The limits of foreign-led growth: Demand for digital skills by foreign and domestic firms in Slovakia

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NATIONAL BANK OF SLOVAKIA
EUROSYSTEM

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The background story

- In 1993, Slovak economy was hopelessly backwards, communist-era industrialization resulted in “pure socialist output” (Balcerowitz 1996) -> huge decline in output, unemployment spike
- Foreign firms important in the process of transformation and modernization of the Slovak economy (Havlat et al., 2018)
- Slovakia has converged to 76% of the EU average, but convergence stopped since the Great Recession -> “middle income trap”?
- Common narrative: Extensive growth potential limited, need to focus on innovations, digital etc.

Theoretical framework – global production networks

- Slovakia's role in the Global production networks – Integrated periphery

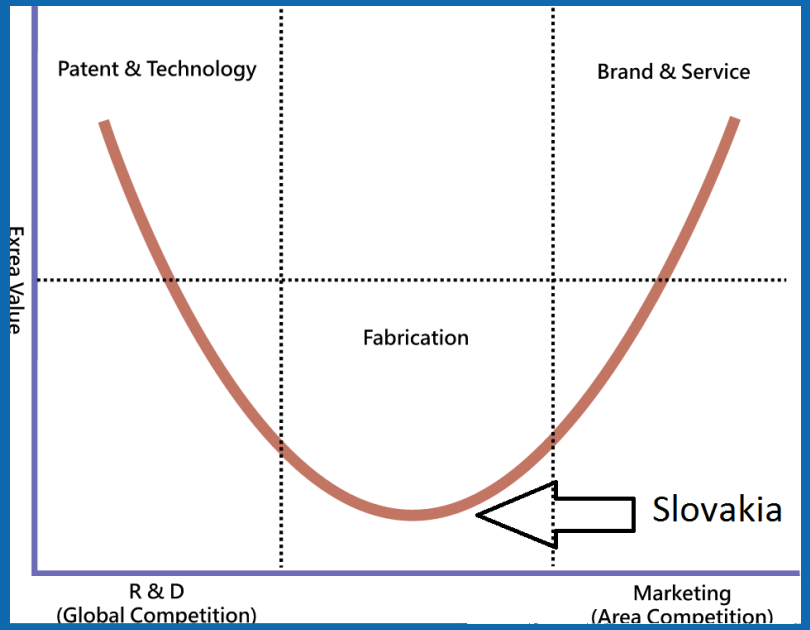
- Strong integration into global value chains…

	Import content of exports, %, 2014	FDI stock, % of GDP, 2017		Foreign control of enterprises, %, 2016	
		Inward	Outward	Value added	Employment
Slovakia	48.19	54.9	3.3	48.1	28.5
Czechia	46.61	65.1	11.6	43.3	27.6
Hungary	47.31	61.2*	20.0*	51.4	25.7
Poland	32.98	42.9	5.4	36.8	29.3
Germany	25.35	24.2	40.9	24.8	11.2
UK	21.87	57.5	58.1	28.0	19.0
France	26.27	31.8	52.8	16.4	11.0
EU19 (EMU)	26.57				
EU28				24.6	15.3

Theoretical framework – global production networks

- Slovakia's role in the Global production networks – Integrated periphery

- …but mainly in the low value added activities



Implications of integrated periphery status for firms

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- Value added created mainly by transnational corporations (TNCs) – mainly in manufacturing (particularly cars, electronics), but also shared service centers.

- Domestic firms typically limited to subordinate role of suppliers of simpler components and services that rely on low-skilled labor (Humphrey and Memedovic, 2003)… except for unicorns (anti-virus software, GPS software, the "flying cars" (?))

- The TNCs offer significantly higher salaries, invest more in R&D and focus on more complex activities than domestic firms.

The digital revolution and the integrated periphery

- The lion share of high-value activities in TNCs concentrated in the home country (Pavlínek, 2016),
- Possible parallel innovation systems (Radosevic et al., 2010)
  - TNCs focusing on strictly "downstream" production upgrades – Slovakia one of world leaders in industrial robotization
  - Small, localized (unicorns based) second innovation cluster focusing on upstream R&D, knowledge intensive activities

Implication for skills

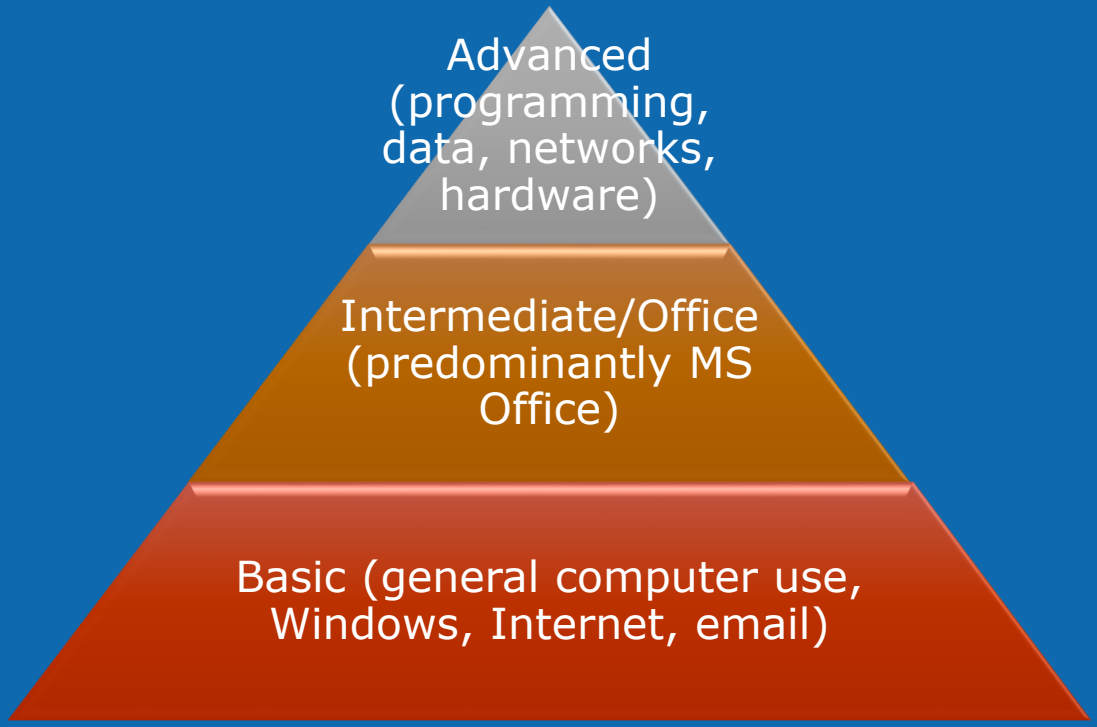
- The position of Slovakia as an integrated periphery country has important implications for the human capital demand. Our expectations:
  - Complex (ISCO 2,3) activities requiring skilled labor concentrated in TNCs. Domestic companies more likely to employ less skilled workers (in particular ISCO 7,8)
  - Digital skills requirements unclear. Might be dominated by TNCs (because their greater innovativeness in general), but also by domestic firms (unicorns)

Data

- Datasets used:
  - Complete database of the leading job website profesia.sk (70% market share) for the period of 2011-2017 (1,250,000 unique vacancies) from which we get
    - ISCO (profesia uses its own classification, which we manually recoded to ISCO)
    - Minimum required education (elementary, secondary (w/wo maturita), tertiary)
    - Region (we ended up using just Bratislava/rest of the country)
    - Skill requirements (list of 220 checkboxes the employer could choose from when positing a vacancy)
  - Firms registry
    - Firm size (<10 workers, 10-99, 100-999, 1000+)
    - Ownership (private, foreign, mixed)
  - We used the firm identification number (IČO) to match the individual observations

Digital skills classification

- In line with Beblavý et al. (2016) we distinguish 3 groups of digital skills:

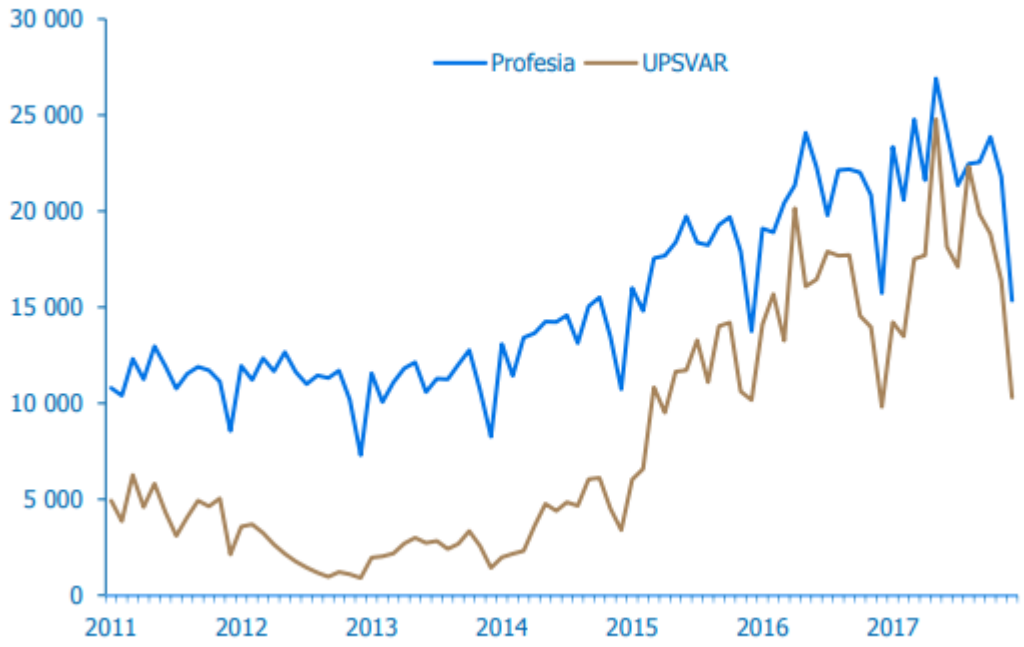


Problems encountered while merging datasets

- In general we were very successful, being able to merge 98% of observations (the rest probably typos in IČO)
- But about 350,000 vacancies were posted by personnel agencies, where we did not know if the actual employer is domestic of foreign
- Accessing company register was not a problem for us, but might have been if we were not affiliated with a public sector institution
- Privacy concerns, matching had to be done by profesia.sk. They were super nice and professional though <3
- Representativeness concerns

Data benchmarking

Figure 1 Inflow of vacancies posted on the Profesia job portal and registered by the Public Employment Agency



Sources: Profesia, UPSVaR.

Data benchmarking

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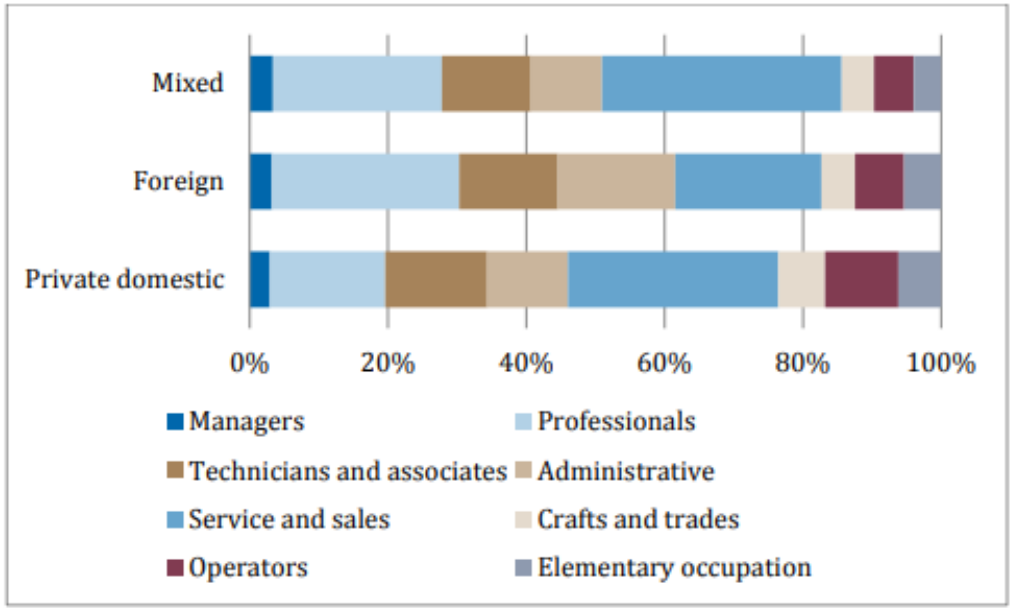
Table 3 Share of civilian occupational groups in vacancies published on the Profesia portal compared with the Public Employment Agency register

ISCO	2011	2012	2013	2014	2015
Managers (ISCO 1)	5% (1%)	4% (-1%)	4% (-1%)	3% (-3%)	3% (0%)
Professionals (ISCO 2)	29% (15%)	28% (14%)	27% (13%)	25% (8%)	23% (11%)
Technicians and associates (ISCO 3)	15% (-5%)	15% (-1%)	15% (-2%)	15% (0%)	14% (-1%)
Administrative (ISCO 4)	14% (3%)	14% (4%)	14% (3%)	13% (1%)	13% (2%)
Service and sales (ISCO 5)	22% (9%)	22% (-4%)	22% (1%)	21% (0%)	21% (-1%)
Skilled agricultural, forestry and fishery workers (ISCO 6)	0% (-1%)	0% (-1%)	0% (-1%)	0% (-1%)	0% (-1%)
Crafts and trades (ISCO 7)	6% (-8%)	7% (-4%)	7% (-4%)	7% (-5%)	7% (-8%)
Operators in production (ISCO 8)	7% (-10%)	7% (-6%)	7% (-5%)	9% (-3%)	12% (-3%)
Elementary occupations (ISCO 9)	3% (-4%)	4% (0%)	4% (-2%)	5% (0%)	6% (-2%)

Note: Figures given in brackets represent the difference in the share of individual occupational groups in the vacancies registered by UPSVR

Results: Occupational Structure

Figure 3 Occupational structure per company ownership



Results: Occupational Structure

Table 6 Digital skill requirements breakdown per ISCO occupation group

	Basic digital skills			Intermediate digital skills			Advanced digital skills		
	Dom	For	Mix	Dom	For	Mix	Dom	For	Mix
Managers (ISCO 1)	**24%**	15%	19%	**77%**	51%	50%	4%	5%	4%
Professionals (ISCO 2)	**12%**	7%	5%	**37%**	27%	28%	**31%**	16%	15%
Technicians and associates (ISCO 3)	**21%**	10%	11%	**66%**	48%	45%	9%	11%	8%
Administrative (ISCO 4)	**23%**	11%	13%	**73%**	*46%*	60%	4%	4%	6%
Service and sales (ISCO 5)	15%	15%	11%	38%	36%	40%	1%	1%	1%
Crafts and trades (ISCO 6)	9%	10%	8%	18%	**34%**	23%	2%	3%	2%
Operators in production (ISCO 7)	4%	4%	5%	10%	**18%**	11%	1%	1%	1%
Elementary occupations (ISCO 8)	4%	2%	1%	9%	8%	4%	0%	1%	0%

Note: Bold denotes the largest value within each particular occupational and skill group as long as they are at least five percentage points higher than the second highest value. Italics denote the smallest value within each particular occupational and skill group as long as they are at least five percentage points lower than the second lowest value.

ISCO	1	2	3	4	5	7	8	9
Basic Skills								
Capital	-0.0527***	-0.0323***	-0.0434***	-0.0312***	-0.00786***	-0.000948	0.0124***	0.000178
Mixed ownership	-0.0509***	-0.0216***	-0.0518***	-0.0430***	-0.00807***	0.0128***	0.0107***	-0.00842***
Foreign ownership	-0.0798***	-0.00834***	-0.0454***	-0.0473***	-0.0107***	0.0132***	0.00389***	-0.00718***
10 - 99 empl.	0.0211***	0.0191***	-0.0420***	0.00239	0.00329*	0.0142***	0.00931***	-0.00187***
100 - 999 empl.	0.0455***	-0.0154***	-0.0708***	-0.0189***	0.0175***	-0.0180***	-0.00713***	-0.000119
> 1,000 empl.	-0.0812***	-0.0595***	-0.128***	-0.124***	-0.118***	-0.0546***	-0.0378***	-0.0183***
Primary					-0.0611***		-0.0522***	-0.0112***
Without exam				-0.0609***	-0.0683***	-0.0459***	-0.0135***	-0.00704***
College	-0.0387***	-0.0221***	-0.0466***	-0.0362***	-0.0256***			
Office Skills								
Capital	-0.0700***	-0.0706***	-0.0593***	-0.0290***	-0.0192***	0.0325***	0.0344***	-0.00635***
Mixed ownership	-0.173***	-0.0678***	-0.154***	-0.0678***	0.0554***	0.0371***	0.00142	-0.0131***
Foreign ownership	-0.200***	-0.0330***	-0.112***	-0.135***	-0.0422***	0.113***	0.0605***	0.0116***
10 - 99 empl.	0.0543***	0.0890***	0.0153***	-0.0338***	0.00738**	0.0230***	0.00633*	-0.00516**
100 - 999 empl.	-0.0207	0.0462***	-0.0517***	-0.144***	-0.0381***	0.0172**	-0.00352	-0.0100***
> 1,000 empl.	-0.223***	-0.0197***	-0.162***	-0.354***	-0.286***	-0.0294***	-0.0138***	-0.0624***
Primary					-0.381***		-0.225***	-0.0978***
Without exam				-0.364***	-0.249***	-0.277***	-0.0943***	-0.0526***
College	-0.0306***	-0.0132***	-0.0599***	-0.0418***	0.0282***			
Advanced Skills								
Capital	0.00223	-0.0259***	-0.00796***	-0.00509***	0.000666***	0.00109	0.00267***	-0.000310***
Mixed ownership	0.00936**	-0.0330***	0.00657**	0.0124***	0.00207***	0.00330**	0.00366***	0.000510**
Foreign ownership	0.0164***	-0.0909***	0.00968***	0.00929***	0.00230***	0.00271***	0.00228***	0.000730***
10 - 99 empl.	-0.00659*	0.0447***	0.00230	-0.00783***	9.23e-05	-0.00537***	-0.00196***	0.000100
100 - 999 empl.	0.000670	-0.0803***	-0.0233***	-0.0107***	-0.000238	-0.00326***	-0.00162***	-0.000388**
> 1,000 empl.	-0.0266***	-0.146***	-0.0434***	-0.0130***	-0.00371***	-0.00372**	-0.00467***	-0.000833***
Primary					-0.00805***		-0.00814***	-0.00153***
Without exam				-0.0527***	-0.00436***	-0.0237***	-0.00523***	-0.00150***
College	0.00562**	-0.0746***	-0.00857***	0.0117***	5.56e-05			
Observations	21,213	151,51	97,897	93,745	170,379	41,757	52,879	35,176

Note: All regressions are controlled for year and sector fixed effects

Sectoral view: Manufacturing vs. IT

Table 9 Regression-based average marginal coefficients for demand for digital skills in foreign owned companies compared to domestic owned ones, by occupation for IT and manufacturing sectors

ISCO	1	2	3	4	5	7	8	9
Manufacturing								
Basc	**-8.41%**	**-5.05%**	**-4.62%**	**-2.62%**	**-9.75%**	**3.16%**	**0.67%**	**1.21%**
Office	**-7.49%**	**-4.46%**	**-6.16%**	-1.14%	**-2.68%**	**11.30%**	**3.92%**	**3.05%**
Advanced	**4.81%**	**2.18%**	**3.17%**	**6.18%**	**0.77%**	**-0.30%**	**0.63%**	0.00%
IT								
Basic	**-6.48%**	**-0.39%**	**-2.32%**	**-1.81%**	**-3.58%**			
Office	**-3.15%**	**-3.51%**	**-4.28%**	**-14.30%**	**-11.70%**			
Advanced	0.28%	**-24.00%**	**-13.40%**	**-0.53%**	**-0.31%**			

Note: controlled for being located in Bratislava, size of the company, education requirements and year fixed effect. Coefficients in bold significant at 5% threshold.

Robustness check: language

Table 13 Regression results foreign language skills

ISCO	1	2	3	4	5	7	8	9
Capital	0.0865***	0.0625***	0.0583***	0.0988***	0.141***	0.0247***	0.00822**	0.0668***
Mixed ownership	0.0491***	-0.0286***	0.115***	0.0932***	0.0472***	0.0659***	0.0254***	0.0921***
Foreign ownership	0.0752***	0.0236***	0.147***	0.109***	0.0674***	0.197***	0.0650***	0.0426***
10 - 99 empl.	-0.0533***	0.0244***	0.0175***	-0.0734***	-0.0418***	-0.0858***	-0.0591***	-0.0364***
100 - 999 empl.	-0.123***	-0.0797***	-0.0368***	-0.111***	-0.0831***	-0.156***	-0.143***	-0.0402***
> 1,000 empl.	-0.225***	-0.0229***	-0.0729***	-0.110***	-0.284***	-0.231***	-0.203***	-0.196***
Priamary					-0.230***		-0.186***	-0.209***
Without exam				-0.358***	-0.225***	-0.362***	-0.143***	-0.163***
Collage	0.334***	-0.00146	0.231***	0.113***	0.377***			
Sector dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	21,213	151,51	97,897	93,745	170,379	41,757	52,879	35,176

Conclusions

- In line with our expectations, TNCs do have on average higher skill requirements than domestic firms
- But when domestic firms hire qualified workers, there are more likely to require digital skills. This is especially the case for advanced digital skills applicable in professional occupations
- Policy implications:
  - Due to higher wages the most skilled workers on the market my end up working for TNCs, which might not position them very well in the digital transformation.
  - Public support is often directed primarily to TNCs (investment subsidies, tax breaks, infrastructure expenditure), while it might be more efficient to focus on developing domestic unicorns (like start ups)