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Prostorové diferenciace a vývojové asymetrie ekonomik v globalizovaném prostředí

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Habilitační práce

2023

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Poděkování

Chtěl bych vyjádřit své poděkování kolegům za odborné rady a konstruktivní kritiku pro zdokonalení obsahu této práce. Poděkování patří také spoluautorům odborných článků z Česka a Polska za důležitou spolupráci a podněty, které společným úsilím přispěly k jejich zpracování.

Zvláště děkuji své rodině za podporu a trpělivost během tvorby práce, nepostradatelné v průběhu celé doby, co jsem se věnoval psaní.

Anotace

Předložená práce navazuje na jedno z hlavních témat výzkumu v oboru regionální ekonomie, kterým je analýza regionálních rozdílů, povahy vývojových procesů a meziregionálních souvislostí. Výzkum se zaměřil na zhodnocení vývojových procesů v prostoru, jejich konvergenční nebo divergenční charakter a formuluje závěry poukazující na některé pravidelnosti ve vývojových procesech na různých měřítkových úrovních regionů.

Práce je tvořena souborem odborných článků a zhodnocením jejich výsledků v kontextu řešené problematiky. Pro výzkum byla použita data z databází národních statistických úřadů, z databáze Eurostatu a vlastních šetření, které byly zpracovány na různých úrovních územních jednotek, od okresů, krajů, regionů NUTS II po mezinárodní komparace se zaměřením na Česko a jeho regiony.

Bylo zjištěno, že dopad přílivu finančních zdrojů přicházejících do regionů v různé míře koresponduje s vývoji jiných socioekonomických ukazatelů územních jednotek, vyšší míra podobnosti se projevila spíše v makroekonomických ukazatelích. Jejich vazba na sociální oblast, a v jednom z výzkumů mapované environmentální a institucionální aspekty (na příkladu networkingu rozvoje klastrových iniciativ), byla méně významná.

Výsledky z výzkumů také prokázaly přetrvávající význam aglomeračních faktorů, vedoucí k silnějším konvergenčním tendencím spíše v intraregionální než mezi meziregionální dimenzi, kde jsou na příkladě analýzy různých ukazatelů výraznější divergentní tendence. V tomto kontextu se objevují vývojové asymetrie, u kterých lze předpokládat, že budou směřovat k existenci dlouhodobých prostorových diferenciací mezi regiony s odlišnými charakteristikami, a to na všech sledovaných úrovních územních jednotek.

Klíčová slova

region, ekonomika, vývojové procesy, konvergence, divergence

Title

Spatial Differentiation and Developmental Asymmetries of Economies Focusing on the Position of the Czech Republic and its Regions

Annotation

This paper is based on some of the main research topics in the field of regional economics, which are the analyses of regional differences, the character of development processes and interregional linkages. The research examines the development processes in space, their convergence or divergence character, and formulates conclusions pointing to some regularities in development processes on different levels within the regions.

The thesis consists of a collection of scientific articles and an evaluation of the results in the context of the problem under investigation. For the research, data from national statistical offices and the Eurostat database was applied. Research was also focused on different levels of territorial units, districts, regions, NUTS II regions as well as comparisons between the Czech Republic and its regions at an international level.

It was found that the impact of inflow of financial resources to the regions corresponds in varying degrees with the development of other socio-economic indicators for territorial units. A higher degree of similarity is more evident in macroeconomic indicators; their link to social sphere and one of the research mapped environmental and institutional aspects (in the example of networking of cluster development initiatives) was less significant.

The results of the research also showed the persistent importance of agglomeration factors, leading to stronger convergence tendencies in the intra-regional rather than inter-regional dimension, where divergent tendencies are more pronounced, as exemplified by the analysis of various indicators. In this context, development asymmetries emerge which can be expected to lead to the existence of long-term spatial differentiations between regions with different characteristics at all levels within the territorial units under consideration.

Key words

region, economy, development processes, convergence, divergence

Seznam tabulek

Obsah

Úvod

Habilitační práce navazuje na diskuzi v oboru regionální ekonomie ve stěžejní tématice oboru, kterou je zhodnocení příčin rozdílného vývoje územních jednotek a diverzifikované ekonomické reality. Vědecké poznání asymetrií a jejich příčin vyžaduje hlubší pochopení regionálních konvergenčních a divergenčních procesů a jejich dopadu na ekonomické prostředí, proč dochází k nárůstu diferenciací a vývojových asymetrií nebo jejich zmírňování v různých oblastech ekonomiky a přeneseně i celých regionů. Nalezení prostorových asymetrií ve vývoji regionálních ekonomik poukazuje na nerovnoměrné rozložení zdrojů, případně jejich nedostatečné využití. Asymetrie se mohou týkat řady ekonomických, sociálních, environmentálních, demografických a infrastrukturních faktorů (Crescenzi a Iammarino, 2017; Charron, 2016) a mohou se vyskytovat na různých měřítkových úrovních.

V rámci vědního oboru regionální ekonomie je proto nezbytné sledovat, jak se vyvíjejí konvergenční a divergenční procesy, které se diferencovaným způsobem promítají do různých sfér regionálních ekonomik. Zatímco ekonomická konvergence přispívá vyrovnání meziregionálních rozdílů a dosažení rovnoměrnějšího rozvoje, což zmírňuje ekonomické, ale i sociální nerovnosti, divergence způsobuje jejich prohlubování, vytváření ekonomických a sociálních problémů, které mohou vést až k oslabení socioekonomické soudržnosti a polarizaci vztahů mezi územními jednotkami. Prostorová asymetrie se vztahuje k nerovnoměrnému rozdělení zdrojů a způsobů jejich využití v prostoru, proto jsou klíčovými tématy oboru analýzy prostorových rozdílů, prostorových interakcí a interpretací kontinuálně probíhajících vývojových trajektorií.

V současnosti probíhající ekonomická globalizace v mnoha aspektech působí na akceleraci regionálních ekonomických změn (Ouedraogo et al., 2023; Fritz et al., 2022; Barrientos, et al., 2016). Regiony se v důsledku globalizace ocitly v intenzivnějším konkurenčnímu prostředí (Scott a Storper, 2003), což vystavilo firmy a tím i regionální ekonomické struktury větší konkurenci. Globalizace ovlivnila jejich rozhodování a zvýšila nutnost reagovat na vývoj vnějšího prostředí, na druhé straně usnadnila dostupnost nových technologií a informací. Firmy, které se prosadily na regionálních trzích, mohou dále růst a expandovat v globalizované ekonomice, což výrazně zvyšuje jejich rozvojový potenciál

a možnosti ekonomické expanze. V makroekonomické dimenzi se regionální ekonomiky a jejich inovační ekosystémy (Berman, et al., 2020) musí přizpůsobovat a reagovat na měnící se ekonomické prostředí (Dicken, 2014) a nové trendy, hledat nové směry ekonomického rozvoje, aby udržely svou ekonomickou úroveň a zejména posílily svou konkurenceschopnost, ke které v širším kontextu lze řadit i zachování udržitelného rozvoje. Bez porozumění konvergenčním a divergenčním tendencím v ekonomice je obtížné účinně reagovat na výzvy, které přináší globalizace a technologický pokrok.

Regionálně ekonomický výzkum (Grillitsch et al., 2018; Isaksen et al., 2017; Capello a Caragliu, 2021; Berman et al., 2020) také pomáhá identifikovat faktory a mechanismy, které ovlivňují ekonomický růst v jednotlivých regionech. Získané poznatky mohou přispět k efektivnějšímu plánování a priorizaci veřejných politik, efektivnějšímu využití regionálních zdrojů a v neposlední řadě i k podpoře vyváženého ekonomického rozvoje všech regionů. Z tohoto důvodů je vyhodnocování konvergenčních a divergenčních procesů nezbytné. Výsledky a poznatky z regionálních analýz zároveň mohou přispět k cílenější specifikaci opatření, zohledňujících regionálně odlišné rozvojové problémy, potřeby a možnosti, jak dále iniciovat rozvoj různě strukturovaných regionálních ekonomik.

Integrálním znakem habilitační práce je orientace na zhodnocení probíhajících procesů v regionálních ekonomikách, vyhodnocení regionálních diferenciací a existence konvergenčních a divergenčních procesů na různých měřítkových úrovních. Vzhledem ke komplexitě a diverzitě probíhajících vývojových procesů byly vybrány vhodné ukazatele reprezentující mechanismy a procesy, umožňující vyhodnotit míru asymetrie ve vývoji regionálních ekonomik a probíhajících vývojových procesech. Práce chce rozšířit odbornou diskusi v oboru regionální ekonomie se zaměřením na regionální vývojové procesy a prostorové nerovnoměrnosti v ekonomickém prostředí.

Struktura, cíl a výzkumné teze, metodika

Zhodnocení regionálně ekonomických vývojových procesů vyžaduje identifikaci faktorů, jevů a mechanismů determinujících aktuální a budoucí výkonnost regionálních ekonomik. Řešení definovaného rámce práce z metodického hlediska obsahuje dvě základní části.

V první části práce je charakterizován teoretický rámec současného výzkumu v řešení vymezené problematiky. V teoretické části jsou představeny a zhodnoceny jednotlivé přístupy v regionální a prostorové ekonomii (resp. ekonomické geografii) k hodnocení vývoje prostorových ekonomik se zaměřením na deskripci přístupů ke klasifikaci probíhajících vývojových procesů. V práci jsou kombinovány teoretické přístupy k tématice regionálních diferenciací s výzkumem regionálních procesů. Další část práce se věnuje tématice globálních produkčních řetězců (nejsou komplexně zpracovány v doložených odborných článcích), protože z pohledu subdodavatelských vazeb a globalizace jsou jedním z nositelů meziregionálních diferenciací.

V druhé části habilitační práce jsou představeny publikované odborné články zaměřené na výzkum ve vybraných dimenzích regionálních ekonomik, články jsou interpretovány ve formě autorského komentáře k jednotlivým článkům. V jednotlivých textech jsou vyhodnocovány regionální rozdíly, vývojové procesy a změny s použitím různých metod a postupů v rámci prostorových analýz. Předmětem výzkumu jsou další klíčové ekonomické, sociální a institucionální ukazatele. Výzkumy prezentované v doložených článcích se soustředí na zkoumání dopadů různých ekonomických a finančních procesů na regiony, prostorové nerovnosti a na odhalení vývojových asymetrií. Poznatky a výsledky, získané z jednotlivých výzkumů jsou shrnuty v závěrečné části práce.

Hlavní cíl práce spočívá ve zhodnocení prostorových souvislostí, konvergenčních a divergenčních procesů v ekonomickém vývoji regionů. Zda je možné, vzhledem k dosažené úrovni ekonomického rozvoje jednotlivých regionů, vysledovat i další makroekonomické a mikroekonomické agregáty, jak korespondují s prostorovým vzorcem míry rozvinutosti regionálních ekonomik. Nedílnou součástí je otázka vývojových asymetrií a rozdílů v ekonomickém vývoji regionů v makroekonomické a mikroekonomické dimenzi.

Výzkumné cíle jednotlivých článků vyplývají z hlavního cíle habilitační práce a skládají se ze souboru výzkumných tezí v následující struktuře:

I. Výzkumná teze

Identifikace vlivu přímých zahraničních investic a jejich dopadu na vývojové procesy jednotlivých zemí, zejména na hospodářský růst skupiny postsocialistických států v Evropě.

II. Výzkumná teze

Znalostně náročné obchodní služby (označované v literatuře jako KIBS – Knowledge-Intensive Business Services) lze považovat za ukazatel míry rozvinutosti regionálních ekonomik, proto je přínosné vyhodnotit, jaké existují souvislosti mezi mírou rozvoje znalostně náročných obchodních služeb a mírou rozvinutosti regionálních ekonomik v EU a zda je možné identifikovat skupiny regionů s podobnou úrovní a způsobem změn.

III. Výzkumná teze

Jak nové formy organizace podniků v postsocialistickém prostoru souvisí s vybranými faktory udržitelného a kvalitativního rozvoje regionů, neboť lze očekávat, že rozvinutější prostředí regionů, ať už v oblasti udržitelnosti, ekonomiky, energetiky nebo lidských zdrojů, povede také k rozvoji vyšší úrovně spolupráce v podobě klastrových iniciativ.

IV. Výzkumná teze

Vyhodnocení inovačního potenciálu střední Evropy na příkladech regionů Česka, Slovenska a Polska prostřednictvím faktorů a struktur, které determinují rozvoj inovačního potenciálu prostředí, na základě dat o regionálních ekonomikách, regionálních trzích práce a stavu výzkumu a vývoje.

V. Výzkumná teze

Zjištění, jakým způsobem se různé finanční toky, konkrétně přílivy přímých zahraničních investic, vládní investiční pobídky a výdaje na vědu a výzkum promítají do rozvoje regionů a to na základě zhodnocení vybraných regionálních, sociálních a ekonomických ukazatelů na úrovni okresů v Česku.

Výzkumné teze byly předmětem výzkumu publikovaného ve čtyřech impaktovaných odborných časopisech v databázi Web of Science a v jednom případě v časopisu registrovaném v databázi Scopus. Ke každému článku je zpracován komentář obsahující řešení tématu, výzkumných cílů, zvolené metodologické postupy, zdroje dat a výsledky analýz včetně diskuze výsledků a závěrů, které představují shrnutí provedeného výzkumu.

Přehled výzkumných tezí v publikovaných textech je prezentován v následujícím seznamu:

- Výzkumná teze I.; publikováno v článku – Hlaváček, P., & Bal-Domańska, B. (2016). Impact of Foreign Direct Investment on Economic Growth in Central European Countries. *Engineering Economics*, 27(3), 294-303. IF 0 ,726, autorský podíl 50 %.
- Výzkumná teze II. publikováno v článku – Markowska, M., Hlaváček, P. & Strahl, D. (2022). Knowledge-Intensive Business Services Employment Structure and Economic Development in EU Regions. *Comparative Economic Research. Central and Eastern Europe,* 25(4), 109–133. https://doi.org/10.18778/1508-2008.25.32. IF 0 .6, autorský podíl 33 %.
- Výzkumná teze III.; publikováno v článku – Mempel-Śnieżyk, A. & Hlaváček, P. (2022). Are clustering and R &D institutions in post-socialist states functional tools for sustainable development? *European Planning Studies,* 30(10), 2022-2042. DOI: 10.1080/09654313.2021.2013779, IF 3 ,551, autorský podíl 50 %.
- Výzkumná teze IV.; publikováno v článku – Hlaváček, P. & Siviček, T. (2017). Spatial differences in innovation potential of central European regions during post-transformation period. *Journal of International Studies*, 10(2), 61-73. doi:10.14254/2071-8330.2017/10-2 /4. Kat. Economics, Econometrics and Finance, perc. 41st, SJR 0, 511, autorský podíl 50 %.
- Výzkumná teze V.; publikováno v článku – Hlaváček, P. & Janáček, J. (2019). The Influence of Foreign Direct Investment and Public Incentives on the Socio-Economic Development of Regions: An Empirical Study from the Czech Republic. *E +M Ekonomie a management*, 22(3),4 -19. IF 1 ,195, autorský podíl 50 %.

Metodickou klasifikaci článků zobrazuje Tabulka 1, ve které jsou články specifikovány podle měřítkové úrovně použité ve výzkumu, řešeného území, aplikovaných metod, použitých dat a jejich časového vymezení. První článek (Hlaváček a Bal-Domańska, 2016) se zaměřil zejména na úroveň států tranzitivních ekonomik ve střední a východní Evropě, jak přílivy

přímých zahraničních investic do hostitelských ekonomik souvisely s vývojem jednotlivých států a vybraných ekonomických ukazatelů.

Tabulka 1 Metodická klasifikace publikovaných článků

	měřítková úroveň	**území**	**metody**	**dimenze aplikovaných ukazatelů**	**časové období**
Hlaváček a Bal-Domańska, (2016)	státy	postsocia-listické státy v EU (k 2012)	komparativní růstový model	makroekonomická, lidské zdroje ve VaV	2000 a 2012
Markowska, Hlaváček a Strahl, (2022)	regiony soudržnosti (NUTS III)	EU (regiony)	komparativní shluková (wardova, k -means)	HDP, zaměstnanost ve znalostně náročných služeb	2008 a 2018
Mempel-Śnieżyk a Hlaváček, (2022)	regionální samosprávné celky (NUTS II a III)	Polsko, Česko, Slovensko	komparativní korelační a regresní analýza	ekonomická, environmentální, institucionální, lidské zdroje pro VaV	2019 (stav klastrů v roce 2022)
Hlaváček a Siviček, (2017)	regionální samosprávné celky (NUTS II a III)	Polsko, Česko, Slovensko	komparativní agregace dat; index IP, korelační analýza	ekonomická, lidské zdroje pro VaV, inovační	2012 a 2014
Hlaváček a Janáček, (2019)	okresy	Česko	komparativní korelační a regresní analýza	ekonomická, institucionální, demografická, oblast trhu práce, urbánní (realitní), odvětvová (stavebnictví)	2015 (záv. proměnné) a časové řady do roku 2015

Další článek (Markowska, Hlaváček a Strahl, 2022) se zabývá klastrováním regionů na úrovni NUTS II. Výzkum si kladl za cíl klasifikovat regiony do skupin podle obdobných vývojových charakteristik, a to na základě zaměstnanosti ve znalostně náročných obchodních službách a v úrovni hrubého domácího produktu na obyvatele. Výzkum ukázal, jak se regiony v EU v čase vyvíjely a přeskupovaly mezi jednotlivými kategoriemi podle intenzity vývojových změn, přičemž byly hledány prostorové souvislosti v kategorizacích skupin regionů se zaměřením na pozice regionů postsocialistických zemí. Regionální rozdíly v rozvoji institucionálního prostředí a vlivu regionálního prostředí na příkladu rozvoje klastrových iniciativ jsou obsahem dalšího článku (Mempel-Śnieżyk a Hlaváček, 2022), který

se tímto tématem zabýval na příkladu polských a českých samosprávných regionů.

Článek o inovačním potenciálu regionů (Hlaváček a Siviček, 2017) hodnotí, jak inovační potenciál regionů souvisí s regionálními nerovnostmi, zejména s ekonomickou úrovní regionů v mezinárodním srovnání českých a polských regionů. V posledním článku (Hlaváček a Janáček, 2019), týkajícím se okresů Česka, je hodnocen vliv toků finančních zdrojů do menších územních jednotek, zastoupených zejména přílivem přímých zahraničních investic a vládních finančních pobídek na různé socioekonomické jevy v regionech.

Společným prvkem výzkumů v uvedených článcích je, že vyhodnocují vývojové procesy a rozdíly na různých měřítkových úrovních. Předmětem výzkum jsou diferenciace na úrovni okresů, krajů, regionů soudržnosti, včetně zhodnocení pozice Česka v širších mezinárodních souvislostech, od kontextu postsocialistických států k pozici regionů v Evropské unii.

V makroekonomické dimenzi jsou zkoumány územní jednotky a jejich výkonnost v klíčových makroekonomických a dalších ukazatelích, v jejich inovačním potenciálu a rozvoji znalostně náročných služeb. V mikroekonomické dimenzi pak prostorové rozdíly v aktivizaci podniků a dalších subjektů pro zakládání klastrů, dále zda existují regionální rozdíly v kategorizacích podniků podle jejich pozic v produkčních řetězcích.

Články se z teoretického hlediska zabývaly některými aspekty, navazujícími na poznatky růstových teorií (Barro-I-Sala a Martin, 2004), zabývající se směřováním ekonomik k ekvilibriu. Úroveň ekvilibria podle těchto přístupů byla přitom determinována parametry území, což vedlo k podmíněné konvergenci do skupiny států s obdobnými parametry. V tomto kontextu se v práci vychází nepřímo i z regulační teorie (Jessop, 2001), poukazující na význam nastaveného regulatorního (např. legislativního a institucionálního) rámce pro ekonomický růst. Teoretická východiska práce navazují také na institucionální přístupy, jako je teorie učících se regionů (Asheim, 2012; Morgan, 1997) zdůrazňující proces učení jako jedno ze stěžejních kritérií ekonomického růstu regionů. Do analyzovaných dat jsou proto zahrnuty ukazatele z oblastí úrovně vzdělanostní úrovně, VaV, inovačních aktivit a kooperace mezi aktéry.

Nový pohled na globalizační procesy, zdůrazňující dopady organizace výroby na organizaci prostorové ekonomiky, přinesly teorie globálních výrobních řetězců (Gereffi et al., 2005) nebo globálních produkčních sítí (Yeung a Coe, 2015). Prostorové rozdíly v lokalizaci podniků podle pozic ve výrobních řetězcích také z pohledu uvedených teorií poskytují další hodnotící pohled na příčiny rozdílů ve výkonnosti regionálních ekonomik a v asymetrických vývojových trajektoriích. Tento přístup nebyl součástí publikovaných článků, byl proto doplněn do habilitační práce, aby vytvořil další teoretické východisko pro zdůvodnění rozdílných vývojových procesů na úrovni regionů.

Rozšíření poznání o existenci asymetrických vývojových procesů a prostorových nerovnoměrností vytváří nová analytická východiska pro formování scénářů budoucího vývoje. V aplikační rovině práce také přináší poznatky a závěry využitelné pro nastavení regionálních a inovačních politik.

Teoretická východiska hodnocení vývojových procesů regionálních ekonomik

Procesům regionálního vývoje se v současnosti věnuje v teoretické i analytické rovině pozornost ze strany různých vědních disciplín, neboť se jedná o procesy holistické podstaty, determinované komplexem jevů a příčin socioekonomické i přírodní povahy. Složitost vývoje regionů je doprovázena kumulací různorodých procesů konvergenčního i divergenčního charakteru (Barro et al., 1991; Rey a Janikas, 2005; Blažek a Netrdová, 2012; Hlaváček, 2012), které jsou dále asymetricky rozvíjeny (Hampl, 1998 a 2005).

Tématika regionálních rozdílů a jejich eliminace je také nedílnou součástí rozhodování decizní sféry (Cairney, 2017), integrující nadefinované vize a strategie rozvoje území do přípravy podpůrných veřejných politik a programů, řešených podle resortní příslušnosti institucemi na jednotlivých řádovostních úrovních organizace státu a jeho územních částí. Podle Iammariny et al. (2019) mohou tyto procesy až ohrozit hospodářský pokrok, sociální soudržnost a politickou stabilitu v Evropě. Regionální vývojové procesy mohou být determinovány vnějšími vlivy, jako je zejména globalizace, ale také vnitřními faktory, jako je robustnost regionálního inovačního systému nebo podnikatelská kultura. Globalizace ekonomiky, i přes některé diskrepance v posledních letech, se v ekonomických mechanismech stále kontinuálně vyvíjí, zejména prostřednictvím globálních hodnotových sítí (Gereffi et al. 2001) a přináší nové příležitosti i ohrožení pro vývoj regionů. Z pohledu regionální ekonomie je proto nezbytné zhodnotit mechanismy a procesy, jak působí na regiony a růst nebo pokles meziregionálních rozdílů.

Odlišné velikostní a výkonové struktury regionálních ekonomik (Capello a Caragliu, 2021; Arbia, 2001) kvůli rozdílným koncentracím a kontinuálním diferencovaným vývojovým procesům často směřují k asymetrickému vývoji, například v prostorovém rozmístění výrobních řetězců (Henderson et al, 2002). Zejména v nových oblastech ekonomiky díky specifickým potřebám nových odvětví (Isaksen a Trippl, 2016) se může více prohlubovat polarizace mezi regiony, kvůli ještě více rozdílným schopnostem implementovat nové technologie a disruptivní inovace. Vývojové procesy potom mohou postupovat selektivněji, čímž se může dále posilovat asymetrická strukturální diferenciace v územním rozmístění ekonomické výkonnosti.

Jedním z aspektů regionálního vývoje středoevropských ekonomik jsou velké rozdíly mezi jednotlivými regiony. Česko a další postsocialistické státy stále ještě determinuje dědictví centrálně plánovaných ekonomik, současné ekonomické struktury a vývojové trajektorie. Když se ekonomiky začaly měnit na tržně orientované systémy, proces ekonomické transformace vedl k růstu meziregionálních diferenciací (Netrdová a Nosek, 2016), které postupem času vytvořily dlouhodobé asymetrie ve vývojových procesech v odvětvovém i prostorovém hledisku. Zatímco některé regiony zaznamenaly nárůst ekonomické produkce a výkonnosti, v jiných došlo a stále dochází ke stagnaci a slabému ekonomickému růstu a to zejména v periferních regionech (Berman et al., 2020; Vaishar a Zapletalová, 2009; Květoň a Šafr, 2019) v komparaci s jinými regiony. K diverzifikovaným vývojovým procesům přispívá mnoho různých faktorů jako geografická poloha území, historické konotace spojené například s útlumem nosných odvětví v regionech, nastavení rozvojových priorit na národní a regionální úrovni, rozdílné behaviorální a kulturní vzorce v regionálních a místních populacích a podnicích. Na jejich základě, včetně existence dalších endogenních a exogenních vlivů (Isaksen a Trippl, 2017), se v rámci postsocialistických zemí, včetně sjednoceného Německa, rozvíjely od devadesátých let v různé míře a v koexistenci divergentní a konvergentní procesy, resp. rozdílné vývojové trajektorie (Crescenzi a Iammarino, 2017; Květoň a Blažek, 2018) na jednotlivých řádovostních úrovních.

Následující vstup do Evropské unie přinesl nový impuls pro ekonomický růst, který sice vedl ke konvergenci postsocialistických států k úrovni EU (Hlaváček a Bal-Domanska, 2016), podle Alcidi (2019) ale nevedl k nastolení trendu obecné konvergence regionů. Charron (2016) vysvětluje nerovností také méně efektivními vládami, které nedokáží vytvořit silné mechanismy na zmírnění divergence. Vývojové asymetrie se vyvíjí podle parametrů různých skupin členských zemí, nejen ve vztahu starých a nových členských zemí, růst polarizace je patrný také mezi jižními státy a ostatními původními členskými zeměmi.

Vzhledem k určité akceleraci vývojových změn bude z pohledu státu nutné přispívat k socioekonomické vyváženosti a soudržnosti území na společensky akceptovatelné úrovni. Veřejná politika by měla podporovat implementaci mechanismů, které mohou pomoci zmírnit již existující ekonomické asymetrie, například v rozdílné regionální konkurenceschopnosti (Ženka et al., 2014), aby se předcházelo jejich nárůstu a prohlubování socioekonomické

polarizace v území. Je úlohou státu a veřejnoprávních korporací na dalších úrovních, aby se vytvořil integrující systém, který bude zmírňovat tato rizika a tlumit asymetrie v procesech regionálního rozvoje. Politiky regionálního rozvoje se často snaží vyrovnávat prostorové asymetrie prostřednictvím strategií a opatření, která podporují zaostávající regiony, posilují infrastrukturu, zlepšují přístup ke službám a podnikatelským příležitostem v méně rozvinutých oblastech a podporují diverzifikaci ekonomiky, aby byly tyto nerovnoměrnosti zmírněny. V neposlední řadě je nutné zdůraznit význam regionálních strategií (Rodríguez-Pose, 2013), jako jsou například regionální inovační strategie, definující domény výzkumné a inovační specializace včetně priorit, jak přispět ke zvýšení inovační výkonnosti regionů. Diferencovaná úroveň regionálních ekonomik by měla vést i k rozdílným alokacím finančních zdrojů veřejné podpory podle míry zaostávání regionů, aby ve všech byly nastartovány strukturální změny a dosažen ekonomický růst. Diferencovaná strukturace regionů společně s diverzitou regionálních aktérů může vést i k rozdílným závěrům a doporučením pro rozvojové strategie na regionálních úrovních. Strategie by měly více reflektovat endogenní potenciál regionů a navrhovat řešení pro danou oblast nejvhodnější, i když může působit suboptimálně v kontextu strategií jiných regionů.

Vývojová asymetrie v regionálních ekonomikách

Regionální ekonomický rozvoj jako integrální a zároveň diferencovaný jev dlouhodobě směřuje k některým procesům, na jejichž základě stále přetrvává různě vysoká míra rozdílů mezi regiony, od zanedbatelných, přes podobně rozvinuté a strukturované regionální ekonomiky, až k extrémním disparitám, které mohou být chronické až neřešitelné. Pro pochopení povah a zejména příčin struktury diferenciací meziregionálních ekonomik a jejich vývoje v čase je důležité zvážit, jaké formy nepravidelností v jejich uspořádání vedou k meziregionálním diferenciacím. Tyto různě agregované a provázené diferenciační a konvergenční procesy pak mohou vytvářet různé formy vývojových asymetrií, podle Scotta a Storpera (2003) regionální diferenciace intenzifikuje dynamické procesy, v nichž se regiony pod vlivem globalizace stále více vystavují riziku nárůstu meziregionálních nerovností.

Objektem výzkumu regionálních ekonomik jsou často rozdíly ekonomického rozvoje analyzované prostřednictvím makroekonomických agregátů, například v úrovni HDP,

v úrovni příjmů a v dalších regionálních ukazatelích, které často doplňují i ukazatele socioekonomické povahy jako je například dosažená životní úroveň nebo struktura vzdělání.

Holistická povaha regionálního rozvoje, přeneseně i jedné z jeho dimenzí – ekonomické sféry, vyžaduje pro interpretaci socioekoekonomických jevů a procesů i vhodný rámec (Fotheringham a Rogerson, 2009), který poskytne exaktní data pro deskripci a explanaci probíhajících regionálně ekonomických procesů. I když jsou v rámci oboru regionální ekonomie prioritně objektem výzkumu ekonomické jevy, hledají se také vysvětlení příčin existence prostorových asymetrií i ze sociologických, sociálně psychologických, behaviorálních nebo environmentálních dimenzí. Zejména ve spojitosti s regiony, ve kterých je ekonomické zaostávání spojeno i nadprůměrným environmentálním poškozením území, jak ukazují příklady strukturálně postižených regionů Česka, kde těžký průmyslu a těžba uhlí vedla k odlišným vývojovým trajektoriím oproti ostatním regionům (Koutský el al., 2014; Sucháček, 2005). Jiným případem je problém dlouhodobého hospodářského zaostávání vnitřních periferií a venkovských regionů (Bernard, Šimon, 2018) projevujícího se v růstu sociální exkluze (Musil a Müller, 2008), sociální stratifikace (Novák a Netrdová, 2011) a ve slabé resilienci (Ženka el al., 2019).

Pro analýzu procesů regionálního rozvoje se v současnosti aplikuje několik pohledů a teoretických východisek pro posouzení rozdílů v regionálních ekonomikách. Nejrozšířenějším explanačním rámcem je pohled na procesy regionálního vývoje z hlediska míry jejich diferenciace, tedy vzájemné konvergence případně divergence a mechanismy, které generují konvergenční nebo divergenční procesy v území. Konvergence poukazuje na tendenci regionů s nižší úrovní ekonomických ukazatelů více akcelerovat vlastní vývojovou dynamiku pro zmírnění nebo eliminaci ekonomického zaostávání za více rozvinutými regiony, zatímco divergenční procesy vedou zpravidla k růstu meziregionálních vývojových diferenciací. Konvergenční a divergenční procesy jako svébytné regionálně ekonomické jevy determinují úroveň hospodářského rozvoje regionu, přičemž jeho akcelerace je ovlivňována například rozvinutostí moderních odvětví ekonomiky a meziodvětvových vazeb podle klasické teorie pólů růstu a růstových os (Boudeville, 1971) nebo v novějším pohledu podle konceptu related variety (Frenken et al., 2007; Grillitsch et al., 2018), inovačního milieu (Maennig a Ölschläger, 2011; Breschi a Lissoni, 2001). Růst regionu dále podporují inovační procesy v podnicích (Lawson a Lorenz, 1999; Odei et al., 2021; Blažek a Csank, 2016), nebo

kvalita lidského kapitálu (Eriksson a Hansen, 2013; Gennaioli et al., 2011). Podle Sucháčka et al. (2017) mají stále významnou roli i tradiční výrobní faktory pro lokalizaci velkých firem.

Příčiny a mechanismy konvergenčních a divergenčních procesů jsou ve výzkumné rovině předmětem teorií regionálního rozvoje. Přínosy uvedených teorií spočívají v hledání příčin a důvodů vzniku prostorových nepravidelností, což vytváří vhodná teoretická východiska pro výzkum v oblasti regionální a prostorové ekonomie v dimenzi prostorových analýz, následně využitelných pro definování a koordinaci veřejných politik.

Z tohoto hlediska je pak možné zhodnotit kontext teorií regionálního rozvoje a jejich závěry, ke kterým procesům dochází z hlediska vývoje regionů. I když se teorie mohou klasifikovat podle jejich vazby k jednotlivým obdobím vývoje ekonomického myšlení (Blažek, Uhlíř, 2021), zdůrazňují jiné příčiny a důvody, které způsobují meziregionální diferenciaci, úspěšnost nebo naopak dlouhodobé zaostávání regionů. V pohledech teorií na vývojové procesy regionů lze nalézt převládající závěr, že spíše dochází k divergenčním procesům, dlouhodobým rozdílům a persistenci prostorových vzorců rozvinutosti a zaostalosti.

Jiný přístup k hodnocení prostorově vývojových procesů se rozvinul s konceptem resilience regionů (Martin, 2012; Simmie a Martin, 2010; Pike el al., 2010) spojenou se schopností odolávat negativním vnějším vlivům, resp. šokům. Sutton et al. (2023) na základě komparativní analýzy odborných zdrojů charakterizoval resilienci jako schopnost regionálních ekonomik odolávat nebo přizpůsobovat se vnějším otřesům a následně udržet nebo zlepšit svou ekonomickou výkonnost. V tomto kontextu regionální resilience může být dalším teoretickým východiskem pro analýzy, jakou formou konvergentního nebo divergentního vývoje regiony prochází. Koncept regionální resilience, vzhledem k teoretickému navázání na evoluční ekonomii (Boschma, 2015; Martin et al., 2015) v sobě obsahuje akcent kontinuálního vývoje regionální ekonomiky a její schopnosti proaktivně se přizpůsobovat a minimalizovat dopady potenciálně destabilizujících vlivů.

Schopnost adaptace regionu na vnější impulsy se z pohledu resilience pohybuje od nulových dopadů vnějších šoků k nastartování dlouhodobých trajektorií divergentního vývoje spojených s omezenou schopnosti ekonomiky dosáhnout opětovného růstu nebo alespoň eliminovat dopady šoků (Martin et al., 2012; Pike et al., 2010). Existují také různé postupy

měření resilience vymezují různé typy regionů podle míry resilience regionů (Davies, 2011; Sensier et al., 2016; Staníčková a Melecký, 2018) případně struktur, napomáhajících vyšší resilienci jako jsou technologická odvětví (Rocchetta a Mina, 2019; Brakman et al., 2014).

Charakteristika teoretických přístupů k posuzování regionálních diferenciací ukazuje, že tématika prostorově rozdílného ekonomického vývoje patří mezi klíčové a dlouhodobě významná témata, mající za cíl interpretovat a zdůvodnit příčiny prostorových asymetrií v současném světě. Současné ekonomické prostředí jednotlivých států a regionů je i vzhledem k intenzivní ekonomické globalizaci vystaveno novým podmínkám a vlivům, které je nutné zohlednit v analýzách regionálních ekonomik. To vyžaduje i pro další období hledání stále nových přístupů, jak vyhodnocovat mechanismy a procesy, probíhající v globalizujícím se prostředí. V tomto prostředí lze vidět v posledních několika letech i určité prvky nestability, dané politickými nebo logistickými důvody, které vedou k přehodnocení významu liberalizace světového obchodu.

Evropská unie jako společný hospodářský prostor v zájmu zachování výkonnosti produkčních řetězců v EU a konkurenceschopné ekonomiky by měla podpořit GVC zejména v klíčových odvětvích ekonomiky (Casadei et al., 2022). Z uvedeného důvodu jsou analýzy pozice ekonomiky Česka a jeho regionů, včetně jejich integrace do nadnárodních, resp., globálních produkčních sítí, stále aktuálním tématem pro výzkum. Zhodnocení vývojových procesů a ekonomického růstu není pouze otázkou, jakým způsobem jsou využívány zdroje, výrobní faktory a jak je organizováno jejich rozmístění. Prostorový kontext strukturace ekonomických činností vyžaduje hodnocení na různých měřítkových úrovních, což je předmětem výzkumu v předkládaných článcích.

Otázky interakce mezi aktéry, networkingu a vytváření produkčních sítí jsou považovány za jedny z významných determinant regionálního růstu. Teoreticky problematiku prostorových organizací výrob se zaměřením na hierarchii sítí věcně rozpracovala řada autorů v kontextu teorie globálních produkčních sítí (global production network – GPN), například práce Dicken et al. (2001), Henderson et al. (2002), Dicken (2014) nebo v teorii globálních hodnotových řetězců (global value chains – GVC), které popisovali například Gereffi a Lee, (2016), Dolan a Humphrey (2000) a Sturgeon et al. (2008). V odborné literatuře se tématika

výrobních řetězců výrazně více popisuje z hlediska teorie GVC než GPN[1]. Přístupy přináší hodnotící rámec pro analýzu a pochopení procesů a struktur, jak jsou podniky integrovány do mezinárodních sítí výroby a distribuce. Rozšiřuje se pak i pohled na regionální ekonomiky, které jsou prostřednictvím uvedených sítí také začleněny do globalizačních procesů v rámci mezinárodního obchodu.

Teoretické ukotvení GVC lze dále nalézt v lokalizačních teoriích a teoriích mezinárodního obchodu (od merkantilismu, teorie absolutní a komparativní výhody k teorii životního cyklu nebo nové teorii mezinárodního obchodu). Podle Lee a Gereffi (2016) jsou teorie GVC novým přístupem vyplňujícím mezeru mezi teoriemi mezinárodního obchodu a rozvoje regionů. Pozitivně je také hodnoceno zakomponování aspektů vládnutí a institucionálních faktorů a vlivu vládní politiky, které mohou determinovat změny v uspořádání GVC (Gereffi et al., 2005) a prostorově reorganizovat rozmístění jednotlivých fází výroby mezi regiony v globalizované ekonomice. Z toho vyplývá, že vedle změn v globální organizaci výroby získává stále větší pozornost také problematika ovládání a řízení vztahů mezi jednotlivými firmami zapojenými do GVC.

Přínosem teorie GVC je, že se neomezuje pouze na horizontální vazby mezi aktéry a zdroji v rámci jednoho regionu. Zabývá se také vertikálními vazbami, tedy propojení dodavatelů s odběrateli a dalšími aktéry a zdroji z jiných regionů a zemí (Gereffi et al., 2001). Samotná redistribuce zdrojů v dnešní době již nestačí k vytvoření konkurenceschopných regionálních ekonomik s pevnou pozicí v globálním světě (Dileo a Gonzalez-Lopez, 2019). Postupný ústup tradičních modelů organizace výroby v Evropě zdůraznil význam posílení vztahů mezi globálními a regionálními sítěmi firem, z čehož vyplývá značná závislost úspěchu regionálních ekonomik na způsobu a míře integrace vlastní ekonomické aktivity do struktur GVC. Ve většině GVC lze proto identifikovat snahy k výraznému posunu směrem k přidané hodnotě prostřednictvím investovaného kapitálu, přičemž vliv GVC na ekonomiky je vysoce závislý na charakteristikách těchto ekonomik (Dicken, 2014). Proces technologických změn a posunu v GVC je tradičně spojen s využíváním různě kvalifikované pracovní síly a investic.

[1] Ve statistice publikovaných článků na Web of Science výrazně převyšuje počet publikací zabývajících se globálními hodnotovými řetězci publikace s tématem globálních produkčních sítí, proto bude aplikován interpretační rámec GVC.

Teorie GVC/GPN lze aplikovat pro interpretaci regionálních rozdílů (Barrientos et al., 2011), kdy vyšší hospodářská úroveň souvisí s vyšší koncentrací podniků ve vyšších úrovních produkčních řetězců. Místní podniky, které jsou zapojeny do výrobních řetězců významných značek, to považují za výhodu pro svou ekonomickou stabilizaci. V regionálním kontextu to napomáhá i stabilizaci podnikatelského prostředí a ekonomiky (Pavlínek a Žížalová, 2016). Na možnost zvýšení firemního upgradingu komplexně působí řada faktorů, od interních strategií vedoucích podniků v produkčním řetězci, jak jej organizovat pro dosažení nejvyšší efektivity, k externím faktorům spojených s kvalitou regionálního prostředí a lokalizací subdodavatelských firem. Lze očekávat, že podle diferencované rozvinutosti regionů budou existovat i jiné stupně atraktivity území pro firmy, podle jejich pozice v produkčním řetězci.

Pro podniky z postsocialistických států byly do značné míry signifikantní atributy post transformačních ekonomik, charakteristické technologickým zaostáváním a nízkou produktivitou, což vyžadovalo zahraniční investice, působící jako nositelé přílivu nových technologií a prostředek pro integraci do subdodavatelských vazeb v GVC. Českým regionům přineslo propojení do globalizované ekonomiky prostřednictvím GVC vedle řady pozitivních dopadů také určitá rizika, neboť produkce podniků zapojených v nižších úrovních GVC vedla k vyšší závislosti na výkyvech hospodářského cyklu (Aimar et al., 2016) v ekonomikách. V případě poklesu poptávky a následných redukcí jsou pobočky a podniky v nižších úrovních produkčních sítí více ohroženy zrušením nebo redukcemi subdodavatelských kontraktů.

Regiony potřebují veřejné politiky cílené na podporu inovačních kapacit, zlepšení podnikatelského prostředí a vytváření silnějších vazeb mezi podniky a výzkumnými institucemi. Cílem je vytvoření podmínek pro firemní upgrading a lokalizaci podniků z vyšších úrovní produkčních sítí i s vědomím, že regionalizace globálních hodnotových řetězců (Gereffi a Lee, 2016) je v prvé řadě řízena nadnárodními společnostmi nacházejícími se v pozici koncových výrobců.

Výzkum produkčních sítí naráží na problém dostupnosti dat o kategorizaci podniků podle jejich pozice v produkčním řetězci, je poměrně složité zpracování detailních analýz

chování a vazeb v produkčních řetězcích[2]. Provedení komparace regionů podle rozmístění podniků v hodnotových řetězcích je proto omezené, výzkum se spíše orientuje parciálně na jedno odvětví nebo hodnotový řetězec (např. Gereffi, 1999), než na klasifikaci regionů podle úrovní v produkčním řetězci.

[2] Podle vlastních zkušeností z dotazníkových šetření, pro řadu podniků měly tyto informace obchodní charakter a často z uvedeného důvodu nebyly ochotny je sdělovat a uvádět své dodavatele a odběratele.

Výsledky výzkumů v předložených vědeckých článcích

V této kapitole jsou zpracovány komentáře k jednotlivým vědeckým článkům, které do oblasti regionálně ekonomického výzkumu přispěly s novými poznatky o procesech konvergence a divergence na úrovni regionů a prostorových vzorcích ekonomické diferenciace mezi územními jednotkami. V jednotlivých statích autorského shrnutí s přihlédnutím k řešené tématice v habilitační práci jsou následně doloženy všechny články v původní podobě, jak byly publikovány ve vědeckých časopisech. Autorský komentář se zejména soustředil na specifikaci výzkumného cíle a dosažené výsledky a přínosy výzkumu. Podíly jednotlivých autorů včetně popisu jejich práce jsou specifikovány v příslušné části habilitační práce.

Soubor představených článků kladl důraz také na zpracování jednotlivých výsledků výzkumu vývojových procesů, aby na jejich základě s využitím různých proměnných a územních jednotek mohl být formulován komplexní pohled na přínos odborných článků pro výzkum divergentních a konvergentních procesů v regionální ekonomii. Předložené články reflektují výše uvedené pohledy a atributy, vytváří východiska pro další výzkum v oblasti prostorové ekonomie, reflexi nových vývojových trendů a trajektorií včetně hledání nových explanačních závěrů zdůvodňujících příčiny konvergenčních nebo divergenčních vývojových trajektorií.

Hlaváček, P., & Bal-Domanska, B. (2016). Impact of Foreign Direct Investment on Economic Growth in Central European Countries. *Engineering Economics*, 27(3), 294-303.

Článek byl zaměřen na objasnění vlivu přímých zahraničních investic na hospodářský růst v rámci postsocialistických zemí střední a východní Evropy. Výzkum kladl důraz na vývoj po roce 2000, neboť se jednalo o období signifikantních vývojových změn v transformačním a posttransformačním období, které byly doprovázeny značnými socioekonomickými dopady a intenzivními vývojovými změnami na úrovni regionů a států. Značné očekávání bylo spojeno s přílivem zahraničních investic, které měly přinést nové ekonomické impulsy pro restrukturalizaci odvětví a reorientaci české ekonomiky na nové

trhy. Z tohoto důvodu se článek zaměřil na přímé zahraniční investice, zda jejich diferencované přílivy do jednotlivých států souvisely i s asymetrickými vývojovými změnami v hospodářském růstu a tím se staly určitým indikátorem úspěšnosti ekonomické transformace.

Výzkum byl rozdělen do dvou hlavních částí. V první části byla zpracována srovnávací analýza vývoje zahraničních investic a hrubého domácího produktu. Následně byly do analýzy zahrnuty další ukazatele, u kterých byla očekávána závislost mezi růstem přílivu přímých zahraničních investic a hrubého domácího produktu. Do analýzy byl dále zahrnut objem hrubého fixního kapitálu na obyvatele, což je ukazatel poukazující na objem kapitálu investovaného do trvalých aktiv. Dalším hodnoceným ukazatelem byl kvantitativní růst objemu pracovních sil, neboť ukazatel reflektuje dynamiku pracovního trhu. Posledním zahrnutým ukazatelem byl podíl absolventů terciárního vzdělávání na pracovní síle, protože přítomnost vysoce vzdělané pracovní síly je významným faktorem pro inovační a tím i hospodářský růst.

Použité ukazatele umožnily důkladně zkoumat vzájemné vztahy mezi přímými zahraničními investicemi a dalšími klíčovými ekonomickými faktory a jejich vlivem na hospodářských růst tranzitivních ekonomik postsocialistických států a existenci prostorových a časových pravidelností v konvergentních a divergentních procesech.

Vliv přímých zahraničních investic na hospodářský růst v zemích střední a východní Evropy vykázal jak konvergenční, tak divergenční procesy. V některých zemích s vyšším HDP měly přímé zahraniční investice silnější pozitivní vliv, zatímco v jiných byl jejich vliv na hospodářský růst nižší. Prostorové rozložení přímých zahraničních investic na pracovní sílu před rokem 2012 souvisí s rozdíly v ekonomické výkonnosti těchto zemí. Zatímco na počátku roku 2000 došlo k prudkému nárůstu přílivu přímých zahraničních investic, ke konci období se tento růst v důsledku globální hospodářské stagnace zpomalil, což se promítlo do rozdílů v makroekonomických ukazatelích.

Na úrovni jednotlivých států byly patrné určité asymetrie ve vývoji přílivu přímých zahraničních investic a růstu dalších makroekonomických ukazatelů. Estonsko a Česko byly příklady zemí, v nichž došlo ke konvergenci hospodářského vývoje. Oba státy dosáhly nejvyšší úrovně přímých zahraničních investic na pracovní sílu, a to především díky své

otevřené a proexportně orientované ekonomice, která také využila potenciál vlastní geografické polohy vůči blízkým významným trhům. Pro Česko a Slovensko hrály klíčovou roli investice z Německa, které akcelerovaly příliv přímých zahraničních investic a přispívaly k růstu HDP, tím posilovaly proces konvergence vůči západoevropským ekonomikám. V případě Estonska jej urychlovaly státy Skandinávie, zejména Finsko. Naopak Slovinsko a Maďarsko se potýkaly s nižší mírou růstu přílivu přímých zahraničních investic, což vedlo v určité době k silnější asymetrii jejich hospodářského vývoje v porovnání s ostatními státy.

Vývoj toků přímých zahraničních investic podmiňovala řada faktorů, jako byl vývoj globálního ekonomického prostředí, vládní politiky vůči zahraničním investicím, stabilita vlád a kvalita institucí. Integrace zemí střední a východní Evropy do Evropské unie zvýšila příliv přímých zahraničních investic a urychlila proces integrace ekonomik do evropských a globálních výrobních řetězců. Naopak v období ekonomické krize (2007-2013) se projevila určitá nestabilita rozvojových procesů, která ukázala na citlivost národních ekonomik vůči vnějším šokům. Oscilační povaha přílivu přímých zahraničních investic byla také jedním z faktorů, které ovlivnily makroekonomické vývojové trajektorie ve střední a východní Evropě.

Lze shrnout, že výzkum na základě vyhodnocení probíhajících vývojových procesů zjistil pozitivní vztah mezi přímými zahraničními investicemi a růstem HDP, pozorovaný v různých časových obdobích (2000-2008, 2009-2012 a 2000-2012). Tyto investice přispěly k nastavení vývojových trajektorií hospodářského rozvoje zemí s vyšším přílivem přímých zahraničních investic, zatímco v zemích s nižším přílivem investic byly častěji patrné známky divergenčního vývoje, doprovázené slabším ekonomickým růstem. I s přihlédnutím k některým zaznamenaným parciálně divergentním procesům, lze spíše zdůraznit, že přímé zahraniční investice podporovaly konvergenční procesy a měly klíčovou úlohu v podpoře hospodářského růstu postsocialistických států a jejich konvergenci k hospodářské úrovni států západní Evropy.

Článek v závěru výzkumu konstatuje, že budoucí vývoj regionů budou i nadále určovat faktory, jako je kvalita institucí, velikost trhu, úroveň lidského kapitálu, kvalita infrastruktury a zejména nastavení veřejných politik, které v konečném důsledku budou ovlivňovat směr hospodářského rozvoje.

Přínos výzkumu spočívá v analýze toků přímých zahraničních investic a jejich vlivu na hospodářský růst. Výzkum poskytl makroekonomický pohled na to, jaké divergentní a konvergentní procesy probíhaly. Analýza přesahovala měření makroekonomických agregátů, tzn. vlivu přímých zahraničních investic na růst HDP, neboť byly zkoumány širší dimenze divergentních a konvergentních procesů prostřednictvím dalších ukazatelů, které by mohly přímo a nepřímo ovlivňovat přímé zahraniční investice lokalizované v hostitelských ekonomikách.

Markowska, M., Hlaváček, P. & Strahl, D. (2022). Knowledge-Intensive Business Services Employment Structure and Economic Development in EU Regions. *Comparative Economic Research*. Central and Eastern Europe, 25(4), 109–133.

Článek se zaměřil na zhodnocení vztahu mezi zaměstnaností v oblasti znalostně náročných služeb a mírou ekonomického rozvoje regionů s vyhodnocením změn, ke kterým došlo včetně repositioningu regionů v porovnání s ostatními regiony v Evropské unii na úrovni NUTS II. Společně s vysledováním repositioningu regionů jsou meziregionální změny rovněž znakem konvergenčních nebo divergenčních procesů mezi regiony nebo statisticky vymezenými skupinami regionů s podobnými charakteristikami. Výzkum chtěl dále identifikovat skupiny regionů s podobnými charakteristikami, jejich případná přeskupení podle vývoje mezi lety 2008 a 2018. Změny v zaměstnanosti ve znalostně náročných službách mohou být významným ukazatelem konvergence nebo divergence mezi regiony, které vykazují podobné zaměstnanecké struktury.

Výzkum vycházel z trendu rostoucí poptávky po službách založených na znalostech, jejichž lokalizace a míra rozvinutosti se stala jedním z ukazatelů ekonomického růstu regionů. Tato tématika byla předmětem výzkumů zaměřených na analýzu efektů strukturálních změn (Hartwig, 2012), geografického rozložení a regionální specializace v rámci znalostně náročných obchodních služeb (Gallego a Maroto, 2015; Ávila Serrano, 2019). Význam uvedeného typu služeb pro regionální růst ekonomiky souvisí s procesy terciarizace, které generují nový hospodářský růst, zejména ve vyspělých regionech. Stále větší důraz na znalosti a služby v oblasti výroby (například progresivní tercier) má za následek proměnu struktur

zaměstnanosti v odvětvích. Lze proto očekávat, že růst zaměstnanosti v oblastech znalostně náročných hi-tech služeb a tržních služeb náročných na znalosti je spojen s růstem ekonomické úrovně v regionu.

Z metodologického hlediska v oblasti znalostně náročných služeb (v odborné literatuře označovaných jako KIBS) byly sledovány ukazatele jako zaměstnanost ve znalostně náročných high-tech službách, znalostně náročných tržních službách a v ostatních znalostně náročných službách, jak byly statisticky monitorovány v databázi Eurostatu. Úroveň a změny v zaměstnanosti bylo možné považovat za indikátory, spojené s konvergenčními nebo divergenčními trendy mezi regiony.

V analýze dat byla použita Wardova metoda k určení optimálního počtu shluků, následně byla aplikována metoda k-průměrů (k-means) k definitivnímu rozdělení regionů do těchto shluků. V dalším kroku byly identifikovány střední hodnoty jednotlivých proměnných v jednotlivých skupinách a změny ve složení těchto skupin na počátku a na konci sledovaného období z hlediska zaměstnanosti ve znalostně náročných službách a v úrovni hrubého domácího produktu. Systematický přístup v analýze uvedených dat umožnil identifikovat vývojové procesy a meziregionální rozdíly se zaměřením na zhodnocení pozic regionů postsocialistických zemí v širším kontextu a zhodnocení jejich konvergence a divergence vůči ostatním regionům Evropské unie včetně vývojových změn, které mohly nastat mezi sledovanými obdobími. Multivariační analýza dat nám umožnila identifikovat skupiny regionů, které jsou si podobné z hlediska struktury zaměstnanosti v sekcích znalostně-intenzivních podnikatelských služeb (KIBS) a úrovně rozvoje, a zhodnotit tyto regiony vzhledem k posunům a podobnostem. Země a regiony EU vykazovaly rozdíly v úrovni a dynamice vývoje obou sledovaných ukazatelů. Diferenciace, které bylo možné pozorovat v podílu zaměstnanosti v těchto znalostně náročných sektorech mezi regiony Evropské unie, byly poměrně významné, podobně jako změny v kategoriích regionů v rámci sledovaného období.

Repositioning regionů směrem do vyšších kategorií v případě podílu zaměstnanosti v sekcích KIBS byl zaznamenán celkem u 38 regionů a pokles se projevil u 34 regionů. Z hlediska úrovně hrubého domácího produktu na obyvatele si svoji pozici zlepšilo 26 regionů, zhoršení pozice naopak nastalo u 20 regionů. Přibližně dvě třetiny regionů EU bylo

současně ve stejných kategoriích jak z hlediska struktury zaměstnanosti, tak HDP na obyvatele.

Struktury zaměstnanosti ve střední a východní Evropě vykazovaly poměrně vysokou míru stability mezi lety 2008 a 2018. Výzkum ale zjistil některé skutečnosti poukazující na prostorové souvislosti a pravidelnosti ve vývojových tendencích regionů. Většina regionů tranzitivních ekonomik patřila do klastrů s nižšími mírami zaměstnanosti a úrovně hrubého domácího produktu. Zlepšení pozic bylo zaznamenáno pouze u regionů s hlavními městy (např. regiony Yugozapaden, Bucuresti – Ilfov, Bratislavský kraj), nebo u klastru z nejnižší úrovně do druhé nejnižší (např. regiony Észak Magyarország, Stredné Slovensko, Východné Slovensko a Litva). Vysoký růst hrubého domácího produktu byl doprovázen i nadprůměrným růstem podílu zaměstnanosti ve znalostně náročných službách. Celkové hodnocení této skupiny regionů poukazovalo na prostorově podmíněnou stabilitu skupin regionů. Konvergenční procesy směrem k úrovni Evropské unie byly silnější u skupiny regionů určitého typu, konkrétně u regionů se sídelními městy nebo významnými metropolemi, zatímco u ostatních regionů se projevovaly spíše známky malého růstu, stagnace a v některých případech i poklesu. Naopak z pohledu vnitrostátních rozdílů a vývojových změn bylo pro regionální procesy charakteristické spíše posilování polarizace ve formě vnitrostátní diferenciace, kdy se posilovala vývojová asymetrie mezi úspěšnými a méně úspěšnými, resp. zaostávajícími regiony v rámci jednotlivých států.

Mempel-Śnieżyk, A., & Hlaváček, P. (2022). Are clustering and R &D institutions in post-socialist states functional tools for sustainable development?, *European Planning Studies,* 30 (10), 2022-2042.

Výzkum sledoval na příkladu rozvoje klastrových aktivit, jak regionální rozdíly v aktivizaci podniků prostřednictvím této nové formy jejich kooperace souvisí s vybranými ukazateli míry rozvoje regionů. V rámci výzkumu se předpokládalo, že regionální prostředí vyznačující se vyšší úrovni environmentální udržitelnosti, hospodářského růstu, tvorby nových energetických zdrojů a lidského kapitálu se promítne do aktivnějšího přístupu podniků, a to na příkladě zájmu o klastrové iniciativy a z toho vyplývajících rozdílů v jejich prostorovém rozmístění. Na vzájemný vztah mezi regionálním rozvojem a klastry poukázal

např. Sölvell et al. (2009). Předmětem výzkum tedy bylo zjistit, zda regiony s výraznými regionálními rozdíly v uvedených oblastech mohou vykazovat i rozdíly v rozvoji klastrových iniciativ a ve velikosti klastrů. Pro zajištění většího souboru a reprezentativity dat byl výzkum realizován na příkladu regionů Polska a Česka. Výzkum v této oblasti v případě výběru relevantních ukazatelů a formulace zadání navazoval také na práce jiných autorů (Dind et al. 2014; Emma Pravitasari et al. 2018) s tím, aby v kontextu institucionálních přístupů zhodnotil vztahy mezi rozvojem klastrů, jako svébytné institucionální formy spolupráce aktérů, a rozvinutostí území i z hlediska míry udržitelného rozvoje regionů.

Výběr ukazatelů vycházel z potřeby pracovat s metodicky stejně pojatými ukazateli, neboť se pracovalo s daty statistických úřadů jednotlivých zemí, protože data Eurostatu nebyla na požadované úrovní regionů jako samosprávných jednotek (kraje NUTS III a vojvodství NUTS II) v požadované struktuře k dispozici. Údaje použité ve výzkumu pokrývaly různé oblasti, hodnocené ukazatele byly strukturovány na regionální úrovni v kategoriích: a) základní data o klastrech včetně získané veřejné podpory, konkrétně se jednalo o počty a velikost klastrů, strukturu členů klastrů a poskytnutou finanční podporu klastrům, b) ekonomická data, c) data o životním prostředí, d) data ze sociální oblasti, e) data z oblasti energetiky. Klastry, u kterých nebylo možné ověřit reálnou činnost, byly z analýzy vyloučeny. Analýza v první fázi vyhodnotila základní statistické charakteristiky dat, pro hodnocení vztahů mezi proměnnými byly provedeny Spearmanovy korelace. Poté byla použita metoda vícenásobné lineární regrese s postupným přidáváním proměnných pro zajištění vhodného výběru vysvětlujících proměnných.

Výzkum předpokládal, že regiony s vyšší kvalitou životního prostředí budou příznivější pro rozvoj klastrových iniciativ. Tento předpoklad nebyl potvrzen, neboť korelační koeficienty ukazovaly na relaci mezi vyšší klastrovou iniciativou a horšími environmetálními ukazateli, neboť klastry se více rozvíjely v urbánních regionech, kde je také horší kvalita životního prostředí (zejména ovzduší) oproti rurálním oblastem. Tato nejednoznačnost mohla být ovlivněna také diverzifikovaným regionálním prostředím, z nichž každé prochází individuálními vývojovými trajektoriemi. U některých regionálních ukazatelů se naopak zdokumentovala souvislost mezi vyšší ekonomickou úrovní a zhoršenými environmentálními ukazateli, což může být dáno také větší environmentální zatížeností území urbánními

systémy, neboť více rozvinuté regiony vykazovaly spíše vyšší ekonomickou úroveň. Výzkumné výsledky poukázaly na souvislost mezi rozvojem klastrů a ekonomickou úrovní, jak obdobně zjistil výzkum podmíněnosti konvergence a klastrů (Delgado et al., 2014), podle Portera (2003) klastry také ovlivňují růst regionální ekonomiky.

Ve výzkumu bylo dále zjištěno, že klastry v méně rozvinutých nebo periferních oblastech ukazovaly vyšší koncentraci převážně místních firem oproti klastrům v rozvinutých regionech, které zapojovali firmy z více regionů. Vyšší počty místních členů klastru v periferních regionech proto spíše poukazovaly na větší motivaci místních podniků a subjektů společně hledat nové možnosti rozvoje, i když jsou méně schopny získávat aktéry z jiných regionů, což poukazuje na problém určité izolovanosti, negativně omezující nejen rozvoj regionů jako takových, ale i možnost vytvářet klastrové iniciativy, které by networkingově rozšířily kooperující vazby i do dalších regionů.

Ukázalo se také, že klastry v urbanizovaných regionech měly tendenci být více rozvinuté a byly schopny získávat více veřejných prostředků, což poukázalo na další aspekt polarizace mezi periferními (v podstatě také rurálními) a urbánními regiony Na druhou stranu se očekávalo, že spolupráce mezi podniky a institucemi výzkumu a vývoje v podobě klastrů bude více spojena s lokalizací VaV institucí, překvapivě zde nebyla nalezena významná korelace. Důvodem může být skutečnost, že univerzity jsou pouze jedním druhem aktéra, vědecké výzkumné instituce se více integrují do oborově blízkých klastrů daných jejich specializací než podle regionálních vazeb. Projevil se dále význam specializace v rámci klastrů a jejich spojení s výrobním řetězcem. Klastry, působící v hodnotových řetězcích se složitějšími výrobními procesy zahrnují větší počet firem, což vede i určité vertikalitě v organizaci klastru, oproti klastrům, které se neorganizují podle výrobního procesu. Dosažené výsledky jsou přínosné pro nastavení veřejné politiky zejména v oblasti podpory mezisektorového networkingu, kde podpora klastrování může být jeden nástrojů pro posílení kooperace mezi aktéry a podpory růstu regionální ekonomiky.

Hlaváček, P. & Siviček, T. (2017). Spatial differences in innovation potential of central European regions during post-transformation period. *Journal of International Studies*, 10(2), 61-73.

Výzkumným cílem článku bylo zhodnotit regionální diferenciace prostřednictvím komparace vybraných ekonomických, vědeckovýzkumných a inovačních ukazatelů vyhodnotit inovační potenciál regionů v Česku, na Slovensku a v Polsku. Výzkum vycházel z předpokladu, že na základě konstrukce agregovaného indexu na bázi dat z uvedených oblastí je možné zhodnotit úroveň a vývojové změny v inovačním potenciálu regionů, včetně vztahu mezi sledovanými proměnnými. Článek se cíleně zabýval analýzou inovačního potenciálu na úrovni regionálních samosprávných celků, nacházejících se v uvedených státech na úrovni NUTS II nebo NUTS III, aby byl zohledněn endogenní přístup v politice regionálního rozvoje. Oblast podpory růstu inovačního potenciálu je často spojena s regionálními inovačními strategiemi a jinými rozvojovými dokumenty, vznikajícími na regionální úrovni.

V rámci analýzy inovačního potenciálu regionů bylo nutné zohlednit ukazatele, které mohou ovlivnit mírů regionálních diferenciací a vývojové procesy. Nejprve bylo nutné provést výběr relevantních ukazatelů pro konstrukci Indexu inovačního potenciálu. Index metodicky vycházel z konstrukce podobného indexu regionální konkurenceschopnosti, používaného Evropskou komisí pro analýzu konkurenceschopnosti na úrovni regionů NUTS II. Navržený index byl vytvořen na základě souboru vybraných ukazatelů. Konkrétně se jednalo o hrubý domácí produkt na obyvatele, podíl obyvatel s vysokoškolským vzděláním v %, podíl pracovníků ve výzkumu a vývoji na pracovní síle podle regionů v %, tvorba hrubého fixního kapitálu na zaměstnance, vytvořená hrubá přidaná hodnota na zaměstnance, počet patentů na zaměstnance. Hodnoty byly standardizovány a použity pro výpočet Indexu, který byl sestaven na základě dat získaných z Eurostatu, Centrálního statistického úřadu Polska, Českého statistického úřadu a Statistického úřadu Slovenské republiky.

Výzkum v rámci prvotního generalizujícího zhodnocení rozdílů mezi regiony v jednotlivých státech zjistil, že vyšší hodnoty inovačního potenciálu vykazovaly nejvíce české regiony, následované slovenskými a polskými. V obecné rovině se také prokázala souvislost mezi kategorií makroekonomických a inovačních ukazatelů. Naopak byl zjištěn negativní vztah mezi nezaměstnaností a počtem poskytnutých patentů, stejně jako vzděláním

obyvatelstva, objemem lidských zdrojů ve výzkumu a vývoji a v růstu přidané hodnoty vytvářené v regionu. Regiony s vyšším HDP na obyvatele a investicemi na pracovní sílu vykazovaly také lepší podmínky pro růst inovačního potenciálu. Tyto regiony měly tendenci konvergovat s vývojem hodnot inovačního potenciálu. Naopak regiony s nižším HDP a menšími investicemi spíše vykazovaly divergenční tendence a růst regionálních rozdílů.

Jiné souvislosti se projevovaly z hlediska jednotlivých typologických skupin regionů. Příkladem jsou rozdíly mezi metropolitními a nemetropolitními regiony. Metropolitní oblasti dosahovaly vyšších úrovní inovačního potenciálu, což bylo dáno lepšími podmínkami pro růst inovací a ekonomického rozvoje. Na druhé straně nemetropolitní regiony, zejména s venkovským charakterem a s menšími městy, spíše stagnovaly. Inovační potenciál těchto regionů bude zřejmě dlouhodoběji zaostávat za více rozvinutými regiony, a to zejména z důvodu omezené dostupnosti investic do inovací, nedostatečného přístupu ke kvalifikovaným pracovníkům a málo rozvinutým regionálním inovačním systémům.

Mezi další výsledky výzkumu patří zjištění, že problémově vnímaná kategorie starých průmyslových regionů (i když se staré průmyslové regiony vyznačují řadou sociálních a hospodářských problémů, jako je vysoká míra nezaměstnanosti, zastaralý průmysl a zhoršené životní prostředí), vykazovala dobrou úroveň v kontextu všech hodnocených regionů. Výhodou starých průmyslových regionů, jako je např. Moravskoslezský a Ústecký kraj nebo Slezské vojvodství je, že mohou transformovat poměrně robustní hospodářské základny a endogenní potenciál na nové vývojové trajektorie. Periferní a agrární regiony (např. Lublinské vojvodství nebo Prešovský kraj) mají vlastní hospodářské základny dlouhodobě poměrně slabé. Nevýhoda těchto typů regionů spočívá v dlouhodobě nízké koncentraci zdrojů jako je kapitál, realizované investice, slabě rozvinutá infrastruktura, méně kvalifikované lidské zdroje a do jisté míry nepříznivá geografická poloha. Nedostatečnost zdrojů je klíčovým limitujícím faktorem, který v těchto případech, oproti starým průmyslovým regionům, poskytuje pouze endogenně slabý potenciál pro nastartování ekonomického růstu. Proto jsou uvedené typy regionů dlouhodobě ohroženy negativní kauzalitou směrem k divergenčním vývojovým trajektoriím. Tyto závěry ukazují na určitou podmíněnost vývojových procesů, daných typologickými diverzifikacemi regionů. Pak lze hovořit o strukturální determinaci a z toho vyplývající vyšší pravděpodobnosti podobného charakteru a směru vývojových procesů pro existující typy regionů.

Inovační politika by proto měla reflektovat regionální rozměr a fungovat jako endogenní mechanismus pro inovační růst spojený s přechodem od top-down přístupu k bottom-up. Implementace tohoto přístupu v koordinaci inovačních procesů by konceptuálně měla vycházet z triple helix přístupu (Etzkowitz a Leydesdorff, 2000; Leyesdorf, 2012), vytvářejícího inovační prostředí na bázi spolupráce mezi podniky, veřejnou správou, výzkumnými a vývojovými institucemi.

Budoucí výzkum by mohl přinést další poznatky z analýzy národních a regionálních inovačních politik a jejich dopadu na růst inovačního potenciálu regionů. Pro další výzkum je také přínosné rozšíření souboru indikátorů a dat, která by mohla poskytnout komplexnější charakteristiku inovačního prostředí regionu a jeho provázanosti na výkonnost regionálních ekonomik a na sítě regionálních a mimoregionálních aktérů.

Hlaváček, P. & Janáček, J. (2019). The Influence of Foreign Direct Investment and Public Incentives on the Socio-Economic Development of Regions: An Empirical Study from the Czech Republic. *E +M Ekonomie a management*, 22(3), 4-19.

Článek měl za cíl zhodnotit, jakým způsobem finanční toky ovlivňují vývojové procesy regionů Česka mapovaných prostřednictvím analýzy vybraných sociálních a ekonomických ukazatelů území. Při výběru dat bylo cílem obsáhnout široké spektrum dat, reprezentujících sociální a ekonomické procesy, byly proto vybrány ukazatele, u kterých bylo možné očekávat určitou reakci na příliv finančních prostředků do regionu. Finanční toky do regionů představovaly nezávislé proměnné, jednalo se o objemy poskytnutých investičních pobídek, příliv přímých zahraničních investic, výdaje na VaV na úrovni okresů.

Závislé proměnné byly reprezentovány daty v sociální, ekonomické a urbánní dimenzi. Jednalo se o ukazatele jako počet obyvatel, počty cizinců a míra urbanizace, počty nezaměstnaných a počty volných pracovních míst. V ekonomické oblasti byly pak sledovány počty firem v kategoriích malý, střední a velký podnik, v oblasti urbanistické pak data za stavební činnost, průměrná cena staveb a míra urbanizace. Zahrnutí ukazatelů za stavební činnost obecně indikuje růstový potenciál území, větší ekonomický růst je zpravidla doprovázen vyšší stavební činností.

V rámci výzkumu bylo očekáváno, že regiony s vyšším přílivem finančních prostředků do území budou mít tendenci dosahovat vyššího ekonomického růstu sledovaného prostřednictvím různých ukazatelů. Důraz ve výzkumu byl proto zaměřen na zhodnocení regionálních prostorových rozdílů s cílem zjistit existenci souvislostí mezi vývojem sledovaných ukazatelů. V zájmu získání detailnějších informací o prostorových rozdílech a podmíněnosti vývojových procesů byla použita úroveň okresů, která umožnila zachytit specifické prostorové vztahy a souvislosti v kvantitativně větším souboru okresů, oproti krajům.

Regiony prokázaly určitou míru adaptace a reakce na měnící se regionální prostředí. Konkrétně se ukázalo, že přímé zahraniční investice a investiční pobídky měly pozitivní vliv na růst malých firem v regionech. V tomto aspektu lze hovořit o určité konvergenční tendenci, skrze kterou se regiony s nižší úrovní ekonomického rozvoje mohou více přibližovat rozvinutějším regionům díky přílivu přímých zahraničních investic a poskytování investičních pobídek. V případě růstu počtu větších firem, středních a velkých podniků, nebyly zaznamenány tak výrazné reakce na vyšší příliv zahraničních investic.

Výzkum zjistil, že investice převážně směřovaly do výrobních aktivit a méně do oblasti spojených s vývojem a výzkumem. V tomto případě byly patrné určité divergentní tendence, regiony s nižšími výrobními náklady byly preferovány před rozvinutějšími regiony. Projevil se zde vliv programu investičních pobídek, který priorizoval zejména vytváření nových pracovních míst v zaostávajících regionech, respektive v regionech s vyšší nezaměstnaností. Výzkum také ukázal, že finanční toky mohou vykazovat kladné i záporné hodnoty (odliv investic) v závislosti na ekonomické situaci, což může způsobit silnější divergenci ve vývoji regionálních ekonomik. Mohou začít odcházet investoři s montážními výrobami vyhledávající nákladově a pobídkově atraktivnější země z regionů, kde tvořili významnou část ekonomiky. V následujících letech s rostoucí inovační výkonností regionů docházelo také k posílení vazby mezi přílivem zahraničních investic a rozvojem vědeckovýzkumných aktivit, projevovala se zde regionálně specifická konvergence, kterou v širším kontextu lze hodnotit pozitivně.

Analyzováním vlivu regionálně specifických lokalizačních podmínek na tok přímých zahraničních investic článek přispěl k poznání a identifikaci typů vývojových procesů mezi regiony. Ukazuje se, že zlepšení atraktivity ekonomiky pro zahraniční investory, zejména

v zaostávajících územích, vykazuje potenciál k postupné nivelizaci ekonomických rozdílů mezi regiony.

Veřejná politika by měla dlouhodobě podporovat a současně vytvářet mechanismy pro restrukturalizaci investic směrem k růstu konkurenceschopnosti regionů, aby byl omezen růst regionální asymetrie ve vývojových procesech. V obecné rovině investice posilují konvergenční potenciál směrem k rozvinutým regionům, proto by měla být, v zájmu tlumení růstu meziregionálních rozdílů a podpoře hospodářského růstu zaostávajících regionů, i nadále poskytována podpora aktérům z těchto regionů.

V článku byly také zhodnoceny probíhající vývojové procesy v regionálním prostředí na základě zhodnocení diverzity ekonomického a sociálního prostředí, které vytvořilo regionálně specifické lokalizační podmínky, a to vedlo k variabilitě investiční atraktivity různých regionů. Výzkum přinesl poznatky o rozdělení investičních pobídek na úrovni regionů, jaká je jejich prostorová diverzifikace v jejich rozmístění prostřednictvím lokalizovaných investorů. Ukázal se význam diferenciace ekonomického a sociálního prostředí, které determinuje regionálně specifické lokalizační podmínky, což vede k rozdílné atraktivitě regionů pro přímé zahraniční investice.

Shrnutí výsledků výzkumu

Vědecká práce přinesla poznatky do diskuse o regionální konvergenci a divergenci v kontextu současného ekonomického prostředí. Diverzita hodnocených ukazatelů byla sledována v kontextu vývojových změn, které dosáhly regiony na různých měřítkových úrovních.

Tržní prostředí v případě Česka a postsocialistických států Evropy po prvním období ekonomické transformace formovaly nové vývojové procesy. Ekonomický vývoj po roce 2000 již ukazoval, i přes meziregionální asymetrické vývojové diferenciace (Hampl, 2005) v obecné rovině konvergenční růstové tendence směrem k západoevropským zemím (Hlaváček a Bal-Domańska, 2016), které byly spojeny růstem divergence na regionální úrovni, jak také propisoval Novotný (2010). Z hlediska jednotlivých států byly patrné individuální vývojové trajektorie vykazující znaky fází hospodářského cyklu, který souvisel s hospodářskými politikami států, což v důsledku determinovalo i vývoj investic.

Přímé zahraniční investice přispěly k pozitivnímu ovlivnění vývojových trajektorií hospodářského rozvoje, jak uvedl také Simionescu et al. (2017), přestože byly zaznamenány určité parciální divergenční procesy. Investice ovlivnily konvergenční procesy, měly klíčovou roli v podpoře ekonomické transformace a hospodářského růstu postsocialistických států a posílení jejich konvergence směrem k ekonomikám západní Evropy, zejména po jejich vstupu do Evropské unie. Současně bylo možné vysledovat určité souvislosti s podílem lidských zdrojů ve VaV v populaci, kdy její vyšší míra korespondovala s více rozvinutými a ekonomicky stabilizovanými zeměmi.

Regionálně specifické procesy měly vliv na formování ekonomických a sociálních diferenciací prostřednictvím tzv. hybatelů změn, které charakterizuje Koutský (2016) jako určité strukturálně a manažersky podmíněné příčiny, v prvém případě prezentované strukturou ekonomiky a podniků, ve druhém případě kvalitou institucí a aktérů. Výsledkem jsou dosažené různé stupně rozvoje a atraktivity jednotlivých regionů pro hospodářský růst. V kontextu institucionálních přístupů k rozvoji regionů, kde právě existence a charakter institucí se považuje za kritérium konkurenceschopného rozvoje (Amin a Thrift, 1994), se nedílnou součástí analýz probíhajících změn stala problematika rozvoje mezipodnikové a mezisektorové spolupráce.

Jak doložil výzkum klastrů v českých a polských regionech, v málo rozvinutých a nemetropolitních oblastech a v regionech s nižší ekonomickou úrovní vznikly spíše místní klastry, které byly také ekonomicky slabší než klastry z urbánních regionů. Navíc také klastry s náročnějšími výrobními procesy zahrnovaly více firem, pro jejich formování jsou také vhodnější urbánní regiony. Pak lze hovořit i o určité podmíněnosti regionálního růstu charakterem regionálního prostředí, podobně byla potvrzena závislost mezi rozvojem klastrů a inovační výkonností (Žižka et al., 2018). Z toho vyplývají některé podobnosti mezi určitými typy regionů, které se v závislosti na svých charakteristikách a strukturách vyvíjejí podobným způsobem a vzájemně spíše konvergují, oproti skupinám jiných regionů, vůči kterým jsou více patrné divergentní tendence. Blažek a Csank (2007) v těchto souvislostech hovoří o určité stabilizaci prostorového vzorce rozvinutosti a zaostalosti regionů v Česku, který se vyvinul s Hamplem (2005) prokázané divergence transformačního vývoje.

Asymetrické vývojové procesy mezi urbánními a neurbánními typy regionů byly prokázány, metropolitní regiony díky aglomeračním výhodám a z důvodů intenzivních strukturálních změn (Kunc et al., 2023) výrazně překonávají ostatní regiony, jak také zjistil výzkum Alcidiho (2019) nebo Ženky et al. (2019). Specifickou kategorii urbánních regionů tvoří strukturálně postižené regiony charakteristické řadou sociálních a ekonomických problémů. Jak ukazují vývojové procesy podobných typů regionů například v Porúří nebo v Nizozemsku, mají tyto regiony v Česku a Polsku díky koncentraci zdrojů a infrastruktury dosud málo využitý rozvojový potenciál vzhledem k ostatním regionům v Česku. V současnosti, i přes signifikantní známky asymetrického vývoje vůči ostatním regionům, charakteristiky uvedených regionů vykazují dobré předpoklady podmíněné konvergence k růstovým regionům, což bude vyžadovat podporu akcelerace jejich endogenního potenciálu prostřednictvím rozvoje nových odvětví.

Tyto výsledky poukazují na podmíněnost vývojových procesů, která je spojena s různými charakteristikami daných diverzifikací typologie regionů. Můžeme tedy hovořit o strukturální determinaci, která by mohla způsobit, že regiony s podobnými charakteristikami by mohly vykazovat tendenci k podobným vývojovým vzorům. To by mohlo vést k procesům konvergence, kdy se skupiny regionů s podobnými charakteristikami přibližují ekonomickému vývoji, nebo k procesu divergence, kdy se jednotlivé skupiny regionů od sebe ekonomicky vzdalují. V současném kontextu byl pozorován posun v regionální dynamice, kde

rozdíly mezi regiony nových a stávajících členských zemí EU zmírňují předchozí geografickou polarizaci a západovýchodní polarita v rozšířené Evropské unii je nahrazována severojižní (Novotný, 2010; Ertur a Koch, 2006) s akcentem vnitrostátních diferenciaci v jednotlivých státech. Je třeba poznamenat, že vývojová asymetrie mezi různými typy regionů může být ovlivněna různými faktory, jako je například dostupnost zdrojů, infrastrukturní vybavenost území, ekonomická specializace nebo rozvinutost regionálního trhu práce.

V rámci hodnocení prostorových rozdílů na nižší měřítkové úrovní okresů v Česku a posuzování souboru ekonomických a sociálních ukazatelů se projevila určitá schopnost adaptace regionů na měnící se ekonomické prostředí. Přestože nebyly zaznamenány podobně intenzivní změny, ale individuálně rozdílné diferenciace, například souvislost mezi přílivem finančních toků do regionů se více promítla do růstu malých a středních firem v ekonomicky méně produktivních regionech. Spíše než o komplexní konvergenční změny jsou tyto vývojové změny parciální, odezvy na ekonomické impulsy se generovaly ve sledovaných ukazatelích v různé intenzitě nebo ani nebyly nalezeny časové souvislosti mezi změnami ukazatelů. I když lze diskutovat o souvislostech mezi danými jevy, zlepšení makroekonomické situace a dosažení hospodářského růstu vytvořilo lepší podmínky pro kvalitativní růst podniků.

Různorodá intenzita vývojových změn v případě lokalizovaných nových poboček výrobních podniků byla ovlivněna také nastavením veřejných politik. Poskytované investiční pobídky čerpaly zejména průmyslové podniky, bylo priorizováno vytváření počtu pracovních míst, jako nástroje tlumícího silně asymetrické vývojové procesy v růstu nezaměstnanosti koncem devadesátých let a po roce 2000. V tomto hledisku byl příliv investorů do problémových regionů žádoucí, i když v současnosti je tento model ekonomiky na hranici produkčních možností a další rozvoj regionálních ekonomik bude vyžadovat jiné formy dělb práce spojené i s vyššími požadavky na kvalitu pracovních sil.

Identifikace determinant, které ovlivňují ekonomické zaostávání nebo růst regionů, je klíčovým faktorem pro formulaci efektivních politik regionálního rozvoje, které budou i nadále ovlivňovat směr ekonomického rozvoje. Veřejná politika by měla být zaměřena na dlouhodobé ovlivňování vývojových procesů a na vytváření mechanismů, které by umožnily restrukturalizaci regionálních ekonomik směrem k růstu konkurenceschopnosti regionů. Tím

by mohl být omezen růst regionálních asymetrií v rámci vývojových procesů. Tyto konsekvence se potvrdily v případě schválení Zákona o investičních pobídkách č. 72/2000 Sb., který přispěl k přílivu investorů do české ekonomiky a ke transformaci ekonomik zejména ve strukturálně postižených regionech (Hlaváček, 2015).

Jak ukazují postpozitivistické přístupy ve vědeckém výzkumu, zcela nelze taxativně specifikovat všechny příčiny a dopady probíhajících hospodářských změn v regionálních ekonomikách, neboť každý region je ontologicky determinován vlastními regionálními podmínkami a prostředím, což ztěžuje i nastavení opatření v rozvojových politikách pro regiony pro větší akceleraci prorůstových vývojových změn.

V analýzách regionální konvergence a divergence je důležité zmínit určitá metodologická omezení, která ovlivňují interpretaci výsledků. Jedním z nich je omezená vypovídací hodnota dat, která nevystihují komplexitu regionálně ekonomických systémů. Data a informace potřebné pro analýzu regionální konvergence a divergence mohou být neúplné, zejména v případě menších regionů. Určitým řešením je interpretovat probíhající procesy na základě dat z vyšší měřítkové úrovně, jak bylo také aplikováno v předkládaných článcích. Z hlediska časových intervalů zpracovaných výzkumů mohou být některé změny výrazem krátkodobého výkyvu, který nemusí být projevem dlouhodobého trendu konvergence nebo divergence. I přes tato omezení výzkum mohl formulovat některé závěry, které byly verifikovány výzkumem z jiných článků v habilitační práci nebo od jiných autorů. Vzhledem k růstu významu otázky, jakým způsobem dosáhnout dalšího ekonomického růstu Česka, bude výzkum regionálních ekonomik dále významný pro formulaci regionálně specifických doporučení a opatření, jak dosáhnout růstu v každém regionu.

Další výzkum by měl směřovat k analýze vztahů mezi aktéry a vlivu ekonomického a inovačního prostředí na jejich rozvoj. Zaměření výzkumu na národní a regionální aspekty inovační politiky, meziodvětvovou spolupráci a růstové předpoklady regionů by také přineslo rozšíření poznání o příčinách procesů nerovnovážného vývoje. Tato analýza by mohla zahrnovat i další státy ve střední a východní Evropě a příklady úspěšných a méně úspěšných regionů, aby lépe porozuměla procesům konvergence a divergence v tranzitivních ekonomikách. Skrze zkoumání současného ekonomického prostředí, by rozšíření vědeckého poznání o příčinách a dopadech vývojových změn mohlo pomoci ve formulaci a nastavení efektivnějších rozvojových politik k podpoře vyváženého rozvoje regionů.

V současné době je pro českou ekonomiku z hlediska teorie GVC naopak klíčové, aby se v podnikovém sektoru dále rozvíjel firemní upgrading (Gereffi, 1999) a firmy se posouvaly do vyšších pozic v produkčních sítích. Pro dosažení dalšího ekonomického růstu je nezbytné zvýšit v podnicích míru produktivity a přidanou hodnotu, což dosahují spíše podniky ve vyšších úrovních produkčních sítí. Další výzkum v této oblasti by mohl přispět k lepšímu pochopení dynamiky konvergenčních a divergenčních procesů.

Pro výzkum jsou velmi inspirativní témata zaměřená na analýzu národní a regionální úrovně rozvojových politik a leadershipu (např. Sotarauta a Beer, 2017), jejich dopadů a přínosů pro rozvoj meziodvětvové spolupráce místních firem, jaký je vliv inovačních politik na růst regionálního inovačního potenciálu a upgrading firem v produkčních sítích. Pro další výzkum lze doporučit rozšíření počtu ukazatelů a dat, která budou vyhodnocovat prostředí regionů a jejich vývojové trajektorie v kontextu řešených oblastí výzkumu.

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Hlaváček P., Bal-Domańska B. *Impact of Foreign Direct Investment on Economic Growth in Central European Countries*, ENGINEERING ECONOMICS, June 2016 (DOI: http://dx.doi.org/10.5755/j01.ee.27.3.3914

My contribution to the paper was:

- procedures and research methods development,
- modelling of regional development issues,
- construction of statistical database,
- co-realization of research in the field of econometric models application and statistical analyses,
- preparing content and conclusion in the chapters entitled: "The specification of models and statistical data" and "The results of model estimations"
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Hlaváček P., Bal-Domańska B. *Impact of Foreign Direct Investment on Economic Growth in Central European Countries*, ENGINEERING ECONOMICS, June 2016 (DOI: http://dx.doi.org/10.5755/j01.ee.27.3.3914

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MARKOWSKA, Malgorzata, Petr HLAVÁČEK a Danuta STRAHL. Knowledge-Intensive Business Services Employment Structure and EconomicDevelopment in EU Regions. Comparative Economic Research. Central and Eastern Europe, 2022. 25(4), 109–133. https://doi.org/10.18778/1508-2008.25.32. Kat. General Economics, Econometrics and Finance, perc. 54th, SJR 0,262

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Články předkládané v habilitační práci

Inzinerine Ekonomika-Engineering Economics, 2016, 27(3), 294–303

Impact of Foreign Direct Investment on Economic Growth in Central and Eastern European Countries

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The paper seeks to analyse foreign direct investment and its impact on economic growth in the Central and Eastern European countries between 2000 and 2012, with an emphasis on the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. The methodology applied in the first part involved comparative analysis of the trends in foreign investment and gross domestic product, and in the other, a growth model based on the Endogenous Growth Model.
The analysis implied a great deal of spatial differentiation in the inflow of foreign investment and in economic growth. Estonia, followed by Hungary, the Czech Republic, and Slovakia by margin reports the highest volume of foreign direct investments for production of the gross domestic product and when recalculated to the manpower. Lower influence of the foreign direct investments on the economy was reported for Lithuania, Poland, Latvia, and Slovenia.
In the second part, a growth model is compiled, which revealed that statistically significant relations exist between economic growth, FDI and investment growth. Growth of foreign direct investment positively demonstrates itself in increasing the level of the gross domestic product. The influence of foreign direct investment on economic growth of the Central and Eastern European countries was more visible in the period of 2009–2012.

Keywords: *Foreign Direct Investment, Gross Domestic Product, Central and Eastern Europe, Growth Model.*

Introduction

Central and Eastern European countries (CEEC) were markedly economically underdeveloped in comparison to Western European countries, they did not have adequate resources and technological levels, and their growth was therefore conditioned by major foreign investment. As a result of political changes, the transformation of the centrally controlled economy to the capitalist market economy changed the development processes of these countries. Rapacki & Prochniak (2009), Estrin, Hanousek, Kocenda & Svejnar (2009) analyze the transformation processes and changes the transition CEEC economies. It was expected that the foreign investors would bring investments, know-how, new management methods, and new export potential. According to Bandelj (2010), the striving of the countries for the inflow of the foreign direct investments at the time of accession to the EU should point out to their attractiveness and successful integration in the global economy. The foreign direct investments in the transition economies in the CEE countries become one of the basic criteria of successful economic transformation.

The paper focuses on selected Central and Eastern European countries (Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia, Slovenia), who, owing to their geographical location, political-economic development, are forming open economies, in which foreign investment has an important role to play. The views on the geo-political definition of the area of the transitive economies, and particularly geographic inclusion of the Baltic countries, differ. This group of countries was included in Central Europe for analysis of the transformation processes (Kornai, 2006). The countries, on which the research focuses, are more often classified as the countries of Central and Eastern Europe in the bibliography. Yet another reason for the selection of these countries is the political factor, as it is the first group of post-socialist states that acceded to the European Union in 2004.

The paper draws on studies (Curwin & Mahutga, 2014; Kornecki & Raghavan, 2011; Leibrecht & Riedl, 2014) that addressed the development of transitional or development economies with an emphasis on the role of foreign direct investment. The investigation into transformation processes in the CEE countries approaches foreign investment from various points of view, ranging from their share in the economy or in selected sectors (Pavlinek, 2012; Popescu, 2007) up to the impact on technological advancement (Bucar, Rojec & Stare, 2009), or institutional quality (Tun, Azman-Saini & Law, 2012).

The study of foreign direct investment is also coupled with analyses of global production chains and geographical distribution of production (Blažek, 2012). An independent approach consists in evaluating direct investment from the geographical point of view where its concentration is followed from the macro-regional to interregional level (Hardy, Micek & Capik, 2012), often through comparing the differences or similarities in selected territorial phenomena

and characteristics. For the CEE countries, the macro-regional level is related, as an example, to the analyses completed by Carstensen & Troubal (2004), Turnock (2005), Ginevicius & Simelyte (2011) which addressed the impact of foreign direct investment on the transformation of national economies or selected sectors in selected countries. With regards to foreign direct investment on lower territorial levels, studies prevail, which deal with the penetration of foreign direct investment in the individual CEE countries. For the Baltic countries (Yucel, 2014) , analyses of the impact of DFI on the economies of Lithuania or Estonia (Tvaronaviciene & Grybaite, 2007; Ginevicius & Tvaronaviciene, 2005) or Latvia (Revina & Brekis, 2009), and of the impact of globalisation processes on Lithuania, Latvia and Estonia contained in the paper by Ginevicius & Tvaronaviciene (2003) deserve to be mentioned here. Further studies which dealt with the inflow of foreign investment to other Central and Eastern European countries, namely Hungary (Boudier-Bensebaa, 2005), Poland (Gorynia, Nowak & Wolniak, 2007), the Czech Republic (Tousek & Tonev, 2003; Hlavacek & Koutsky, 2013; Hlavacek, 2009), Slovakia (Wokoun, Tvrdon & Damborsky, 2010) and Slovenia (Bucar, Rojec & Stare, 2009) were also published.

The purpose of the article is to identify the impact of foreign direct investment on economic growth in selected Central and Eastern European countries, with an emphasis on post-2000 development. This is followed by compiling a model based on the Endogenous Growth Model (Mankiw, Romer & Weil, 1992) processed according to Solow's neo-classical growth model. The model employs such indicators as gross domestic product per capita, inward foreign direct investment stock per capita, gross fixed capital formation per capita, increase in labour force, human resources in science and technology as the percentage of active population, which are followed for each country between 2000 and 2012. The construction of the model seeks to assess the impact and relevance of selected economic factors, including foreign direct investment, with regard to the economic growth of transitional economies in Central and Eastern European countries. Intensively, how foreign direct investment in transitional economies contributes to the development process in the individual countries.

Development of the Economy and Inflow of Foreign Direct Investment

What rendered these countries attractive for foreign direct investments was the privatisation process, where the countries privatised a sizable amount of major enterprises of pivotal significance to their national economies. The rate of these privatisation processes, the transformation of the economies as well as the establishment of functional security markets, which allowed portfolio investments, all had a significant role to play in the territorial differentiation of foreign direct investment.

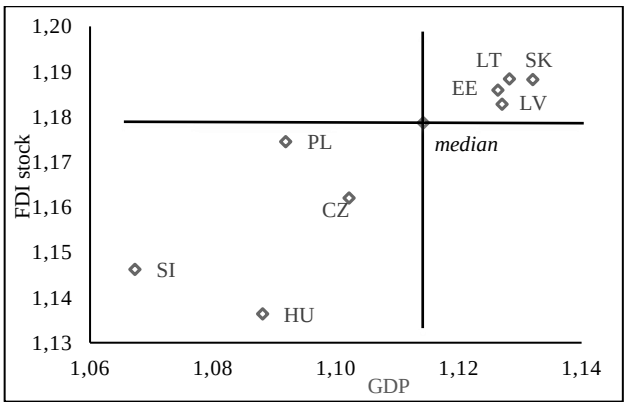

Figure 1. Average growth rate of gross domestic product and the stock of the foreign direct investments (FDI) per capita (USD) in Central and Eastern European countries in the period of 2000–2012 (USD)
Source: Author's compilation based on UNCTAD data

After 2000, the rate of economic growth increases and the economies enter a conjunctural stage of the economic cycle (Figure 1). This period was also coupled with growth in foreign direct investment, while the accession of the Central and Eastern European countries to the European Union in 2004 also had a positive role to play by strengthening the process of political and, first and foremost, economic integration in the European Economic Area.

The Gross Domestic Product growth remained above the EU level in all the countries during the period following the EU accession until 2008, when the macro-region also came down with the effects of the global economic crisis. In 2009 GDP growth slumped abruptly with only Poland managing to sustain its long-term growth owing to its economy being more closed in nature. The effects of the economic crisis were most profound in Lithuania, Latvia and Estonia, where the GDP slump approached the limit of 15 %. On the contrary, the Baltic countries' economies shook off the crisis effects rather quickly, registering above-average rates of growth. Slovakia and Poland did not level the growth of the Baltic economies, yet their own economic growth was markedly higher than that of the European Union. The last group comprises of the Czech Republic, Hungary and Slovenia, where the rate of growth in the crisis period starting in 2008 was the lowest and often under the EU level. According to Prochniak (2011), this is due to the fact that less developed countries tend to grow faster, on average, compared to more developed countries. The hypothesis stands for Slovenia and the Czech Republic, which have two of the highest GDP per capita levels of all the Central and Eastern European countries.

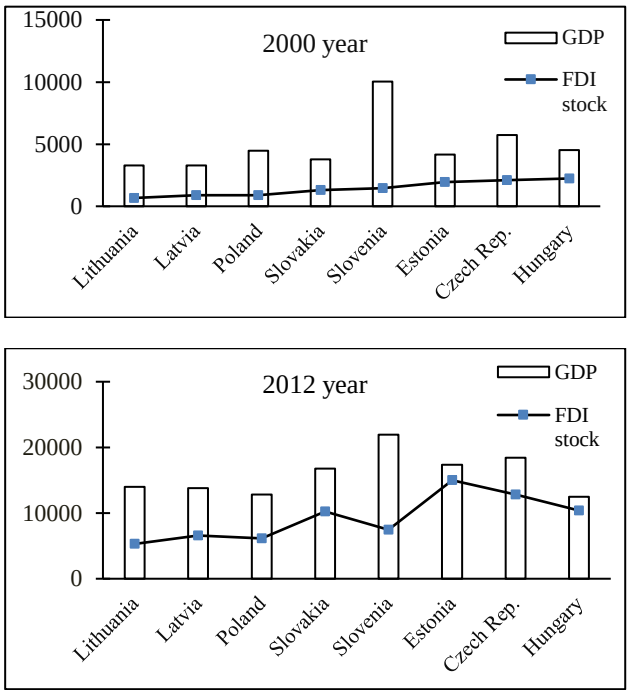

Figure 2. Gross domestic product (GDP) per capita (USD) and the stock of the foreign direct investments (FDI) per capita (USD) in Central and Eastern European countries in 2000 and 2012

Source: Author's compilation based on UNCTAD data

In the countries under consideration, the volume of foreign direct investment and the gross domestic product grew from 2000 to 2012. The final number is shown in Figure 2 showing the overall foreign direct investment volume and gross domestic product per capita. Figure 2 shows the position of the individual countries based on the average rate of GDP growth and the volume of foreign direct investment between 2000 and 2012. The highest growth in foreign direct investment is reported by Slovakia, Lithuania and Estonia, where the average value of invested foreign capital grew by 20 %. In the Czech Republic, Latvia and Poland, the stock of FDI grew roughly by 17–18 % per annum. On the contrary, a sloppier growth was observed in Slovenia (15 %) and the lowest number was reported in Hungary (14 % per annum). The varying rates of growth are also down to the overall investment volume during the years preceding 2000, when the countries in which the privatisation process had been completed, and which had already been open to foreign investment, had already achieved a higher volume of foreign investment per capita.

The comparison of the gross domestic product per capita and volume of FDI per capita shows the important differences between individual countries. Figure 2 illustrates total volume of the foreign direct investments and gross domestic product per capita in 2000 and 2012. High share of the foreign direct investments was seen in Estonia, in which a total share of foreign direct investments per capita amounted to almost 87 % of the GDP per capita, and in Hungary (83 %). The Czech Republic and Slovakia follows with a margin where the share did not exceed 70%. The lower share of the foreign direct investments was reported in Latvia and Poland (48%), and lowest figures were reported from Lithuania (38%) and Slovenia (34%). In parallel with ending the privatization process, the greenfield investments started in the said countries and they aimed at making a share in the internal markets (market-seeking investments) or at using lower production costs (factor seeking investments) and to export the production of the new branches to markets in Western Europe.

Figure 3. FDI stock per labour force in 2012 (USD)

Source: Author's compilation based on UNCTAD data

The developments in spatial distribution of foreign direct investment per labour force until 2012 are markedly uneven among the countries. The spatial differences between the countries in the volume of foreign direct investment per labour force achieved until 2012 are shown in Figure 3. The countries may be divided into three categories by the quantity of investment. The highest volume of foreign direct investment per labour force was reported in Estonia, Hungary and the Czech Republic. These countries received the highest investments thanks to developed economic links to neighbouring countries, Scandinavia in the case of the Baltic countries and Germany in the case of the Czech Republic. Slovakia and Slovenia are included in the second group. Slovenia rather stagnates but in the case of Slovakia, in recent years and particularly before the economic crisis, above-than-average economic growth has been seen including stronger export focus of the economy contributed by the growth of the direct foreign investments. For example, Slovak automotive industry belongs among the biggest producers of passenger cars in Europe when recalculated per capita where the production is intended particularly for export.

The third group includes Lithuania, Latvia, and Poland, which despite the fact it has the strongest economy of all monitored countries but relatively less open for foreign investments.

The accession to the European Union in 2004 positively influenced the inflow of direct foreign investment because it brought free movement of goods and services to EU Single Market, political stability, and improved the economic environment for foreign investors. According to UNCTAD data for pre and post-2004, the development in of foreign direct investment demonstrates that the inflow of

foreign direct investment was higher following the accession than before 2004 in all analyzed countries. As far as differences among the countries are concerned, a higher inflow of direct foreign investment was observed in Lithuania, Latvia, Poland, and Slovakia; the lowest inflows were observed in Hungary and Slovenia although still higher than before accession to the EU. The higher inflow of direct foreign investment also helped to economic growth and production capacity, especially in the export area. Foreign investors also began to re-invest their profits in the domestic economies, which can be interpreted as an expression of increased confidence in the economic environment of the new member countries. CEE countries offer a number of comparative advantages compared to Western European countries, including lower wage costs (Gauselmann, Knell & Stephan, 2011). However, in recent years, we have seen the interest of foreign investors drop as a result of the economic crisis and growth of competition in the Balkan countries and Turkey.

The Specification of Models and Statistical Data

Solow neoclassical growth model constitutes the starting point in the discussion referring to the significance of foreign direct investments targeted at the Central and Eastern European countries development. Aggregate production function for the unique final good, in its version related to the concept of endogenous growth, augmented by human capital (Mankiw, Romer & Weil, 1992 – hereinafter referred to as MRW) can be, in its general form, described as:

$$Y(t) = K(t)^{\alpha} H(t)^{\beta} (A(t)L(t))^{1-\alpha-\beta} \quad (1)$$

which means that at any (t) time moment economy has a certain capital (K), human capital (H), labour (L) and knowledge (A)[1] at its disposition, which are joined together in order to produce a product/income (Y). In the above equation α, β parameters represent *elasticity* regarding the selected production factor. It can be assumed that $\alpha+\beta < 1$ implies that there are decreasing returns to scale to all capital. It is also possible to assume that $\alpha+\beta = 1$, which implies that there are constant returns to scale in the productivity factors.

The theory of endogenous growth ruled out the neo-classical assumption inherent in growth models regarding the exogenous nature of the technological level and human capital, regarding these indicators as endogenous factors of economic growth.

Knowledge and human capital constitute important factors of endogenous economic growth. The reason is the opinion that the rate of technological and human capital growth results out of individual decision-making and priorities of entities acting reasonably. The initial level of human capital is one of the basic factors influencing development. Countries featuring a higher initial level of human capital resources absorb knowledge and innovation at a faster pace, which manifests itself in higher growth rate. Knowledge influences income in a different way than human capital. As (Romer, 1986; Romer, 1990) indicates knowledge, regardless of its type, does not result in competition. Its implementation by one enterprise does not reduce opportunities for its application by another entity. Knowledge can be preserved; it does not disappear together with its creator's disappearance. It is, however, often protected by ownership rights, since it is created as the result of investing private outlays in research and development processes. Spillovers created by knowledge represent its crucial characteristics, which mean that investments carried out by some enterprises are also associated with advantages for others; however, no simultaneous remuneration occurs in the form of market price. As the result joint benefits resulting from knowledge are larger than just the sum of benefits experienced by individual entities (Tokarski, 2005).

The implementation of knowledge as an element of development requires certain resources' presence in a given country (human capital, infrastructure), which altogether allow for the full implementation of overall advantages resulting from knowledge and its effects in the form of e.g. advanced technologies. It raises the idea of the existence of a certain critical volume of economy saturation with its basic production factors, which facilitates full implementation of knowledge and its effects. One can refer to the absorption capacity of countries, allowing for new solutions (innovation) assimilation and implementation. Such capacity is very limited in the case of an extensive developmental gap occurrence. On the other hand, if this gap is small the capacity is big, but there are few solutions possible to be acquired by a transfer. One may expect that countries presenting an intermediate stage, i.e. in between of these very poorly and very well developed ones, will experience the fastest development rate (Gomulka, 2008).

The above mentioned Solow neoclassical growth model through Cobb-Douglas production function is frequently used to describe processes related to selected factors' impact on regional development. The production function illustrates the relation between production (economy) volume and the level of production factors outlays. The source of production growth (income, economy), in the model, takes the form of either increasing outlays or their implementation efficiency.

In the accepted study model construction, the factors influencing economic growth level were the ones in line with MRW model structure (capital, human resources and human capital). The distinctive component in the model, as compared to a standard MRW model structure, is represented by an inward foreign direct investment stock. This parameter illustrates the size of foreign capital captured by a given country, which results not only in infrastructure development and opening more jobs, but also enhances innovation and human capital quality increase. The model can be presented in the following way:

$$\ln GDP_{it} = \beta_1 \ln FDI_{it} + \beta_2 \ln GFCF_{it} + \beta_3 \ln(n_{it} + g + \delta) + \beta_4 \ln HRST_{it} + \beta_5 CR_t + \alpha_i + \alpha_t + \varepsilon_{it}$$

$$\varepsilon_{it} \sim \text{IID}(0, \sigma_{\varepsilon}^2) \quad (2)$$

where*:*

[1] *A(t)L(t) is reffered to as Harrod-neutral technological progress, which can be define as improvements in technology that increase the efficiency of the labor force, so that the labour force in efficiency units increases faster than the number of workers available.*

β - coefficients illustrate the impact of particular factors (explanatory variables) on the level of economic development.

ε_{it} - error represents unobserved shocks in each time period and country.

GDP_{it} - gross domestic product per capita (US Dollars), refers to the size and level of economic growth in *i*-th country and *t*-th year.

FDI_{it} - inward foreign direct investment stock (annual) per capita (US Dollars), indicates the size of capital invested in the form of foreign direct capital investments in *i*-th country and *t*-th year.

$GFCF_{it}$ - gross fixed capital formation less direct foreign investment flow per capita (US Dollars), illustrates investment less the means flowing in as direct foreign investments presented by FDI_{it} variable in *i*-th country and *t*-th year.

$(n_{it}+g+\delta)$ - labour force growth rate augmented by the depreciation rate and technical advancement rate. It is assumed that the depreciation rate and technical advancement rate ($g+\delta$) are constant across countries and time. $g+\delta$ were set at the standard level of 0,05 accepted in most research (Mankiw, Romer & Weil, 1992).

$HRST_{it}$ – human resources in science and technology as the percentage of active population (%) - refers to persons fulfilling one of the following conditions: either having successfully completed tertiary education level in S&T field of study, although not formally qualified as above, or employed in S&T occupation where the above qualifications are normally required. Human resources in science and technology represent the most creative part of human resources, which may have the highest impact on innovation in particular countries.

Two important events were recorded in the studied period. In 2004 these countries jointed the EU structures and in 2008 the economic crisis took place. Based on the observation of the GDP values in the analysed period it is noticeable that the accession to EU structures did not change the earlier trends for GDP per capita and thus it is not covered in the model. However, a well noticeable change in GDP trends, as a result of the 2008 crisis, is observed. GDP value per capita, in all studied countries, was growing till 2008, whereas after 2009 these tendencies stopped and in the period 2009-2010 a drop in GDP level per capita was recorded. In order to reflect it in the model, a binary variable was introduced CR_1 – additional binary variable for time after the 2008 crisis (CR_1 = 1 if *t* = 2009, 2010, 2011, 2012). Moreover, additional estimations were carried out for the period before the crisis (2000–2008) and after the crisis (2009–2012). It allowed for the verification of crisis impacts on the relations between GDP and growth factors covered by the model, including FDI stock.

β coefficients illustrate the impact of particular factors (explanatory variables) on the level of economic development. ε_{it} error represents unobserved shocks in each time period and country.

Model estimation was performed for data panel with 8 countries from Central and Eastern Europe (The Czech Republic, Estonia, Lithuania, Latvia, Hungary, Poland, Slovenia and Slovakia) in the period of 2000–2012. Statistical data were obtained from two sources: United Nations Conference on Trade and Development (UNCTAD) (*GDP*, *GFCF*, *FDI*, labour force) and Eurostat (*HRST*).

Estimation techniques typical for panel data (Wooldridge, 2002; Greene, 2003; Maddala, 2006) were applied for the purposes of model structural parameters estimations (Table 1, Figure 4). They allow for the model to cover factors specific for a given object (country) and period (years), which is manifested in the model by the introduction of time series (α_t t = 1, 2, …, T) and individual effects (cross-section α_i i = 1, 2, …, N). Therefore it was assumed that the influence of country-specific factors (characteristics) on economic growth level is constant in time, however, spaciously diversified (e.g. geographical location, natural resources as well as other unobservable and omitted aspects in the model), which resulted in individual effects inclusion in the model referring to each α_i country. The presence of α_t parameters (so called time effect), which represent different intercepts in each year, allows for GDP to change over time (common for all objects (countries)). β coefficients on FDI_{it}, $GFCF_{it}$, $(n_{it}+g+\delta)$, $HRST_{it}$ are assumed constant across years and countries. Such model construction offers extensive opportunities for model application and allows for solving certain econometric problems, e.g. allows to avoid mistakes resulting from omitting an important variable, the application of substitution variables or aggregated data or omitting non-linear nature of a model (Wooldridge, 2002; Greene, 2003; Dziechciarz, 1993).

Individual effects α_i can be referred to as random or fixed. The choice when individual effects should be regarded as random or fixed is not an easy one. If there are only a few observations available about a given object it becomes extremely important to apply them in a way which allows for capturing differences between the studied objects in the best possible way (Hsiao, 1986). In contemporary econometrics the approach based on random effects is identified with zero correlation between α_i omitted individual effect and values of the observed explanatory variables. However, if the term of fixed effects appears in practice it means the possibility of α_i and x_{it} correlation. Literature presents a critical approach to the assumption regarding the absence of correlation between α_i and x_{it} – (Mundlak, 1961) effect, since in practice it is difficult to maintain. LSDV model (least squares with dummy variable) (Wooldridge, 2002; Greene, 2003) was used in the procedure of structural parameters estimations.

Whether the introduction of individual effects in a model is founded still has to be verified. In order to assess whether model specification is correct and the introduction of individual effects is founded, The F test (Greene, 2003) was used. The F test allows for checking joint substantiality of artificial variables referring to individual effects for each object (country) of the study. Zero hypothesis referring to constant intercepts (individual effects) can be presented in the following way: $H_0: \ \alpha_i = \alpha = \text{const}, \ i = 1, \ldots, N$.

Models based on cross-sectional data were estimated using Ordinary Least Square (OLS). Robust HC3 standard errors were applied in determining the significance of structural parameter estimates, which gives an alternative bias correction for the variance calculation as suggested by (Davidson & MacKinnon, 1993), who reported that this

method tends to produce better results when the model is really heteroskedastic. HC3 standard errors produce confidence intervals that tend to be even more conservative.

Autocorrelation or/and hetroskedasticity of unknown origin, present in data structure, pose a frequent burden for models. Heterosckedasticity and autocorrelation consistent estimator HAC (Arellano, 2003) was applied in order to avoid negative consequences of these two phenomena for model assessment.

Akaike information criterion (Akaike, 1974) was used for the purposes of models comparability. It is the measure of relative goodness of the fit of a statistical model. The purpose was to select, from among a few models, the one which minimizes information loss for the "true" model. A model presenting the lowest AIC value is the preferred one. R^2 determination coefficient was used as a quality measure of model adjustment to empirical data. It informs about the extent to which the variability of an explained variable is presented by the model which ranges from 0 to 1. In general, the higher the R^2, the better the model fits data. All calculation were made in STATA and GRETL programs.

The Results of Model Estimations

The results of model estimations, which describe the influence of growth factors regarding economic growth, are presented in Table 1. F statistics values equal 38,6 – 89,9 confirm that including α_i individual effects in the model is fully founded, since as statistically significant they improve estimation results significantly. Test F.results indicate major differences between countries in economic growth processes. Determination coefficient values inform that over 98 % of economic growth variability was explained by models.

The first specification (model with lnHRST variable) covers a full set of variables. After verifying the assessments of structural parameters it turned out that human capital, presented as lnHRST variable, does not have any statistically significant relation with the level of countries, economic growth. However, it has to be emphasized that the exclusion of the variable responsible for human capital from some of the models structure did deteriorate its quality (as compared to model GDP (2000–2012)) – indicated by an increase in Akaike information criterion value. This suggests that it is an important component of economic growth model structure.

The absence of statistical significance between lnGDP and lnHRST could result from the complexity of relations between human capital resources and the size of global production. An important quality of HRST is its relative stability of changes, and in the case of GDP high sensitivity to environmental changes. HRST level was steadily growing (in 2012 this variable value in the majority of countries was higher when comparing to 2000 by about 20 %; the highest increase was recorded in Poland by about 64 % and Slovenia – by 55 %), whereas GDP, in the same period of time, doubled or quadrupled respectively. As a result particular economies were gaining various benefits from the available HRST resources. This could be due to specialization and diversification of mid and high-tech sectors' efficiency and thus – their different roles in GDP creation.

Statistically significant relations (at the level of 0,1 or higher) were identified for the remaining economic growth factors: labor force growth, size of invested foreign capital and investment rate.

This indicates the presence of a statistically significant relation between factors illustrated in the right part of the model and economic growth. While comparing to the specification without InHRST variable, no significant differences in the values of structural parameters were observed regarding particular economic growth factors of the GDP (2000–2012) models with lnHRST variable.

A positive sign for the labor force growth rate is striking. In accordance with Solow's model GDP per capita growth rate is reduced by the labor force growth rate due to the diminishing returns to scale. In our example, in the period prior to crisis, the labor force growth rate has increased and the lnGDP per capita has risen almost in the same way. Such anomaly from the assumptions of Solow's neoclassical growth model can indicate certain interference in estimation processes resulting from e.g. external effects of some phenomena, intense changes in the analyzed economies experiencing extensive socio-economic and political transformations as well as growth and thus the absence of statistical dependence between employment rate changes and in GDP per capita. Following the purpose of conducted analyses, i.e. examining relations occurring between InFDI and economic growth, the estimation was reiterated without the employment growth rate variable (3rd part table 1.). The estimation values under discussion with ln*FDI* and ln*GDCF* variables did not change significantly. It confirms the stability of obtained results. Further in the article specification results without In*HRST* variable $ln(n_{it}+g+\delta)$ will be discussed.

Table 1

The results of economic growth models estimations (with and without ln*HRST*, $ln(n_{it}+g+\delta)$ variables) referring to the Central and Eastern European countries (in the entire period 2000–2012, before 2000-2008 and after 2008 crisis 2009–2012)

Specification	Model GDP (2000–2012)	Model GDP (2000–2008)	Model GDP (2009–2012)
1) $lnFDI_{it}$	0,436*** [0,061]	0,365*** [0,051]	0,521*** [0,144]
$lnGFCF_{it}$	0,171*** [0,031]	0,157** [0,060]	0,089*** [0,011]
$ln(n_{it}+g+\delta)$	0,615** [0,267]	0,961*** [0,350]	0,026 [0,333]
$lnHRST_{it}$	-0,408* [0,242]	-0,236 [0,207]	0,062 [0,240]
CR	0,312*** [0,101]	-	-
Const.	5,515*** [0,856]	5,512*** [0,878]	4,001*** [0,810]
Test F (*p-value*)	47,4 (*0,000*)	38,6 (*0,000*)	79,7 (*0,000*)
Akaike information criterion	-243,3	-170,7	-135,6
R^2	0,98	0,989	0,993

Specification	Model GDP (2000–2012)	Model GDP (2000–2008)	Model GDP (2009–2012)
2) $lnFDI_{it}$	0,392*** [0,062]	0,351*** [0,049]	0,531*** [0,116]
$lnGFCF_{it}$	0,182*** [0,037]	0,166** [0,063]	0,089*** [0,011]
$ln(n_{it}+g+\delta)$	0,525* [0,316]	0,904*** [0,314]	0,007 [0,276]
CR	0,290*** [0,101]	-	-
Const.	4,368*** [0,401]	4,749*** [0,473]	4,139*** [1,106]
Test F α_i (*p-value*)	44,0 (*0,000*)	50,5 (*0,000*)	89,9 (*0,000*)
Akaike information criterion	-235,6	-170,0	-137,5
R^2	0,986	0,989	0,993
3) $lnFDI_{it}$	0,393*** [0,063]	0,36 *** [0,057]	0,531*** [0,113]
$lnGFCF_{it}$	0,185*** [0,039]	0,172** [0,065]	0,089*** [0,011]
CR	0,288*** [0,101]	-	-
Const.	4,364*** [0,415]	4,692*** [0,553]	4,138*** [1,083]
Test F α_i (*p-value*)	44,1 (*0,000*)	40,9 (*0,000*)	95,3 (*0,000*)
Akaike information criterion	-236,6	-169,3	-139,5
R^2	0,986	0,988	0,993

*In the presentation of results individual α_i and time effects α_t were omitted.*** significant at the level of 0,001; ** significant at the level of 0,05; * significant at the level of 0,1. Arellano robust standard error HAC is quoted in parentheses []. Source: Author's compilation in GRETL program.*

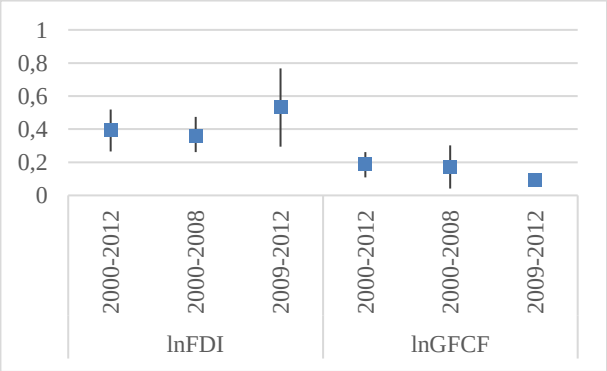

Figure 4. The statistically significant coefficient (at the level 0,05) with a 95 % confidential interval of economic growth models estimations (excluding ln*HRST*, $ln(n_{it}+g+\delta)$ variables) referring to Central and Eastern European countries (in the whole period 2000-2012, and before (2000-2008) and after the 2008 crises (2009-2012))
Source: Author's compilation in GRETL programme

The analysis of models' estimations for the period before and after crisis indicated certain differences in the level of estimated parameters. For the purposes of better presentation parameter estimations including a 95 % confidence interval are shown in Figure 4. Basic differences in the level of coefficients in the period before and after the crisis refer to:

- ln*FDI* impact on ln*GDP* – this relation was characterized by higher elasticity in the second period after the crisis: before the crisis an increase of foreign direct investment stock by 1 % was translated into 0,36 % rise of economic growth level (ceteris paribus); while after the crisis the respective relation was 0,531 %;
- ln*GFCF* impact on ln*GDP* – after the crisis the impact of domestic investment rate on ln*GDP* level was inconsiderable: before the crisis an increase of ln*GFCF* by 1 % was translated into 0,172 % increase of economic growth level (ceteris paribus); while after the crisis the respective relation was only 0,089 %; it was due to a much stronger ln*GFCF* reaction to the crisis and a strong decline in their value comparing to ln*GDP* level changes.

Panel models offer a general outlook on the relations combining the analysed phenomena jointly for all countries (considering their specificity by introducing individual effects). For better understanding of FDI importance in terms of particular economies, estimations were reiterated based on specification 3 (only ln*FDI* and ln*GDCF* variables) for each country separately (Figure 5). It was based on cross-sectional data. Due to a limited number of observations (especially for the post crisis period) the analysis was limited to a model covering the entire period (2000–2012). The obtained models were characterized by a high adjustment level to empirical data (R^2 values ranged from 0,962 to 0,994).

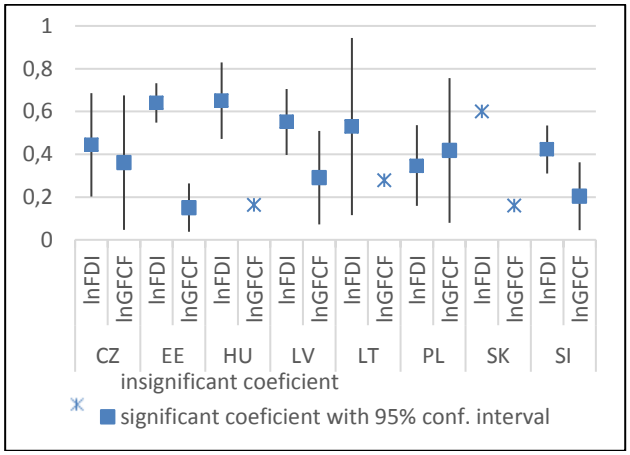

Figure 5. The coefficients (at the level of 0,05) with a 95 % confidential interval of economic growth models estimations referring to particular Central and Eastern European countries in the period 2000–2012
Source: Author's compilation in STATA programme

Slovakia was the only country in the case in which both explanatory variables did not present any statistically significant relation with ln*GDP* changes. It means that changes in ln*GDP* did not correlate with the strength and direction of changes in ln*FDI*. Parameter estimations, with ln*FDI* variable were statistically significant for the other countries. ln*FDI* elasticity presented a higher level than ln*GFCF* (excluding Poland) and ranged (ceteris paribus)

from 0,423 % in Slovenia up to 0,65 % in Hungary. In Poland, foreign capital elasticity against ln*GDP* changes was lower and amounted to 0,344 %, whereas the elasticity of ln*GFCF* variable – 0,418 %. As mentioned above, Poland was the only country in which elasticity against investments exceeded the elasticity level against foreign capital. In the other countries (for which statistically significant estimations were obtained), i.e. the Czech Republic, Estonia, Latvia, Slovenia – elasticity against investments ranged from 0,151 % (Estonia) up to 0,361 % (The Czech Republic) *ceteris paribus*. In Hungary and Lithuania elasticity against ln*GFCF* did not present any statistically significant relation with ln*GDP* changes.

In general, economic growth shows significant relations with the invested foreign capital in particular countries, FDI stock increase has impact on economic growth, however, economic growth is slower than foreign capital increase in a particular country. This dependence was visible in the entire period covered by the study and the dependence between FDI stock and GDP remained more pronounced after the crisis.

Conclusion

Foreign direct investment in Central and Eastern European countries has been a major indicator of economic development and external economic trust in the stability and development of their economies. During the economic transformation, the foreign direct investments in the countries of Central and Eastern Europe have become an important indicator of the economic development and an indicator of external economic confidence in stability and development of their economy. National governments expected from the foreign direct investments inflow that the foreign investors will restrict economic and social impacts of transformation and contribute to growth of competitiveness of the economies, which is confirmed by positive impact of the foreign investments on export and growth of gross added value in companies under foreign control.

The aim of the article was analysis of the differences in the foreign direct investments inflow among the selected Central and Eastern European countries with special focus on analysis of the influence of the foreign direct investments on the economic growth. The development of the spatial placement of the foreign direct investments per labour force before 2012 is highly imbalanced between the countries. First, the inflow of the foreign direct investments has been characterized since 2000 by dynamic growth, later attenuated at the end of the monitored period by the world economic crisis.

The highest volume of the foreign direct investments per labour force was achieved in Estonia and in the Czech Republic, which is influenced in the Baltic countries by building of the open and export economy with the use of the geographical position of the countries. In the case of the Czech Republic and Slovakia, the investments from Germany have been reflected in the inflow of the foreign direct investments, where the highest volume of the export is directed, which influences the growth of the gross domestic product. Lower growth of the foreign direct investments inflow is, on the other hand, reflected in Slovenia and Hungary. Slovenia employed a rather passive policy with respect to the foreign investments; Hungary is much more active in the long-term run and therefore, it achieved a higher volume of the implemented foreign investments per capita earlier and the inflow stagnates now. Deteriorated macro-economic situation of the countries influenced negatively the current slowdown of the foreign direct investments inflow to both countries.

The other result of the analysis was estimates of models based on the Endogenous Growth Model. The evaluation of structural parameters (panel models) showed that statistically significant relations exist between economic and FDI, investment growths. The growth of foreign direct investment positively demonstrates itself in increasing the rate of growth of the gross domestic product in all analysed periods 2000–2008; 2009–2012 and all 2000–2012. The growth model also points to the fact that with regards to foreign direct investment, its growth will have an even more marked impact on the gross domestic product developments than was the case for gross fixed capital formation. The elasticity of ln*FDI* is under 1, what means that ln*GDP* rise is slower than foreign direct investments. In the period 2009–2012 the elasticity was higher than in the previous period 2000–2008 (but still under 1), It indicates that after the 2008 crises the changes in ln*FDI* values would yield to faster economic growth according the changes before time of the crises.

Taking into account results of the econometric analyses for the whole period for particular countries in most of them (excluding Poland and Slovakia) changes in FDI stock have an even greater impact on economic growth that the values of GFCF.

Integration of the countries of Central and Eastern Europe to the European Union increased inflow of the foreign direct investments and accelerated the process of integration of economies into the European and global production chains. The ongoing internationalisation of the economic relationships will reflect in the future in expansion of the production capacities worldwide and the structure of company networks will lose its strong link to its country of origin over time.

During the era of the economic crisis, certain instability in the development processes appears, as well as in mutual dependency between the growth factors, and the development trajectories of the CEEC countries became more differentiated.

Finally, it could be said that both domestic as well as foreign direct investments contribute to the economic growth of the countries of Central and Eastern Europe and growing competitiveness of Central Europe in the global economy. The future risk, which starts to appear, is successive reduction in the inflow of the foreign direct investments of the investors who start to place their investments in more cost-effective countries in Europe and in the world. The reason is the growth of production costs in the CEEC countries that should create the environment attractive for the investments of higher added value. In terms of future development, according to Tun, Azman-Saini & Law (2012), institutional quality will have a bigger role to play than market size and quality of infrastructure.

Acknowledgement

This paper is supported by Internal Grant Agency of Jan Evangelista Purkyne University in Ústi nad Labem in the Czech Republic.

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The article has been reviewed.

Received in March, 2013; accepted in June, 2016.

Comparative Economic Research. Central and Eastern Europe
Volume 25, Number 4, 2022
https://doi.org/10.18778/1508-2008.25.32

Knowledge-Intensive Business Services Employment Structure and Economic Development in EU Regions

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Abstract

The study presents the results of grouping EU NUTS 2 regions based on the share of employment in particular sectors (knowledge-intensive high-technology services, knowledge-intensive market services and other knowledge-intensive services), as well as GDP per capita, in 2008 and 2018. The grouping of regions was done by clustering methods (for structure data), including Ward's method to determine the number of groups and the k-means for the final partition. GDP groups were defined using a sample mean and one standard deviation. To assess the similarity of the classifications and, consequently, to evaluate correlations between the employment structures and the level and pace of economic development, the similarity measure for partitions proposed by Sokołowski was used.

Keywords: structures of employment, GDP per capita, regions of NUTS 2, similarity

JEL: E24, J21, R11

Received: 19.01.2022. Verified: 4.05.2022. Accepted: 5.09.2022

Introduction

The development of civilization and successive industrial revolutions have changed the economic structures at a different pace. Various methods of production, administration, and management in business, along with evolving customer service methods, have resulted in the emergence of knowledge-intensive employment, which has replaced traditional structures (with a predominance of agriculture and the significance of industry and complementary services).

In primitive civilizations, the share of people working in agriculture was 80%. However, Fourastié (1972) predicted that at the beginning of the third millennium, the share of people working in services in developed economies would reach almost 80%, while agriculture and industry would account for the remaining 20%. Indeed, in 2018, in the European Union (EU), the share of people working in services was 74%, industry and construction 22%, and agriculture 4% (Eurostat 2021c). The transformation in employment structure is also a result of the increasing reliance of both manufacturing and services on knowledge. The share of employment is continuously growing in the sections of knowledge-intensive high-technology services and knowledge-intensive market services. The diversification of the countries and regions of the EU in the employment shares in those sections is highly significant, as are the changes in these structures over time. The countries and regions of the EU also differ in the level and pace of development.

Therefore, the purpose of the study is to investigate the correlation between employment shares in the knowledge-intensive sections and the changes in these shares related to the level and pace of economic development, and to identify groups of regions with similar levels and paths of change.

Literature overview

Clark (1940), Fisher (1952), and Fourastié (1972) are considered the pioneers of structural change assessment, proposing the concept of three sectors in the economy. Their studies represent the first attempt to grasp the regularities and reasons for the transformations in employment structures. Further research was conducted in economics by Kuznets, Fuchs, Chenery, Sauvy, Menz, and Stigler (Kwiatkowski 1982). Structural changes are analyzed from the historical perspective (Pasinetti 1981; 1993; Schmenner 2009; Timmer 2009; Gabardo, Pereima, and Einloft 2017), but also to identify structural changes in the World Economy (Memedovic and Iapadre 2010; Lewis et al. 2022), the role of manufacturing and services in economic growth (Attiah 2019; Institute 2021), employment polarization (Bárány and Siegel 2018), industrial growth, economic integration and structural change (Kallioras and Petrakos 2010;

Cutrini 2019). There have also been comparative analyses of employment structures (Sepp, Kaldaru, and Eerma 2009; Cheba and Bąk 2019; Markowska, Strahl, and Sobczak 2019; Pacana and Siwiec 2019; Bumberova and Kanovska 2020), a decomposition of changes in structure and trends in employment (Markowska 2017; Kouvavas et al. 2019; Luquini et al. 2019), and the assessment of sector share in the diversification of employment structures and trends in sector structure changes of employment (Markowska and Sokołowski 2017).

Correlations between the level of development, economic growth, and employment structures have been assessed in terms of structural change and economic growth (Laitner 2000; Bianchi, Valle, and Tapia 2021) and employment growth in knowledge-intensive business services (KIBS) (Chadwick, Glasson, and Smith 2008; Amancio et al. 2021; Zięba 2021). Research has investigated different territories, like China (Cai and Wang 2010) and US Metropolitan Areas (Bieri 2012), as well as smaller territories, including Romanian NUTS 3 regions (Jula and Jula 2013), the NUTS 3 regions of the V4 Group (Szakálné Kanó and Lengyel 2021), the Madrid city-region (de Ávila Serrano 2020), and larger economic systems, i.e., OECD countries (Dietrich 2012).

As a result of the increasing importance of knowledge in development, changes in employment in the industry sector and knowledge-based services are also research subjects. They are assessed in terms of the determinants of market extension and regional innovation systems (Bettiol et al. 2013; Lewandowska, Pater, and Cywiński 2019), testing the growth effects of structural change (Hartwig 2012), the geographical distribution and regional specialization of KIBS (Delgado-Márquez and García-Velasco 2013; Gallego and Maroto 2015; de Ávila Serrano 2019), employment growth in KIBS (Chadwick, Glasson, and Smith 2008), business services as a production factor (Drejer 2002), KIBS: prospects and policies (Miles 2005), exploring the financial consequences of the servitization of manufacturing (Neely 2007), business services location and market factors (Rubalcaba et al. 2013; Colaço and de Abreu e Silva 2021), knowledge-intensive services in a core industrial economy (Strambach 2004), innovation and productivity growth in services sector (Uppenberg and Strauss 2010; Börsch-Supan, Hunker, and Weiss 2021; Kurbonov 2021; Vujanovic 2021;), knowledge-intensive services and a restructuring economy (Wood 2004a), knowledge-intensive services: the diversity of processes and policies (Wood 2004b), the significance of KIBS (Wood 2006), and the business service revolution (Wood 2004a).

Europe, as a community of countries, is covered by the research addressing the specialization in KIBS (Marelli 2004; Gallego and Maroto 2015; Sisi and Zubiaurre 2021), the evolution of employment structures (Marelli 2004; Markowska, Sokołowski, and Strahl 2019), similarities in employment structures (Sepp, Kaldaru, and Eerma 2009; Markowska, Strahl, and Sobczak 2019; Godlewska-Dzioboń 2020), innovation and productivity growth in the EU services sector (Uppenberg and Strauss 2010; Georgescu and Herman 2019; Börsch-Supan,

Hunker, and Weiss 2021), the business service revolution (Wood 2004c), the significance of KIBS in Europe (Wood 2006), and the diversity of processes and policies in knowledge-intensive services (Wood 2004b).

Analysis lower than the country level covers NUTS 2 regions, in which the research focuses on, among other things, the geographical distribution and regional specialization of KIBS (Delgado-Márquez and García-Velasco 2013; Markowska, Kusterka-Jefmańska, and Jefmański 2016, Sisi and Zubiaurre 2020), industrial growth, economic integration, and structural change (Kallioras and Petrakos 2010), the decomposition of changes in structure and employment trends (Markowska 2017) and the correlations between KIBS and the regional importance of KIBS (Wood 2006).

Method

In order to cluster EU NUTS 2 regions concerning KIBS employment and GDP level, and to compare both classifications, the following procedure was used: 1) the set of variables that refer to employment structures and the level of development were defined, 2) the research objects and years of analysis were identified (2008 and 2018), 3) for the data on employment structures, Ward's method (Ward 1963) was used to determine the number of groups, and the k-means method (MacQueen 1967) was used for final partition, 4) for the data on the level of development, regions were divided into four groups based on the sample mean and standard deviation of GDP per capita, 5) groups and mean values of variables in the groups were identified, the composition and changes in the groups were assessed, 6) the similarity of the partitions were assessed.

Research objects and variables

The analysis required that the variables be determined and statistical data be collected. The changes in employment structures in KIBS sectors were assessed using variables selected from the Eurostat database (Eurostat 2021a):

- HT – employment share in the knowledge-intensive high-technology services section,
- M – employment share in the knowledge-intensive market services section (except for financial intermediation and high-technology services),
- O – employment share in the other knowledge-intensive services section.

Two hundred and seventy-two out of 281 EU regions (i.e., 96.8%) at the NUTS 2 level (Commission Commission Regulation (EU) No. 2016/2066) were covered by the research. Due to data unavailability, the analysis did not cover the overseas regions

of France (Guadeloupe, Martinique, Guyana, La Réunion, Mayotte), Portugal (Região Autónoma dos Açores, Região Autónoma da Madeira), or Spain (Ciudad Autónoma de Ceuta, Ciudad Autónoma de Melilla).

The assessment of the basic statistics of the employment structure variables (HT, M and O) revealed that in 2018, for each variable, the mean and median values were higher than in 2008. Additionally, an increase in characteristics was recorded for the maximum employment shares in knowledge-intensive high-technology services and other knowledge-intensive services sections. Increases were also noted for the minimum and standard deviation for employment shares in knowledge-intensive high-technology services and knowledge-intensive market services sections. However, the minimum and standard deviation for employment shares in other knowledge-intensive services were lower. The coefficient of variation was lower for all variables.

It is also interesting to find that the number of regions in which the employment shares in 2018 significantly changed compared to 2008. And so, the employment share of the HT variable increased in 180 regions, for M in 214 regions, and for O in 206 regions. A higher employment share in 2018 dynamics, which exceeded 150%, was observed for HT (42 regions), M (17 regions), and O (1 region). Additionally, HT in 9 regions and M in 2 regions exceeded 200%. There was a decline in employment shares in 2018 to, at most, 90% of 2008's level for HT in 42 regions, for M in 28 regions, and for O in six regions.

The second set of variables covers the indicators that describe the level of development – GDP per capita (GDPpc) in thousand Euro PPS (Purchasing Power Standard). Interestingly, the regions with the highest (UKI3) and the lowest (BG31) GDPpc are the same in both years. In 2018, the borderline (maximum and minimum) mean and median values were higher. Twenty regions in 2018 had lower dynamics of changes in GDPpc. For two of them, NL11 and EL41, it amounted to only 80% of the 2008 level. By contrast, for 116 regions, it exceeded 120%, for 19 regions, it reached over 150%, and for one Irish region – Southern – it was more than 200% (Eurostat 2021b).

Classification of regions in terms of the employment structure in the KIBS sections

2008 results

With Ward's agglomerative hierarchical clustering method, the number of groups of regions was identified by looking at the first big increase in agglomerative distance. Then the k-means method was used to obtain the final partitions. The characteristics of the groups of regions are presented in Table 1, and the regions included in these

groups are shown in Table 2. Full names of regions together with acronyms are given in the Appendix.

Table 1. Characteristics of the groups – 2008

Group	Number of regions	Mean values of the variable			Sum of mean values	GDPpc – values in the group		
		HT	M	O		mean	min.	max.
A	13	6.8	11.5	29.3	47.6	47.9	30.4	147.5
B	39	4.4	7.8	29.6	41.8	33.3	18.6	68.4
C	83	2.2	5.0	32.6	39.8	24.8	16.6	48.2
D	70	1.9	5.2	24.4	31.5	25.4	10.2	44.8
E	67	1.3	3.3	19.3	23.9	17.1	7.3	34.0

Source: authors' compilation.

Table 1 also summarizes the mean and borderline values of GDPpc, calculated for the regions in the groups. The decreasing average employment share in knowledge-intensive high-technology services and knowledge-intensive market services sections is accompanied by a decreasing average level of GDP per capita (excluding group D).

Table 2. Number of regions from a given country and regions in the groups in 2008 – breakdown by employment structure

Group	Regions – acronym and number of regions from a given country
D (70)	DE (19), EE (1), IE (1), EL (3), ES (7), FR (2), HR (1), IT (17), CY (1), LV (1), HU (3), AT (6), PL (2), PT (1), FI (1), UK (4)
	DE11, DE13, DE14, DE23, DE24, DE25, DE26, DE27, DE91, DE93, DE94, DEA1, DEA3, DEA4, DEA5, DEB3, DED4, DEE0, DEG0; EE00; IE05; EL52, EL54, EL63; ES12, ES21, ES41, ES43, ES51, ES61, ES70; FRD2, FRF1; HR03; ITC1, ITC3, ITC4, ITH1, ITH2, ITH3, ITH4, ITH5, ITI1, ITI2, ITF1, ITF2, ITF3, ITF4, ITF5, ITF6, ITG2; CY00; LV00; HU12, HU23, HU32; AT11, AT12, AT21, AT22, AT32, AT33; PL42, PL63; PT18; FI1C; UKD1, UKF2, UKF3, UKM5
B (39)	BE (3), BG (1), DK (1), DE (7), EL (1), IT (1), LT (1), LU (1), MT (1), NL (5), AT (1), PT (1), RO (1), SI (1), SE (3), UK (9)
	BE10, BE24, BE31; BG41; DK01; DE12, DE21, DE30, DE60, DE71, DEA2, DED5; EL30; ITI4; LT01; LU00; MT00; NL23, NL31, NL32, NL33, NL41; AT13; PT17; RO32; SI04; SK01; SE12, SE22, SE23; UKD6, UKH2, UKH3, UKI5, UKI6, UKJ2, UKJ3, UKK1, UKM8
E (67)	BG (5), CZ (7), DE (1), EL (8), ES (9), HR (1), IT (1), LT (1), HU (4), AT (2), PL (14), PT (3), RO (7), SI (1), SK (3)
	BG31, BG32, BG33, BG34, BG42; CZ02, CZ03, CZ04, CZ05, CZ06, CZ07, CZ08; DE22; EL51, EL53, EL61, EL62, EL64, EL65, EL42, EL43; ES11, ES13, ES22, ES23, ES24, ES42, ES52, ES53, ES62; HR04; ITI3; LT02; HU21, HU22, HU31, HU33; AT31, AT34; PL21, PL22, PL41, PL43, PL51, PL52, PL61, PL62, PL71, PL72, PL81, PL82, PL84, PL92; PT11, PT15, PT16; RO11, RO12, RO21, RO22, RO31, RO41, RO42; SI03; SK02, SK03, SK04

Group	Regions – acronym and number of regions from a given country
C (83)	BE (8), DK (4), DE (11), IE (1), EL (1), FR (19), IT (2), NL (7), FI (2), SE (4), UK (24)
	BE21, BE22, BE23, BE25, BE32, BE33, BE34, BE35; DK02, DK03, DK04, DK05; DE40, DE50, DE72, DE73, DE80, DE92, DEB1, DEB2, DEC0, DED2, DEF0; IE04; EL41; FRB0, FRC1, FRC2, FRD1, FRE1, FRE2, FRF2, FRF3, FRG0, FRH0, FRI1, FRI2, FRI3, FRJ1, FRJ2, FRK1, FRK2, FRL0, FRM0; ITC2, ITG1; NL11, NL12, NL13, NL21, NL22, NL34, NL42; FI19, FI1D; SE21, SE31, SE32, SE33; UKC1, UKC2, UKD3, UKD4, UKD7; UKE1, UKE2, UKE3, UKE4, UKF1, UKG1, UKG2, UKG3, UKH1, UKJ4, UKK2, UKK3, UKK4, UKL1, UKL2, UKM6, UKM7, UKM9, UKN0
A (13)	CZ (1), IE (1), ES (1), FR (1), HU (1), PL (1), FI (2), SE (1), UK (4)
	CZ01; IE06; ES30; FR10; HU11; PL91; FI1B, FI20; SE11; UKI3, UKI4, UKI7; UKJ1

Source: authors' compilation.

The names of groups A-E correspond to the decreasing intensity related to the sum of mean values in the groups of regions. Group A, which covers 13 regions, has the highest average employment share in the knowledge-intensive high-technology services and knowledge-intensive market services sections. The subsequent groups, due to employment shares in these sections, mostly have regressively lower values. The most numerous group – group C – which covers 83 regions, shows the highest average employment share in the knowledge-intensive services section.

2018 results

In this section, the k-means method was again used to cluster the EU regions into the number of groups identified in Ward's dendrogram. The initial characteristic of the groups of regions identified based on employment shares in the analyzed sections is provided in Table 3, and the regions assigned to these groups are shown in Table 4.

Table 3. Characteristics of the groups – 2018

Group	Number of regions	Mean values of the variable			Sum of mean values	GDPpc – values in the group		
		HT	M	O		mean	min.	max.
A	17	7.6	11.3	28.3	47.2	55.6	25.4	190.5
B	43	4.2	9.1	31.1	44.4	37.2	14.4	80.9
C	66	2.4	5.9	34.6	42.9	27.8	14.9	46.3
D	81	1.9	4.8	27.8	34.5	28.8	14.1	69.2
E	65	1.9	4.6	20.5	27.0	22.6	10.3	43.9

Source: authors' compilation.

Table 4. Number of regions from a given country and regions in the groups in 2018 – breakdown by employment structure

Group	Regions – acronym and number of regions from a given country
A (17)	BE (1), BG (1), CZ (1), IE (1), ES (1), FR (1), HU (1), PL (1), RO (1), SK (1), FI (1), SE (1), UK (5)
	BE10; BG41; CZ01; IE06; ES30; FR10; HU11l; PL91; RO32; SK01; FI1B; SE11; UKI3, UKI4, UKI6, UKI7; UKJ1
B (43)	BE (3), DK (1), DE (5), EL (2), FR (1), IT (2), CY (1), LT (1), MT (1), NL (7), AT (1), PT (1), SI (1), FI (1), SE (3), UK (11)
	BE21, BE24, BE31; DK01; DE21, DE30, DE60, DE71, DEA2; EL30, EL41; FRJ2; ITC3, ITI4; CY00; LT01; LU00; MT00; NL11, NL22, NL23, NL31, NL32, NL33, NL41; AT13; PT17; SI04; FI20; SE12, SE22, SE23; UKD3, UKD6, UKG1, UKH1, UKH2, UKH3, UKI5, UKJ2, UKJ3, UKK1, UKL2
C (66)	BE (7), DK (4), DE (6), EL (1), FR (14), IT (1), NL (3), FI (3), SE (4), UK (23)
	BE22, BE23, BE25, BE32, BE33, BE34, BE35; DK02, DK03, DK04, DK05; DE40, DE50, DE72, DED2, DED5, DEF0; EL54; FRB0, FRC1, FRC2, FRD2, FRE1, FRE2, FRH0, FRI1, FRI2, FRJ1, FRK1, FRK2, FRL0, FRM0; ITC2; NL12, NL13, NL21; FI19, FI1C, FI1D; SE21, SE31, SE32, SE33; UKC1, UKC2, UKD1, UKD4, UKD7, UKE2, UKE3, UKE4, UKF1, UKF2, UKF3, UKG2, UKG3, UKJ4, UKK2, UKK3, UKK4, UKL1, UKM6, UKM7, UKM8, UKM9, UKN0
D (81)	DE (27), EE (1), IE (2), EL (4), ES (9), FR (6), HR (1), IT (8), LV (1), LT (1), HU (4), NL (2), AT (6), PL (2), PT (3), SK (2), UK (2)
	DE11, DE12, DE13, DE14, DE22, DE23, DE24, DE25, DE26, DE27, DE73, DE80, DE91, DE92, DE93, DE94, DEA1, DEA3, DEA4, DEA5, DEB1 Koblenz, DEB2 Trier, DEB3, DEC0, DED4, DEE0, DEG0; EE00; IE04, IE05; EL51, EL52, EL53, EL61; ES11, ES12, ES13, ES21, ES24, ES41, ES42, ES43, ES61; FRD1, FRF1, FRF2, FRF3, FRG0, FRI3; HR03; ITH1, ITH2, ITF2, ITF3, ITF5, ITF6, ITG1, ITG2; LV00; LT02; HU23, HU31, HU32, HU33; NL34, NL42; AT11, AT12, AT21, AT22, AT32, AT33; PL42, PL62; PT15, PT16, PT18; SK03, SK04; UKE1, UKM5
E (65)	BG (5), CZ (7), EL (6), ES (7), HR (1), IT (10), HU (3), AT (2), PL (14), PT (1), RO (7), SI (1), SK (1)
	BG31, BG32, BG33, BG34, BG42; CZ02, CZ03, CZ04, CZ05 CZ06, CZ07, CZ08; EL62, EL63, EL64, EL65, EL42, EL43; ES22, ES23, ES51, ES52, ES53, ES62, ES70; HR04; ITC1, ITC4, ITH3, ITH4, ITH5, ITI1, ITI2, ITI3, ITF1, ITF4; HU12, HU21, HU22; AT31, AT34; PL21, PL22, PL41, PL43, PL51, PL52, PL61, PL63, PL71, PL72, PL81, PL82, PL84, PL92; PT11; RO11, RO12, RO21, RO22, RO31, RO41, RO42; SI03; SK02

Source: authors' compilation.

Group A comprises 17 regions and is characterized by the highest mean values of the HT and M variables. In the subsequent groups, the mean values of these variables get smaller. Group C, with 66 regions, has the highest share in the Other knowledge-intensive services section. The table also shows the mean and borderline values of GDPpc for the regions in these groups.

Like the classification for 2008, the decreasing average employment share in the knowledge-intensive high-technology services and knowledge-intensive market services sections accompanies the decreasing average level of GDPpc (except for group D). Table 4 provides the list of regions included in the groups.

Regional clustering by GDP per capita

2008 results

In order to define the groups of EU regions at the NUTS 2 level based on GDPpc, we are using the mean value and standard deviation. The first group covers the regions where the GDPpc is higher than the average plus standard deviation. The second group comprises the regions for which the variable value is lower than this limit but higher than the mean value. The third group includes regions characterized by a GDPpc that is below the average but higher than the mean value minus standard deviation. The fourth group consists of the regions where the GDPpc is lower than the mean value minus standard deviation. Table 5 presents the characteristics of the groups of regions.

The groups of NUTS 2 regions identified in terms of GDPpc values are characterized by the fact that the increasingly lower ranges of GDPpc level go along with the decreasing mean values of employment shares in the sections of knowledge-intensive high-technology services, knowledge-intensive market services and other knowledge-intensive services. The sums of average shares in the groups I-IV were, respectively, 43.1, 36.2, 33.7, and 23.9.

Table 5. Characteristics of the groups – 2008

Group	Number of regions	Group limits	GDPpc value in the group			Values of variables in the groups identified according to the level of GDPpc								
						HT			M			O		
			mean	max	min	mean	max	min	mean	max	min	mean	max	min
I	24	>37.1	48.5	147.5	37.5	4.8	7.8	1.3	9.1	19.7	4.4	29.2	36.3	22.9
II	97	25.4–37.1	30.0	36.5	25.4	2.8	7.8	0.9	6.0	13.0	3.4	27.4	27.4	16.5
III	121	13.6–25.4	21.0	25.1	14.0	1.9	6.7	0.4	4.7	9.1	1.6	27.1	27.1	12.7
IV	30	<13.6	12.6	13.4	7.3	1.1	1.9	0.6	2.8	5.3	1.0	20.0	20.0	11.7

Source: authors' compilation.

The technique used to determine the "ranges" for including regions in particular groups imposed their progressively lower mean values, as well as the decreasing values of these ranges.

2018 results

The previously described technique for determining ranges used in grouping the regions according to GDPpc was also used for the data from 2018 (cf. Table 6).

Table 6. Characteristics of the groups – 2018

Group	Number of regions	Group limits	GDPpc value in the group			Values of variables in the groups identified according to the level of GDPpc								
						HT			M			O		
			mean	max	min	mean	max	min	mean	max	min	mean	max	min
I	24	>44.5	59.5	190.5	44.6	5.6	9.6	1.9	9.6	17.0	4.3	28.5	37.0	22.3
II	89	30.0–44.5	35.6	44.5	30.1	3.1	9.1	1.0	6.9	15.5	3.2	29.5	42.9	18.4
III	143	15.5–30.0	23.4	29.7	15.5	2.2	6.9	0.7	5.3	13.6	2.6	28.0	41.7	13.2
IV	16	<15.5	13.7	15.4	10.3	1.6	4.8	0.7	3.5	6.4	1.4	23.1	30.3	10.7

Source: author's compilation.

In 2018, the regions grouped by GDPpc regarding the HT and M variables were characterized by increasingly lower ranges of GDPpc and decreasing mean values of employment shares in the two sections. The sums of average shares in groups I-IV were, respectively, 43.7, 39.5, 35.3 and 28.2.

Changes and similarities in regional clustering

Based on the employment structure in 2008 and 2018

Compiling the results of grouping the EU regions by employment structure allows us to assess changes in the classifications. Table 7 presents the number of regions that were included in groups with similar employment structures (i.e., average shares) in both classifications in both years.

Table 7. Number of regions in the groups according to employment structure – 2008 and 2018 classifications

Specification	A 2018	B 2018	C 2018	D 2018	E 2018	Total
A 2008	12 (92.31)	1 (7.69)				13
B 2008	5 (12.82)	31 (79.49)	2 (5.13)	1 (2.56)		39
C 2008		9 (10.84)	58 (69.88)	16 (19.28)		83
D 2008		2 (2.86)	6 (8.57)	48 (68.57)	14 (20.0)	70
E 2008				16 (23.88)	51 (76.12)	67
Total	17	43	66	81	65	272

Note: row % are given in parenthesis.
Source: author's compilation.

After adding the number of regions that were included in the groups characterized by similar "parameters" of employment structures in both years, the total number reached 200, i.e., 73.5% of all the assessed regions. Table 8 lists the regions that changed position. Of the 272 regions, 72 i.e. 26.5% changed position.

Table 8. Regions that changed classification positions in terms of employment structures in the respective sections in 2018

Group in year		Number of regions	Regions (acronym)
2008	2018		
A	B	1	FI20
B	A	5	BE10, BG41, SK01, UKI6
	C	2	DED5, UKM8
	D	1	DE12
C	B	9	BE21, EL41, FRJ2, NL11, NL22, UKD3, UKG1, UKH1, UKL2
	D	16	DE73, DE80, DE92, DEB1, DEB2, DEC0, IE04, FRD1, FRF2, FRF3, FRG0, FRI3, ITG1, NL34, NL42, UKE1
D	B	2	ITC3, CY00
	C	6	EL54, FRD2, FI1C, UKD1, UKF2, UKF3
	E	14	EL63, ES51, ES70, ITC1, ITC4, ITH3, ITH4, ITH5, ITI1, ITI2, ITF1, ITF4, HU12, PL63
E	D	16	DE22, EL51, EL53, EL61, ES11, ES13, ES24, ES42, LT02, HU31, HU33, PL62, PT15, PT16, SK03, SK04

Source: author's compilation.

Based on the GDPpc in 2008 and 2018

Initially, the similarity of the regional classifications was assessed by comparing the number of regions that had the same GDP values per capita regarding similar parameters in both years. Group III was the most numerous and most stable in terms of the number of regions covered in both years, followed by group II (Table 9).

Table 9. Regions in the groups according to GDP per capita – 2008 and 2018 classifications

Specification	I 2018	II 2018	III 2018	IV 2018	Total
I 2008	20 (83.3)	4 (16.7)			24
II 2008	4 (4.1)	80 (82.5)	13 (13.4)		97
III 2008		5 (4.1)	113 (93.4)	3 (2.5)	121

IV 2008			17 (56.7)	13 (43.3)	30
Total	24	89	143	16	272

Note: % from the row is given in parenthesis.
Source: authors' compilation.

Twenty regions were moved to a "lower" group and 26 to a "higher" one, which means that 226 regions, i.e., over 83%, were included in the same groups of regions in terms of GDPpc parameters. Twenty regions in both years were always listed in group I, 80 in group II, 113 in group III, and 13 in group IV (Table 10).

Table 10. Regions in the groups identified in terms of GDPpc in 2008 and 2018

Group in year		Number of regions	Regions (acronym)
2008	2018		
I		20	BE10, CZ01, IE06, FR10, SK01, SE11, UKI3, UKI4, DK01, DE21, DE60, DE50, DE11, DE71, LU00, NL31, NL32, AT13, ITH1, AT32
II	I	4	HU11, PL91, RO32, IE05
I	II	4	FI1B, UKJ1, NL11, UKM5
II		80	BE21, BE24, BE31, BE23, BE25, PT17, SI04, FI20, SE12, SE22, SE23, SE21, SE31, SE32, SE33, UKD6 UKH2, UKJ2, UKJ3, UKI7, UKK1, DK03, DK04, DK05, DE72, DEF0, FRK2, FI19, FI1C, UKM7, DE12, DE13, DE14, DE22, DE23, DE24, DE25, DE26, DE27, DE73, DE91, DE92, DE94, DEA1, DEA3, DEA4, DEA5, DEB1, DEB3, DEC0, DE30, DEA2, NL34, NL42, NL22, NL33, NL41, NL21, AT12, AT21, AT22 S, AT33, AT31, AT34, ES22, ES51, ES53, ES21, ES24, ES30, ITC1, ITC4, ITH3, ITH4, ITH5, ITI1, ITC3, ITI4, ITH2, ITC2
III	II	5	LT01, MT00, NL23, UKG1, DED5
II	III	13	UKI6, EL30, CY00, UKH1, NL12, NL13, FI1D, UKE2, UKM6, EL42, ES23, ITI2, ITI3
III		113	BG41, FRJ2, UKD3, UKH3, UKI5, UKL2, BE22, BE32, BE33, BE34, BE35, DK02, DE40, DED2, FRB0, FRC1, FRC2, FRD2, FRE1, FRE2, FRH0, FRI1, FRI2, FRJ1, FRK1, FRL0, FRM0, UKC1, UKC2 UKD1, UKD4, UKD7, UKE3, UKE4, UKF1, UKF2, UKF3, UKG2, UKG3, UKJ4 Kent, UKK2, UKK3, UKK4, UKL1, UKM8, UKM9, UKN0, DE80DE93, DEB2 Trier, DED4, DEE0, DEG0, EE00, IE04, EL52, EL53, EL61, ES11, ES12, ES13, ES41, ES42, ES43, ES61, FRD1, FRF1, FRF2, FRF3, FRG0, FRI3, HR03, ITF2, ITF3, ITF5, ITF6, ITG1, ITG2, LV00, AT11, PT15, PT16, PT18, SK03, UKE1, CZ02, CZ03, CZ04, CZ05, CZ06, CZ07, CZ08, EL62, EL63, EL64, EL65, EL43, ES52, ES62, ES70, HR04, ITF1, ITF4, HU12, HU21, HU22, PL22, PL41, PL51, PT11, RO42, SI03, SK02
IV	III	17	LT02, HU33, PL42, SK04, PL21, PL43, PL52, PL61, PL63, PL71, PL72, PL84, PL92, RO11, RO12, RO22, RO31
III	IV	3	EL41, EL54 , EL51

Group in year		Number of regions	Regions (acronym)
2008	2018		
IV		13	HU23, HU31, HU32, PL62, BG31, BG32, BG33, BG34, BG42, PL81, PL82, RO21, RO41

Source: author's compilation.

Similarity of classifications

The assessment of the classification similarity was performed using the similarity measure proposed by Sokołowski (1976; see also Rand 1971), as shown in Table 11. The similarity coefficients demonstrate what portion of pairs of objects were identically classified (pair of objects together or separately) in both classifications. The study focused on assessing the similarity of the groups of EU NUTS 2 regions based on the employment structure in KIBS sections, and the level of development assessed using GDPpc.

Table 11. The similarity of classifications

Specification	Sections 2008	Sections 2018	GDPpc 2008	GDPpc 2018
Sections 2008	1	0.799	0.625	0.605
Sections 2018	0.799	1	0.615	0.595
GDPpc 2008	0.625	0.615	1	0.807
GDPpc 2018	0.605	0.595	0.807	1

Source: author's compilation.

The assessment was performed from different perspectives, i.e., sections, level of development and years. The largest similarity of divisions (0.807) is characteristic for the regions grouped according to the level of development in 2008 and 2018, followed by employment in the service sections regarding the intensity of using knowledge in 2008 and 2018, and next groups of regions from the EU countries in 2008 in terms of the employment structure in the analyzed sections and the level of development (0.625). Generally, the level of similarity of analyzed partitions can be evaluated as moderate.

Conclusions

The multivariate data analysis methods made it possible to identify groups of regions that are similar due to their employment structures in KIBS sections and the level of development, and changes and similarities in the classifications for 2008 and 2018. It also made it possible to assess these regions' allocation in relation to the shifts and similarities, covering the countries that have joined the EU since 2004.

The shifts of regions to "better" mean an increase in employment share in KIBS sections (38 regions), and to the groups with the smallest numbers, there is an increase in the GDPpc (26 regions). At the same time, no changes in classification were observed for 200 regions regarding the employment structure in KIBS sections in both analyzed years, or for 226 regions regarding GDPpc. In total, 172 EU regions were simultaneously in the same groups in terms of employment structure and GDPpc, i.e., over 63%. This situation means that in the analyzed period, the majority of EU regions recorded stagnation in the structure and level of development.

There are many regions (34) – covering whole countries, including Austria, Denmark, Czechia, Croatia, Sweden and Slovenia, and three country-regions, i.e., Estonia, Luxembourg and Latvia – which were allocated to the same groups in terms of employment structure and development level in both years. The regions from Belgium, Bulgaria, France, and Portugal (25 in total) are included in the same groups based on development level in both years. Malta is a country-region that, based on the employment structure, was placed in the same group in both years.

More than half of the regions (32 out of 61) from the countries that joined the EU in 2004 were placed in the same group in both years in terms of employment structure and development level:

- CZ01 was in group A and group I.
- SI02 was in group B and group II.
- SI04, HR03, EE00, and LV00 were in group D and group III.
- The remaining 7 Czech regions (CZ02–CZ08), three Polish regions (PL22, PL41, and PL51), as well as two Hungarian (HU21 and HU22), one Slovak (SK02), one Romanian (RO04), one Croatian (HR04) and one Slovenian (SI03) region were in group III and group E.
- Two Hungarian regions (HU23 and HU32) were in group D and group IV.
- Five Bulgarian (BG31, BG32, BG33, BG34, and BG42), two Polish (PL81 and PL82) and two Romanian (RO21 and RO41) regions were in group IV and group E.

The movement to "better" groups was recorded for 38 regions in terms of:

1. **both classification systems** for five EU regions, including four that joined the EU in 2004.
   - RO32 moved from group B to A and from group II to I;
   - UKG1 moved from group C to B and from group III to II;
   - LT02, HU33, and SK04 moved from group E to D and from group IV to III;
2. **the level of development for 26 regions:**
   - four regions moved from group II to I, including three that joined the EU in 2004: HU11, PL91 (the capital region), RO32 and IE05 from group A;
   - five regions moved from group III to II, including one that joined the EU in 2004: LT01, MT00, NL23 (group B in terms of the employment structure), DED5 (it went from B to C), and UKG1 (from group C to B);
   - 17 regions moved from group IV to III, including twelve that joined the EU in 2004 and which were classified E in terms of employment structure: eight Polish regions (PL21, PL43, PL52, PL61, PL71, PL72, PL84, PL92) and four Romanian regions (RO11, RO12, RO22, RO31);
3. **the employment structure for 38 regions:**
   - five regions moved from group B to A, including three that joined the EU in 2004: BE10, SK01 (group I), RO32 (from II to I), UKI6 (although it moved from group II to III), BG41 (stable level of development);
   - nine regions moved from group C to B: NL11 (group I to II), BE21 and NL22 (stable in group II), UKH1 (although it moved from group II to III), UKG1 (group III to II), FRJ2, UKD3, UKL2 (stable in group III), and EL41 (although it moved from group III to IV);
   - two regions moved from group D to B, including one new EU member – this is the only "leap" by two groups: ITC3 (stable in group II), CY00 (group II to III);
   - six regions moved from group D to C: FRD2, UKD1, UKF2, UKF3, and FI1C (stable in group III), and EL53 (although it moved from group III to IV);
   - 16 regions moved from group E to D, including six new EU members: DE22 and ES24 (stable in group II), EL53, EL61, ES11, ES13, ES42, PT15, PT16, and SK03 (stable in group III), HU31 and PL62 (stable in group IV), EL51 (although it moved from group III to IV), and LT02, HU33, and SK04 (group IV to III).

Negative changes occurred for 34 regions:

1. **the Italian region ITI2 moved for both classification systems, from group D to E and from II to III;**
2. **in terms of the level of development:**
   - four regions moved from I to II: FI1B and UKJ1 (both in group A), NL11 (although it moved from group C to B), and UKM5 (stable in group D);
   - 13 regions moved from II to III, including one new EU region: NL12, NL13, FI1D, UKE2, and UKM6 (stable in group C), EL42, ES23, ITI3 (stable in group E), EL30 (stable in group B), UKI6 (although it moved from B to A), UKH1 (although it moved from C to B), CY00 (although it moved from D to B), and ITI2 (from D to E);
   - three regions moved from III to IV, although they all improved in terms of employment structure: EL41 (from C to B), EL54 (from D to C), and EL51 (from E to D);
3. **in terms of employment structure:**
   - region FI20 from A to B (stable in group II);
   - two regions moved from B to C: UKM8 (stable in group III) and DED5 (although it moved from group III to II);
   - one moved from B to D: DE12 (stable in group II);
   - 16 regions moved from C to D: DE73, DE92, DEB1, DEC0, NL34, NL42 (stable in group II), and DE80, DEB2, IE04, FRD1, FRF2, FRF3, FRG0, FRI3, ITG1, and UKE1 (stable in group III);
   - 14 regions moved from D to E: ES51, ITC1, ITC4, ITH3, ITH4, ITH5, and ITI1 (stable in group II), EL63, ES70, ITF1, ITF4, and HU12 (stable in group III), ITI2 (from group II to III), and PL63 (from III to IV).

The main finding observed in the 2008 and 2018 classifications of Central and Eastern Europe regions (i.e., Poland, Czechia, Bulgaria, Hungary, Romania, Slovakia, Slovenia, Latvia, Lithuania, and Estonia) based on the KIBS employment structure is the high level of cluster stability. Eighty-eight percent of the 59 regions were in the same clusters, and most were in groups with lower employment rates in all economic sections. Seven regions improved, moving from group B to A (regions with capital cities, i.e., BG41 Yugozapaden, RO32 Bucuresti – Ilfov, and SK01 Bratislavský kraj) or from E to D (HU31 Észak-Magyarország, SK03 Stredné Slovensko, SK04 Východné Slovensko, and LT01 Lithuania). Generally, the employment structures in Central and Eastern Europe were fixed between 2008 and 2018.

Acknowledgments

The project is funded under the program of the Minister of Education and Science titled "Regional Initiative of Excellence" in 2019–2023, project number 018/RID/2018/19, the amount of funding PLN 10 788 423,16.

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Struktura zatrudnienia w usługach biznesowych opartych na wiedzy a rozwój gospodarczy regionów Unii Europejskiej

Praca przedstawia wyniki grupowania regionów Unii Europejskiej szczebla NUTS 2 dokonanego na podstawie struktury zatrudnienia w usługach biznesowych opartych na wiedzy, rozpatrywanej w trzech sekcjach: usługi wysokich technologii, usługi marketingowe oraz pozostałe usługi biznesowe oparte na wiedzy, w powiązaniu z poziomem PKB na mieszkańca. Analizę przeprowadzono dla lat 2008 i 2018. Do grupowania regionów z punktu widzenia struktury zatrudnienia wykorzystano aglomeracyjną metodę Warda (do identyfikacji liczby grup) oraz metodę k-średnich (dla uzyskania ostatecznego podziału). Dla oceny podobieństwa podziałów oraz związków pomiędzy strukturą zatrudnienia w analizowanych usługach biznesowych a poziomem i dynamiką rozwoju gospodarczego zastosowano miarę podobieństwa podziałów zbioru skończonego.

Słowa kluczowe: struktura zatrudnienia, PKB per capita, region NUTS 2, podobieństwo

Appendix – list of regions and acronyms

AT11 Burgenland
AT12 Niederösterreich
AT13 Wien
AT21 Kärnten
AT22 Steiermark
AT31 Oberösterreich
AT32 Salzburg
AT33 Tirol
AT34 Vorarlberg
BE10 Région de Bruxelles-Capitale
BE21 Prov. Antwerpen
BE22 Prov. Limburg
BE23 Prov. Oost-Vlaanderen
BE24 Prov. Vlaams-Brabant
BE25 Prov. West-Vlaanderen
BE31 Prov. Brabant Wallon
BE32 Prov. Hainaut
BE33 Prov. Liege
BE34 Prov. Luxembourg
BE35 Prov. Namur
BG31 Severozapaden
BG32 Severen tsentralen
BG33 Severoiztochen
BG34 Yugoiztochen
BG41 Yugozapaden
BG42 Yuzhen tsentralen
CY00 Kypros
CZ01 Praha
CZ02 Střední Cechy
CZ03 Jihozápad
CZ04 Severozápad
CZ05 Severovýchod
CZ06 Jihovýchod
CZ07 Střední Morava
CZ08 Moravskoslezsko
DE11 Stuttgart
DE12 Karlsruhe
DE13 Freiburg
DE14 Tübingen
DE21 Oberbayern
DE22 Niederbayern
DE23 Oberpfalz
DE24 Oberfranken
DE25 Mittelfranken
DE26 Unterfranken
DE27 Schwaben
DE30 Berlin
DE40 Brandenburg
DE50 Bremen
DE60 Hamburg
DE71 Darmstadt
DE72 Gießen
DE73 Kassel
DE80 Mecklenburg-Vorpommern
DE91 Braunschweig
DE92 Hannover
DE93 Lüneburg
DE94 Weser-Ems
DEA1 Düsseldorf
DEA2 Köln
DEA3 Münster
DEA4 Detmold
DEA5 Arnsberg,
DEB1 Koblenz
DEB2 Trier
DEB3 Rheinhessen-Pfalz
DEC0 Saarland
DED2 Dresden
DED4 Chemnitz
DED5 Leipzig
DEE0 Sachsen-Anhalt
DEF0 Schleswig-Holstein
DEG0 Thüringen
DK01 Hovedstaden
DK02 Sjalland
DK03 Syddanmark
DK04 Midtjylland
DK05 Nordjylland
EE00 Esti
EL30 Attiki
EL41 Voreio Aigaio
EL42 Notio Aigaio
EL43 Kriti
EL51 Anatoliki Makedonia, Thraki
EL52 Kentriki Makedonia
EL53 Dytiki Makedonia
EL54 Ipeiros
EL61 Thessalia
EL62 Ionia Nisia
EL63 Dytiki Ellada
EL64 Sterea Ellada
EL65 Peloponnisos

ES11 Galicia
ES12 Principado de Asturias
ES13 Cantabria
ES21 País Vasco
ES22 Comunidad Foral de Navarra
ES23 La Rioja
ES24 Aragón
ES30 Comunidad de Madrid
ES41 Castilla y León
ES42 Castilla-la Mancha
ES43 Extremadura
ES51 Cataluna
ES52 Comunidad Valenciana
ES53 Illes Balears
ES61 Andalucía
ES62 Región de Murcia
ES70 Canarias
FI19 Länsi-Suomi
FI1B Helsinki-Uusimaa
FI1C Etelä-Suomi
FI1D Pohjois-ja Itä-Suomi
FI20 Aland
FR10 Île de France
FRB0 Centre-Val de Loire
FRC1 Bourgogne
FRC2 Franche-Comté
FRD1 Basse-Normandie
FRD2 Haute-Normandie
FRE1 Nord-Pas de Calais
FRE2 Picardie
FRF1 Alsace
FRF2 Champagne-Ardenne
FRF3 Lorraine
FRG0 Pays de la Loire
FRH0 Bretagne
FRI1 Aquitaine
FRI2 Limousin
FRI3 Poitou-Charentes
FRJ1 Languedoc-Roussillon
FRJ2 Midi-Pyrénées
FRK1 Auvergne
FRK2 Rhône-Alpes
FRL0 Provence-Alpes-Côte d'Azur
FRM0 Corse
HR03 Jadranska Hrvatska
HR04 Kontinentalna Hrvatska
HU11 Budapest
HU12 Pest
HU21 Közép-Dunántúl
HU22 Nyugat-Dunántúl
HU23 Dél-Dunántúl
HU31 Észak-Magyarország
HU32 Észak-Alföld
HU33 Dél-Alföld
IE04 Northern and Western
IE05 Southern
IE06 Eastern and Midland
ITC1 Piemonte
ITC2 Valle d'Aosta
ITC3 Liguria
ITC4 Lombardia
ITF1 Abruzzo
ITF2 Molise
ITF3 Campania
ITF4 Puglia
ITF5 Basilicata
ITF6 Calabria
ITG1 Sicilia
ITG2 Sardegna
ITH1 Provincia Autonoma di Bolzano
ITH2 Provincia Autonoma di Trento
ITH3 Veneto
ITH4 Friuli-Venezia Giulia
ITH5 Emilia-Romagna
ITI1 Toscana
ITI2 Umbria
ITI3 Marche
ITI4 Lazio
LT01 Sostines regionas
LT02 Vidurio ir vakaru Lietuvos regionas
LU00 Luxembourg
LV00 Latvija
MT00 Malta
NL11 Groningen
NL12 Friesland
NL13 Drenthe
NL21 Overijssel
NL22 Gelderland
NL23 Flevoland
NL31 Utrecht
NL32 Noord-Holland
NL33 Zuid-Holland
NL34 Zeeland
NL41 Noord-Brabant
NL42 Limburg
PL21 Małopolskie
PL22 Śląskie
PL41 Wielkopolskie

PL42 Zachodniopomorskie
PL43 Lubuskie
PL51 Dolnośląskie
PL52 Opolskie
PL61 Kujawsko-Pomorskie
PL62 Warmińsko-Mazurskie
PL63 Pomorskie
PL71 Łódzkie
PL72 Świętokrzyskie
PL81 Lubelskie
PL82 Podkarpackie
PL84 Podlaskie
PL91 Warszawski stołeczny
PL92 Mazowiecki regionalny
PT11 Norte
PT15 Algarve
PT16 Centro
PT17 Área Metropolitana de Lisboa
PT18 Alentejo
RO11 Nord-Vest
RO12 Centru
RO21 Nord-Est
RO22 Sud-Est
RO31 Sud-Muntenia
RO32 Bucuresti–Ilfov
RO41 Sud-Vest Oltenia
RO42 Vest
SE11 Stockholm
SE12 Östra Mellansverige
SE21 Smaland med öarna
SE22 Sydsverige
SE23 Västsverige
SE31 Norra Mellansverige
SE32 Mellersta Norrland
SE33 Övre Norrland
SI03 Vzhodna Slovenija
SI04 Zahodna Slovenija
SK01 Bratislavský kraj
SK02 Západné Slovensko
SK03 Stredné Slovensko
SK04 Východné Slovensko
UKC1 Tees Valley and Durham
UKC2 Northumberland and Tyne and Wear
UKD1 Cumbria
UKD3 Greater Manchester
UKD4 Lancashire
UKD6 Cheshire
UKD7 Merseyside
UKE1 East Yorkshire and Northern Lincolnshire
UKE2 North Yorkshire
UKE3 South Yorkshire
UKE4 West Yorkshire
UKF1 Derbyshire and Nottinghamshire
UKF2 Leicestershire Rutland and Northamptonshire
UKF3 Lincolnshire
UKG1 Herefordshire Worcestershire and Warwickshire
UKG2 Shropshire and Staffordshire
UKG3 West Midlands,UKH1 East Anglia
UKH2 Bedfordshire and Hertfordshire
UKH3 Essex
UKI3 Inner London-West
UKI4 Inner London-East
UKI5 Outer London-East and North East
UKI6 Outer London-South
UKI7 Outer London-West and North West
UKJ1 Berkshire Buckinghamshire and Oxfordshire
UKJ2 Surrey East and West Sussex
UKJ3 Hampshire and Isle of Wight
UKJ4 Kent
UKK1 Gloucestershire Wiltshire and Bristol/Bath area
UKK2 Dorset and Somerset
UKK3 Cornwall and Isles of Scilly
UKK4 Devon
UKL1 West Wales and The Valleys
UKL2 East Wales
UKM5 North Eastern Scotland
UKM6 Highlands and Islands
UKM7 Eastern Scotland
UKM8 West Central Scotland
UKM9 Southern Scotland
UKN0 Northern Ireland

European Planning Studies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ceps20

Are clustering and R&D institutions in post-socialist states functional tools for sustainable development?

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To cite this article: Anna Mempel-Śnieżyk & Petr Hlaváček (2022) Are clustering and R&D institutions in post-socialist states functional tools for sustainable development?, European Planning Studies, 30:10, 2022-2042, DOI: 10.1080/09654313.2021.2013779

To link to this article: https://doi.org/10.1080/09654313.2021.2013779

EUROPEAN PLANNING STUDIES
2022, VOL. 30, NO. 10, 2022–2042
https://doi.org/10.1080/09654313.2021.2013779

Routledge
Taylor & Francis Group

Are clustering and R&D institutions in post-socialist states functional tools for sustainable development?

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ABSTRACT

This paper explores the process of achieving sustainable development at a regional level in post-socialist states in the context of the clusters concept. In spite of the research on how it is achieved in particular countries, it remains under-researched or the results are in conflict. We consider if qualitative parameters of regions, the complex process of dependence between R&D financing in regions, whether the policies implemented in the development processes of post-socialist countries are important for the greater development of clustering and the higher concentration of clusters. The empirical analysis is based on Spearman's ρ rank correlation and the stepwise regression analysis. We find that dependencies between the functioning of clusters and selected factors of the sustainable and qualitative development of regions were confirmed. The research shows that the expected effects are not clear, albeit that such policies resulted in a change in the direction of the activities, and that better performance can be expected by taking directional measures. Overall, our findings confirm the expected dependencies of involving public financing on R&D and clusters in regions. We find that the policies implemented in the post-socialist states do not necessarily involve large-scale permanent environmental improvement.

ARTICLE HISTORY
Received 12 June 2021
Revised 24 November 2021
Accepted 25 November 2021

KEYWORDS
Cluster; sustainable development; post-socialist states; regional development; R+D financing

1. Introduction

The nature of economic changes has moved towards sustainable development (SD) over time. The response to the shift in the economy was a reformulation of the structure of the socio-economic space, establishing systems of correlations and spatial structures aimed at ensuring the economic growth of particular regions in accordance with SD. Even so, interest in SD among economic development researchers remains strong, and SD is still a fundamental objective of the European Union (Drastichová 2020).

Problems related to adapting to new development challenges were particularly intense in the post-socialist countries, because of the delay to and then the accelerated pace of their occurrence. Although each country creates its own unique environment for companies, transition economies share several common characteristics that set them apart from

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developing economies. Post-communist countries undergoing transformation had less experience of competition, fewer business environment institutions, and less confidence in government initiatives (Sölvell, Lindqvist, and Ketels 2006).

The above-mentioned post-transformed countries have adopted economic reforms aimed at accelerating the structural transformation of their production systems by strengthening territorial development while adopting a cluster development policy. The concept of a cluster was noted as a creative new concept for improving the international competitiveness of the economy (Brodzicki and Szultka 2002), and clusters were viewed as points of regional economic growth since the competitiveness of a product presently depends on the associated environmental burdens (Metechko and Sorokin 2018). Over time, talk of national programmes and regional clusters in terms of economic growth and competitiveness has been extended to include the discussion of clusters in SD. In spite of practitioners and academics, as Cooke mentioned (Cooke 2012), being sceptical of policy capabilities to create, let alone build, clusters, cluster policy is 'evolving' and continues and governments need to face challenges resulting from implemented cluster concepts in recent years. After many years, cluster policy 'is noted as a multi-dimensional, multi-instrument policy, informed by a mix of rationales and the development of clusters, therefore, means different things in different places' (Njøs et al. 2017).

However, the question remains; are the effects of an implemented cluster policy and actions undertaken visible from an SD perspective? Do clusters in post-socialist countries lead to an improvement in the condition of the environment? The central question then becomes: might clusters through their activities affect SD? This study addresses the stated research gap referring to a grounded but still current topic, which has been studied but where results are still contradictory. One can find confirmation of the aforementioned dependencies and in contrast, research showing a lack of dependencies.

Against this background, the aim of our research is to evaluate whether the development of cluster activities, as a new form of organization of companies in the post-socialist space, is related to selected factors of the sustainable and qualitative development of regions. The more qualitatively developed environment of regions, whether within the areas of sustainability, economy, energy or human resources, can also be expected to lead to the development of a higher level of cooperation in the form of cluster initiatives. The development of clusters is influenced not only by the parameters of the region but also by public programmes to support the development of clusters. The second research aim will, therefore, be to evaluate the role of public policy in clustering.

To achieve the aim of the research, the paper is organized as follows: the first part of the research is based on a literature review of the concept of SD, the concept of clusters, and links between both in the proposed theoretical framework. The second part presents the materials and methods. The structure of the research, the construction of the audit questionnaire for primary data collection, and the sources of secondary data are explained. The next section presents the results and discussion, followed by the conclusions, contributions, limitations and opportunities for further research.

2. Theoretical background

2.1. Sustainable development concept and regional development

The notion of SD, defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their needs' (WCED 1987), is still widely discussed (Mensah 2019) and is an urgent priority when it comes to addressing growing environmental and social problems (Linnenluecke et al. 2017). SD is one of the most critical challenges in the world at present, and therefore, is one of the fundamental and most important objectives of policy-makers (Emma Pravitasari et al. 2018). It is also observed as a strategic trend in global environmental protection policy and socio-economic development (Megyesiova and Lieskovska 2018).

SD is still relevant in both theoretical and empirical research (Dizdaroglu 2019; Emma Pravitasari et al. 2018; Abrahams 2017; Esteves, Santos and Anunciação, 2012). The multitude of dimensions of SD discussed in the subject literature (Megyesiova and Lieskovska 2018) proves its importance and topicality. It is analysed in both the context of enterprises, cities and regions and at an international level, as well as with different temporal focuses (ex-ante, concurrent, ex-post) (Dizdaroglu 2019; Lazaretti et al. 2019; Joseph et al., 2019; Lazaretti et al. 2019).

It is worth mentioning that regional development refers to phenomena occurring within a broader system, e.g. on a national scale, taking regional decomposition into account (Gorzelak 2000). Regional development is perceived as a multidimensional process; therefore, it is defined in various time and spatial terms, as well as in relation to various fields of socio-economic activity (Pike, Rodríguez-Pose, and Tomaney 2018). We refer to SD at a regional level in the paper to explain the issues and dependencies analysed. In the subject literature, various aspects of SD at a regional level are analysed, e.g. economic development, institutional aspects, and measuring context (Islam and Siwar 2012; Jovovic et al. 2017; Bakri et al. 2018; Corradini 2021). SD at a regional level includes all activities, instruments, and tools that promote SD within the framework of regional economic initiatives (Jovovic et al. 2017).

To follow the changes referring to sustainability in particular areas where SD indicators were developed and applied. They refer to the main areas of SD: social, economic, and environmental (United Nations 2007),

A multitude of SD measures were proposed e.g. Moldan identified ca. 260, (Moldan, Billharz, and Matravers 1997) and additionally, SD was analysed through 78 indices (Sachs et al. 2016; Megyesiova and Lieskovska 2018). Over time, approaches which minimize the number of indicators were developed (Mirghaderi and Mohit-Ghiri 2019).

SD is one of the most widely accepted regional-level constructs in the subject literature and its indices are most often defined as a measurable aspect of the above-mentioned SD domains. There is no single and universal method of choosing indicators for sustainable regional development assessment.

The indices analysed form the basis for subsequent researchers creating their own indices and methods of measuring SD, reflecting the uniqueness of countries and regions. Efforts of the European Union showed, next to global measurement, regions using their own resources and potential, try to find the best way to meet present and forthcoming SD challenges (Dickens et al. 2019). Due to different approaches to SD from different disciplines combined with the complexity of SD assessment, redundancy

Table 1. The correlation between sustainable development indicators and clusters of data.

	Clusters total	Members	cluster members per 1 mil pers.	companies / 1 mil. pers	UniRaDper 1 mil. Pers.	Subsidy per person	Subsidy per Cmemb
GDPpop	-.30	-.47*	.02	.01	.04	.11	.15
Gross fixed capital formation (GFCF) by region in 2018 per citizen	-.36^	-.46*	.12	.10	.17	.24	.27
Government financial support of research and development by Region per citizen in 2019	-.21	-.37*	-.08	-.09	.06	.12	.20
Degree of urbanisation in %	-.01	-.05	.24	.16	.26	.39*	.36^
Research and development personnel by region- per 1 000 employees in the region 2019	-.08	-.24	.04	.04	.07	.24	.32
Carbon Carbon monoxide (CO) per person in the region 2019	-.08	-.22	-.30	-.34^	-.07	-.17	-.06
Sulphur dioxide (SO_2) per person in the region 2019	-.40*	-.54**	-.23	-.25	-.02	-.18	-.08
Industry sector	-.21	-.24	-.18	-.27	.15	.03	.17
Energy sector	.18	.20	-.15	-.15	-.01	-.13	-.11
Environmental protection investments by Region EURper citizen		-.22	-.19	-.19	-.20	-.18	-.12

Notes:^ **0,1 > *p*** > 0,05; *p <.05,** p <.01; Correlation strength was presented as a heat map. The blue colour represents negative correlations, the orange represents positive correlations. No colour was applied for weak correlations (rs < 0,2)

can easily appear between indicators at different levels (local, regional, national, and international) (Geniaux et al. 2009).

To analyse the relationship between clusters and regional development in the context of SD, we concentrate on the basic measures (see Table 1). Gross domestic product (GDP) per capita - the basic measure of economic development, the basic measure of regional performance (Ketels and Protsiv 2021) as well as being an important indicator of the level of economic development and its long-term growth - is the main objective of economic policies. Gross fixed capital formation (GFCF) is a factor of economic growth which affects the growth of innovation and the competitiveness of enterprises. GFCF is recognized as contributing to economic growth (Gibescu 2013) and is one of the main determinants of productivity (Trpeski and Cvetanoska 2019). Socio-economic development largely depends on the technological level of the economy, and R&D resources are a driving force behind it. Increased outlays on R&D lead to increased innovation and competitiveness within the economy and the importance of knowledge of SD is underlined (Johansson and Karlsson 2006) (Shahraki 2019). We included R&D personnel per 1000 employees within the region in the measures.

Another important point of reference in the analyses was the degree of urbanization. Urbanization is recognized on one hand as one of the preconditions of development, but on the other hand as a source of problems in developing countries (Ketels 1966). A report on MDGs finds that urban poverty rates are significantly lower than rural poverty rates; furthermore, urban populations have far better access to public services as defined by MDGs, e.g. access to safe water and sanitation facilities (The World Bank, 2013; Zhong et al. 2020).

SD involves the efficient and sustainable use of resources, as well as the protection of the environment (by reducing emissions and preventing biodiversity loss). We refer to the benefits of reducing air pollution for improving SD (Zhao, Tan, and Feng 2020). To this end, we took into account the fact that energy use is a significant factor in causing pollution in the region, indicating that the industrial sector in the region produces environmentally unclean energy. Regions need environmentally cleaner technologies in energy production to achieve SD (Atici 2009). Therefore, the relationship between clusters and the quality of the environment in the regions was a topic of interest to us. We included basic environmental measurements such as carbon monoxide (CO) per person in the region and nitrogen oxides (NO_x) per 1000 people in the region.

2.2. Links between the cluster concept and sustainable development within regional development

Strong processes of globalization have developed and strengthened the position of the cluster as one of the key factors in the development of regional and national economies. The most popularized definition of a cluster is geographically concentrated and interrelated enterprises, suppliers, and service providers operating within related sectors and associated institutions (such as universities, standardization entities and industry-related associations) (Porter 1990). The cluster concept was also developed from a broad spectrum of disciplines. A series of neologisms has emerged from its various applications, such as Marshallian agglomeration and his industrial districts concept (Marshall 1920), new Italian industrial districts (Becattini 1992) and others e.g.: territorial production systems, local production arrangements, regional innovation systems (Kitchen 2017). It can be added that the cluster concept is also connected with the notion of agglomeration and is most central to economic geography (Kitchen 2017) related to the endogenization of the growth process. Continuing agglomeration of economies in the sense of the new economic geography discussed by Krugman (1991) were underlined as important, and it can be mentioned that one feature of NGE models is the endogenization of the location of economic activity in a space (Brülhart 2001). According to Krugman (1991), the advantages of agglomeration emphasize the concentration of skilled labour, technological spillovers, and interaction among local firms. The last factor is also closely related to clustering, which is actually more successful in such equipped regions. From the perspective of New Economic Geography, the path dependent process (Hassink and Gong 2019) should be emphasized, which should then create better conditions for the development of interactions, and thus clusters, in developed regions in the long term.

The industrial district was defined by Pyke and Sengenberger (1992), who indicated that it is not only a cluster of companies within related sectors. They saw the essence in the manner in which the enterprises grouped within the district are organized, and they understood this organization as a system of correlations between the companies and organizations from their surroundings (Pyke and Sengenberger 1992).

Clusters are discussed in the context of increasing competitiveness (Ketels, Lindqvist, and Sölvell 2012; Anić et al. 2019), increasing innovativeness (Battaglia et al. 2010; Vlasceanu 2014), contributing to the exchange of knowledge (Voyer 1998), in the context of smart specialization development (Del Castillo, Paton, and Saez 2013;

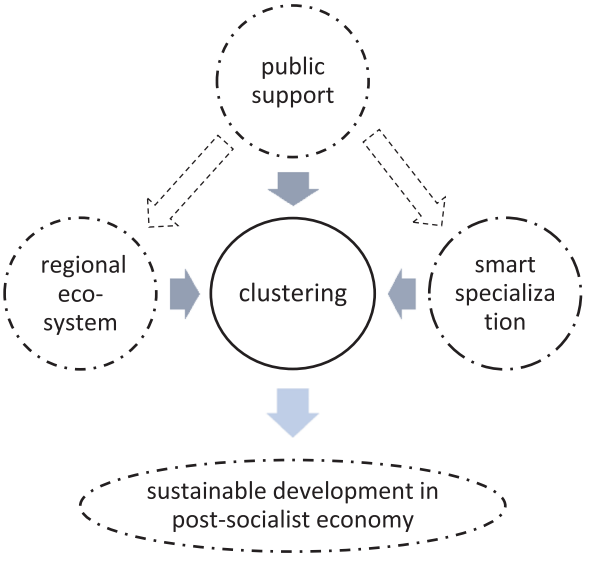

Figure 1. Sustainable development of clusters. Source: own elaboration.

Mempel-Śnieżyk 2013; Pronestì 2019), regional and economic development (Ketels, Lindqvist, and Sölvell 2012; Njøs and Jakobsen 2016), regional development through their activities (Meyer-Stamer 1999; Gordon and Mccann 2005; Njøs and Jakobsen 2016; Havierniková and Kordoš 2019) or the circular economy (Razminiene 2019). The popularity of clusters is still growing and becoming prevalent in strategies for the economic development of countries (Rentkova 2019). Researchers underlined the fact that the strength of clusters influences the economic prosperity of regions to some extent (Sölvell, Ketels, and Lindqvist 2009). The relationship between clusters and regional prosperity is positively and significantly associated with our measure of cluster portfolio strength. Clusters are an important factor in understanding regional performance (Ketels and Protsiv 2021).

Clusters facilitate interactions between members at regional, national, trans-national, international or sectoral levels (Laur, Klofsten, and Bienkowska 2012) (see Figure 1).

The clusters, in regional terms, were discussed in the context of the proximity of companies enabling cooperation in a specific sector. The traditional reasons for enterprises to join cluster structures (e.g. employment growth, lower costs, promotional activities, entering new markets, or new business contacts) have expanded to include new reasons (obtaining new information, implementing innovations and carrying out joint projects, etc.) (Srovnalíková, Havierniková, and Guščinskienė 2018).

Attention has also been paid to the relationship between clusters and SD (Knauseder 2009; Sail and Ongsakul 2018; Srovnalíková, Havierniková, and Guščinskienė 2018; Derlukiewicz et al. 2020; Abrahams 2017) and clusters are viewed as the impetus for new sustainable business opportunities (Srovnalíková, Havierniková, and Guščinskienė 2018).

Clusters are analysed by means of a prism of the activities resulting in SD. They operate in sectoral industries such as sustainable energy, automotive and environmental services (e.g. *Technology of Wallonia Energy, Environment and Sustainable Development Website* n.d.; *Electric Vehicles Industrial Cluster /EVIC/ Website* n.d.), and indirectly

foster SD (*Upper Rhine Cluster for Sustainability Research* n.d.; *Green and Sustainable Finance Cluster in Germany (GSFCG) Website* n.d.) through cooperation which allows for an exchange and transfer of knowledge, leading to interdisciplinary research on the governance of sustainable growth. Furthermore, a cluster conducts different projects to improve levels of protection against pollution or to increase renewable energies. The environmental protection advantages of cluster activities include technological activities (e.g. energy, water treatment, innovative solutions in reducing storage), educational activities (e.g. training in the use of renewable energy issues, energy efficiency, biomass, photovoltaic, wind and water turbines) and research activities (e.g. environmental studies) (Dyrda-Muskus 2012).

However, there are more factors by means of which clusters can support achievements in the area of SD. The possibilities which clusters have of contributing to SD were tested in the context of Bulgarian cluster development and the CSR of enterprises belonging to clusters (Slavova-Georgieva and Bankova 2017). The authors based their research on indicators (ecological sustainability index, social progress index, and the state of cluster development).

Knauseder (2009) defined four main areas in which a cluster can be a driver of SD at a regional level: strengthening regional identity and thus encouraging the participation of stakeholders in the process of sustainable regional development; promoting collaborations and networks in which common sustainability goals can be achieved more easily; fostering knowledge creation, knowledge spillovers and joint learning and thus promoting sustainable innovations within a 'learning region'; and facilitating the sustainable upgrading of local SMEs (Knauseder 2009). Clusters influence SD in the regions by means of the implementation of non-standardized activities (e.g. cleaner production and technology, eco-innovations) and standardized solutions (e.g. EMAS, ISO standards, Environmental Management Systems) by cluster members. Furthermore, eco-innovative orientation in a cluster results in building pro-ecological consumer attitudes, supporting environmentally friendly products and expanding markets for them, as well as decreasing outlays on resources and energy and the simultaneous improvement of the quality of processes, functions, manufactured goods and services provided.

3. Methodology

In this study, we assessed the impact of clusters on SD in Polish and Czech regions as examples of post transformed states. To this end, we used secondary data available from the Polish and Czech Central Statistical Offices. Because of the large variety of measures of SD, deciding which should be considered in the analysis was challenging. In expanding the list of indicators for the research, we based this on measures previously presented by researchers (Perlo 2014; Ding, de Vries, and Han 2014; Rezende and Sinay 2016; Bakri et al. 2016; Emma Pravitasari et al. 2018). The indicators were finally selected based on those which clearly stated that they measure sustainability, are sufficiently detailed and suitable for regional level, and cover all domains of SD. Data representing different areas was used in the research (see Table 1.).

The first set of data was collected on clusters in Poland and Czechia. Clusters were found to have information on:

- the number of clusters in the regions;
- the number of members of the clusters;
- the composition of cluster membership (in the structure of a company, university, R&D, public sector institutions, e.g. cities, municipalities and citizens), as well as the amount of financial support received from public sources.

We took into account formally concentrated enterprises but one can find the research for formal as well as informal clusters. Findings on agglomeration economies concern the formal sector and the informal sector is largely missed out of analysis (Combes and Gobillon 2015; Tanaka and Hashiguchi 2020).

The second group was data from the economic area, as was explained in the theoretical part, where gross fixed capital formation (GFCF) per person by region (2018) was collected, insofar as research data was available for 2018. Another indicator was the level of government financial support for research and development per person by region (2019). The third group included data from the environmental area such as carbon monoxide levels (CO) per person in a given region (2019), sulphur dioxide (SO_2) per person in a region (2019), nitrogen oxides (NO_X) per 1000 people in a region (2019), and environmental protection investments by region measured in EUR per citizen. In the field of social data, the following indicators were included in the research: the degree of urbanization (%), research and development personnel per 1000 employees in a region (2019), and the number of students in natural science and technical fields of education at public and private universities in a region (2019). The fifth and last area included energy indicators, namely net consumption of electricity per person by industry (2019) and net consumption of electricity per person by energy sector (2019).

In order to evaluate the spatial context between cluster concentrations and regional qualitative units, the hierarchy of territorial units was used at the level of self-governing regions - in Poland this division was voivodeships (NUTS II) and in Czechia it was regions (NUTS III) – which helped to sufficiently capture the specific links and dependencies between cluster activities and the degree of development of the regions. There are a total of 16 regions in Poland, based on the newly established NUTS II regions. Two regions (the Warsaw Capital region and the Mazowiecki region) were included under the original Mazowiecki region. Czechia is divided into 14 regions, i.e. 13 regions and Prague.

In the first stage, taking into account the lack of one dedicated institution for clusters, as it is organized in Czechia, the list of clusters operating in Poland was prepared (based on reports, studies, and information on the websites of individual regions – where the clusters are listed) (Tuziak 2018; Buczyńska, Frączek, and Kryjom 2016; *Benchmarking of Clusters in Poland – 2018 Edition General Report*, 2018). The clusters included in the research depended on the criteria adopted within the research. It was important that clusters that could not be verified were excluded from the study. Due to the diversity of information on the clusters' websites and difficulties in obtaining all the information to be collected according to the questionnaire which had been developed, research was supported by the CATI telephone survey method.

We started analyses with descriptive statistics (Appendix) to determine the basic properties of the distributions obtained. The following descriptive statistics were calculated: range (min–max), measures of central tendency (mean and median) and dispersion

(standard deviation), measures of asymmetry and concentration (skewness, kurtosis). To check if distribution differed from theoretical normal distribution, Shapiro–Wilk tests were calculated, as suggested in a situation of a relatively small sample size (Bedyńska 2012). Results of these tests were mostly statistically significant and the distribution of many variables were highly skewed, therefore, a non-parametric analysis was performed.

Spearman's rank correlations were performed. Additionally, to ensure the selection of an appropriate subset of explanatory variables, a multiple linear regression analysis was performed with a stepwise procedure (Agostinelli 2002). We took into account the fact that in our study, we researched the whole population (and we only have a small sample), and some variables are strongly correlated, therefore, we chose the regression model made using the IBM SPSS stepwise method, matching predictors to the model. At each step of the analysis, the independent variables were entered into the model. Because of the small sample size, the stepwise method had to be applied, because there should be at least ten cases per predictor entered into the model. Therefore, statistical significance was used in this analysis. The stepwise regression analysis were performed, but its results have to be taken into account with great caution. In the study the *p*-value was reported, but it was interpreted mainly for regression analysis purposes, because all analyses were performed on the whole population, not on a sample. There was no need to inferred for the population, so the observed relations are real and the errors of the first or second type of statistical inference do not appear here.

4. Results & discussion

The reason for using a correlation analysis was to determine which dependencies exist between the monitored values and what level of positive or negative correlation exists between them, whether the dependence is statistically significant, and at what level. After the correlation analysis, values without proven dependence were excluded from the main dataset, as were those which represented a rather isolated and statistically low correlation. Therefore, the summary table displays only those indicators which showed a certain statistical dependence with a logical interpretation.

In order to investigate the interactions between clusters in regions and the measures of SD mentioned, Spearman's rank correlations were performed. Negative correlations were found between members in clusters and sulphur dioxide (SO_2) per person in the region 2019, nitrogen oxides (NO_X) per 1000 person in the region 2019, gross fixed capital formation (GFCF) by region in 2018 per citizen, government financial support of research and development by region per citizen in 2019 and GDP. Furthermore, there were correlations between the number of clusters in the region in total as follows: sulphur dioxide (SO_2) per person in the region 2019, nitrogen oxides (NO_X) per 1000 person in the region 2019, gross fixed capital formation (GFCF) by region in 2018 per citizen and GDP. While the relationship of the negative correlation with environmental indicators can be logically explained and is related to the industrial sector, the research confirmed the relationship between cluster agglomeration and the prosperity of the region. The significant negative correlation between members in clusters and GDP and GFCF is in contrast to Ketels et al. result confirming clusters as an important factor in understanding regional performance (Ketels and Protsiv 2021).

Problems with confirmation of environmental quality have been covered in Jacobson and Hilliard's investigation into whether companies in clusters are able to improve environmental performance by developing cleaner technologies in response to imposed regulations (Hilliard and Jacobson 2011). We noticed that the relationship between the clusters operating within the region and the indicators of the environmental dimensions of SD was significant. This ambiguity can be influenced by heterogeneous sets of research regions, each undergoing individual development.

We also performed a series of linear regression analyses, taking into account the fact that some variables were highly skewed, so results can be corrupted. We found out that clusters in total, members, subsidy per person, and subsidy per cluster members were dependent variables. As this results from a linear regression analysis for companies / 1 mil. pers, university, and R&D per 1 mil. person, non-predictors were introduced to the model.

In the first step, we performed an analysis whereby a cluster in total was the dependent variable. Two predictors were added to the model – the energy sector and sulphur dioxide (SO_2) $F(2, 25) = 4.777$; $p < .001$. This model was relatively well related to the data and explained more than 20% of the variance, $R^2 = .22$. Unfortunately, the possible correlation occurred between predictors, as the value of Beta coefficient is higher in the second step than in the first one. Nevertheless, clusters in total can be predicted by a larger energy sector and lower sulphur dioxide. The energy sector is a stronger predictor.

Cluster total – two predictors – energy sector and sulphur dioxide (SO_2) $F(2, 25) = 4.777$; $p < .001$; $R^2 = .22$.

Model	Variable	*B*	SE	Beta	*t*	*p*
1	(Stała)	3.47	1.30		2.67	.013
	Energy sector	3.75	1.82	.374	2.06	.050
2	(Stała)	5.39	1.51		3.58	.001
	Energy sector Sulphur dioxide per person	4.32	1.73	.430	2.50	.019
		−.25	.11	−.374	−2.17	.040

Continuing, we performed an analysis, whereby, members were the dependent variable. One predictor was added to model sulphur dioxide (SO_2); $F(1, 26) = 6.419$; $p < .001$. This model was explained by a 17% variance (=.22).

Members – one predictor Sulphur dioxide (SO_2) $F(1, 26) = 6.419$; $p < .001$; $R^2 = .17$.

Model	Variable	*B*	SE	Beta	*t*	*p*
1	(Constant) Sulphur dioxide per person	448.26	82.79		5.414	<.001
		−19.00	7.10	−.445	−2.534	.018

In the analysis performed for the next dependent variable, subsidy per person, one predictor was added to the model, which was the degree of urbanization predictor.

Subsidy per person – degree of urbanization $F(1, 26) = 7.34$; $p < .001$; $R^2 = .19$.

Model	Variable	*B*	SE	Beta	*t*	*p*
1	(Constant) Degree of urbanization	−2.96	1.73		−1.713	.099
		0.74	.027	.470	2.715	.012

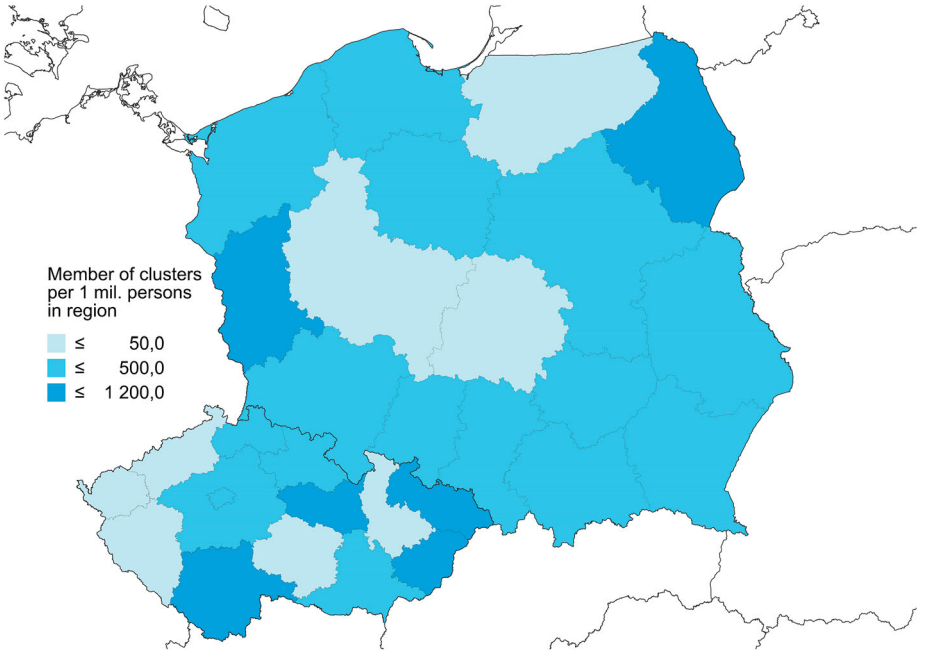

Figure 2. Intensity of clustering in Czechia and Poland. Source: own elaboration.

In the last model where subsidy per cluster members was a dependent variable, one predictor was added to the model which was the degree of urbanization $F(1, 26) = 6.75$; $p < .001$ and this model was explained by a 18% variance ($R^2 = .18$). As a result, subsidies per person and subsidies per member are explained by the same variable degree of urbanization and the same result can be observed in rank correlation.

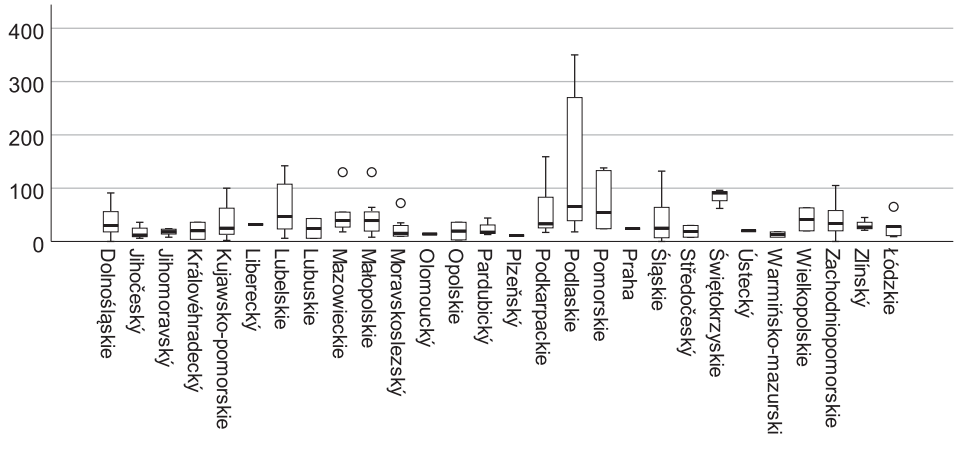

Figure 3. Number of members in clusters in Polish and Czech regions. Source: own research. * the point indicates the existence of a large cluster in the territory above the parameters of other clusters in the region, a dash indicates the existence of only one cluster in the region.

Subsidy per cluster members – predictor degree of urbanization $F(1, 26) = 6.75$; $p < .001$. $R^2 = .18$.

Model	Variable	*B*	SE	Beta	*t*	*p*
1	(Constant)	−824.5	5913.32		−1.39	.175
	Degree of urbanization	241.10	92.78	.454	2.60	.015

Continuing, we concentrate on differences in cluster concentrations between regions in Poland and Czechia (Figure 2), and we found out that there are large differences.

In some clusters in less developed or peripheral areas, more local companies are also concentrated, such as in the Podlaskie region in eastern Poland (Figure 3). The critical size of the cluster is not regulated by legislation or the size of the companies involved, but rather by the motivations of companies and institutions to join the cluster.

The specialization of the cluster and the production chain in which the cluster originated is also important. More fragmented and sophisticated production leads to the involvement of a larger number of companies. These clusters are organized vertically as opposed to horizontally, bringing together end producers or various entities such as local producers or creative industry institutions. The highest numbers of companies involved in clusters are registered in rather peripheral regions, as companies are most likely looking for development opportunities and creating larger groupings, which can also gain political importance.

The development of the cluster is connected with the existence of universities and scientific research activities in the regions. The importance of universities in a cluster formation also confirm the findings of Wolfe (Wolfe 2005). The correlation results were unexpected and a negative weak correlation was observed between R&D and members in clusters. We suppose it results from the importance of universities and their scope of activities, transfer of knowledge and so on - a lower level than researched examples from highly developed countries. It is worth mentioning that universities are part of the relationships within a region. A university is one factor, and there is the danger of magnifying the role of the university so that one can mistakenly link any observed effect to a universitys' work (Paytas, Gradeck, and Andrews 2004). When a university is located in a given region, it often becomes a member of a cluster. In regions where there is a developed structure of universities and R&D institutions, these entities often enter into cluster activities and become members of clusters. Clusters including the aforementioned institutions are then directed towards a more professional focus and the integration of scientific research into the cluster's activities.

Clusters in urban regions were able to create more developed clusters and to obtain more public resources, which is confirmed by the positive correlations between the higher degree of urbanization of the region. On the other hand, it may be an inefficiently set up cluster support programme that has not been very successful in regions which lag behind. The principle of cluster initiatives can be applied in groups of companies that do not require a strong scientific research background, but which affect the cluster within a common production chain. These types of clusters are an exception, as the remaining clusters purposefully integrate scientific research institutions.

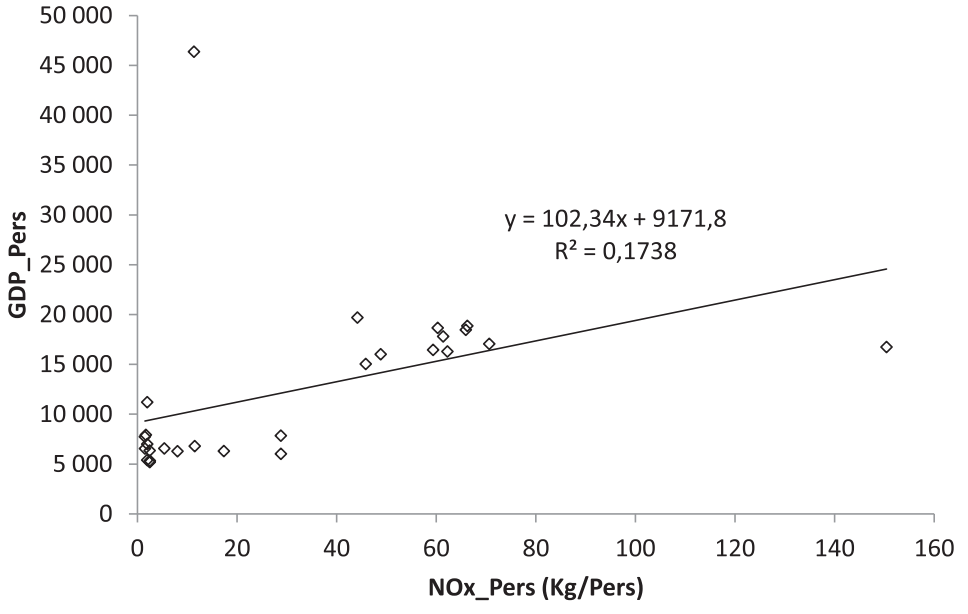

Figure 4. Relationship between regional GDP per capita and NO_X per person (kg/person). Source: own research.

The research was also focused on an evaluation of how indicators within the field of SD are related to the concentration and size of clusters. Most clusters stress the importance of the environment (Derlukiewicz et al. 2020). Therefore, it was possible to expect that regions with a better environment, as one of the indicators of maturity and level of development, create better conditions for the development of clusters. This connection has been demonstrated in the model where clusters in total were a variable dependent predicted by the energy sector and sulphur dioxide per person. A negative significant correlation was also observed.

This is also in accordance with the example of the Moravian-Silesian region, which has the most damaged environment among the regions as a result of coal mining and heavy industry, with 12 clusters operating within the region, which is the highest number in the whole of Czechia. It also turns out that regions with higher emissions of SO_2, CO, and NO_X are characterized by higher electricity consumption in industry. This is the effect of large industrial agglomerations, where more companies and institutions are concentrated because of the development of cluster initiatives. As Figure 4 shows, a more oxide-laden environment is typical of regions with large agglomerations, which also generate a higher GDP.

The creation of clusters in Poland was in many cases not based on the Italian model, in which bottom-up initiatives of entrepreneurs play a key role. Although in the literature we have different models of cluster functioning, Polish cases were not exactly based on the Danish model with the participation of a network broker, or the Dutch model which assumes close cooperation with a research institution. Furthermore, special economic zones (SEZs) (representing concentrated companies from industry) also began to create clusters. The role of cluster coordinators was assigned to the managers of the SEZs, who

in such cases should act as coordinators and create conditions for the development of clusters. This is the other example of a top-down approach in cluster creation. This affects the inclusion of many universities and R&D only as members, without their active engagement. The results are in accordance with the research of Anić et al. (2019) in Croatia and also with the literature arguing that policy-driven clusters, initiated by the government, tend to fail in developing economies and countries in transition (Anić et al. 2019).

Due to the high number of clusters in Poland, the actions in the field of cluster policy are not currently focused on supporting the formation of clusters, but on supporting existing clusters, which are the most important for the country and individual regions in terms of innovation. The so-called Key National Clusters with the greatest competitive potential are selected in order to attract public funds. The activities undertaken are in accordance with Abbasiharofteh (2020) directions, who underlines that policy should concentrate on the most exciting and connected local actors and facilitate knowledge transfer, geographical proximity and social contacts through intermediation and coordination. Furthermore, in Poland, financial streams have been made dependent on the status of a cluster. This is also due to the policy of limiting the number of clusters, especially the less active ones, in which cooperation and its effects between entities representing various sectors of the economy are not noted. The activities undertaken seem to be in accordance with the discussed ailing cluster idea (Yun, Cooke, and Park 2017).

5. Conclusion

The main goal of the article was to identify the extent to which the qualitative parameters of regions are important for the greater development of clustering as a form of corporate and institutional cooperation and the higher concentration of clusters in less and more developed areas respectively. The dependencies between regional development and clusters have been emphasized and confirmed (Sölvell, Lindqvist, and Ketels 2006). European Commission analysis indicates that there is a positive correlation between the existence of dynamically operating clusters and the innovativeness of the region; the level of per capita income; new regional industries emerge where there is a strong cluster, which has also been confirmed in research on clusters in France, Germany and Sweden (Delgado, Porter, and Stern 2014; Skica, Dzyuma-zaremba, and Hady 2015). We noticed that the relationship between the clusters operating within the region and the indicators of the economic and environmental dimensions of SD was significant. We found that only some of the features of the clusters analysed (clusters in total, members in clusters, subsidy per person, and subsidy per cluster members) were dependent variables. The regression analysis used eliminated the variables that did not contribute to the model and the variables obtained that affect the prediction of the dependent variables were only the energy sector, sulphur dioxide per person, and degree of urbanization.

The growth in cooperation between companies and R&D institutions in the form of clusters includes more active decision-makers, which are more concentrated in metropolitan regions and less so in rural ones. Martin and Sunley (Martin and Sunley 2003) show this as a positive effect of institutional strength. Institutionally larger clusters can emerge which are able to obtain more financial support from public sources, as research has also proven. Clusters can also cross regional borders (Hallencreutz and Lundequist 2003), and thus complicate the use of funding instruments from regional sources.

A negative consequence of the well-intentioned public support for the development of cooperation between companies and R&D institutions was found in some cases. Furthermore, Vanka and Heijman (2013) point out the issue of purely formal cooperation between cluster members in the case of Serbia, where public support was drawn upon inefficiently.

An analysis of cluster policy shows the shortcomings of and barriers to achieving economic benefits - discussed and confirmed on a global scale. So what is the root of a different development path? It is not only the endogenous factors of the area. Post-communist countries face far more challenges than developed countries with higher levels of trust in government, less bureaucracy, less corruption and higher social capital.

There are also several important implications for policy-makers at a regional level. One of these is the cluster policy, especially in Poland, which should be continued – financial support for potentially competitive clusters. This may help to prevent the extinction of clusters which operate only thanks to public funds or those whose development has stalled. Otherwise, the lack of a well-developed strategy may result in a lack of positive effects on welfare and the environment, and would be a waste of public funds. Another recommendation for public policy is to approach cluster financing more selectively, creating better evaluation mechanisms for the selection of truly functional clusters. Palyvoda and Plavan (Palyvoda and Plavan 2016) also recommend a stricter analysis of existing clusters. These critical findings cannot be generalized to all clusters; on the contrary, many of them help to develop the research and development activities of cluster members.

We are aware of the limitations of our research. Further research on cluster initiatives should, therefore, focus on how clustering has contributed to the growth of companies or what other suitable factors can help to develop clusters. The findings of this research would then be beneficial for new public policy setting to support and face challenges resulting from implemented cluster initiatives. Future research replicated at different intervals can provide a thorough understanding of the variability of the dependence between economic indicators and cluster features that would enrich our knowledge of the directions of regional policies. In addition, an analysis of case studies in other post-socialist countries is required to develop a more comprehensive policy framework for SD using cluster structures for compatible states in terms of economic history.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The project is financed by the Ministry of Science and Higher Education in Poland within the auspices of the programme "Regional Initiative of Excellence" 2019–2022, project number 015/RID/2018/19, total amount of funding 10,721,040.00 PLN. Petr Hlaváček also would like to thank to the European Union, the European Social Fund and the Ministry of Education, Youth and Sports of the Czech Republic for the financial support his research activities in the frame of the project Smart City – Smart Region – Smart Community – CZ.02.1.01/0.0/0.0/17_048/0007435).

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Appendix. Data set of indicators

	M	Me	SD	Sk.	Kurt.	Min.	Maks.	W	p
Cluster members per 1 mil pers.	206.47	176.09	176.75	1.66	2.89	21.89	752.41	0.82	<.001
Companies/1 mil. pers	168.48	150.79	158.73	1.85	3.70	18.19	683.86	0.78	<.001
UniRaDper 1 mil. Pers.	7.71	5.59	7.42	1.95	3.91	0.57	29.57	0.77	<.001
Subsidy per person	1.65	0.71	1.88	0.95	-0.83	0	5.15	0.77	<.001
Subsidy per Cmemb	6855.56	4539.45	6390.78	0.77	-0.64	0	19312.20	0.87	0.002
GDPpop	12341.38	7897.05	8590.61	2.38	8.30	5207.80	46381.40	0.72	<.001
Gross fixed capital formation (GFCF) by region in 2018 per citizen	3250.78	3028.80	2295.65	3.55	15.55	1100.40	13543.50	0.62	<.001
Government financial support of research and development by Region per citizen in 2019	61.35	29.10	110.12	3.68	15.32	0	552.70	0.53	<.001
Degree of urbanization in %	62.63	62.05	12.04	0.90	2.30	41.20	100	0.95	0.151
Research and development personnel by region- per 1 000 employees in the region 2019	8.84	8.30	5.89	1.75	3.66	2.40	28	0.84	<.001
Carbon monoxide (CO) per person in region monoxide (CO) per person in region 2019	5.56	4.25	6.48	3.99	18.38	0.80	35.70	0.55	<.001
Sulphur dioxide (SO_2) per person in region 2019	8.99	7.05	7.55	1.89	4.50	2	35.30	0.81	<.001
Nitrogen oxides (NOx) per 1000 person in region 2019	30.97	14.45	35	1.57	3.43	1.50	150.40	0.79	<.001
Industry sector	1.63	1.60	0.76	0.40	0.25	0.30	3.50	0.98	0.793
Energy sector	0.52	0.30	0.50	1.47	1.74	0	2	0.82	<.001
Environmental protection investments by Region EURper citizen	84.44	76.55	27.81	0.91	0.45	41.70	157.30	0.93	0.056

Source: Own elaboration based on data from the Polish and Czech Statistical Offices

Hlaváček, P., & Siviček, T. (2017). Spatial differences in innovation potential of central European regions during post-transformation period. *Journal of International Studies, 10*(2), 61-73. doi:10.14254/2071-8330.2017/10-2/4

Journal of International Studies

Spatial differences in innovation potential of central European regions during post-transformation period

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Abstract. The article focuses on mapping the innovation potential of the regions in Czech Republic, Slovakia, and Poland having their own elected institutions, which may influence the development of innovation potential of the regions. The correlation analysis and calculation of the aggregate index were used for comparison of the regions. The research is based on the authors' own construction of the Innovation Potential Index which uses 6 indicators: a) GDP per capita in EUR, b) the share of inhabitants with university degree in population, c) the share of R&D involved persons per workforce, d) gross fixed capital formation (GFCF) by regions, e) the number of patents and utility models per regions. Better conditions for growing innovation potential can be seen in the metropolitan areas rather than in agricultural and old industrial regions. The main advantage of old industrial regions is that they can improve their innovative potential by transforming the economic potential, which is weak in the peripheral and agrarian regions.

Received: December, 2016
1st Revision: January, 2017
Accepted: April, 2017

DOI: 10.14254/2071-8330.2017/10-2/4

Keywords: innovation potential, regions, Czech Republic, Poland, Slovakia.

JEL Classification: O31, R11, R58

1. INTRODUCTION: INNOVATION POTENTIAL AND A REGION

Central European regions are more sensitive to economic changes due to post-transformation development processes and thus, growth of innovation potential of these regions is one of their development priorities. The research goal is to evaluate the innovation potential of regions in Czech Republic, Slovakia and Poland. The multifactor observation of innovation potential follows from the fact that the growth of innovation potential is significantly connected not only with economic growth, but also

with a mechanism of innovation policy and its priorities, what causes complex and differentiated development processes at the regional level as a result.

In general, there is a broad consensus concerning innovation being the source of growth and competitive advantage for companies, regions, and states. Thus, definitions of innovation potential are frequently connected to competitiveness, even as its "backbone element" (Coenen et al., 2015; Nijkamp et al., 2010; Rodionov et al., 2014), but also containing other subsystems (technical scientific; educational; investment; consumer sector) and elements (institutional; investment and financial; organisational and management; consolidate indices).

The studies following the achievements of the national systems of innovations analyse the existence, elements, dynamics, and evaluation of regional systems of innovations. Since, there is economical and political demand for support and stimulation of innovations, the regions prepare their own Regional Innovation Strategies. In contemporary literature focused on innovations in the CEE region, the results suggest that when designing the strategy, the DUI model of innovation (learning by doing, using, interacting) using synthetic knowledge base is more suitable than the STI (science, technology, innovation) model where the process uses analytical knowledge base.

According to Tödtling and Trippl (2005), the innovative environment at the level of regions can be characterised as an evolution process that is conditional upon intensive communication and localisation of innovative stakeholders in the region. The socioeconomic conditions seem to be contextual factors in this regard. Practical implications are related to a broad support of cooperation among actors, development of entrepreneurial culture, or developing nontechnical competencies of companies. Blažek et al. (2012) also points at the positive role of various discussion platforms for stakeholders and regional leadership.

This perspective confirms the important role (positive or negative) of regional authorities and in innovation processes in determining or limiting the innovation potential (Rodriguez-Pose & Di Cataldo, 2015; Cooke, 1997). In order to help national and regional governments in preparing and implementation of strategies and policies, international institutions provide guidance, expertise, analysis, studies, and other tools (UNDP, 2016; OECD, 2016). The academic and research studies (Riche, 2010; Viturka et al., 2011) are complemented by empirical evidence, usually by private sector analysis (performed by consulting companies for the purposes of private sector itself or also for the public sector – in terms of policies' development).

Pokorný *et al.* (2008) are more specific in defining the innovation potential *"as ability of a region, under certain conditions, to use effectively own resources, to react flexibly to external development impulses, to create and to develop activities with higher value-added, and through that to achieve new, and hieratically higher qualities"* (Pokorný et al., 2008). Very valuable inputs from methodological and empirical points of view can be provided by the project INKA (TACR, 2015) on mapping of innovation capacity in Czech Republic.

The Regional Innovation Paradox has been described by Oghton et al. (2002), Klímová and Žítek (2015) as a situation, when regions with lack of innovation have also insufficient absorption capacity for public funding supporting innovation. The work is put in the context of previous studies on regional systems of innovation and triple helix and confirms the key importance of regional level for improving innovation performance, although other factors at national and global levels are important as well. The role of regions and regional innovation systems is strengthened by the decentralisation processes, cluster activity, and regionally focused policies like the Cohesion policy (European Commission, 2014; Barca, 2009).

The conclusions of Oghton et al. (2002) suggest more integrated and inclusive approach towards policy design in line with the triple helix concept. The triple helix concept underlines the importance of close cooperation of three elements: government, universities and companies in order to improve innovation performance and competitiveness (Etzkowitz et al., 2003; Etzkowitz & Leydesdorff, 1997, 2000). However,

the element of cooperation and interaction is present also in the concepts of learning regions or knowledge regions (Ratajczak & Weltrowska-Jęch, 2008; Asheim, 1996).

As Asheim (1996) reminds, from the evolutionary point of view, learning regions are a further step in the development from industrial districts defined by Marshallian characteristics and compares it also to Porter's ideas of clustering as a source of competitive advantage. He comments how factors of territory and collaboration influence learning. Learning regions are then seen as a way out of path-dependency trajectory.

In the concept of the regional innovation system, triple helix or theory of learning regions, innovation potential and innovation creation capability is regarded as the key indicator of regional economy growth. The triple helix concept has also practical implications. For instance, in Czech Republic the Operational Programmes, Regional Innovation Strategies are based on this concept. The quadruple helix includes also broader public into the system (Reichert, 2006; Carayannis & Campbell, 2009) as an important element of knowledge creation and distribution as one of the prerequisite to innovation. In a broader sense, it includes various cultural aspects leading to "innovation culture" (Carayannis & Campbell, 2011) necessary for promoting knowledge-based economy and knowledge society and they further develop the concept into quintuple helix taking into consideration also the "natural environment".

At the level of the European Union, the topic of innovation is among priorities as well. It is directly related to its ambitious strategy "Europe 2020" – as one of the seven flagship initiatives called "Innovation Union". The goal of this initiative is to create suitable environment for innovations improving quality of live, increasing competitiveness and creating more jobs by top quality research, removing barriers to innovation and supporting public-private cooperation. For fostering territorial and social cohesion or "catching up" in competitiveness and innovation of the lagging behind regions and for better efficiency and coordination of national and European tools and sources used, the European Union provides guidance for research and innovation strategies for smart specialisation (RIS3). The national level RIS3 strategy with regional annexes is usually accompanied by a Regional Innovation Strategy, which is usually a broader strategic document.

The article aims at reviewing the innovation potential of the regions in Czech Republic, Slovakia and Poland with their own elected institutions, which may influence the development of innovation potential of these regions. The article focuses on the analysis of innovations within the development of innovation environment in the regional dimension and aims to ascertain the differences between the self-governed regions in Central Europe. Therefore, data from the self-governed units is monitored at the NUTS III level for Czech Republic and Slovakia, and the NUTS II for Poland, which is added value for the article because the research of self-governed regions is not frequently published for international comparison due to poor data accessibility from NUTS III. To monitor the potential of the regional innovation environment, various types of indicators and data should be reviewed and therefore, the search will monitor the selected characteristics from the macroeconomic data, regional labour markets, and R&D used for determination of the Innovation Potential Index referring to the data from 2010 to 2012. Our sources of information include the Eurostat, Central Statistical Office of Poland, Czech Statistical office, Statistical office of the Slovak Republic.

2. METHODS FOR MEASURING INNOVATION POTENTIAL

Definition of the relevant methodology for evaluation of the data sets for different types of indicators is needed in the analysis of the innovation potential. The regional innovation potential can be referred to as an ability of a region to effectively use internal resources, to respond flexibly to the external development trends and competition, to develop the activities and products having higher added value, and to form the

regional environment assisting in the development of the innovations. According to Andersson and Karlsonn (2004) the national innovation systems are defined by the state and governmental policies, the regional innovation systems specific for each region and their regional policy, and the innovation systems defined by knowledge and technologies, and networks in production chains. Hence, the quantitative review of the innovation potential of the regions required capturing of the specific factors that when combined co-create and form the innovative environment and the innovation potential of the region to a certain extent.

Among the tools provided by the initiative "Innovation Union" is an "Innovation Union Scoreboard" for measuring a progress in innovation even for every member country, which should be helpful for policy design, making, implementation and evaluation. It uses a composite index "Summary Innovation Index" based on 25 indicators of 3 main types (Enablers, Firm Activities, Outputs) covering 8 dimensions for measuring innovation performance. The Enablers cover availability of Human Resources, attractiveness of research system and availability of finances. The Firm activities cover firm investment (R&D, non R&D innovation); linkage and entrepreneurship (in-house or collaborative innovation and publications), intellectual assets (e.g. patent applications, trademarks, design). Finally, Outputs cover Innovators (SMEs with process, product, marketing and organizational innovations; employment in fast-growing sectors) and economic effects (e.g. employment, export of knowledge intensive products and services, income from IPR from abroad).

This index allows dividing countries into four groups: Innovation Leaders, Innovation Followers, Moderate Innovators, and Modest Innovators; based on the average performance. All three countries – the Czech Republic, Slovakia and Poland are among "moderate innovators" slightly under the EU average. (European Commission, 2015) Besides this index, the European Union conducts and prepares several other analyses surveys like: Foresights, Community Innovation Survey, Innobarometer, Business Innovation Observatory, Regional Innovation Monitor plus, or Regional Innovation Scoreboard. Counterfactual impact evaluations are used in order to measure efficiency of policy and sources.

The Regional Innovation Scoreboard provides information on innovation performance at regional level. Using the same methodology, but measuring only 11 indicators due to lack of regional data, it also divides regions (NUTS II.) into four groups just as the Innovation Union Scoreboard. For instance, all the regions in the Czech Republic are classified as Moderate Innovators, but in Poland, there are regions classified as Moderate Innovators as well as Modest Innovators, and in Slovakia there is also a third group of Innovation Follower. The study suggests that regions with positive attitude to new things, lifelong learning, and with public funds supporting innovations are more successful. In the context of EU funding, there are only a few regions able to use even Framework programmes (15.6 %), some focus on supporting services (6.1 %), some on technological and research activities (3.7 %) and some on both areas (3.7 %), when using structural funds, while the vast majority of regions are low absorbers (71 %), which supports the argument about the Regional Innovation Paradox (EC, RIS 2014).

The research has been applied at the level of regions having their regional government because each region stimulates its development innovation policy, and uses its measures and instruments to directly influence the growth of the innovation potential in the region. Therefore, the research was applied at the regional levels (NUTS III.) in the Czech Republic and Slovakia, and voivodeships (NUTS II) in Poland. On the other hand, combination of the research and the regional government level resulted in fact that NUTS II. and NUTS III. level data had to be used in the research as well because the link of the territory to the regional government has higher priority that the size category of the NUTS territorial classification.

To analyze the innovation potential of the regions, for research is constructed own the Innovation Potential Index, this index is based on similar Regional Competitiveness Index (RCI) applied by the European Commission Directorate for the competitiveness analysis at the level of the NUTS II regions.

The RCI has been designed based on the set of selected indicators from the fields of infrastructure, human resources, and production environment, which are standardized and subsequently summed to form the resulting RCI. The methodology for calculation of the Innovation Potential Index also uses some indicators used for calculation of this index, and some other indicators relevant to mapping of the regional innovation potential are added. The method for calculation of the Innovation Potential Index used in this article uses 6 indicators listed in Table 1.

For the purpose of evaluation of the development trajectories, the development of GDP per capita in the period of question provides rather representative view on monitoring of the economic development of the region. The first evaluation criterion is the development level of the regional economy represented by the gross domestic product per capita (in PPS). Another indicator is the average volume of the fixed capital between 2010 and 2012 that points out to the investment activities in the regions. Higher investment activity also includes the investments in procurement of the new technologies and equipment that increase working productivity and contribute to the growth of the innovation potential of the region. The indicator of share of inhabitants in the region with full tertiary education between 2010 and 2012 represents the conditions prevailing on the labour market, which points out to the regional potential of the knowledge economy and innovation environment. Data about share of R&D staff in the workforce make the innovation potential complete in the field of the workforce. The last indicator for calculation of the Innovation Potential Index is the number of patents and utility models between 2010 and 2012 converted per workforce.

Table 1

The indicators used for calculation of the Innovation Potential Index (I_{IPA} *and* I_{IPB})

symbol	indicator	years	source
I. - GDP_EA	gross domestic product per capita (EUR)	- 2012 and 1214	Eurostat
II. - UNI_POP	share of population with university degree (in %)	- average value (11/12 and 13/14)	Eurostat, statistical office from CZ, PL, SVK
III. - RD_EA	share of R&D personnel on labour force by region (in %)	- average value (11/12 and 13/14)	Eurostat, statistical office from CZ, PL, SVK
IV. - FIX_EA	gross fixed capital formation (GFCF) per employee	- 2012 and 1214	Eurostat, statistical office from CZ, PL, SVK
V. - GVA_EA	gross value added per employee	- average value (11/12 and 13/14)	Eurostat, statistical office from CZ, PL, SVK
VI.- PAT_EA	Patents per employee	- average value (11/12 and 13/14)	Eurostat, statistical office from CZ, PL, SVK

Source: Authors own calculations

The group of indicators focused on the analysis of the regional labour market, used the following data from the regional level in the Czech Republic, Poland and Slovakia:

- GDP_EA – represents gross domestic product per capita that provides a representative insight to the economic potential of the region.
- UNI_POP – share of population with university degree (in percentage). The character of the economic situation in the region but also indicates the educational quality of the population.
- RD_EA – share of R&D employee on labour force (in percentage).
- FIX_EA – gross fixed capital formation per capita refers to overall investment activity in the region.
- GVA_EA- gross value added per employee shows productivity of economies

- PAT_EA – number of patents in the year 2010-2012 per employee.

The analysis stems from the research goal and evaluates data that represents the selected areas, and has been monitored statistically over the long term at the same time. The selected research data has some specific limitations resulting from its aggregation for the regions, e.g. employment in R&D also includes branches not focused on the development of the innovations. However, detailed information about R&D outlays is not available and therefore, aggregated data needs to be used. Csank and Žížalová (2009) note in the analyses of the innovation potential that the inputs to the innovation process, which often result from cooperation with various companies and research institutions, are measured. Research is often the result of multidisciplinary and interregional networks; research results and patent applications may be the result of wider interregional and international participation. This indicators shows the capability of the regional environment to adapt to ongoing social, economic and innovation processes, to create new jobs or to find opportunities on the regional labour markets. The Innovation Potential Index (I_{IPA}) assessed the regional innovation environment wherein the indices were calculated according to the following formulas:

a) standard deviation $\sigma(x)$

$$\sigma(x) = \sqrt{\sum_{i=1}^{N} \frac{1}{N}(x_i - \mu_N)^2}, \quad (1)$$

x – represents monitored indicator,
N – region,
μ - aritmetic value of monitored indicator for group of regions.

b) Innovation Potential Index (var A.- I_{IPA})

$$I_{IPA(1\text{-}N)} = [(I_{(1\text{-}N)} - \mu I_{(1\text{-}N)})/\ \sigma_I + [(II_{(1\text{-}N)} - \mu II_{(1\text{-}N)})/\ \sigma_{II} + (III_{(1\text{-}N)} - \mu III_{(1\text{-}N)})/\ \sigma_{III} + [(IV_{(1\text{-}N)} - \mu IV_{(1\text{-}N)})/\ \sigma_{IV} + [(V_{(1\text{-}N)} - \mu V_{(1\text{-}N)})/\ \sigma_V + (VI_{(1\text{-}N)} - \mu VI_{(1\text{-}N)})/\ \sigma_{VI}] / 6 . \quad (2)$$

$I_{IPA(1\text{-}N)}$ is index, which shows formula for calculating of value for years 2012 and 2014 ($I_{IPA2012(1\text{-}N)}$ and $I_{IPA2014(1\text{-}N)}$). First, individual indicators were calculated together with the standard deviation for each regional indicator from the data for the regions. The calculated values were also used for standardisation of the data file and the comparison of the calculated dimensionless values. The calculated indicators for each region have either positive or negative values, where the positive value means an above-average value, and a negative value means a less-than-average value when compared to the mean indicator value for the regions in question. The values are designed so that the sum of the index region values for an indicator is always zero, i.e. $\Sigma\ I_{IP2012(1\text{-}N)} = 0$ and also $\Sigma\ I_{IP2012(1\text{-}N)} = 0$ *and* $\Sigma\ I_{IP2014(1\text{-}N)} = \mu\ I_{IP2014(1\text{-}N)} = 0$.

c) Innovation Potential Index (var B.- I_{IPB})

$$I_{IPB\,(1-N)} = \sum_{X=I}^{VI} x_{(1-N)}\ /max\ x_{(1-N)} * 100 \quad , \quad (3)$$

N – region,
x – represents monitored indicator.

The selected indicators are of a macroeconomic nature, it can be assumed considering their complete information value, that they characterize the economic and innovation dimensions of the regions. Data from

Eurostat and to a lesser extent data from databases of the national statistical offices in Poland, Czech Republic, and Slovakia were used. The analysis works on data from years 2012 and 2014.

The calculated Innovation Potential Index ($I_{IPB)}$ has been expressed in per cents. The absolute values of the indicators were first standardized in the 0 to 100% interval, wherein maximum value was used for each indicator as a benchmark. In the next step the % deviation from maximum value was calculated as found in the group of Czech, Polish, and Slovak regions. The last step summarized the values in each area for each region, and their final average value, based on six monitored indicators in formula (2), was calculated to represent the resulting Innovation Potential Index.

Table 2

Standardized regional indicators $I_{IPA2012}$ and $I_{IPA2014}$

region	$I_{IPA2012}$	$I_{IPA2014}$	change 14-12	region	$I_{IPA2012}$	$I_{IPA2014}$	change 14-12
Praha (CZ)	1,95	2,44	0,48	Banskobystrický (SK)	-0,39	0,51	0,90
Středočeský (CZ)	0,21	-0,14	-0,34	Prešovský (SK)	-0,19	0,22	0,41
Jihočeský (CZ)	-0,05	-0,25	-0,20	Košický (SK)	-0,19	0,64	0,83
Plzeňský (CZ)	0,08	-0,21	-0,29	Lódzkie (PL)	-0,18	-0,42	-0,24
Karlovarský (CZ)	0,39	-0,76	-1,15	Mazowieckie (PL)	0,83	0,43	-0,41
Ústecký (CZ)	0,21	-0,48	-0,69	Malopolskie (PL)	0,13	-0,13	-0,26
Liberecký (CZ)	-0,71	-0,15	0,56	Slaskie (PL)	-0,10	-0,24	-0,14
Královéhradecký (CZ)	0,11	-0,29	-0,40	Lubelskie (PL)	-0,51	-0,50	0,01
Pardubický (CZ)	0,30	-0,10	-0,40	Podkarpackie (PL)	-0,51	-0,36	0,16
Vysočina (CZ)	0,05	-0,44	-0,49	Swietokrzyskie (PL)	-0,54	-0,53	0,00
Jihomoravský (CZ)	0,70	0,41	-0,29	Podlaskie (PL)	-0,46	-0,35	0,10
Olomoucký (CZ)	-0,09	-0,30	-0,21	Wielkopolskie (PL)	-0,12	-0,22	-0,09
Zlínský (CZ)	0,03	-0,23	-0,25	Zachodniopomorskie (PL)	-0,19	-0,18	0,01
Moravskoslezský (CZ)	-0,06	-0,25	-0,19	Lubuskie (PL)	-0,28	-0,46	-0,19
Bratislavský (SK)	2,04	2,37	0,33	Dolnoslaskie (PL)	0,14	0,00	-0,14
Trnavský (SK)	0,02	0,43	0,42	Opolskie (PL)	-0,41	-0,40	0,01
Trenčiansky (SK)	-0,33	0,05	0,38	Kujawsko – Pomor. (PL)	-0,41	-0,50	-0,09
Nitriansky (SK)	-0,32	0,84	1,15	Warminsko – Mazur.(PL)	-0,55	-0,49	0,06
Žilinský (SK)	-0,49	0,21	0,71	Pomorskie (PL)	-0,01	-0,16	-0,15
				mean	**0,00**	**0,00**	**0,00**
				standard deviation	**0,57**	**0,67**	

Source: Authors own calculations

4. RESULTS OF THE INNOVATION POTENTIAL INDEX ANALYSIS

The values of the Innovation Potential Index report comparatively significant differences among Czech, Slovak, and Polish regions. Considering the complex review of the indicators, the Czech regions followed by the Slovak and Polish ones achieve generally higher innovation potential in 2012. As shown in

Table 2, the development before 2014 was associated with various growth changes. The overall assessment clearly shows slower pace in the growth of the indicators for the Czech regions, which lagged behind the Polish regions. On the contrary, above-average growth in the Slovak regions has been recorded because these regions adapted best to the economic environment in the post-crisis period. From the point of view of the development of various groups of regions, the most innovation developed regions are those with the capital cities and major metropolitan areas, which do not undergo significant structural changes as seen in Figure 1. The rural and peripheral regions report weaker innovative potential, which is also reflected by the differences in the west-east gradient. Fedirko (2014) also confirms the context between the economic potential and the innovative potential of the regions. The research of the innovative potential of regions from other authors, e.g. research of the Visegrad countries (e.g. Kozun-Cieslak, 2016) points to the other factors that impact their potential, such as historical circumstances and geographical advantages. The political aspects have a specific role, while the approaches of the regional and city governments in support of economic development are also different (Sucháček, 2013) where the regions – according to his findings – are more active and have a higher economic potential to influence the changes in the localization of companies than the city governments. According to the research of the innovation potential by Hoope and Winter (2015), similar intranational differences could also be found in the area of transport; in addition to the metropolitan areas, Lower Silesia in Poland and Kuyavian-Pomeranian have higher innovative potential. In Slovakia, the east-west polarity is strongly reflected, and as far as Czech Republic is concerned, stronger positions are occupied by Southern Moravia and the northern part of the country in addition to the Prague metropolitan area. The existence of the said differences must not necessarily mean the growth of regional divergence; according to Zdražil and Applová (2016) it could generally be said that the convergence is conditional and occurs in the Czech, Polish, and Slovak regions.

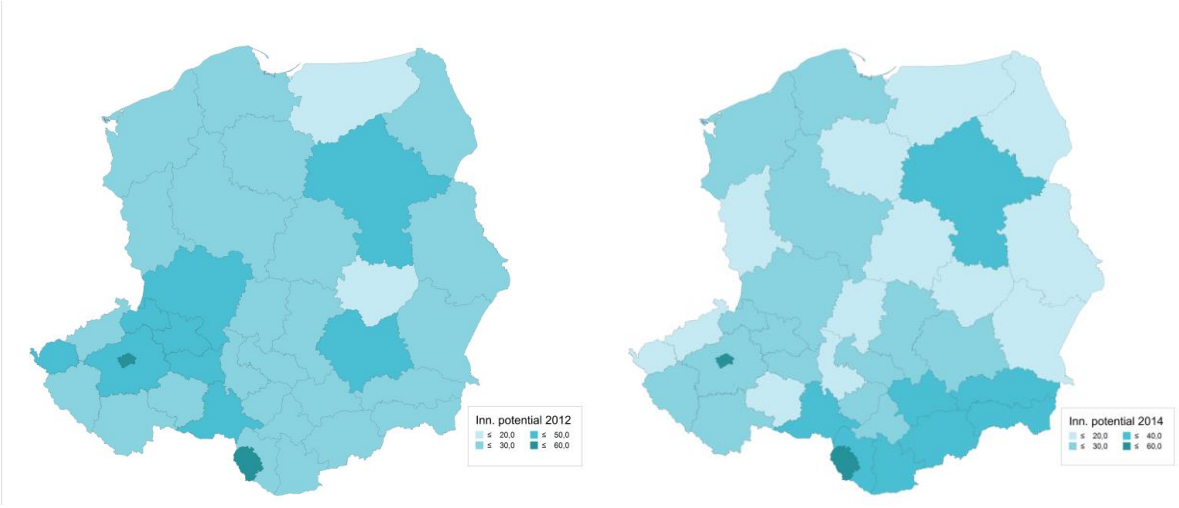

Figure 1. Changes of the Innovation Potential Index $I_{IPB2012}$ and $I_{IPB2014}$ in the years 2012 and 2014
Source: own calculation

The advantages of the capital cities is substantially higher share of R&D workforce, and the developed network of colleges, universities, and R&D facilities, as well as higher investments level per workforce compared to the other regions. Southern Moravia Region having higher level of patents and fixed capital converted to economically active inhabitants sums up this category; it achieves substantially higher values compared to the other regions in both indicators.

In case of Slovak regions and of Polish ones to a certain extent, the factor of the geographic location of the territory in the East – West axis is reflected significantly in the innovation potential, where the innovation potential increases westwards. For the Czech regions, this factor is less significant compared to Poland and Slovakia. Although importance of the settlement structure and metropolitan areas are reflected in ranking of the regions and the amount of the innovation potential, the administrative definition of the units of the regional governments in case of larger regions statistically reduces the potential of the regional centres.

The regional data was further analyzed by correlation thereof in order to monitor the dependence level among the indicators used in the calculation of the Innovation Potential Index. The data set from among the selected indicators and the innovation potential was compared with other innovative factors while the R&D outlays were also monitored. The use of the indicator for the R&D outlays per each employee is based on the endogenous growth model by Romer (1994), which is expressed as Y = f(R,K,L), where the R&D outlays are an endogenous growth component that determines the total product quality. The results of the correlation analysis among the indicators are shown in Table 3 where annual average from 2010–2012 is calculated to remove annual sudden changes.

Table 3

The correlation dependence of selected indicators of Czech, Polish, and Slovak regions between 2012 and 2012

		GDP_EA12	**UNI_POP12**	**RD_EA12**	**FIX_EA12**	**GVA_EA12**	**PAT_EA12**
GDP_EA12	Pearson Correlation	1	.039	.399*	,421**	,432	,316
	Sig. (2-tailed)		.816	.013	,008	,007	,053
UNI_POP12	Pearson Correlation	.039	1	.285	,225	-,081	-,095
	Sig. (2-tailed)	.816		.083	,175	,631	,569
RD_EA12	Pearson Correlation	.399*	.285	1	,870**	,748*	,109
	Sig. (2-tailed)	.013	.083		,000	,000	,516
FIX_EA12	Pearson Correlation	.421**	.225	.870**	1	,762**	,099
	Sig. (2-tailed)	.008	.175	.000		,000	,555
GVA_EA12	Pearson Correlation	.432**	-.081	.748**	,762**	1**	,197
	Sig. (2-tailed)	.007	.631	.000	,000		,237
PAT_EA12	Pearson Correlation	.316	-.095	.109	,099	,197	1
	Sig. (2-tailed)	.053	.569	.516	,555	,237	
		GDP_EA14	UNI_POP14	RD_EA14	FIX_EA14	GVA_EA14	PAT_EA14
GDP_EA14	Pearson Correlation	1	,416**	,859**	,943**	,587	,260**
	Sig. (2-tailed)		,009	,000	,000	,000	,115
UNI_POP14	Pearson Correlation	,416**	1	,404*	,326*	,135**	-,114
	Sig. (2-tailed)	,009		,012	,046	,419	,494
RD_EA14	Pearson Correlation	,859**	,404*	1	,814**	,711**	,521*
	Sig. (2-tailed)	,000	,012		,000	,000	,001
FIX_EA14	Pearson Correlation	,943**	,326*	,814**	1	,481**	,214*
	Sig. (2-tailed)	,000	,046	,000		,002	,198
GVA_EA14	Pearson Correlation	,587**	,135	,711**	,481**	1**	,652
	Sig. (2-tailed)	,000	,419	,000	,002		,000
PAT_EA14	Pearson Correlation	,260	-,114	,521**	,214	,652	1
	Sig. (2-tailed)	,115	,494	,001	,198	,000	

* Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: own calculation

The data indicates a statistically significant dependency at 99% reliability level between the macroeconomic indicators, in particular between the GDP level, investment, and innovation factors. Higher investments are reported in the regions with higher level of the gross domestic product; statistically most significant dependence with 99% reliability level was demonstrated between the gross domestic product level converted per capita and the volume of investments per workforce. Also significant is the direct dependence between the investment levels per economically active person and other macroeconomic indicators. More patents are applied to where the companies make higher investments and regions have higher level of GDP. Inversely, the dependence between the unemployment rate and the number of patents and education of the population demonstrated as well, where the correlation between the level of the regional HDP and most of the monitored indicators increases between 2012 and 2014 while the more developed regions report higher values of the other indicators in 2014. A similar development can also be seen in the field of human resources in R&D, investments, and growth of added value.

However, available data demonstrate higher share of R&D workforce in the regions of the metropolitan character, particularly those with capital cities. On the contrary, the regions of the non-metropolitan and of rather rural nature have lower share of this workforce and have lower economic and innovative potential.

4. CONCLUSION

The article aimed at reviewing of the innovation potential of the regions in the Czech Republic, Slovakia, and Poland having their own elected regional institutions, which may influence the growth of the innovation potential of the regions. From the point of complex review of the differences among the regions, the Czech regions have higher innovation potential in average followed by the Slovak and Polish regions. Better conditions for growing innovation potential can be seen rather in the metropolitan areas than the regions focused more on agriculture and the old industrial regions.

The key benefits of the analysis include the finding that the critically judged category of the old industrial regions reports rather good conditions for the development of the innovative environment with respect to the future perspective. Despite the old industrial regions being characterised by a range of social and economic problems such as a high unemployment level, obsolete industry, a focus on mining, and an impaired environment, the regions have a rather high growth potential. The advantages of the old industrial regions, such as Moravia-Silesia Region in Czech Republic or Silesian Voivodeship in Poland is that they may transform the economic potential which is very weak in the peripheral and agrarian regions (Lubelskie in Poland or Prešov Region in Slovakia).

A disadvantage of the agrarian and peripheral regions is the low concentration of resources in the long-term run such as capital, investment, human resources, and traffic and technical infrastructure to a certain extent. The insufficiency of the resources is a heavily limiting factor, which has a negative impact on their future development.The relationship among the applied indicators was the object of the correlation analysis aiming at finding out the dependence of the reviewed regions. The regions with higher GDP per capita and investments per workforce show also better conditions for growing innovation potential. Many regionally specific factors having their impact on the innovation environment of the region and growing innovation potential can be defined in the review of the regional differentiation of the innovation potential. An important factor is educated and flexible workforce employable in companies from the growing sectors being localized in the regions.

Central support from the public resources for further growth of the innovation potential should be aimed at the firms (Streimikiene, 2014; Zumbusch & Scherer, 2012; Hlaváček, *et al.* 2015), which make up

the main segment with the innovation potential on the basis of the principal sectors of the regional economy, hand in hand with motivation of the out-of-regional and winning of the new investors bringing higher added value, and developing in the innovative business with the use of the modern technologies and services. The geographical location of the region in combination with good transport connections to the Western markets creates good conditions for growing innovation potential.

The R&D policy in these countries also has a regional dimension, which can be seen as an endogenous instrument for the innovative growth of the regions. A feature is the change from the top-down approach to the bottom-up approach consisting in the support of independently organized networks of participating companies, public sector, and R&D. The regional innovation strategies often aims at basing on the endogenous factors of the region, innovatively and potentially dominant sectors in the region complemented by the public support to the companies expressing high innovative potential. The topics aimed at the analysis of the national and regional level of the innovation policies and their benefits for development of the inter-sectorial cooperation of local companies, impact of the innovative policies on the growth of the regional innovation potential, or statistic expansion of the set of further relevant indicators with direct link to the description of the innovation potential of the regional economies are very inspirational for the future research.

The expansion of the number of indicators and data, which will map the innovation environment of the regions, could be recommended for further research of the innovation potential. Although the research data used in the article is not able to fully assess the quality and complexity of the innovation potential of the regions, the research results are a valuable source of information for mapping the innovation potential of the regions and setting up innovation and regional policy tools.

ACKNOWLEDGEMENTS

This work was supported by the Internal Grant 2016/2017 Agency of Jan Evangelista Purkyně University in Ústí nad Labem in the Czech Republic.

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THE INFLUENCE OF FOREIGN DIRECT INVESTMENT AND PUBLIC INCENTIVES ON THE SOCIO-ECONOMIC DEVELOPMENT OF REGIONS: AN EMPIRICAL STUDY FROM THE CZECH REPUBLIC

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Introduction

In the transitional economies of Central and Eastern Europe after the completion of the privatization process, there was increased pressure to win foreign investment to support the ongoing economic transformation. Countries systematically dealt with the problem of a lack of foreign investments (Švejnar, 2002; Hardy et al., 2011). For this reason, in the Czech Republic and in other post-communist countries an incentive system was created for foreign investors (Ginevičius & Šimelytė, 2011). The aim was to increase the attractiveness of the economy for foreign investors in competition with other countries, which also created their own incentive systems. In the Czech legislation, a foreign investor is defined as a company that establishes or expands its representation as a foreign investor in the host economy, which includes acquiring at least 10% of the share of the assets and/or voting rights in a company.

The development of localization of foreign direct investment in the Czech Republic and in the other countries of Central Europe has been the subject of numerous studies (Kornecki & Raghavan, 2011; Gauselmann, Knell, & Stephan, 2011; Domanski & Guzik, 2009). If we interpret their results, it is apparent that the flows of foreign direct investment were affected by regionally specific localization conditions, which created a differentiated economic and social environment, with varying attractiveness for foreign direct investment (Santos-Paulino, Squicciarini, & Fan, 2014).

The concentration of foreign direct investment has an impact on the economic environment of the region in a number of areas (Gersbach & Schmutzler, 2011; Alazzawi, 2012). The effect on the inflow of foreign direct investment on economic growth in medium-developed countries is not always clear. Alvarado, Iñiguez and Ponce (2017) did not confirm a statistically significant dependence in Latin America but in the case of Central European countries, a positive correlation was found (Fidrmuc & Martin, 2011; Tuan, Ng, & Bo, 2009). This can be explained by other initial economic conditions and the necessity of a complex economic transformation (Hlaváček & Bal-Domańska, 2016). In general, investment in GDP growth contributes to the regional economy (Bajo-Rubio et al., 2007), while enterprises in the region are more integrated into global production chains in subcontracting (Wei et al., 2012; Pelinescu & Radulescu, 2009). According to Mukherjee and Sinha (2016), growth in competition has a positive effect on the decline in producer prices for consumers. The number of jobs, labor productivity and reskilling are expected to grow as well (Javorcik, 2012). Very often, a positive impact on the growth of research and development (R&D) activities is also mentioned (Santos-Paulino et al., 2014; Chen & Yang, 2013; Blomström & Sjöholm, 1999). New knowledge, know-how and spillover effects are flowing into the region with the inflow of foreign direct investment, according to the intensity of interconnection of local companies with foreign companies. Todo and Miyamoto (2006) point to this effect with examples coming from Japanese companies. Gersbach and Schmutzler (2011), Chen and Yang (2013) are also expected to influence the development of Science and Research expenditures (in this article, science and research expenditures refer to the same aspect as R&D expenditures).

 DOI: 10.15240/tul/001/2019-3-001

In the list of negatives, the most important risk is the instability of localization – the investors may move production to other countries following the expiry of contractual arrangements. Another risk for the region is the crowding-out of domestic firms, which, according to Srholec (2004), are not sufficiently competitive because of the incentive system for foreign companies. Alazzawi (2012) confirms this by showing that the inflow of foreign direct investment increases competitive pressure on domestic firms. On the other hand, an analysis of companies in Spain shows that the inflow of foreign investors has led to growth in competitiveness and production efficiency in local firms (García et al., 2013). Within the overall context there are more positive effects which are reinforced by the need for the transformation of economic structures in transitional economies (Tvrdoň & Skokan, 2012). Each type of region has individual localization prerequisites for the inflow of new investments, due to the fact that regions have varying attractiveness and diversified economic growth. Therefore, an incentive system has been created for investors that motivates more investors to locate branches in problematic regions (Šimelytė & Liučvaitienė, 2012; Meriküll et al., 2013). The investment incentives have gradually become a regular socio-political tool in developed and developing countries. An investment incentive is generally defined as an advantage and motivational tool, through which the government wants to influence the companies' decision to localize investments, particularly in less developed regions. The reason for providing such incentives is to attract new investment or maintain existing businesses as measures against economic stagnation and decline of a region. Providing investment incentives has several advantages and disadvantages. The national and local governments can use an investment system relatively effectively for the transformation and modernization of the sectoral or spatial structure of the economy. Another advantage is the transfer of modern technologies to the region or the creation of new jobs. However, the effect of reducing the level of unemployment is only partial because workers are often taken from another companies and pressure may be imposed on local businesses. On the other hand, the creation of new jobs and subcontracting links for local businesses can be initiated.

Investors have the opportunity in the Czech Republic to use various types of investment incentives: exemption from property tax, aid for the creation of new jobs and retraining or the training of new employees, corporate tax relief and contributions for the acquisition of property. If expansion or the implementation of a new production occurs, both in the processing industry as well as in the technological centre, material support may reach as much as 12.5% of eligible costs. In the case of strategic investment in production, this support may reach a maximum of 1.5 bil. CZK. For a technology centre, the maximum is 500 mil. CZK. The last usable form of support is the transfer of land, including infrastructure, for a discounted price.

The system for granting selective incentives carries the risk of excessive subsidy, which may be caused by great competition among governments in Central Europe. Any positive effects for the economy as a whole therefore can be easily turned into higher profits for the investor, who after several years may sell the branch and realize investments in another country, again with public support. It is also the case that some investment incentives can be gained by investors who would realize a particular investment even without the provided investment incentives. The effects of a localization decision are very extensive. According to a study from Deloitte (2010), with the support of investment incentives many new jobs have been created, of which a quarter were created directly in supported companies and three quarters in subcontracting networks. A localized branch in the region in the form of domestic or foreign investments may cause some positive multiplication effect, manifested in other indicators and in the comprehensive development of the region. An example may be the localization of new production, improving relationships with regional supplier companies, which also increases their innovative capacity (Bučar et al., 2009).

With inflows of foreign direct investment and investment incentives, such cash flow can also be expected to lead to the development of companies in the region and to increase their innovation potential. This should also increase growth and expenditures for science and research due to spillover effects between R&D and companies (Autant-Bernard & LeSage, 2011). The problem of regions with a lower potential of economic growth and lower

competitiveness lies in the lower level of activity of the businesses in the areas of research, development and innovation. In the less successful regions, it is therefore necessary to have a higher level of public support for the development of R&D, since according to Kroll et al. (2009) the scope of the R&D activities also affects the quality of the regional environment.

The aim of this article is to identify how the different financial flows are reflected in the development of the regions, through the analysis of selected social and economic indicators. In this case, examination will be carried out of foreign direct investment (FDI), government investment incentives (GII) as well as science and research expenditures (SaRE). So far, no study has been conducted in the area of FDI, GII and SaRE, that would encompass analysis and connections with as many indicators as our study. This complex approach offers new possibilities of research. Studying the effect of FDI, GII and SaRE on characteristics of regions connected with the labor market, population growth and migration as well as construction activity can yield new insight as well as unique results, which can contribute to the research in this field in original way. Although our approach is relatively complex, we must note that many important indicators as well as independent variables were not included into our study while we recommend that this be done in future research.

1. Methodology and Data

In the interest of gaining more detailed information about spatial differences and conditions for development processes, in terms of the hierarchy of territorial units, the level of districts was used (NUTS III). By doing this, there was a more extensive sampling and the identification of spatial specifics could be conducted compared to using the level of regions (NUTS II). Our dataset is cross-sectional based on these regions without Prague. The reason why we excluded Prague from our dataset is that it is a completely different environment with different structures. The predictors of regional development indicators are presented in Tab. 1.

The source of data on inflows of foreign direct investment in the districts is the Czech National Bank, which keeps track of the flows of foreign investment. The data for provided investment incentives for individual investors, which may be either of foreign or domestic origin, originate from sources of the government agency for support of investments (CzechInvest, 2017), which has been aggregated for individual incentives at the level of districts (Tab. 1).

Firstly, we analyzed data for foreign direct investment between the years 2000-2015. The average FDI over all regions over the time period between 2000 and 2015 is 657.6 million CZK per year. There is a sharp increase in 2007 and a decline during 2013-2015. During 2013 and 2015, the averages over all Czech regions were even negative. This means that during these years, investment money was flowing out of the country at a higher level than foreign direct investment was flowing into the Czech regions.

Foreign direct investment inflows have usually acquired positive values, but they can

Tab. 1: Investigated independent variables

Variable	Code	Number of variables (years)	Source
Government investment incentives for firms between the years 2000-2016 (district level, mil. CZK)	Incentive_2000-2016	17	CzechInvest database (2017)
Foreign direct investments total between the years 2000-2015 (district level, thous. CZK)	FDI_2000-2015	16	Czech National Bank (2017)
SaRE Expenditure between the years 2009-2015 (district level; mil. CZK)	Research_2009-2015	7	Czech Statistical Office (2017)

Source: own based on CzechInvest, Czech National Bank, Czech Statistical Office

also report negative values. In this case, there is a situation when the inflow of FDI is lower than the outflow of FDI. This can be the result of an economic recession or the saturation of the Czech economy. This situation in the Czech Republic has been linked to the onset of the economic crisis in 2008 when companies significantly reduced their investments, as described by (Novák & Drdová, 2018). Another explanation is given by (Dunning, 2018) who says that in a certain phase, saturation of the local environment with direct foreign investments occurs and the host economy is already so developed that companies are able to a greater extent to invest abroad, while the result of that could also be a negative difference between the inflow and outflow of investments.

However, from a geographical point of view, in the placement and flows of FDI, there is spatial differentiation in regionally specific types of territories. Examples of this are urban versus rural regions, metropolitan versus non-metropolitan areas.

Secondly, we have a series of data for government financial incentives of the Czech Republic. This series goes from 1998 to 2017. Out of 1,520 (76 regions x 20 years) cell values, 1,019 were equal to 0, which means that there were no government incentives in the given region in the given year.

The government's approach to investment incentives in the past 18 years has changed several times. At present, under Act No. 84/2015 Coll., three areas of foreign investment are supported – the introduction or the expansion of production in the processing industry, construction or expansion of a technological centre as well as the development of strategic centers specialized in software development and high-tech service centers.

According to Czech Statistical Office (2019), expenditure on research and development is normal cost incurred within an institution or organization for research and development regardless of the source of their funding. The amount of expenditure on science and research varies among regions in the long run. Differentiation points to the absorption capacity and the research potential of the region and the financing of SaRE depends on these characteristics. We can build on the theory of regional innovation systems (Cooke, 2001; Asheim & Coenen, 2005), where the location of the research and development institutions or activities reinforces the innovative potential of the region.

The average value of SaRE for all regions over the time period between 2009 and 2015 is 367 million CZK per year. If we take into account only non-zero cells, we come up with an average of 415 million CZK per year.

A sharp difference is apparent: while FDI are sharply decreasing between the years 2012-2015, science and research expenditures are rising. Whether this has some consequence for the development of regions in this time, we will see in model.

There are another 13 variables that we work with in addition to those presented in Tab. 1. Our analysis is based on regression models. Firstly, we use these 13 characteristics as dependent variables. Also, in the models we use them as independent variables in order to control for their effects. This data originates from the database of the Czech Statistical Office. An overview of used data, including the summary of statistics, can be found in Tab. 2.

During the selection of data, the aim was to maintain a complex approach in mapping social and economic changes. Therefore, such indicators were selected in relation to which it is possible to expect a certain reaction to the inflow of finances into the territory. The social area is represented by indicators such as the number of inhabitants, the numbers of foreigners and the urbanization rate. The labor market is represented by data about the number of unemployed people and the numbers of available jobs. This is due to the fact that some authors (Driffield & Taylor, 2000; Bandelj, 2002) argue that the inflow of FDI stimulates employment growth. The growth of the population can also be expected as a result of FDI inflow.

According to Ascani and Iammarino (2018) FDI inflow will also be reflected in the migration of citizens and the change of cultural relations between investors and the local environment. Thus, data concerning immigration and the number of foreign workers will also be included in the model. The insertion of the last indicator is also based on current experience; many industrial companies employ more foreign workers due to the lack of a domestic labor force.

In the economic area, numbers of companies are monitored in the categories of small, medium-sized and large businesses and

Tab. 2: Dependent variables and control variables

Variable name	Variable description	Code	Mean	Median	Min	Max	Std. Dev.
Population_2015	Population (2015)	Po15	122,189	111,371	39,261	37,7028	58,183
dPopulation_2015	Population (2015 - 2014)	dPo15	94.7105	-15.5	-2,427	3,849	800.4
Unemploy_2015	Number of unemployed (2015)	Un15	5,472.4	4,790	1,292	2,2754	3,786.3
dUnemployed_2015	Number of unemployed (2015 - 2014)	dUn15	-1,085.7	-1,009	-2,975	-139	561.9
JobsFree_2015	Jobs free (2015)	JF15	1,155.3	985.5	224	3,939	671.7
dJobsFre_2015	Jobs free (2015 - 2014)	dJF15	506.39	413	3	1,784	374.2
Active_2015	Economically active people (2015)	A15	80,957	73,194	26,334	24,6583	38,501
dActive_2015	Economically active people (2015 - 2014)	dA15	-751.0	-710.5	-3,160	1,539	629.4
Urban_2014	Urbanization 2014	Ur15	62.482	60.35	34.75	100	14.8
FirmsSma_2015	Number of small firms (2015)	FS15	2,607.8	2,189	753	15,628	2,020.1
dFirmsSma_2015	Small firms (2015 - 2014)	dFS15	-8.3684	-10	-69	121	31.5
FirmsMed_2015	Number of medium firms (2015)	FM15	110.67	96	26	566	74.9
dFirmsMed_2015	Number of med. firms (2015 - 2014)	dFM15	0.447	0	-12	15	4.5
FirmsLarg_2015	Number of large firms (2015)	FL15	21.026	15	4	123	18.7
dFirmsLarg_2015	Number of large firms (2015 - 2014)	dFL15	0.6579	1	-6	5	1.8
Foreigners_2015	Number of foreigners (2015)	F15	3,848.8	2,533	811	24,850	3,654.4
dForeigners_2015	Number of foreigners (2015 - 2014)	dF15	133.78	83.5	-181	1,169	194.9
Immigrants_2015	Number of immigrants (from other dist.) 2015	Im15	1,819.9	1,353	375	8,934	1,424.1
BuildPermits _2015	Number of building permits (2015)	BP15	977.61	844.5	252	2,822	493.5
BuildingTotal _2015	Approximate value of constructions (mil. CZK)	BT15	2,367.5	2,047	543	9,343	1,479.9
BuildPermitsResid _2015	Number of residual build. perm. gr. (2015)	BPR15	341.79	298.5	68	1,127	203.8
ValueResident _2015	Approx. value of resid. building 2015 (mil. CZK)	VR15	850.08	658.5	133	4,117	677.2

Source: own based on CzechInvest, Czech National Bank, Czech Statistical Office

construction activity, including the average cost of construction. According to Munemo (2017) the influx of FDI stimulates the emergence of new start-ups and the creation of new businesses. Sajid and Sizhong (2016) also pointed out that the export potential of local businesses is increasing as well. According to Albulescu and Tamasila (2014), FDI inwards also positively influenced the opportunity-driven entrepreneurs. The impact on local businesses is also described by Javorcik (2012), who points to positive productivity spillovers from FDI to local suppliers.

Indicators concerning construction activity generally indicate the growth potential of a territory. The positive influence of foreign investment on the building development of a region is evidenced by Chen, Melachroinos and Chang (2010). For this reason, the model also includes data from the construction and real estate markets, specifically data for the average value of buildings and the number of building permits. The insertion of this data is also based on the fact that the intensity of construction activity is an indicator of the development dynamics of the territory.

For the variable Urbanization, we only have data for the year 2014. However, since the Urbanization rate is a relatively stable value, we can assume that in the year 2015 the values for all regions will be very similar that of 2014. For the other 12 variables, we have values for 2014 and 2015. Sometimes, we only need values for the year 2015. Since we investigate what effect FDI, SaRE and GII have on the region, it is sometimes necessary to work with the differential value during the years 2014 and 2015. To calculate this, we also need the value for the year 2014.

We named differential variables "d…_2015". For example, "dPopulation_2015" stands for the difference of population for the given region during the years 2014 and 2015 (Tab. 3). We could try transforming our data (for example logarithmically). However, for the sake of mathematical clarity, we stick to initial models with no transformations.

2. Results and Discussion

Our goal is to determine the influence of FDI, SaRE and GII on various characteristics of the regions presented in Tab. 2. Technically, it would be optimal to use panel regression with a long enough data series. This model would yield more precise results. Although our dataset is quite large, this is not enough to perform panel regression (especially in the case of dependent variables). For this reason, we used a different technique. We created a linear OLS regression model for each characteristic of a region that we wanted to study. The mathematical model is introduced in the following formula.

$$y_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_p x_{ip} + \\ + \varepsilon_i = x_i^T \beta + \varepsilon_i,\ i = 1, \dots, n \\ \{y_i, x_{i1}, \dots, x_{ip}\}_{i=1}^{n} \quad (1)$$

Letter y stands for the dependent variable. Names of dependent variables used in our models are in the first row of Tab. 3. Letter x stands for independent variables (x_{i1}, …, x_{ip}). In our case, the names of these are presented in the first column of Tab. 3. Letter n is the number of regions we use for our models. $\beta_{0, \dots,} \beta_p$ are the coefficients that we estimate in each of the regression equations. These numbers are the outcome of regression models that we used. Again, we can find them in Tab. 3 – all the numbers with the exception of those in the last row.

In these models the dependent variable is either the value for the year 2015 or value for the difference between the values in 2014 and 2015. For example, we studied the effect of FDI and other independent variables on the difference in small firms during the years 2014 and 2015.

We are aware of the fact that in this way we only use the information of dependent variables for the years 2014 and 2015, whereas panel regression would use data for a long time series but as explained before, for this technique sufficient data is not available. With the data that we have, our model is the most precise technique that can be applied.

In each of our models the independent variables are the FDI for the years between 2000-2015, science and research expenditures for the years between 2009-2015, government financial incentives for the years between 1998-2016 and control variables that can also influence the dependent variables. The results are presented in Tab. 3. This table shows the estimated coefficients of the independent variables. Each column stands for one linear regression model whose dependent variable is in the top cell of the column. Each row stands for one independent variable. In the last row of the table, we present the R-squared coefficients.

Tab. 3: Results of OLS regression models (Part 1)

Regressor	dPo15	dA15	dFS15	dFM15	dF15	lm15	dBP15	BPR15	VR15
const	155.59	407.35	-9.924	0.190	-129.3	243.11	-103.4	-5.969	154.043
FDI_00	2.4E-05	-3.2E-06	-3.2E-07	3.6E-07	-2.0E-05	-5.9E-05	1.9E-05	6.1E-06	-2.1E-06
FDI_01	-4.7E-06	2.6E-05	6.5E-06*	-8.4E07*	-1.6E-05	-5.6E-05	1.6E-05	1.1E-05	3.2E-06
FDI_02	-2.8E-05	-1.2E-05	1.0E-05***	-1.3E-07	5.1E-06	7.3E-05*	4.2E-05*	-1.5E-06	-1.7E-05
FDI_03	9.1E-06	-1.5E-05	1.6E-06	-3.8E-07	1.6E-05	6.5E-05	-5.E-05**	-8.3E-06	1.9E-05
FDI_04	1.7E-05	2.1E-05	3.8E-06*	2.9E-07	6.1E-06	5.0E-06	1.2E-05	3.1E-06	2.2E-07
FDI_05	1.1E-05	2.5E-06	5.6E-06***	-3.7E-07	-1.5E05*	8.6E-06	4.E-05***	2.2E-06	-1.9E-05**
FDI_06	3.3E-05	7.4E-06	8.0E-06**	1.1E06**	-1.5E-05	-2.2E-05	4.7E-06	-7.7E-07	1.2E-05
FDI_07	1.1E-05	-1.6E-06	1.1E-06	-2.7E-07	-5.3E-06	-1.4E-05	-4.E-05***	-4.4E-06	1.9E-05**
FDI_08	-8.2E-06	-1.1E-05	-1.9E-06	-5.6E-07	-1.7E-05	-2.2E-05	-5.E-05***	5.0E-06	2.3E-05
FDI_09	4.1E-05	2.4E-05	-3.1E-06	1.4E-07	8.9E-06	-6.8E05*	1.3E-05	1.1E-05	-3.2E-07
FDI_10	2.9E-05	5.2E-06	7.4E-08	1.2E-07	-2.3E-06	-1.7E-06	-3.E-05**	-4.9E-06	1.7E-05**
FDI_11	-1.0E-05	6.9E-06	-4.8E-06	3.3E-07	2.9E-05	5.0E-05	-1.5E-05	1.1E-05	3.3E-06
FDI_12	-1.2E-05	-2.3E-05	-6.6E-06*	-6.5E-07	-3.6E-06	4.5E-06	-8.9E-06	-6.0E-06	9.3E-07
FDI_13	7.7E-05	-1.6E-06	3.0E-06	5.6E-07	-1.7E-06	-2.0E-05	-1.3E04***	-2.E05**	5.E-05***
FDI_14	1.8E-05	7.2E-06	3.7E-06*	1.2E-07	9.1E-06	-6.4E-06	-6.5E-06	-2.8E-06	1.3E-05
FDI_15	2.5E-05	8.7E-06	7.2E-07	1.8E-07	-1.0E-05	-1.1E-05	-1.9E-05	-2.9E-06	1.5E-05**
Research_09	0.121	0.118	0.076**	0.003	0.024	-0.021	0.125	0.012	-0.040
Research_10	1.537	0.525	-0.037	-0.007	0.288	-0.555	-1.840**	-0.314	0.919*
Research_11	-1.956*	-0.789	0.018	0.008	-0.286	2.389*	1.097	0.164	-0.750*
Research_12	1.259	0.245	-0.001	0.003	0.105	-2.200*	0.697	0.228	-0.246
Research_13	0.182	-0.100	-0.125	0.003	0.135	0.483	-1.293*	-0.203	0.734*
Research_14	-0.803	0.034	0.068	-0.003	-0.190	0.339	1.018	0.098	-0.575
Research_15	-0.162	-0.074	0.041	-0.003	-0.117	-0.493	0.228	0.027	0.037
Incentiv_00	0.008	0.180	0.008	0.002	-0.202	0.352	1.657***	0.200	-0.870***
Incentiv_01	0.226	-0.051	0.026	-0.001	0.019	-0.098	-0.123	-0.048	0.066
Incentiv_02	0.054	0.120	0.021	0.002	0.079	0.400	0.409***	0.015	-0.176**
Incentiv_03	-0.205	-0.021	-0.011	-0.003	0.018	1.016***	0.298	0.042	-0.144
Incentiv_04	0.008	-0.055	-0.043	-0.001	-0.011	-0.085	-0.500***	-0.045	0.146
Incentiv_05	0.127	0.215	-0.002	-0.004	0.010	-0.152	0.599**	0.114	-0.173
Incentiv_06	0.063	0.110	-0.011	0.001	0.035	0.027	0.047	0.017	-0.045
Incentiv_07	-0.249	0.021	0.056***	0.001	0.250**	-0.054	0.346	0.069	-0.110
Incentiv_08	-0.350*	-0.049	-0.021	-0.001	-0.039	-0.063	0.395***	0.112**	-0.165**
Incentiv_09	0.020	-0.457	0.071	-0.006	0.031	-0.129	0.067	-0.186	-0.234
Incentiv_10	1.340	-0.060	0.214	-0.008	0.072	-0.010	-1.628	-0.386	0.623
Incentiv_11	-0.135	-0.072	-0.045	1.5E-04	-0.186	-0.224	-0.737*	-0.122	0.218
Incentiv_12	-0.282	-0.096	-0.010	-0.001	0.006	0.158	0.001	0.082**	-0.023
Incentiv_13	-0.108	-0.139	-0.037	0.005	0.021	-0.097	-0.450**	-0.066	0.131

Tab. 3: Results of OLS regression models (Part 2)

Regressor	dPo15	dA15	dFS15	dFM15	dF15	Im15	dBP15	BPR15	VR15
Incentiv_14	-0.169	0.011	0.010	-0.001	-0.063	-0.025	0.159	0.034	-0.076
Incentiv_15	-0.607	-0.372	0.153***	0.004	-0.015	1.076	0.113	-0.085	-0.160
Incentiv_16	1.840	0.916**	0.092	0.014	-0.367	-1.343	1.762*	-0.114	-0.291
Popul_15	-0.019	-0.031	-0.001	3.4E-04	-0.016	0.135	-0.200***	-0.022	0.062*
Unemp_15	-0.115*	-0.090*	0.006	0.001	-0.012	0.009	-0.100***	-0.033	0.044*
JobsFree_15	0.206	0.058	0.018	3.6E-04	0.048	-0.045	-0.211*	-0.070*	0.100
Active_15	0.024	0.034	0.000	-0.001	0.018	-0.199	0.266	0.039	-0.098
Urban_14	-13.700*	-13.000**	0.443	0.019	3.073	1.161	8.115	1.244	-6.230**
FirmsSma_15	0.088	-0.191	0.044**	-0.002	0.113	0.142	-0.064	-0.065	0.047
FirmsMed_15	3.232	5.584*	-0.018	0.049	-0.083	-7.631	3.201	0.201	-0.457
FirmsLarg_15	-1.689	5.935	-5.100***	0.028	11.422	5.675	-56.900***	-6.437	18.728*
Foreigner_15	-0.096*	-0.046	-0.005	2.2E-04	-0.022	0.177***	-0.013	-0.010	0.015
Immigrant_15	0.934***	0.593***	-0.013	0.001	0.123*		-0.067	0.037	0.094
BuildPerm_15	0.197	0.059	-0.060*	-0.003	0.043	-0.508			0.400***
Build.Tot_15	0.226	0.071	-0.017	-0.001	-0.026	-0.281	-0.109	-0.007	
BuildPermRes_15	0.753	-0.011	0.077	0.030*	-0.055	1.751			0.256
ValResid_15	-1.460**	-0.393	0.116*	-0.006	-0.068	1.562*	1.656***	0.329***	
R-squared	0.981	0.984	0.887	0.882	0.948	0.988	0.964	0.977	0.994

Source: own

Note: T-test significance levels: * = 10% (p-value lower than 0.1 and higher or equal to 0.05), ** = 5% (p-value lower than 0.05 and higher or equal to 0.01), *** = 1% (p-value lower than 0.01)

Significant FDIs start to appear from the year 2002. There are no significant FDIs before 2002. This shows that FDI only influences our dependent variables for 13 years. Also, there is only one case when an independent variable has an FDI p-value lower than 0.05 during the years 2014 and 2015. This shows that it takes at least two years for FDI to take effect.

There are only three dependent variables that have more than two significant FDIs (two stars, p-value less than 0.05). It is highly probable that FDIs only have influence on these three dependent variables and the rest is statistical interference. The three dependent variables influenced by FDI are: small firms differential during the years 2014 and 2015 (dFS15), number of building permits in year 2015 (BP15) and the value of residential buildings during the year 2015 (VR15).

We can determine the exact effect of FDI by studying the magnitude of the coefficients of significant variables. In order to determine the total effect of FDI on difference in small firms, we have to add up all significant FDI coefficients (two or three stars with p-value less than 0.05) in the column dFS15 (small firms differential during the years 2014 and 2015) in Tab. 3. The reason for this is that if one FDI was executed, it would with time gradually move up the column dFS15 (small firms differential) in Tab. 3. It follows the simple logic that we are not interested in the effect of specific FDI in only one year but in the total effect in all years after the FDI was executed. Since the sum of all the significant FDI coefficients in the column dFS15 (small firms differential) is 2.38E-05, we compute that every 1,000 CZK of FDI increases the growth rate of small firms in the region by 2.38E-05. Multiplying this by 100,000, we get that 100,000,000 CZK of FDI increases the growth rate of small firms in the region by 2.38. The conclusion is that FDI has quite a high impact on the number of newly created firms in the region. It must be noted that our regression

models do not include other variables which could be in some way connected with the functioning of the FDI effects. If they did, the results could be more precise and more authoritative. In any way, results of models such as ours should not be taken as precise predictions but rather as observations of general trends.

Following the same procedure, we add up all significant FDI coefficients in the column dBP15 (number of building permits during the year 2015) and we get the number -2.85E-04. This means that for every 1,000 CZK of FDI the number of work permits would decrease by -2.85E-04. Multiplying this by 10,000, we get that every 10,000,000 CZK of FDI will decrease the number of building permits by 2.85. In the same way we calculate the effect of FDI on the value of residential buildings. We can say that every 100,000,000 CZK of FDI will increase the value of residential buildings in the region by 9.13 mil. CZK.

These findings can be interpreted as examples of specific reactions of the local environment to the inflow of FDI. In the following paragraphs, we offer interpretation of the regression results focused on the effect of FDI.

Companies in the region are reacting and attracting new investors to a varying degree. Effects of the localization of multinational companies are described for example by (Massey, 1995). A company's new branch with varying intensity is integrated into the local environment, usually depending on the extent of its development. A newly localized branch of a multinational company without links to the local environment represents an extreme scenario, which was the situation appearing more in transitive economies at the beginning of the economic transformation. A conjuncture phase of the economic cycle of the Czech economy can currently be observed, with positive macroeconomic development also supported by an inflow of foreign investment in recent years, also leading to the growth of small companies. The relevance between the inflow of FDI and the growth of local domestic companies is significant. However, a limiting factor is the ability of local and regional firms to meet the requirements of localized foreign investors. There may be large technological gaps between the incoming foreign investor and domestic companies (land, Jindra, & Marek, 2012), limiting the possibility of developing mutual cooperation.

FDI does not have a major effect on construction activity, since a significant part of FDI flows is represented by acquisitions in the business environment. Positive dependency is more linked with investment incentives, which directly leads to new construction development. The value of permitted individual construction projects in the regions with a greater inflow of FDI has been growing over the long term as a result of greater investment activity. The unemployment level in recent years has remained at very low levels and instead there has appeared to be spillover of the work force rather than an increase in the number of available jobs.

Tab. 3 shows that government incentives most likely influence the same three dependent variables as FDI. This correspondence indicates the consistency and significance of the regression models. Also, there is potential influence of government incentives on the number of immigrants (Im15). This is in line with the basic notion of how government incentives influence the labor market: with more government incentives, there are more company branches (industrial objects, factory complexes, etc.). This leads to an increase of jobs in the region. If this gap cannot be saturated by the domestic workforce, foreign workers are needed and subsequently admitted into the country. This functioning is connected with the nature of the business cycle, as documented by Jíchová (2007; 2011).

As for the small firms differential, we use the same method to calculate the effect of GII as we did to calculate the effect of FDI. Adding up the numbers 0.0559025 and 0.153041, we get 0.2089435. The impact of 1 million CZK of GII is an increase in the growth rate of small firms in the region by 0.2. Multiplying this by 10, we get that the impact of 10 million CZK of GII is an increase the growth rate of small firms by 2. As for the number of building permits in year 2015, we use the same method and we come up with the result that 1 million CZK of GII increases the number of building permits by 2.1. As for the value of residential buildings (VR15), we use the same method as we did in previous cases and we come up with the result that 1 million CZK of GII decreases the value of residential buildings by 1.21.

The general opinion is that government investment incentives increase the value of residential buildings, but regression analysis

results shows a different impact. The reason why our analysis shows a negative correlation of government investment incentives with the value of residential buildings is that government investment incentives are a proxy variable for other socio-economic factors which decrease the value of residential buildings (e.g. a lack of business opportunities and business activities in the region) and which are not included in our model. Government investment incentives correlate with these factors because they are allocated in regions where these socio-economic factors are strong. Taking this into account we can say that FDI and government investment incentives have similar influence on the region where they are allocated.

If we assess the impact of the provided investment incentives on the regional environment, they have an apparent indirect positive impact on the growth of the number of small businesses and start-ups in districts. The localization of investments develops the local environment from a quantitative and qualitative point of view (Guesnier, 1998) because the region gets better conditions for the establishment of new companies. The positive relationship between the location of the investment incentives and monitored indicators was apparent also in the growth of the number of building permits issued. The location of the investment incentives also increases the construction activities of companies in the region.

Construction activity generally contributes to the development of regions, development of new infrastructure and buildings for production, housing as well as has a positive influence on the GDP growth in the region. On the other hand, new development will not necessarily be linked to the increase in prices of construction and in this case, there has been a decline in new construction, which can be explained by an effort to support rather quantitative development of housing and ensure economically affordable housing for new workers. Industrial development, financed by government investment incentives, also has a negative effect on the attractiveness of housing; the development of objects with a higher price of individual construction is generally not carried out in industrial areas and their immediate vicinity.

The years of significant independent variables for government incentives range from 2000 to 2015. Thus, we can suspect that they take effect almost immediately and that the effect is still significant after 15 years. We could also talk at length about the effects of control variables. We can see that many control variables are significant. Therefore, the conclusion would be that it is important to control for these variables.

As is apparent from the table, science and research expenditures have little influence on the studied characteristics of the regions. The p-value of independent variables standing for research expenditures rarely goes below 0.1 and only goes below 0.05 twice. It is most likely that these cases are statistical interference rather than significant statistical findings. Therefore, we will not study those in detail. It is possible that money invested in science and research has significant results only after seven years. In this case, it would be more valuable to study this in later years.

The value of the R-squared coefficient for the model concerning small firms is 0.887. Although this value is high enough, it is relatively lower than the values of R-squared coefficients of other models. This corresponds with the fact that the number of small firms in any region is subject to high fluctuation. However, since we do not need precise predictions of this number, the relatively lower value of the R-squared coefficient is not a problem. The R-squared coefficients of models with dependent variables building permits and the value of residential buildings (other models in which the dependent variable is influenced by FDI and GII) are also high enough to ensure good quality of these models.

Conclusions

The aim of this article was to analyze whether regionally different flows of direct foreign investment, government investment incentives as well as science and research expenditures influence the development processes of regions. The local economy can react to these financial impulses in various areas with varying intensity. Therefore, our selection of observed regional aspects includes indicators related to different socio-economic areas. In the case of both foreign direct investment and government investment incentives, the results show significant influence on the number of small firms in the region, number of building permits and the value of residential buildings. Considering

all interconnections within the national economy and regional development, the observed effects can be described as positive. As for science and research expenditures, our results show that these take more than seven years to take effect. Unfortunately, the accessible data did not allow us to study this effect during such a long time period.

In a theoretical context, our results contribute to the development of theory in the field of foreign investment and government spending aimed at giving support to the various regions. Connections found in our study created a basis for the specification of recommendations and interpretations that could be used both in theoretical research and in practical decision-making within concrete institutions. For example, the connection of FDI with the growth of the number of small firms in the region and the fact that no connection between the realization of FDI and the number of medium-sized firms in the region has been found, calls for more in-depth research in this field as these results offer valuable insight into the functioning of the economy and the effects of FDIs.

As mentioned above, the results show a significant influence of FDI and GII on several indicators included in our analysis. Also, the results show no effect on the remaining variables. This is a rather unique result distinguishing between areas where the effect of these financial inflows can be experienced and areas which remain relatively untouched by the realization of the aforementioned expenses. For example, no effect of FDI and GII has been observed in the change of population inside regions and in the growth of medium-sized firms in the regions. This division may serve as guide for further political considerations and public policy regarding FDI and GII.

As far as the influence of foreign direct investment and government incentives on the number of small firms goes, this points to their flexibility and the ability to react to changes in the changing regional environment. These impacts can be evaluated positively, since companies adapt to new requirements, qualitative demands and integration to global markets. In transitive economies, this aspect is very important. Nonetheless, the impacts of localization of companies are very diversified (Sucháček et al., 2017). Reactions of larger companies to foreign direct investment and government investment incentives were not observed. In their case, changes can be expected in a longer period as they are often integrated into different production chains at the international and global levels, without strong ties to the region.

Foreign direct investments tended to involve a search for lower production costs in regions rather than technological and research potential. These conclusions also follow the research from McDonald et al. (2018), who found that positive effects of FDI increase with greater geographic proximity to core cities. With the growth of innovation performance of the regions, there also comes the strengthening of the link between foreign direct investment as well as the development of science and research activities in addition to their internationalization (Miravitlles et al., 2013).

No link between spending on science and research activities as well as the analyzed indicators has been found. It can be said that these expenditures have had little influence on the regional development processes and their impact is more selective on the activities of specific companies than on the development of regional indicators. If there are some effects on the general regional performance, then they could be observed in longer time periods.

It can be stated that development changes on the regional level are conditioned due to a variety of factors, internal and external influences, which are mutually dependent to a varying degree. For example, there is a positive dependency between a greater number of building permits and the number of foreigners in regions with higher investment attractiveness. If we assess the regional changes comprehensively, we can identify different development processes, an increase in asymmetry, which level also leads to the forming of different development trajectories. Viturka (2010) describes them as regionally different social systems, which also require regionally different public policies. In macroeconomic terms, it can be said that as in the Baltic countries (Šimelytė & Liučvaitienė, 2012), the policy of supporting inflows of foreign direct investment and incentives has had a positive impact on the development of the regions in the Czech Republic.

In the microeconomic dimension, investment incentives and foreign direct investment have also contributed to the restructuring of

companies and growth in quality. For example, they have significantly transformed production in the automotive and electro-technical industry. Know-how in the form of new technology and management experience along with integration in the global production chains can also be mentioned (Deloitte, 2010). Investment incentives have been spatially concentrated differently compared to the inflow of foreign investments.

Recommendations for public and regional policy can also be drawn from research. The aim of public and regional policy is to contribute to limiting the growth of asymmetry between developed and less developed regions. They have sufficiently attractive conditions, comparative and localization advantages for investors. In 2018, the government approved an amendment to the Investment Incentives Act, which provides for investment incentives for the manufacturing industry. Public policy will be more supportive of higher value-added investments, not low-cost factories, technology centers and shared service centers. This change is intended to bring greater benefits from supported foreign investment, which will increase the competitiveness of regions. Andreff (2017) proves that the promotion of science and research as well as the development of high-tech industries led to a decline in FDI outflow. For this reason, public policy was to support R&D and high-tech sectors, for example, by amending the setting of investment incentives at a national and regional level in the priorities of regional innovation strategies. Thus, it is important to establish mechanisms for increasing the efficiency of foreign direct investment (Makiela & Ouattara, 2018) and their impact on the growth of the competitiveness and economy of the regions. Institutions, which conduct policies concerning government incentives and foreign direct investment (e.g. CzechInvest) in the case of Czech Republic, should take into account all interconnections and influences, some of which were found in our analysis.

Further research could be focused on the analysis of interaction between investors and the regional innovation environment, especially in the development of cooperative links in R&D to the extent that the regional environment is able to generate innovation of usable growth of newly localized companies in the region. With a greater set of data for districts, it would be possible to create a more advanced panel regression model. Also, the influence of foreign direct investment, government incentives as well as science and research expenditures on other indicators other than these that we have used in our models could be investigated. This could yield new insight into the functioning and nature of the aforementioned financial inflows. Understanding these connections would provide a basis for further political decision-making and public policy in the area of financial incentives. Transitive economies have had different development tendencies and therefore research could also be conducted in other countries in Central and Eastern Europe. Similar analysis could also be realized in the form of case-study examples of successful and less successful regions as well as their ability to absorb and integrate companies in global production networks.

The paper presents the results of the research within the GA CR project No. 18-11299S, "The development of trajectories of traditional industries in the old industrial regions".

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Abstract

THE INFLUENCE OF FOREIGN DIRECT INVESTMENT AND PUBLIC INCENTIVES ON THE SOCIO-ECONOMIC DEVELOPMENT OF REGIONS: AN EMPIRICAL STUDY FROM THE CZECH REPUBLIC

Petr Hlaváček, Julius Janáček

This article investigates the impact of foreign direct investment, government financial incentives as well as science and research expenditures on different socio-economic development processes in the Czech Republic. These financial flows are important for economic growth of regions and constitute a substantial part of financial flows within national economies. We focus on the effect of these aspects on various indicators concerning the business environment, labor market, population growth and construction activity. The analysis is conducted using OLS regression models.

Results indicate that it takes about two years for foreign direct investment to take effect and its influence is relevant for approximately 13 years. We found that foreign direct investment has a considerable influence on the number of small firms in the region, on the number of buildings permits in the region and on the value of residential estates. Our analysis further shows that government investment incentives have an impact on similar areas as foreign direct investment, which is in accordance with the general theory of the functioning of the economy. Science and research expenditures, on the other hand, seem not to have any effect in the first seven years after the expense has been realized. In this case, science and research expenditures show a longer time to respond as far as the studied indicators are concerned.

The concrete effects of foreign direct investment and government financial incentives in terms of numerical values have been calculated using the structure of our models. The magnitude and reasons for these effects are discussed. The results of these calculations indicate that foreign direct investment and government investment incentives have significant positive effect on the development processes of regions but in specific areas only.

Key Words: *Investment incentives, foreign direct investment, region, Czech Republic.*

JEL Classification: *R12, R53.*

DOI: *10.15240/tul/001/2019-3-001*