Borders and Productivity Spillovers from Foreign Direct Investment - Evidence from Eastern Europe

Work in progress

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Introduction

Together with enterprise creation, encouraging foreign direct investment (FDI) is one of the cornerstones of most industrial policy

- MNEs expected to bring resources, technology, jobs, ...
  - MNEs are more productive

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Together with enterprise creation, encouraging foreign direct investment (FDI) is one of the cornerstones of most industrial policy

- MNEs expected to bring resources, technology, jobs, ...
  - MNEs are more productive
- MNEs also expected affect domestic firms through (positive) indirect/spillover effects
  - 'knowledge' transfer in a broad sense (e.g. pure technology, but also managerial know-how)
    - developing/transition countries!

Introduction

This paper = combination of 3 strands of literature

- Literature on productivity spillovers from foreign to domestic firms
  - Country studies using firm-level data
    - Smarzynska (2004), Damijan et al. (2013); Havranek and Irsova (2011)
- Literature on macro technology transfer across countries
  - Decreases with distance, distance effect weakens over time
    - Keller (2002), Comin, Dmitriev, and Rossi-Hansberg (2012)
- Border effects in trade literature
  - Within country trade dwarfs cross-border trade
    - McCallum (1995, factor 20), Havranek and Irsova (2015)

Introduction

RQ = do cross-border technology spillovers exist and how are they affected by borders?

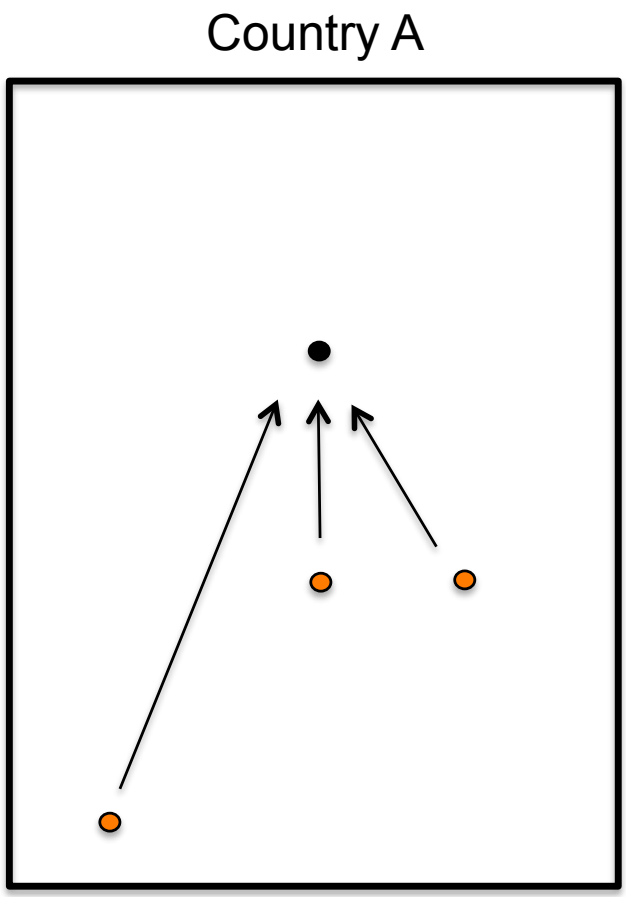
- knowledge spillover effects require interaction between firms, so there is potential for border effects

Preview

productivity spillovers from FDI in multi-country firm-level dataset for 7 Eastern European countries

- confirm country-wide spillovers
- national borders constitute insurmountable barriers for within industry productivity spillover effects
- national borders significantly dampen cross-border spillover effects through supplier-customer relations
  - size of border impact related to '*depth*' of the border

Visually



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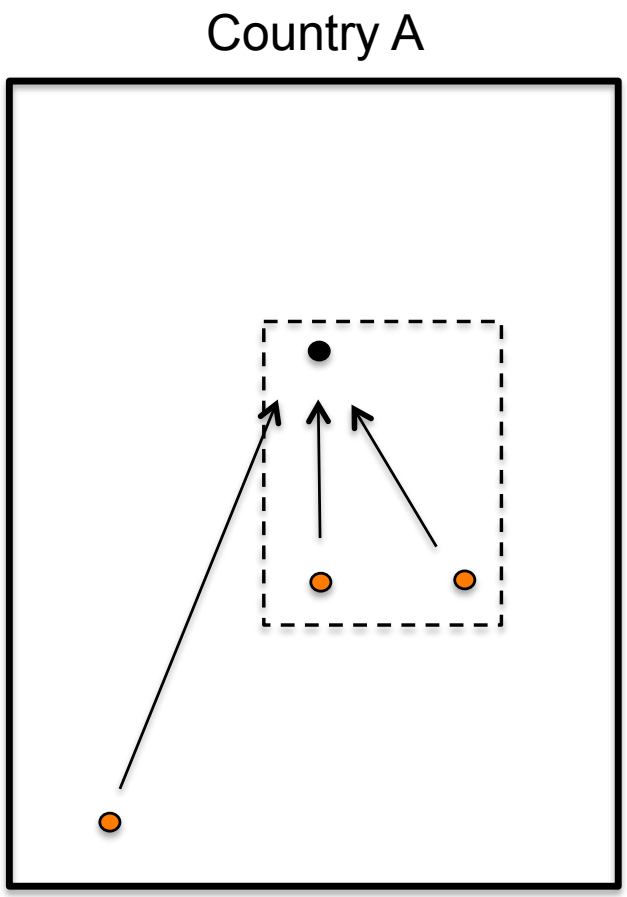

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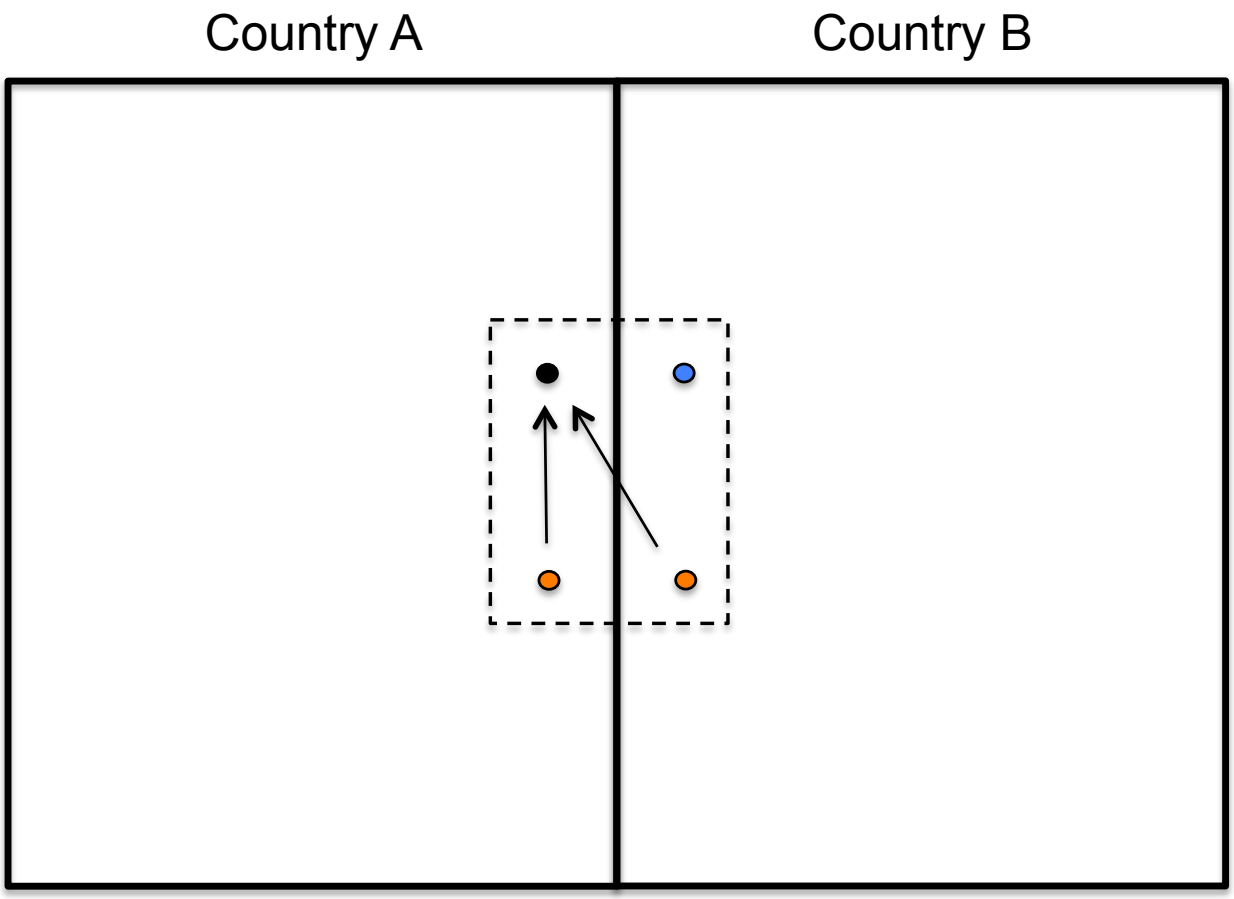

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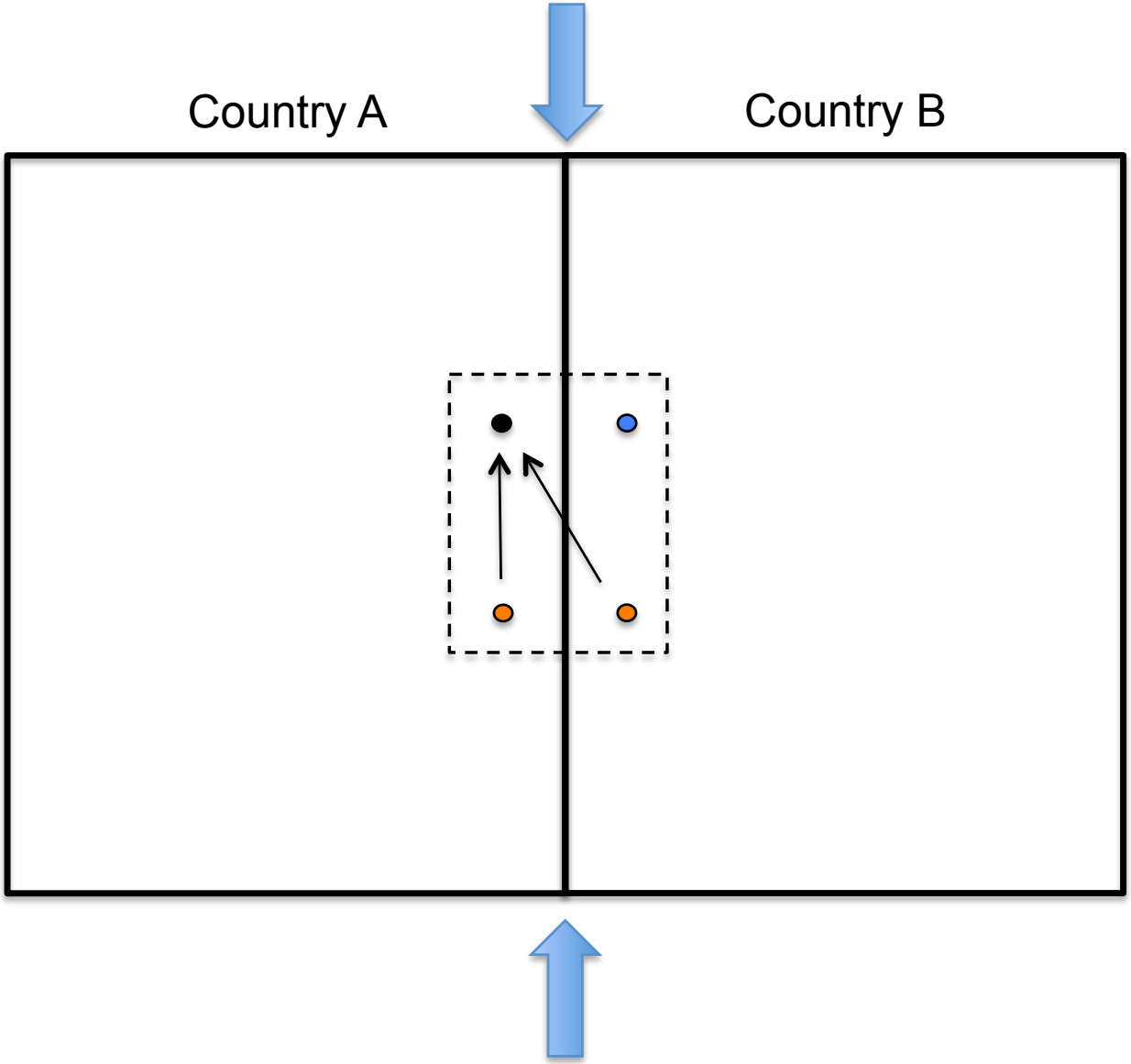


FDI Spillover effects and the supply chain

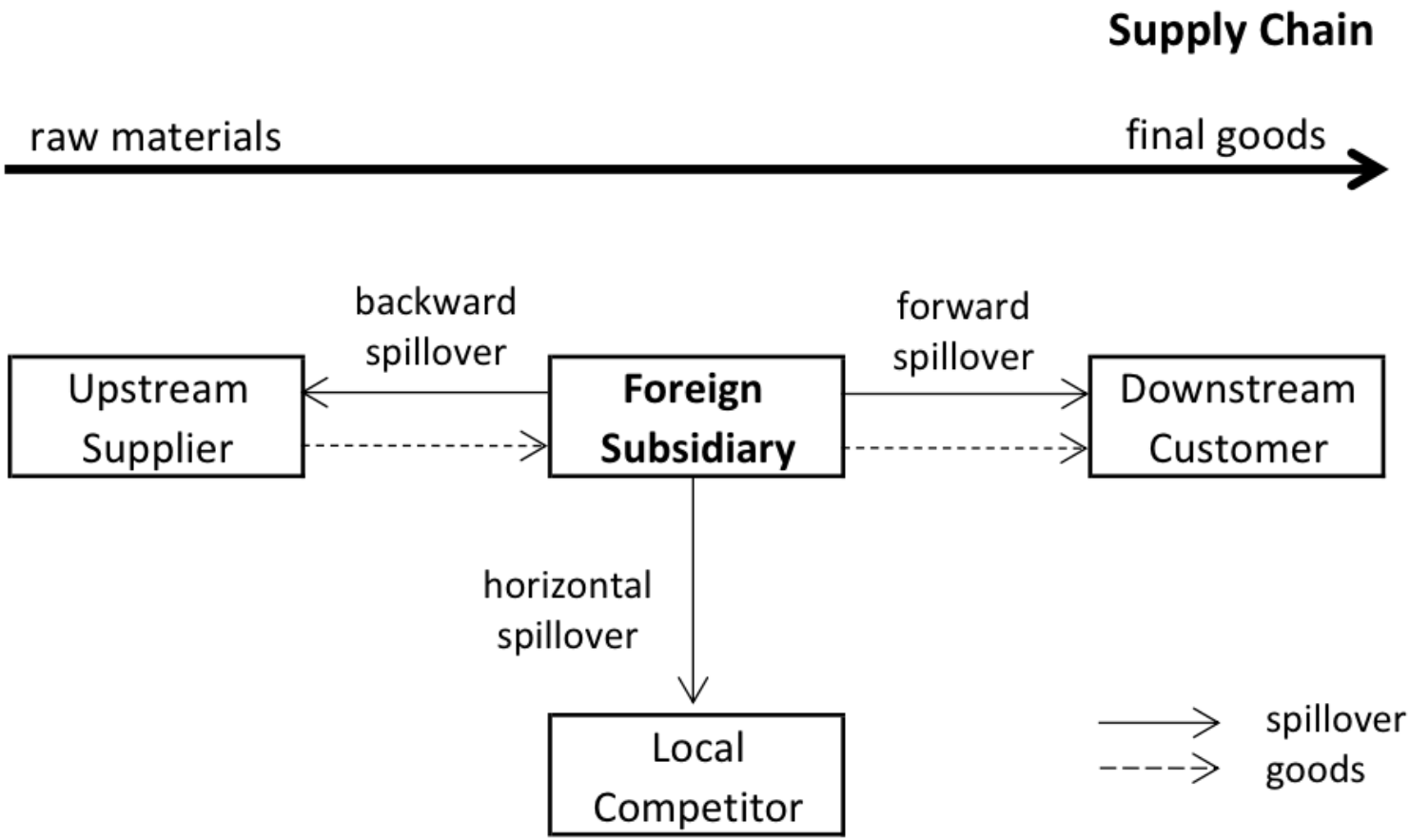


Figure: Spillover effects and foreign and domestic firms' position in the supply chain.

Measurement (1) - Within industry effects

- Measure to proxy foreign presence within industry (*horizontal* spillover effects):

$$HR_{jt} = \frac{\sum_{i \in j} F_{it} * Y_{it}}{\sum_{i \in j} Y_{it}} \tag{1}$$

- Input-output tables for vertical relationships
- Measures proxying upstream and downstream foreign presence using input-output tables (*forward* and *backward* spillover effects):

$$BK_{jt} = \sum_{k} \gamma_{jkt} * HR_{kt} \tag{2}$$

$$FW_{jt} = \sum_{l} \delta_{jlt} * HR_{lt} \tag{3}$$

Empirical framework - Havranek and Irsova (2011, JIE)

- standard approach = analyse FDI spillovers as additional inputs explaining total factor productivity (TFP) in a production function framework
  - (1) Obtain firm-level TFP-measure (WLP-methodology by country-industry)
  - (2) Relate TFP of domestic firms to variables capturing foreign presence (HR, BK, FW) and controls in first differenced specification

$$\Delta TFP_{ijrt} = \psi_1 \Delta f(FDI_{jt-1}) + \psi_2 \Delta Z_{i(j)t-1} + \psi_3 Y_{i(j)t-1} + \alpha_t + \alpha_j + \alpha_r + \epsilon_{ijrt} \quad (4)$$

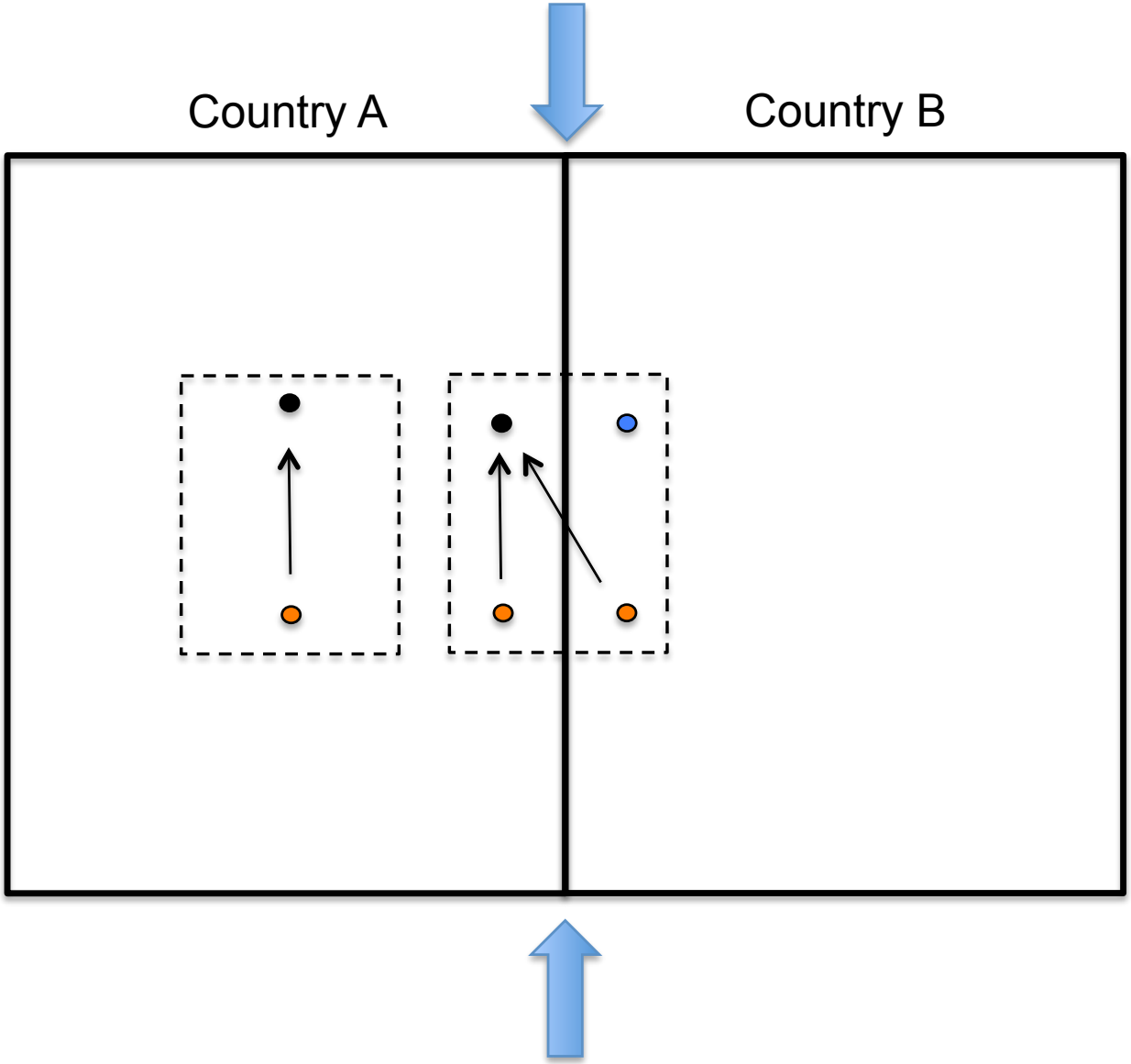
  - *Controls*: (firm-level) age, size, exit; (industry-level) competition, import competition, export orientation

Cross-border spillovers in the standard framework

Analysis

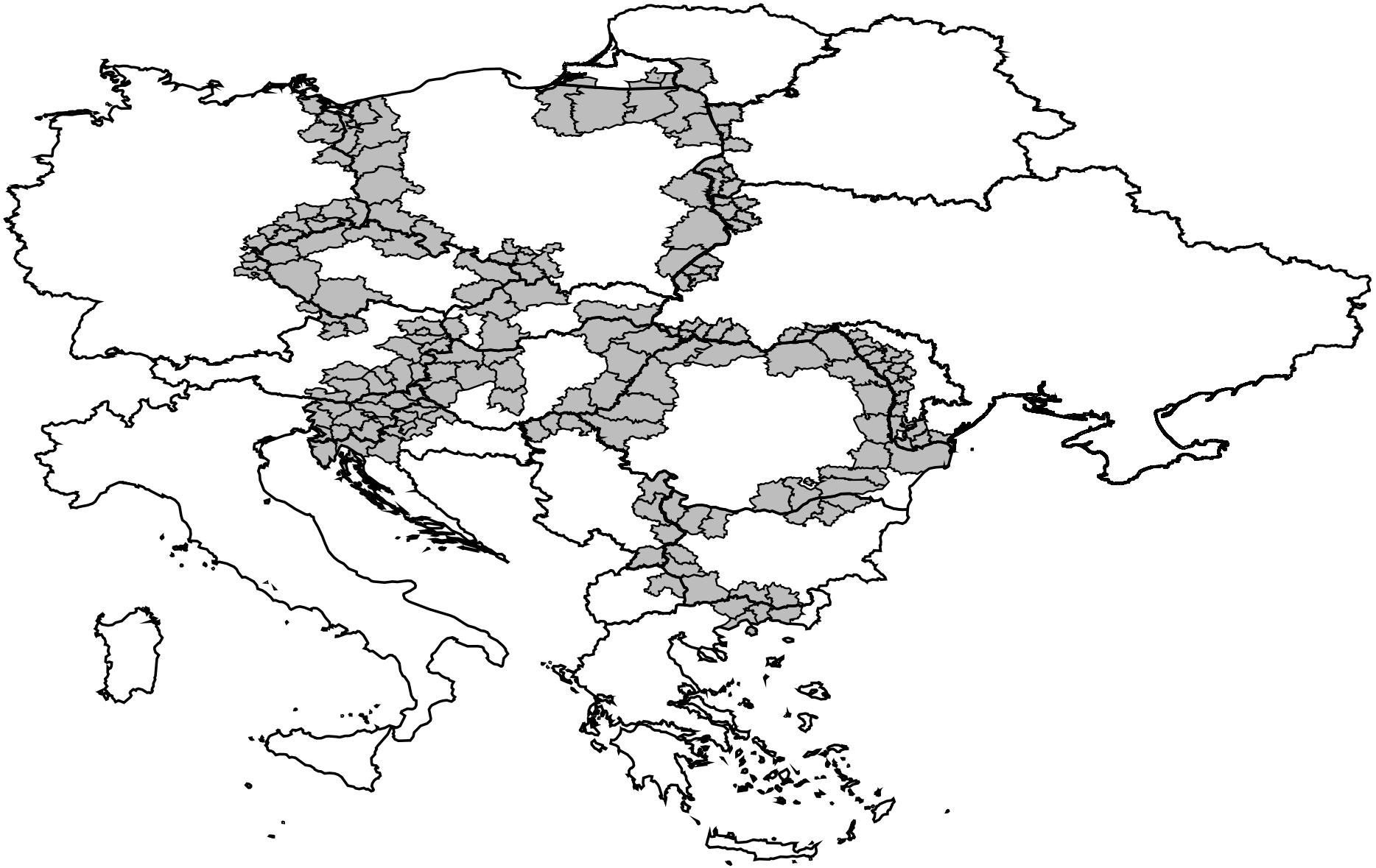
- sample of multiple countries in Eastern Europe (unlike standard)
- use standard spillover variables for 'country-wide' spillovers
- introduce additional variable to capture border effect for domestic firms near the border
  - location of firms in data = NUTS 3-digit region
  - define 'area of interest' for domestic firm: all regions within 75km, also cross-border regions (using NUTS 3-digit capitals to calculate distances between regions)

Identification visualised



Cross-border in the data - Sample countries

Border regions in the data - 75km definition



Cross-border spillovers in the standard framework

- introduce additional variable to capture border effect for firms near the border
  - define 'area of intrest' for domestic firm in border region of 75km

$$HR_{jt}^{AI} = \frac{\sum_{i \in j,75km} F_{it} * Y_{it}}{\sum_{i \in j,75km} Y_{it}} \tag{5}$$

Cross-border spillovers in the standard framework

split the variable in a home and a cross-border component

$$HR_{jt}^{AI} = \frac{\sum_{i \in j,75km,home} F_{it} * Y_{it}}{\sum_{i \in j,75km} Y_{it}} + \frac{\sum_{i \in j,75km,cross-border} F_{it} * Y_{it}}{\sum_{i \in j,75km} Y_{it}} \quad (6)$$

$$HR_{jt}^{AI} = HR_{jt}^{AI-H} + HR_{jt}^{AI-CB} \quad (7)$$

- backward and forward spillover variables follow

Data, distribution of foreign firms across countries

- datasource Augmented Amadeus, period 2000-10

Table 1: Number of foreign firms by country

	10% ownership		50% ownership	
Country	Number	Percentage	Number	Percentage
Austria	10,749	7.47	8,179	7.35
Bulgaria	1,046	0.73	706	0.63
Belarus	653	0.45	653	0.59
Czech Republic	4,418	3.07	3,936	3.54
Germany	60,706	42.18	43,170	38.82
Greece	1,077	0.75	847	0.76
Croatia	1,120	0.78	1,038	0.93
Hungary	3,870	2.69	2,449	2.2
Italy	6,882	4.78	5,460	4.91
Moldova	20	0.01	20	0.02
Macedonia	692	0.48	692	0.62
Poland	9,554	6.64	8,139	7.32
Romania	17,930	12.46	11,675	10.5
Serbia	21,321	14.81	21,321	19.17
Russia	1,971	1.37	1,442	1.3
Slovenia	756	0.53	569	0.51
Slovakia	983	0.68	780	0.7
Ukraine	172	0.12	135	0.12
Total	143,920	100	111,211	100

Cross-border backward spillovers do exist, but are smaller

Table 4: Home country and cross border FDI spillover effects

	(1)	(2)	(3)	(4)
Home country spillover effects				
Country-wide				
Horizontal^{CW}	0.270***	0.274***	0.270***	0.274***
	[0.045]	[0.043]	[0.045]	[0.043]
Backward^{CW}	1.686***	1.695***	1.695***	1.701***
	[0.204]	[0.210]	[0.205]	[0.210]
Forward^{CW}	-0.868***	-0.865***	-0.881***	-0.877***
	[0.154]	[0.148]	[0.154]	[0.148]
Area of interest vs. country-wide				
Horizontal^{AI-H}		-0.022		-0.022
		[0.071]		[0.071]
Backward^{AI-H}		-0.066		-0.047
		[0.197]		[0.196]
Forward^{AI-H}		0.011		-0.004
		[0.185]		[0.182]
Cross-border spillover effects				
Area of interest				
Horizontal^{AI-CB}			0.055	0.055
			[0.069]	[0.069]
Backward^{AI-CB}			1.019***	1.021***
			[0.263]	[0.265]
Forward^{AI-CB}			0.202	0.197
			[0.206]	[0.208]
Observations	314,150	314,150	314,150	314,150
R-squared	0.116	0.116	0.116	0.116

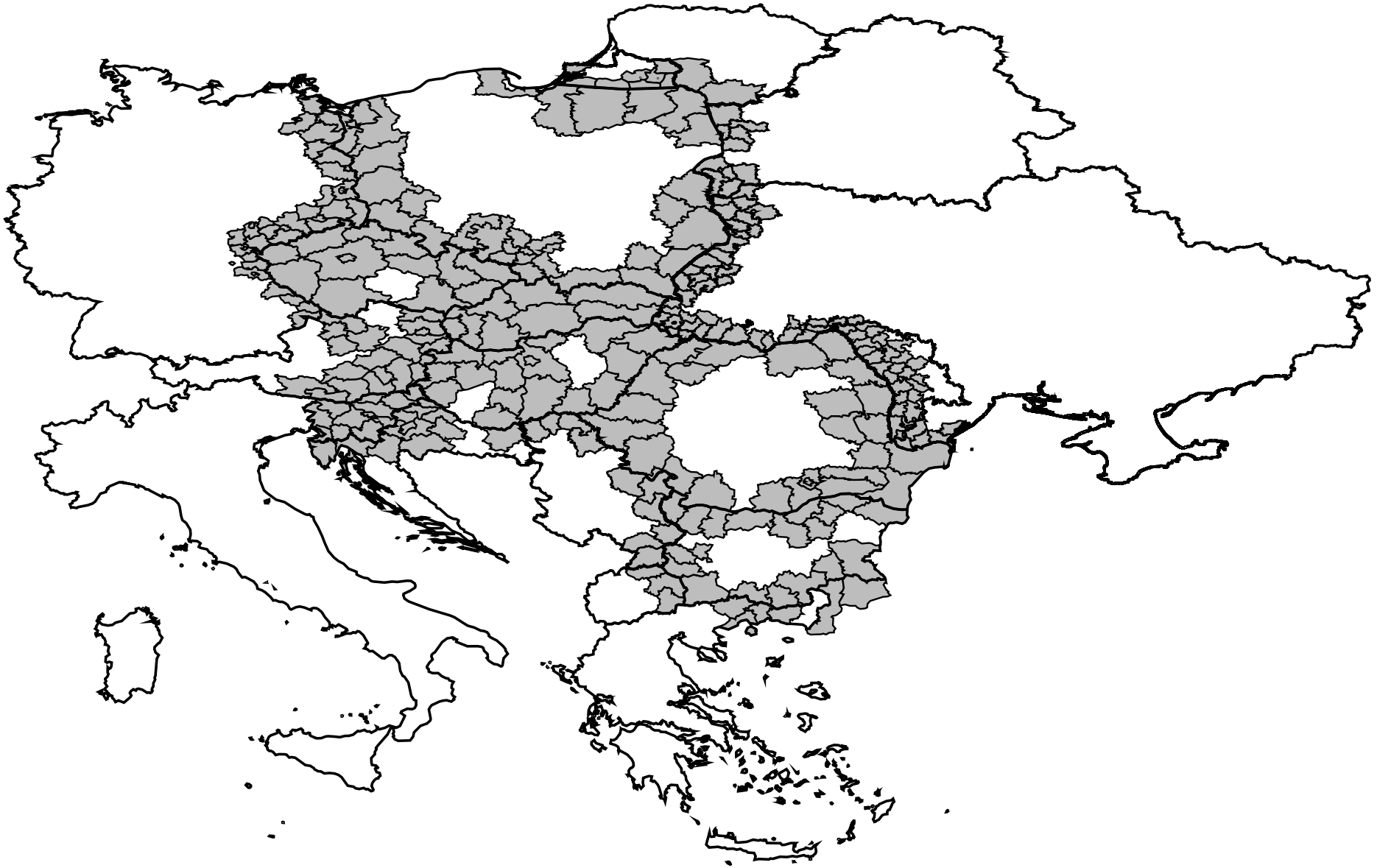
Border Heterogeneity: Schengen vs. Non-Schengen

Border Heterogeneity: Schengen vs. Non-Schengen

Border Heterogeneity: Schengen vs. Non-Schengen

	(1)	(2)
Home country spillover effects		
Country-wide		
Horizontal^{CW}	0.274***	0.277***
	[0.045]	[0.043]
Backward^{CW}	1.713***	1.716***
	[0.207]	[0.212]
Forward^{CW}	-0.833***	-0.835***
	[0.152]	[0.146]
Area of interest vs. country-wide		
Horizontal^{AI-H}		-0.020
		[0.071]
Backward^{AI-H}		-0.026
		[0.194]
Forward^{AI-H}		0.025
		[0.180]
Cross-border spillover effects		
Area of interest - Schengen border		
Horizontal$^{AI-CB-SH}$	0.097	0.097
	[0.072]	[0.072]
Backward$^{AI-CB-SH}$	1.292***	1.288***
	[0.299]	[0.302]
Forward$^{AI-CB-SH}$	0.284	0.286
	[0.266]	[0.268]
Area of interest - Non-Schengen border		
Horizontal$^{AI-CB-NSH}$	0.031	0.031
	[0.080]	[0.080]
Backward$^{AI-CB-NSH}$	0.873***	0.871***
	[0.281]	[0.284]
Forward$^{AI-CB-NSH}$	0.131	0.133
	[0.255]	[0.256]
Observations	314,150	314,150
R-squared	0.116	0.116

Robustness - 100km definition + foreign ownership 10%



Robustness - 100km definition + foreign ownership 10%

	(1) $75km-10\%$	(2) $100km-50\%$	(3) $100km-10\%$
Home country spillover effects			
Country-wide			
Horizontal^{CW}	0.289***	0.267***	0.296***
	[0.043]	[0.045]	[0.045]
Backward^{CW}	1.759***	1.641***	1.731***
	[0.210]	[0.219]	[0.229]
Forward^{CW}	-0.845***	-1.033***	-1.021***
	[0.146]	[0.162]	[0.158]
Area of interest vs. country-wide			
Horizontal^{AI-H}	-0.024	0.017	-0.033
	[0.068]	[0.050]	[0.048]
Backward^{AI-H}	-0.245	0.161	-0.081
	[0.184]	[0.171]	[0.175]
Forward^{AI-H}	0.049	0.423***	0.428***
	[0.170]	[0.142]	[0.120]
Cross-border spillover effects			
Area of interest - Schengen border			
Horizontal$^{AI-CB-SH}$	0.042	0.184**	0.112
	[0.078]	[0.091]	[0.094]
Backward$^{AI-CB-SH}$	1.077***	0.944***	0.971***
	[0.277]	[0.311]	[0.286]
Forward$^{AI-CB-SH}$	-0.127	0.382	-0.153
	[0.278]	[0.250]	[0.262]
Area of interest - Non-Schengen border			
Horizontal$^{AI-CB-NSH}$	0.002	0.308	0.179
	[0.070]	[0.201]	[0.190]
Backward$^{AI-CB-NSH}$	0.676***	0.531*	0.398
	[0.254]	[0.304]	[0.280]
Forward$^{AI-CB-NSH}$	-0.074	0.095	-0.121
	[0.251]	[0.292]	[0.269]
Observations	305,251	314,150	305,251
R-squared	0.115	0.117	0.115

Conclusion

productivity spillovers from FDI in multi-country firm-level dataset for 7 Eastern European countries

- country-wide spillovers exist and largely confirm earlier findings for single country setting
- national borders constitute insurmountable barriers for horizontal and forward productivity spillover effects
- national borders significantly dampen cross-border backward spillover effects
  - size of border impact seems related to '*depth*' of the border: non-Schengen borders are more detrimental than Schengen borders