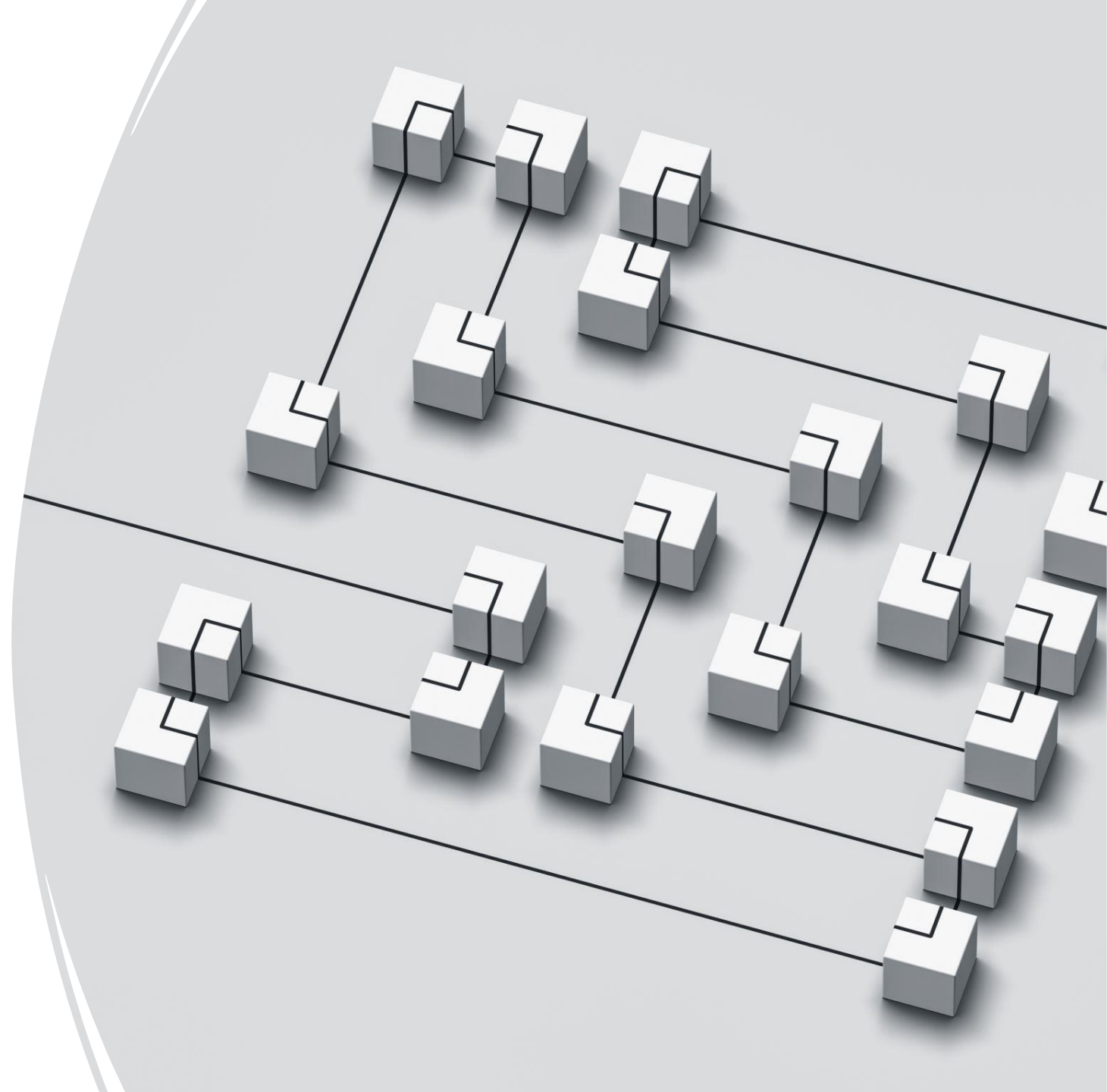


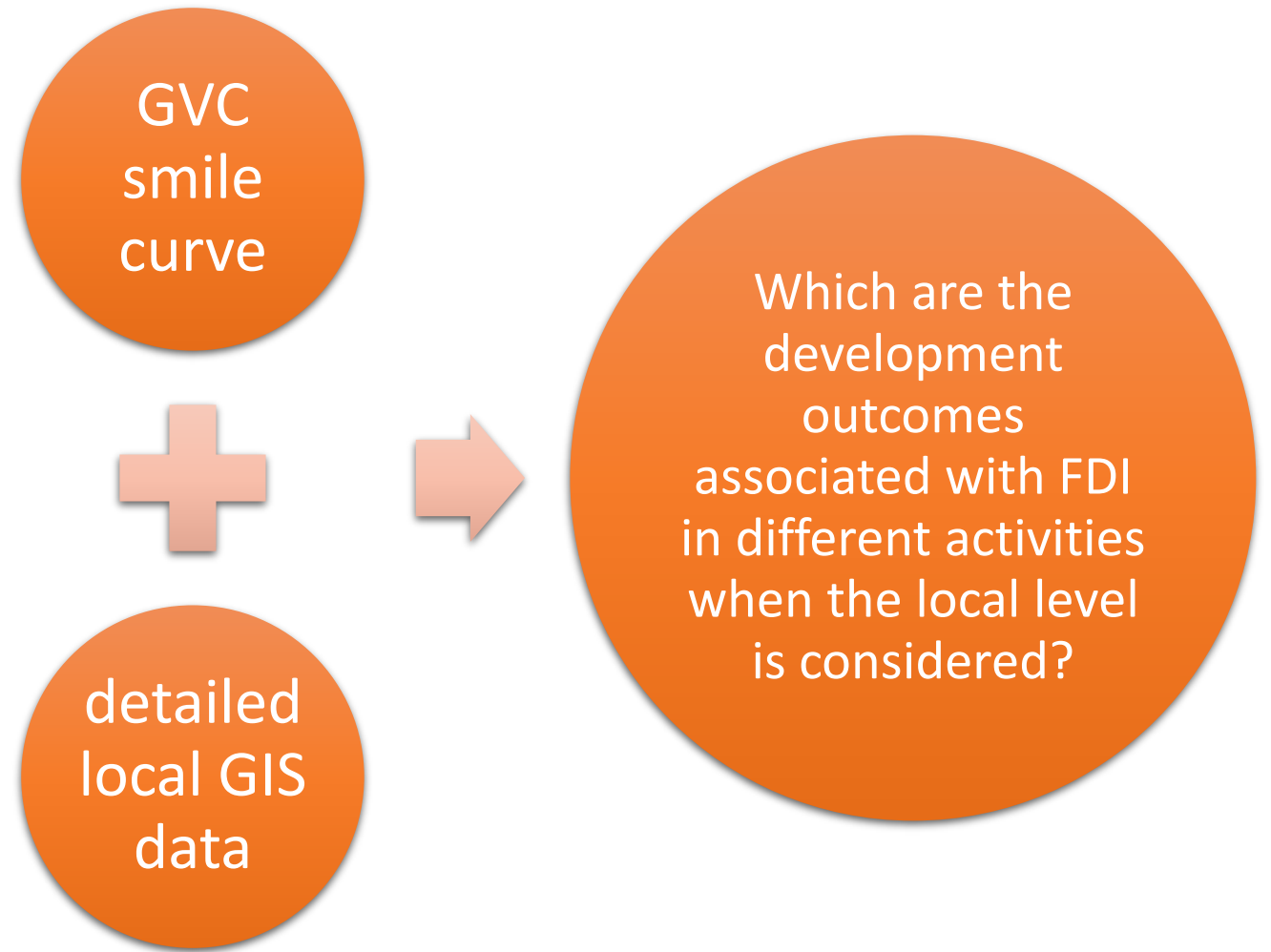
FDI and local development: a spatial analysis

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Research question



outline

Literature

FDI data

GIS data

Methodology

Results

Robustness tests

Conclusions



literature

- **'smile curve'** (Shih, 1996; Baldwin and Evenett, 2015; Gereffi, 1999; Humphrey and Schmitz, 2002): specialization in intangible-intensive stages of the GVC (vs production functions) positively related with the amount of value the economies capture domestically
- more competition in **fabrication activities** (Baldwin and Evenett, 2015).
- strategic control of lead firms based in high-income countries through ownership of **intangible assets** (Chen, Los and Timmer, 2018; Jaax and Miroudot, 2021)
- measures of **nighttime lights visible from space** as a **proxy for standard measures of GDP** for countries with low-quality statistical systems
nightlights (Chen and Nordhaus, 2011)



FDI DATA

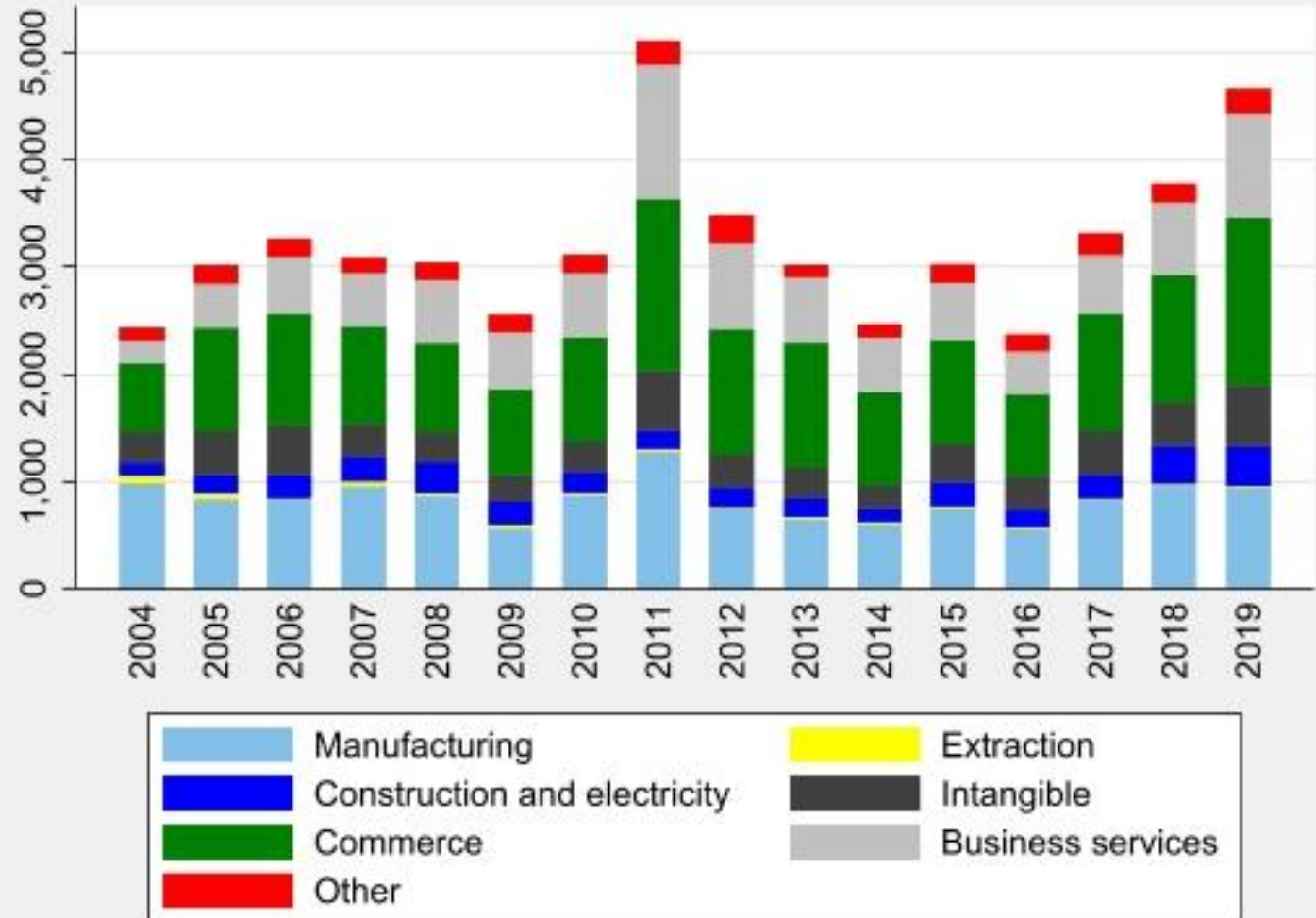
- fDi Markets database by Financial Times Ltd: cross-border bilateral greenfield announced investments
- Up to date and detailed information
- FDI in non-OECD countries
- Geolocalization of destination areas through geocode and opencagegeo (stata)

classification of FDI by activity

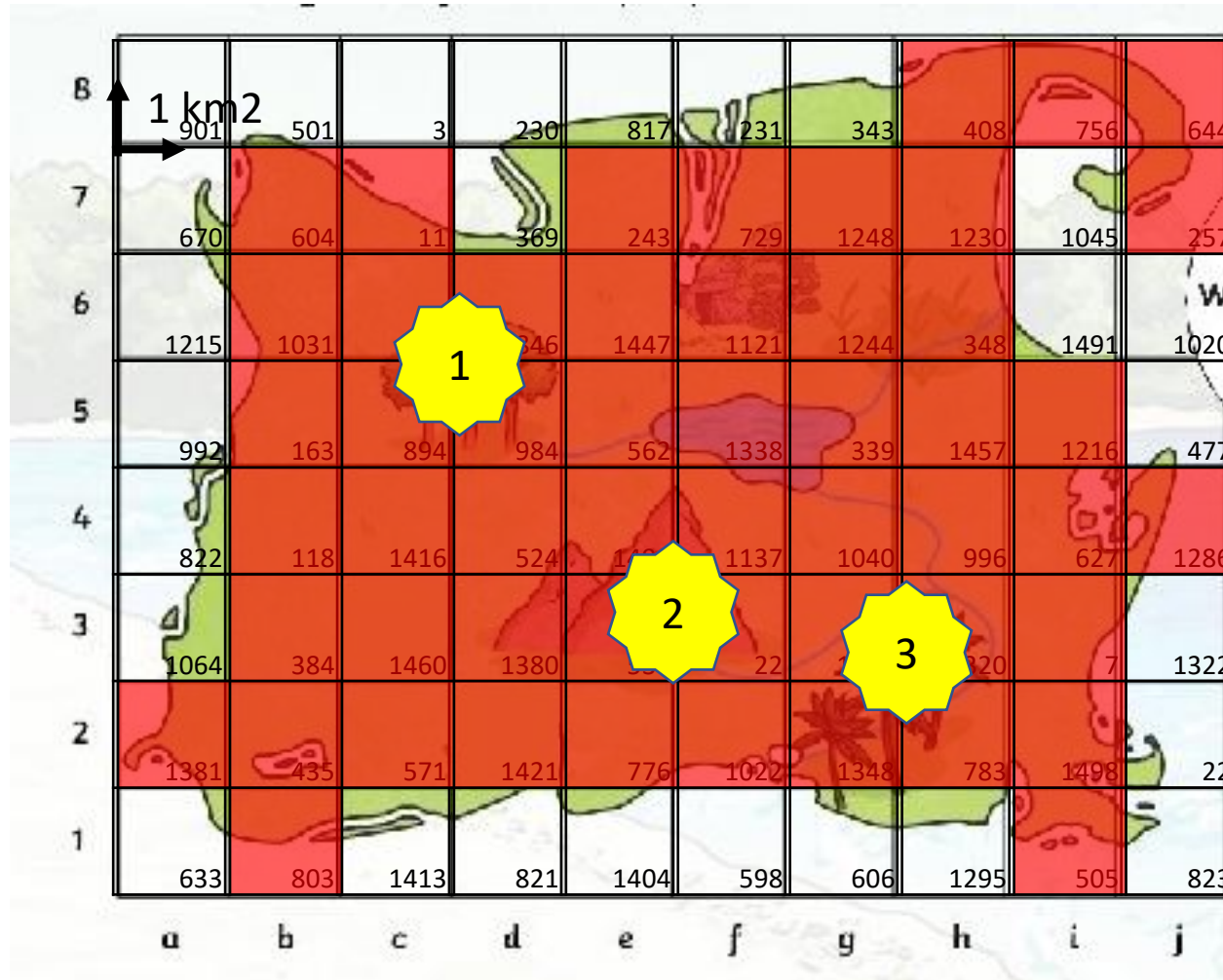
1. Extraction
2. Manufacturing
3. Construction and electricity: Construction, Electricity
4. Commerce: Logistics, Distribution & Transportation, Retail, Sales, Marketing & Support
5. Intangible: Headquarters, ICT & Internet Infrastructure, Research & Development
6. Business Services
7. Other: Customer Contact Centre, Education & Training, Maintenance & Servicing, Recycling, Shared Services Centre, Technical Support Centre



Number of FDI by activity and year



GIS: from grid cells of raster images to regional data



- the dependent variable and the controls refer to admin units of level 2 (1 when 2 is missing)
- more than 31,000 admin units
- more than 275,000 obs
- 152 countries
- From **2 raster images** x 16 years (2004-2019): nightlight and population density

GIS DATA for admin2

- LG_{it} is **logged annual nightlight growth**, in each region i and year t
- LSD_{it} is the **standard deviation of light divided by their average** over cells in region i and year t (proxy of spatial inequality)
- POP_{it} is average **population density** in the region



methodology

- potential reverse causality bias, do not claim causality
- lagged explanatory variables FDI
- control group: all regions including those which did not receive FDIs to avoid selection bias
- multilevel fixed effects estimator (Correia, 2016): fe of the region η_i and for time and country θ_{ct}

$$LG_{it} = \alpha + \sum_{h=1}^7 \beta_h FDI_{i,t-1,h} + \gamma LSD_{it} + \delta POP_{it} + \eta_i + \theta_{ct} + \varepsilon_{it}$$



all FDI and FDI by activity

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog
Manufacturing				0.0120 (0.00425)***	0.0117 (0.00425)***	0.0102 (0.00423)**
Extraction				0.0864 (0.0491)*	0.0865 (0.0490)*	0.0900 (0.0475)*
Construction and electricity				0.00324 (0.0156)	0.00369 (0.0156)	0.00549 (0.0155)
Intangible				0.00855 (0.0100)	0.00892 (0.0101)	0.00844 (0.0102)
Commerce				-0.0186 (0.00715)***	-0.0184 (0.00719)**	-0.0164 (0.00726)**
Business services				0.0152 (0.00807)*	0.0151 (0.00810)*	0.0153 (0.00803)*
Other				0.0202 (0.0223)	0.0190 (0.0223)	0.0183 (0.0221)
All FDI	0.00162 (0.00181)	0.00162 (0.00181)	0.00210 (0.00186)			
Population density		-2.16e-05 (8.08e-06)***	-6.97e-06 (7.20e-06)		-2.13e-05 (8.07e-06)***	-6.76e-06 (7.18e-06)
Standard deviation of lights			-0.0657 (0.00470)***			-0.0656 (0.00469)***
Constant	-1.851 (0.000329)***	-1.844 (0.00261)***	-1.691 (0.0112)***	-1.851 (0.000313)***	-1.845 (0.00261)***	-1.692 (0.0112)***
Regions	31.101	31.101	31.101	31.101	31.101	31.101
Observations	275,298	275,298	275,298	275,298	275,298	275,298
R-squared	0.560	0.560	0.567	0.560	0.560	0.567

FDI by activity: sub-samples by continent

	AFRICA			ASIA			EUR			LAC		
VARIABLES	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog	lightmadminG Rlog
Manufacturing	-0.0179 (0.0352)	-0.0198 (0.0351)	-0.0130 (0.0346)	0.00962 (0.00422)**	0.00949 (0.00422)**	0.00728 (0.00416)*	0.0249 (0.0199)	0.0243 (0.0199)	0.0239 (0.0199)	0.0684 (0.0276)**	0.0686 (0.0276)**	0.0652 (0.0268)**
Extraction	0.323 (0.103)***	0.322 (0.103)***	0.278 (0.0983)***	-0.0800 (0.0935)	-0.0790 (0.0934)	-0.0503 (0.0934)	0.123 (0.156)	0.124 (0.156)	0.146 (0.156)	0.0295 (0.0770)	0.0297 (0.0770)	0.106 (0.0760)
Construction and electricity	0.0344 (0.0525)	0.0370 (0.0527)	0.0389 (0.0525)	-0.00686 (0.0210)	-0.00682 (0.0210)	-7.88e-05 (0.0205)	-0.0215 (0.0329)	-0.0227 (0.0328)	-0.0239 (0.0328)	0.117 (0.0460)**	0.117 (0.0460)**	0.0987 (0.0453)**
Intangible	0.0778 (0.0668)	0.0883 (0.0708)	0.0927 (0.0703)	0.00747 (0.0111)	0.00731 (0.0111)	0.00729 (0.0112)	0.0404 (0.0454)	0.0415 (0.0442)	0.0429 (0.0442)	-0.0592 (0.0616)	-0.0588 (0.0616)	-0.0528 (0.0600)
Commerce	-0.0116 (0.0202)	-0.0102 (0.0203)	-0.00430 (0.0210)	-0.0170 (0.00854)**	-0.0172 (0.00854)**	-0.0168 (0.00843)**	-0.00786 (0.0180)	-0.00831 (0.0181)	-0.00801 (0.0182)	-0.0807 (0.0259)***	-0.0804 (0.0260)***	-0.0643 (0.0276)**
Business services	-0.0330 (0.0336)	-0.0327 (0.0333)	-0.0279 (0.0327)	0.0170 (0.00943)*	0.0171 (0.00945)*	0.0180 (0.00923)*	-0.00735 (0.0198)	-0.00773 (0.0197)	-0.00825 (0.0196)	0.123 (0.0474)***	0.122 (0.0474)**	0.102 (0.0478)**
Other	0.162 (0.0581)***	0.160 (0.0579)***	0.162 (0.0583)***	0.0147 (0.0271)	0.0137 (0.0271)	0.0106 (0.0268)	-0.0599 (0.0475)	-0.0591 (0.0473)	-0.0606 (0.0472)	0.0232 (0.0784)	0.0232 (0.0784)	0.0411 (0.0766)
Population density		-1.42e-05 (1.11e-05)	-2.15e-06 (1.01e-05)		-2.87e-05 (1.08e-05)***	-2.36e-05 (1.06e-05)**		-0.000210 (7.26e-05)***	-0.000205 (7.17e-05)***		-3.20e-05 (3.17e-05)	1.88e-05 (3.35e-05)
Standard deviation of lights			-0.0388 (0.00282)***			-0.0798 (0.00488)***			-0.0359 (0.0127)***			-0.126 (0.00623)***
Constant	-1.597 (0.00158)***	-1.587 (0.00747)***	-1.430 (0.0135)***	-1.933 (0.00108)***	-1.916 (0.00667)***	-1.768 (0.0112)***	-1.807 (0.000737)***	-1.783 (0.00818)***	-1.722 (0.0232)***	-1.948 (0.000436)***	-1.944 (0.00451)***	-1.645 (0.0156)***
Observations	41,316	41,316	41,316	62,833	62,833	62,833	71,461	71,461	71,461	98,495	98,495	98,495
R-squared	0.654	0.654	0.659	0.628	0.628	0.633	0.410	0.410	0.412	0.541	0.541	0.559

robustness tests



alternative lag structure

in usd

without non-OECD high income countries

robustness test

	3 YEAR CUM	3 YEAR CUM	3 YEAR CUM	USD	USD	USD	NO HIGH INCOME
VARIABLES	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog	lightmadminGRlog
Manufacturing	0.0161 (0.00626)***	0.0157 (0.00628)**	0.0134 (0.00624)**	5.21e-05 (1.77e-05)***	5.19e-05 (1.78e-05)***	4.98e-05 (1.78e-05)***	0.00931 (0.00428)**
Extraction	-0.0805 (0.110)	-0.0814 (0.110)	-0.0817 (0.105)	6.06e-05 (5.13e-05)	5.98e-05 (5.13e-05)	5.94e-05 (5.18e-05)	0.0918 (0.0479)*
Construction and electricity	0.0486 (0.0224)**	0.0484 (0.0223)**	0.0472 (0.0223)**	8.55e-06 (2.73e-05)	9.42e-06 (2.74e-05)	1.24e-05 (2.73e-05)	0.00235 (0.0165)
Intangible	0.0144 (0.0172)	0.0145 (0.0172)	0.0120 (0.0180)	0.000115 (9.14e-05)	0.000125 (9.44e-05)	0.000114 (9.57e-05)	0.0111 (0.0106)
Commerce	-0.0319 (0.0119)***	-0.0315 (0.0119)***	-0.0275 (0.0121)**	-0.000156 (8.94e-05)*	-0.000159 (8.93e-05)*	-0.000130 (8.84e-05)	-0.0158 (0.00758)**
Business services	0.0267 (0.0141)*	0.0262 (0.0141)*	0.0282 (0.0138)**	4.50e-05 (0.000300)	4.16e-05 (0.000299)	1.29e-05 (0.000298)	0.0162 (0.00902)*
Other	0.00849 (0.0453)	0.00871 (0.0454)	0.00912 (0.0454)	-5.19e-05 (0.000185)	-5.54e-05 (0.000185)	-1.39e-05 (0.000184)	0.0197 (0.0230)
Population density		-1.49e-05 (9.20e-06)	1.53e-06 (8.30e-06)		-2.17e-05 (8.07e-06)***	-7.11e-06 (7.21e-06)	-7.96e-06 (7.41e-06)
Standard deviation of lights			-0.0691 (0.00550)***			-0.0656 (0.00469)***	-0.0716 (0.00282)***
Constant	-1.865 (0.000468)***	-1.860 (0.00284)***	-1.708 (0.0125)***	-1.851 (0.000195)***	-1.844 (0.00260)***	-1.691 (0.0112)***	-1.614 (0.00736)***
Regions				31.101	31.101	31.101	
Observations	243,555	243,555	243,555	275,298	275,298	275,298	253,998
R-squared	0.578	0.578	0.584	0.560	0.560	0.567	0.562

results

fabrication activities

- Positive association of manufacturing FDI with development
- Some association of extractive FDI

Logistics, Distribution & Transportation, Retail, Sales, Marketing & Support

- Negative association of FDI in commercial activities with development
- Crowding out effects of imported goods on local production?

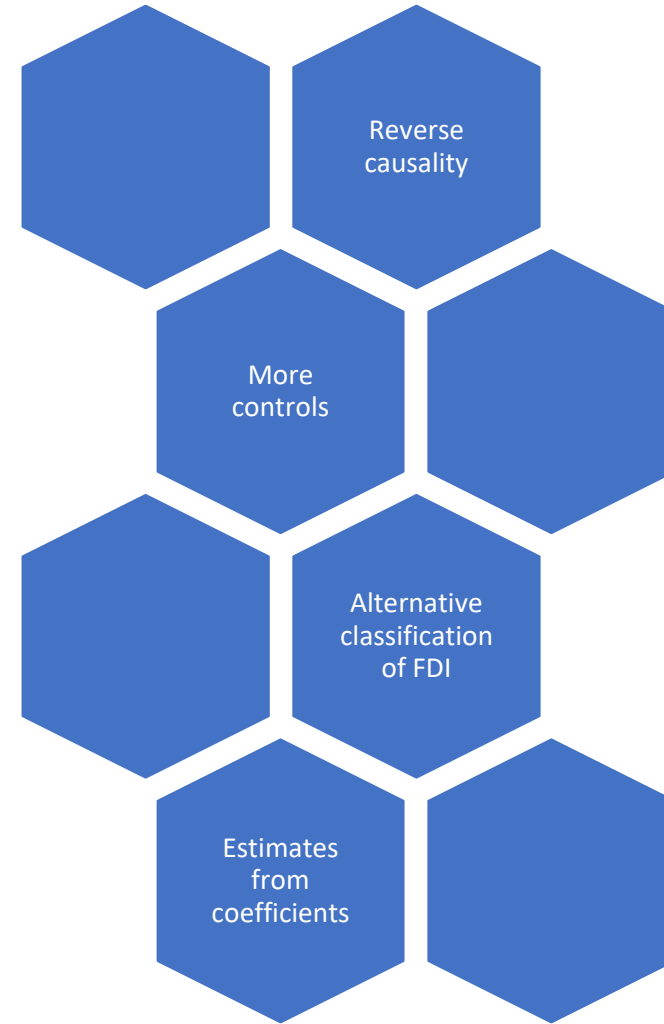
intangible-intensive activities

- Intangible: Headquarters, ICT & Internet Infrastructure, Research & Development
- Do not seem to be associated with development

Conclusion

- **fabrication activities** in the value chain seem to be associated with positive development outcomes
 - **intangible-intensive activities** in the value chain do not seem to be associated with much development outcomes
-
- high returns from intangible-intensive activities might be concentrated in few places and groups and inflate average national outcomes
 - but they are questioned by the consideration of the local level outcomes

Limitations and way forward:
thank you for attention and
comments



basic references

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Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Light growth (ln)	236,482	1.470649	43.11991	0.00	14746.36
FDI all	236,482	0.18449	3.770188	0	402.6667
Manufacturing FDI	236,482	0.048818	0.699536	0	107
Extraction FDI	236,482	0.001332	0.02613	0	1.666667
Construction and electricity FDI	236,482	0.012012	0.183494	0	21
Intangible FDI	236,482	0.019982	0.661642	0	86
Commerce FDI	236,482	0.058609	1.579798	0	155.6667
Business services FDI	236,482	0.033814	0.954269	0	103.3333
Other FDI	236,482	0.009923	0.204057	0	19.33333
Population density	236,482	312.1397	1486.709	1	74277.92
Standard deviation of lights	236,482	1.996455	3.308692	0	141.4143

Sources of data

variable	description	construction	source
Light growth (ln)	Logged growth of nightlight emission	Natural logarithm of the growth of nightlight emission averaged over the region	Li et al. (2020) https://pubmed.ncbi.nlm.nih.gov/32499523/
FDI	Number of fdi in the region classified by activity of sector		fDi Markets
Population density	Population density	Average population density per square km in the region	Oak Ridge National Laboratory; Edward A. Bright, Phillip R. Coleman, Amy N. Rose LandScan Global Population Database Oak Ridge, TN 37831 Oak Ridge National Laboratory LandScan Global Population Database. Population counts at 30 arc second resolution.
Standard deviation of lights	Variability of development in the region	Standard deviation of nightlight emission in the region divided by its mean	Li et al. (2020) https://pubmed.ncbi.nlm.nih.gov/32499523/