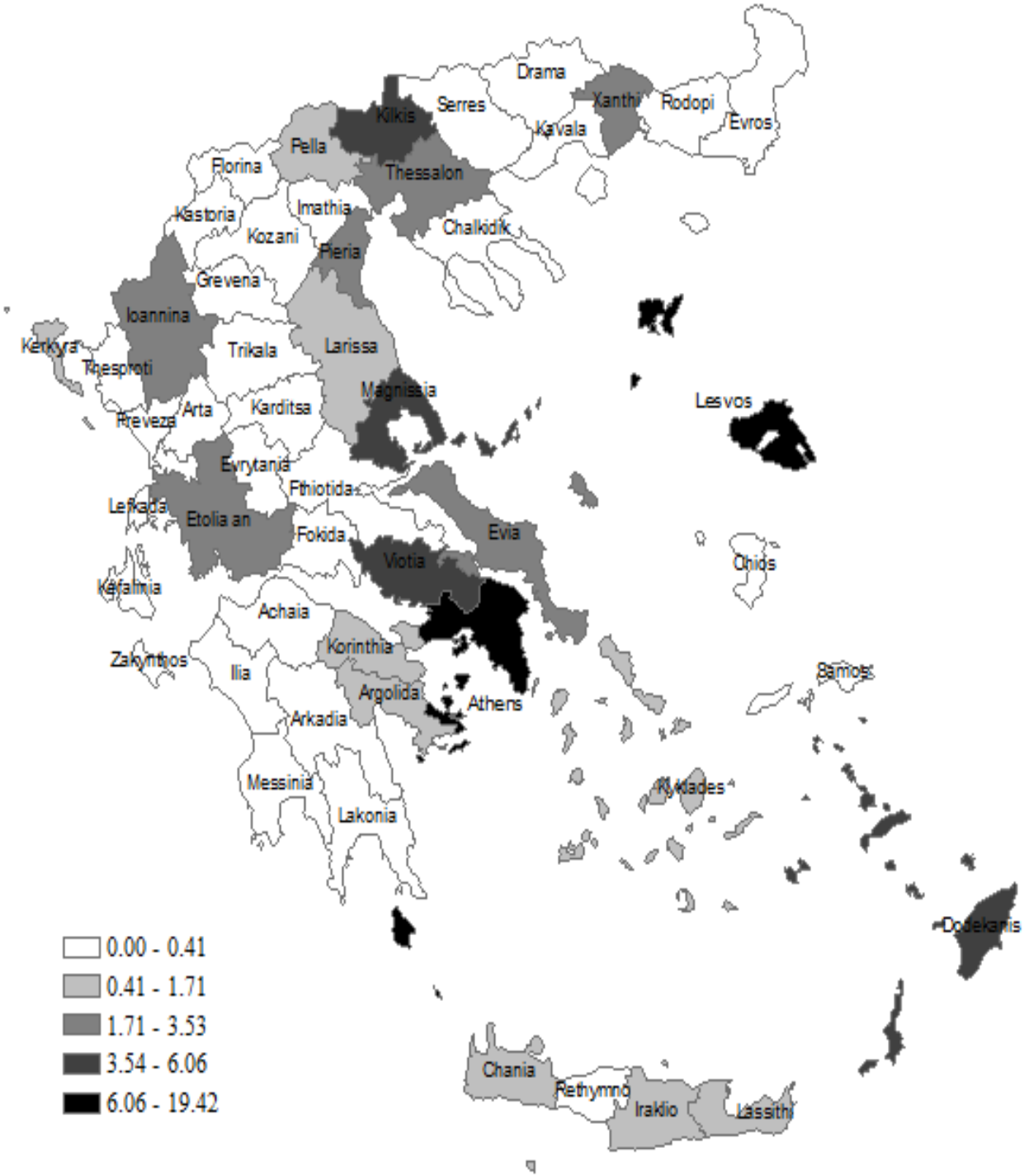
What do we know?

- **Greece histrorically not an important FDI recipient**
  - Incentives since the 1950s and growing; but today <1% of total FDI in EU27
  - Stock <10% of GDP (Louri et al 2000); flows <10% of GFCF (UNCTAD 2009)
  - Well below the country's potential (from gravity) (UNCTAD 2004)

- **Low technology content**
  - BoG: in 2008 33% of FDI stock in manufacturing, mainly consumer goods
  - Low-technology and labour-intensive sectors (Barrios et al 2004)

- **Over-concentration**
  - In a few sectors and regions (Dimelis et al 2004; Bitzenis 2007)
  - BoG: 25/51 regions with FDI; manu/baning/transport/trade accounts for 90%
  - Around 85% of FDI stock in Attiki; 0.5% going to the best performer outside top-5
  - Other: Thessaloniki; Lesvos (manufacturing); Dodecanese (non-manufacturing)

FDI in Greece and its regions



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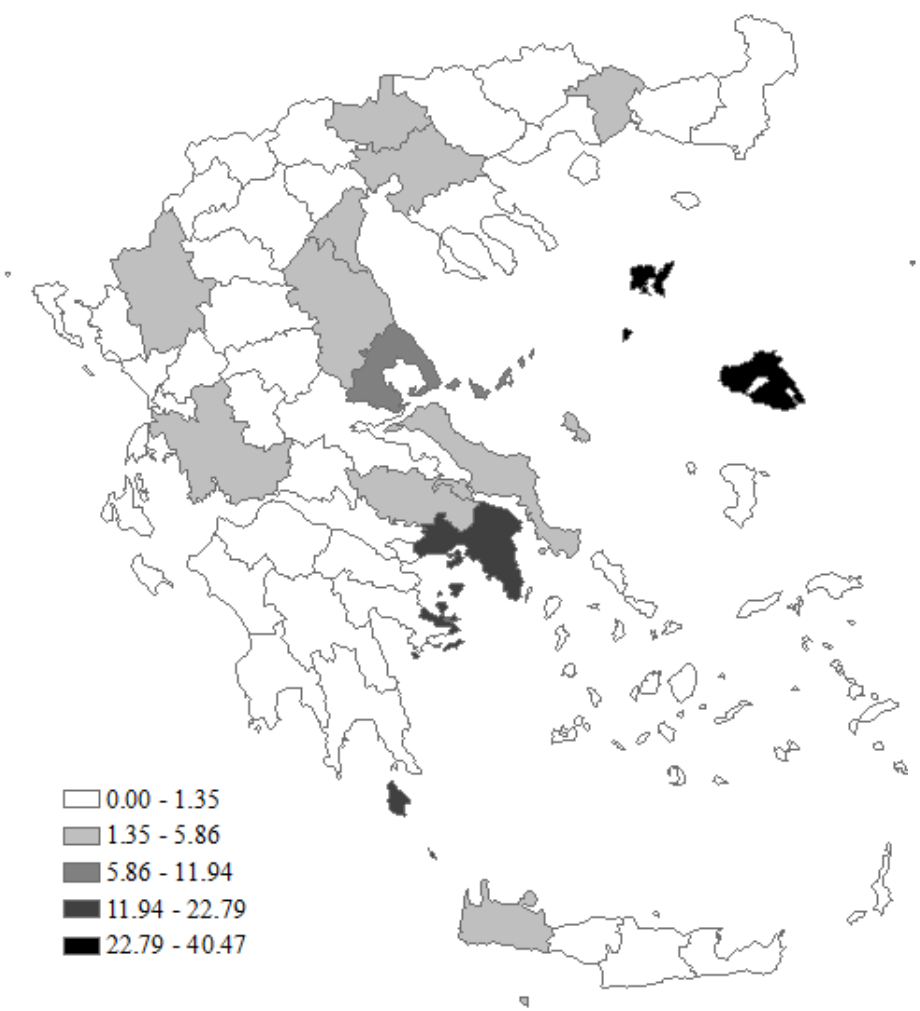
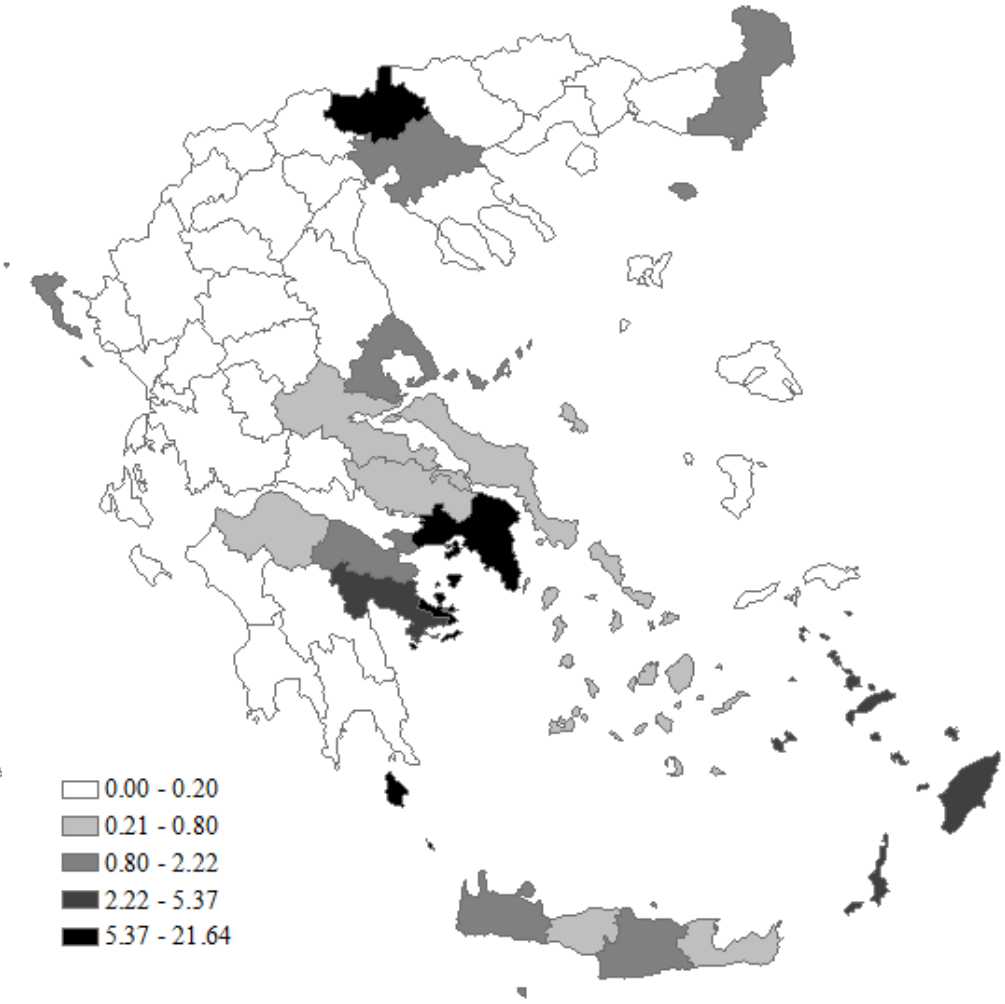
FDI in Greece and its regions



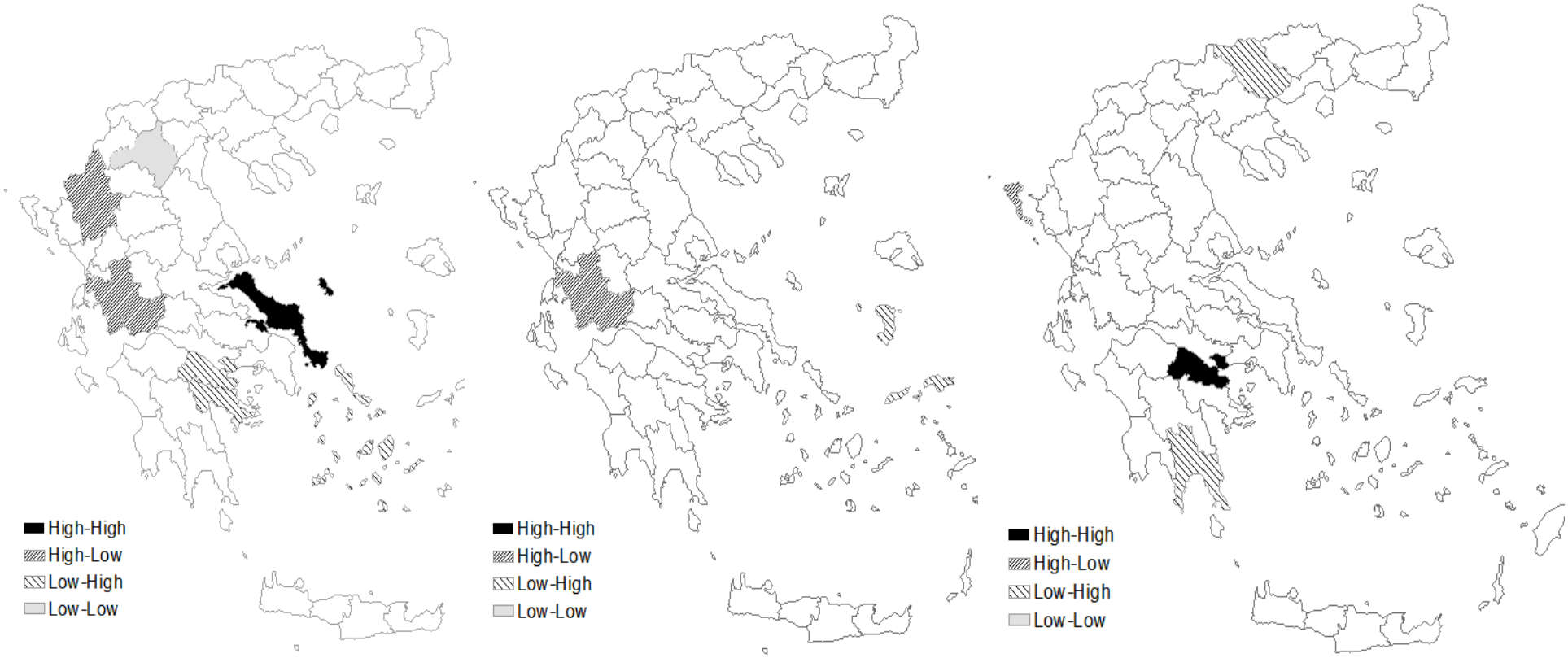
Manufacturing



Non-manufacturing

FDI in Greece – is there spatial clustering?

LISA: Concentration is ‘within’; hardly anything ‘across’



FDI:	Total	Manufacturing	Non-manufacturing
Moran’s I:	0.0016	0.0283	-0.0200

Data and descriptive statistics

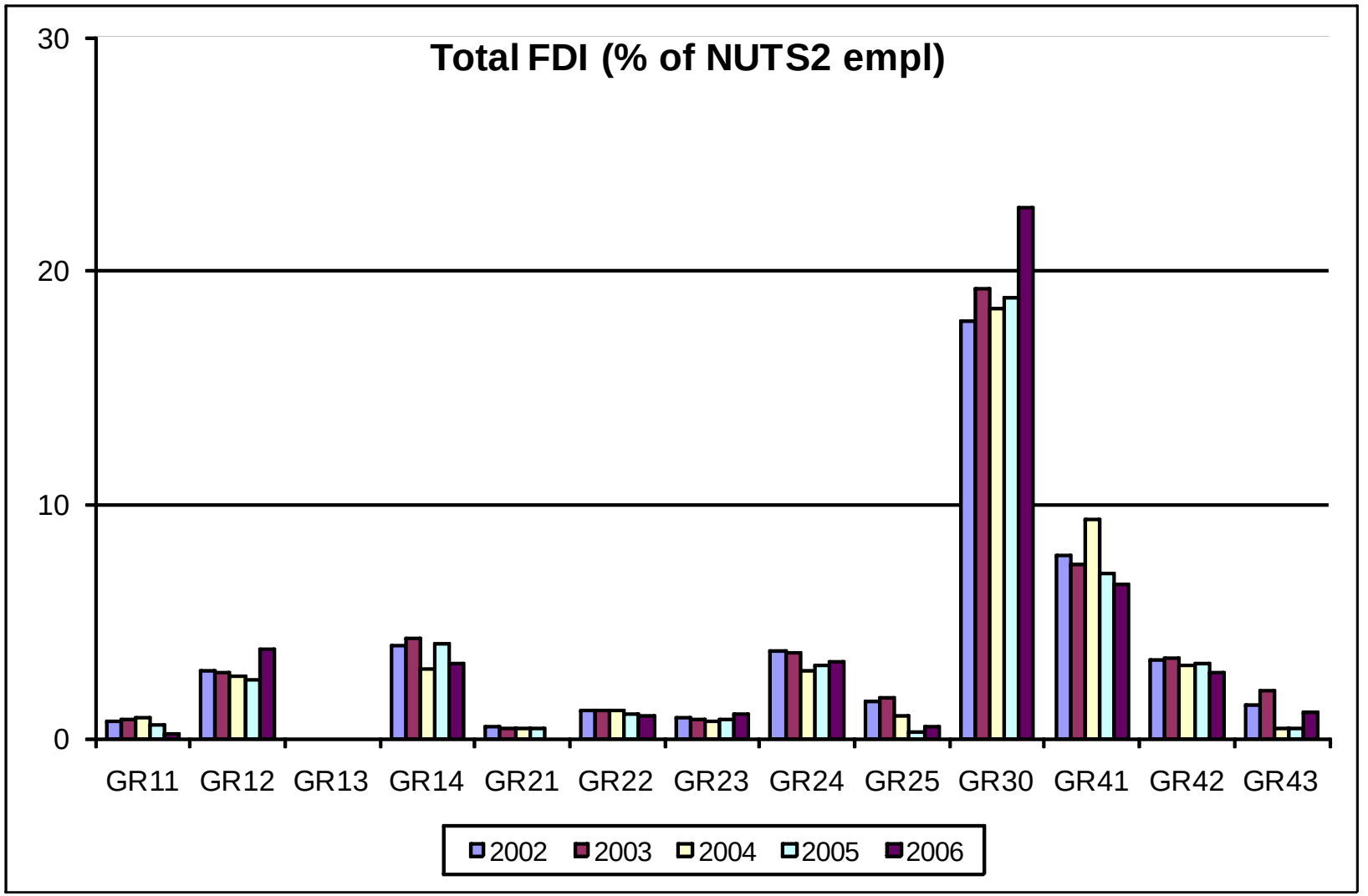
Data

- **Source**
  - Firm-level data for Greece derived from Amadeus (Bureau van Dijk database) for the period 2002-2006; full data available since 1997, but much missing information

- **Sample**
  - **Full sample**: approx.27,000 firms (in 2006); 2,085 with >10% foreign ownership (7.8% of firms; c.15% of total turnover; c.10% of total employment)
  - **Clean sample**: removing outliers, firms with missing data and very small firms
    - c.20,000 firms per year (excluding foreign affiliates)

- **Variables**
  - Consistent information on sales, employment, fixed assets and sector-location
  - FDI data aggregated at the NUTS2 and NUTS3 levels, for NACE2 sectors (looking at NACE4 is possible, but sample is split too thinly)

Regional shares



Sectoral shares

Sector	Share	Sector	Share	Sector	Share	Sector	Share
Agriculture	5.4%	Publishing and printing	7.1%	Other transport equipment	1.2%	Other transport services	18.7%
Fishing	1.4%	Coke	7.3%	Furniture and other	1.4%	Post and Telecommunications	19.6%
Mining of coal	0.0%	Chemicals	46.4%	Recycling	0.0%	Fin. intermediation services	19.2%
Extraction of crude	0.0%	Rubber and Plastic	12.4%	Electricity, gas etc	1.7%	Other fin. intermediation	8.6%
Mining of metal ores	11.5%	Other non-metallic	10.1%	Collection etc of water	0.0%	real estate	4.0%
Other mining	10.8%	Basic metals	11.9%	Construction	5.2%	Education	12.4%
Food and beverages	15.5%	Fabricated metals products	6.9%	Sales motor vehicles	17.8%	Computer and related services	19.9%
Tobacco	15.7%	Machinery and equipment	20.2%	Other wholesale trade	22.6%	Other business services	16.0%
Textiles	7.0%	Office machinery / computers	8.1%	Retail trade services	16.9%	Public administrations	0.0%
Wearing apparel	1.4%	Electrical machinery	32.5%	Hotel and restaurants	3.7%	Renting services of machinery	0.9%
Leather	11.3%	Radio etc equipment	16.3%	Land transport	5.2%	Health and social work	3.2%
Wood	0.2%	Medical etc instruments	0.0%	Water transport	5.7%	Sewage etc services	11.3%
Pulp and paper	22.2%	Motor vehicles	1.8%	Air transport services	34.7%	Recreational etc	9.7%

Econometric analysis

- The model

-Production function approach – log-linear specification

-Augmented Cobb-Douglas with controls for various FDI and other characteristics

-FDI enters directly (human capital approach) or through the technology parameter

$$y_{ist} = a + a_t + a_i + b_1 * l_{ist} + b_2 * k_{ist} + b_3 * m_{ist} + c * h_{st} + \varepsilon_{ist}$$

-*i*, *s* and *t* index firms, sectors and time; a_t: time dummy, a_i: firm-level fixed-effects

-*y*: output (total sales); *l*: employment; *k*: total fixed assets; *m*: cost of raw materials

-*h*: employment share of foreign-owned firms (defined at the NACE 2-digit level)

- Specification

-Econometric model

-Two-way fixed effects specification (firm-specific unobservables); robust s.e. clustered within 2-digit sectors (to correct for 'horizontal' being defined at the sectoral level)

-No temporal or sectoral deflators (T=4; fixed-effects specification)

-No Olley-Pakes (1996) correction (self-selection of investment by type – no systematic differences in the productivity of expanding/contracting firms)

-Economic model

-Foreign participation impact on TFP; no restrictions on returns to scale

-FDI variable defined alternatively at the NUTS2 and NUTS3 levels to investigate the question concerning the geographical scale of spillovers

Specification of the production function

Model: ln(output)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(capital)	0.133***	0.131***	0.192***	0.200***	0.158***	0.160***	0.206***	0.112***
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0020)	(0.0020)	(0.0019)	(0.0026)
ln(employ-ment)	0.606***	0.608***	0.638***	0.628***	0.574***	0.573***	0.612***	0.397***
	(0.0039)	(0.0039)	(0.0036)	(0.0036)	(0.0039)	(0.0039)	(0.0036)	(0.016)
Constant	5.002***	4.901***	4.525***	4.440***	4.686***	4.715***	4.129***	5.564***
	(0.011)	(0.013)	(0.038)	(0.099)	(0.025)	(0.044)	(0.10)	(0.041)
Fixed effects	No	Time	Nace2	Nace4	NUTS2	NUTS3	All	Firms & Time
Obs	98407	98407	98407	98407	98407	98407	98407	98407
R-sq	0.35	0.35	0.49	0.53	0.36	0.37	0.54	0.05

Notes: Model (8) is estimated using the Fixed Effects Within estimator. All other regressions are estimated with OLS. NACE2 (NACE4) contains 54 (429) sectoral dummies while NUTS2 (NUTS3) contains 13 (51) regional dummies. The model of column 7 includes dummies for NACE4, NUTS3 and time.

The impact of FDI on domestic productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Capital	0.156***	0.112***	0.192***	0.192***	0.199***	0.157***	0.112***	0.193***	0.193***	0.200***	0.201***	0.202***	0.193***	0.200**
	(0.0019)	(0.0026)	(0.0019)	(0.016)	(0.015)	(0.0019)	(0.0026)	(0.0019)	(0.016)	(0.015)	(0.015)	(0.015)	(0.016)	(0.015)
Employment	0.589***	0.396***	0.636***	0.636***	0.624***	0.588***	0.396***	0.635***	0.635***	0.624***	0.615***	0.606***	0.635***	0.624**
	(0.0038)	(0.016)	(0.0036)	(0.032)	(0.028)	(0.0038)	(0.016)	(0.0036)	(0.032)	(0.028)	(0.028)	(0.029)	(0.031)	(0.028)
FDI (nuts2)	1.701***	0.148***	0.237***	0.237	-0.549***								-0.407	-0.827**
	(0.028)	(0.041)	(0.03)	(0.15)	(0.19)								(0.32)	(0.33)
FDI (nuts3)						1.730***	0.138***	0.284***	0.284*	-0.428**			0.667**	0.310
						(0.027)	(0.04)	(0.029)	(0.17)	(0.19)			(0.33)	(0.28)
$FDI_{(t-1)}$ nuts3											-0.455**			
											(0.19)			
$FDI_{(t-2)}$ nuts3												-0.500**		
												(0.21)		
Fixed effects	No	Firm Year	NACE2 Year	NACE2 Year	NACE2 NUTS3 Year	No	Firm Year	NACE2 Year	NACE2 Year	NACE2 NUTS3 Year	NACE2 NUTS3 Year	NACE2 NUTS3 Year	NACE2 Year	NACE2 NUTS3 Year
Estimation method	OLS	Within	OLS	OLS + cl(nace2)	OLS + cl(nace2)	OLS	Within	OLS	OLS + cl(nace2)	OLS + cl(nace2)	OLS + cl(nace2)	OLS + cl(nace2)	OLS + cl(nace2)	OLS + cl(nace2)
Constant	4.703***	5.546***	4.430***	4.430***	4.240***	4.702***	5.548***	4.428***	4.428***	4.245***	4.306***	4.444***	4.430***	4.239***
	-0.012	-0.042	-0.039	-0.075	-0.12	-0.012	-0.042	-0.039	-0.074	-0.12	-0.11	-0.11	-0.075	-0.12
Observations	98407	98407	98407	98407	98407	98407	98407	98407	98407	98407	79801	60045	98407	98407
R-squared	0.37	0.05	0.49	0.49	0.5	0.37	0.05	0.49	0.49	0.50	0.49	0.49	0.49	0.50

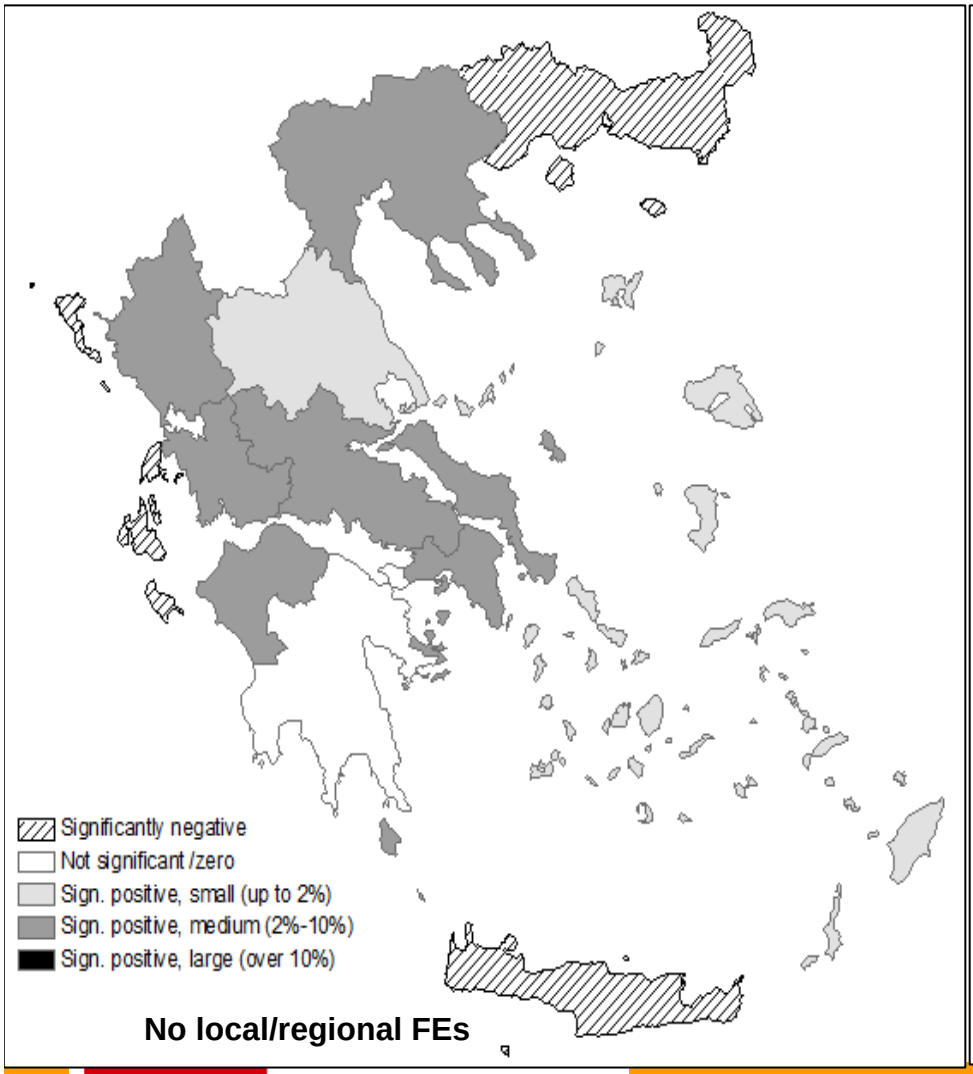
Notes: standard errors (clustered at NACE2, when indicated) in parentheses

Functional heterogeneity of FDI spillovers

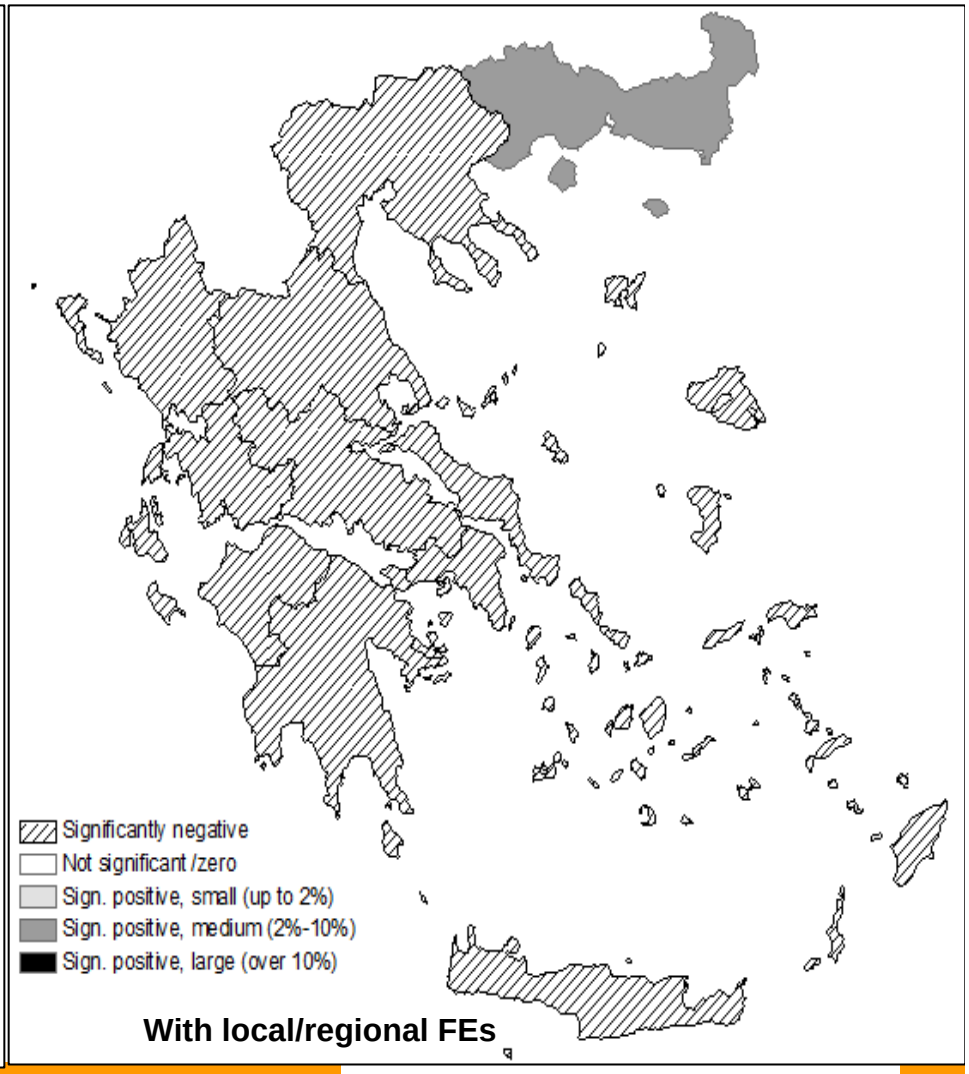
	Manu-facturing	Non-manuf.	High-tech	Low-tech	Large	SMEs	Medium	Small	Low techn. gap	High techn. gap
	WITHOUT REGIONAL DUMMIES									
Capital	0.224***	0.186***	0.192***	0.193***	0.252***	0.175***	0.186***	0.148***	0.133***	0.134***
	(0.021)	(0.019)	(0.025)	(0.019)	(0.025)	(0.015)	(0.017)	(0.019)	(0.016)	(0.019)
Employment	0.633***	0.632***	0.644***	0.633***	0.690***	0.532***	0.729***	0.307***	0.716***	0.792***
	(0.027)	(0.040)	(0.052)	(0.038)	(0.038)	(0.028)	(0.042)	(0.026)	(0.029)	(0.041)
FDI (nuts2)	-0.0323	-0.915*	-0.514	-0.350	0.562***	-0.705**	-0.618*	-0.813*	0.0527	-0.505
	(0.27)	(0.46)	(0.60)	(0.37)	(0.18)	(0.32)	(0.33)	(0.43)	(0.16)	(0.36)
FDI (nuts3)	0.398	1.13**	1.35**	0.491	-0.111	0.853**	0.810**	0.810*	0.549***	0.507
	(0.28)	(0.50)	(0.58)	(0.38)	(0.15)	(0.34)	(0.33)	(0.47)	(0.16)	(0.35)
Constant	5.106***	4.487***	3.075***	4.452***	3.934***	4.643***	4.028***	5.084***	4.797***	1.696***
	(0.049)	(0.088)	(0.19)	(0.082)	(0.14)	(0.070)	(0.11)	(0.073)	(0.080)	(0.061)
Observations	26224	72183	18563	79844	20520	77887	53742	24145	48366	50041
R-squared	0.55	0.47	0.47	0.49	0.52	0.34	0.34	0.22	0.73	0.58
	INCLUDING REGIONAL DUMMIES									
Capital	0.236***	0.191***	0.195***	0.199***	0.260***	0.181***	0.195***	0.151***	0.141***	0.135***
	(0.019)	(0.017)	(0.023)	(0.018)	(0.023)	(0.014)	(0.015)	(0.018)	(0.017)	(0.018)
Employment	0.620***	0.620***	0.634***	0.621***	0.676***	0.523***	0.712***	0.307***	0.701***	0.793***
	(0.025)	(0.035)	(0.048)	(0.034)	(0.035)	(0.025)	(0.041)	(0.027)	(0.026)	(0.040)
FDI (nuts2)	-0.191	-1.52***	-0.819***	-0.765*	0.295	-1.16***	-1.16***	-1.04***	-0.207	-0.642*
	(0.27)	(0.33)	(0.25)	(0.39)	(0.21)	(0.31)	(0.33)	(0.38)	(0.16)	(0.38)
FDI (nuts3)	0.0598	0.661**	0.536**	0.254	-0.480**	0.499*	0.506*	0.446	0.275*	0.598*
	(0.29)	(0.30)	(0.23)	(0.33)	(0.19)	(0.26)	(0.29)	(0.36)	(0.15)	(0.34)
Constant	4.589***	4.461***	2.366***	4.265***	4.052***	4.419***	3.673***	5.064***	4.671***	1.566***
	(0.093)	(0.12)	(0.34)	(0.13)	(0.18)	(0.11)	(0.12)	(0.16)	(0.10)	(0.12)
Observations	26224	72183	18563	79844	20520	77887	53742	24145	48366	50041
R-squared	0.56	0.48	0.49	0.49	0.52	0.35	0.34	0.23	0.73	0.58

Notes: All regressions include temporal and sectoral FEs and standard errors clustered at NACE2.

Spatial heterogeneity of FDI spillovers

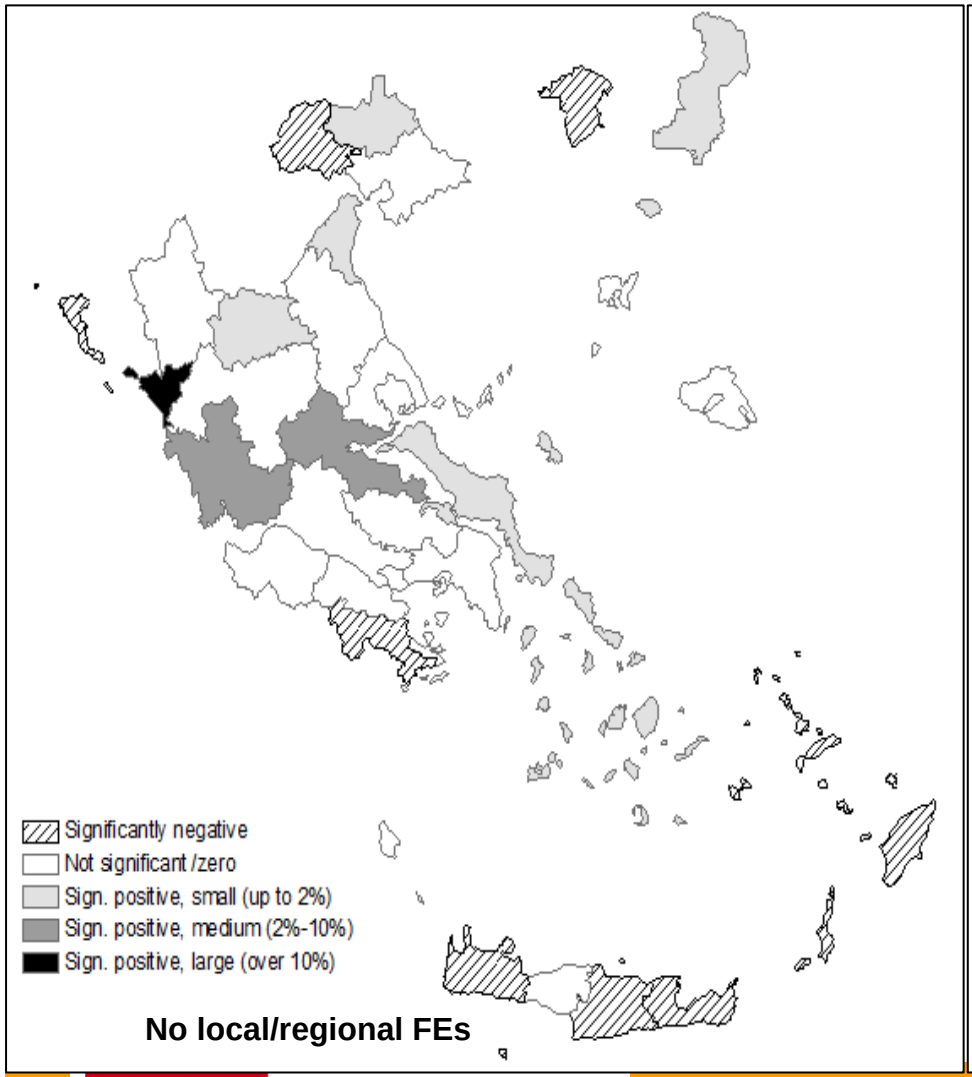


No local/regional FEs

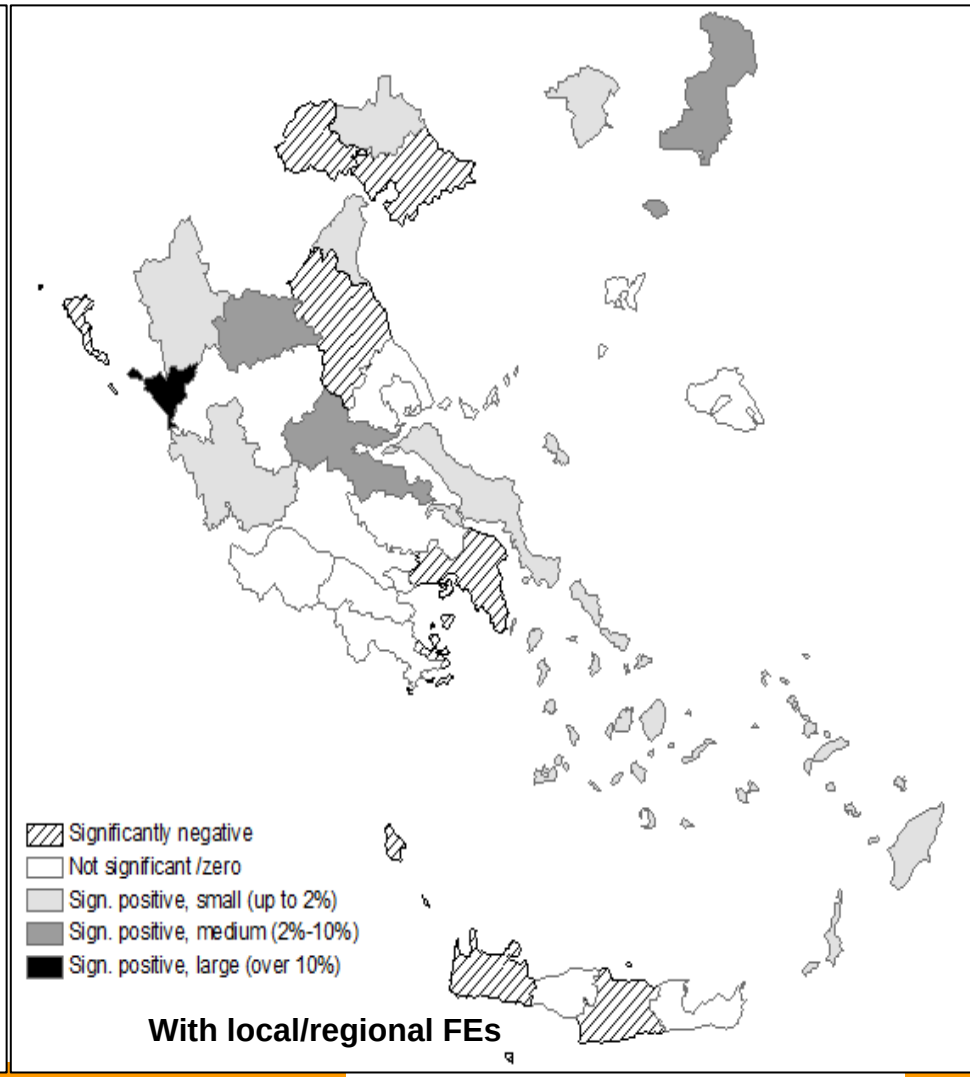


With local/regional FEs

Spatial heterogeneity of FDI spillovers



No local/regional FEs



With local/regional FEs

Results

- **Concentration / selection of FDI**
  - -Concentration in few regions – but no cross-regional clustering
  - -Self-selection into high-productivity regions (hence OLS estimates misguided)
  - -But less so self-selection into high-productivity sectors

- **The impact of FDI on domestic productivity**
  - -Overall effect is negative (competition effect – no technology diffusion)
  - -No contemporaneous, nor 'hysterisis' effect
  - -Effect seemingly positive only due to self-selection

- **The spatial dimension**
  - -Substantial heterogeneity of FDI effects across space
  - -Local effects mostly +ve (learning?); wider effects -ve (market-capture?)
  - -Negative mainly in large urban regions; more positive in the periphery

- **Factors conditioning FDI spillovers (besides co-location/distance)**
  - -Manufacturing, high-tech sectors, high-productivity and large firms

Implications / conclusions

- **Contribution to literature**
  - -Filling an important gap: analysis of the spatial heterogeneity of FDI spillovers at the local and regional levels
  - -FDI conditioned on firm, sectoral and regional characteristics but also more importantly dependent on geographical proximity

- **FDI's contribution to regional development and convergence**
  - -Selection tends to reinforce existing asymmetries
  - -But heterogeneity of effects tends to mitigate them

- **Implications for policy**
  - -FDI policies need regional dimension: attention to endogenous (firm sizes) and exogenous (proximity to agglomerations) locational characteristics that influence local abilities to benefit from FDI spillovers
  - -Aim at directing FDI to less dynamic, less urbanised and less competitive regions – particularly relevant in the "fast-track" era of foreign investment
  - -The objective should not be to maximise the volume of FDI, but rather to optimise its location and maximise its spillovers