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The Role of Specialisation in the Export Success of Polish Counties in 2004-2015

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ABSTRACT

Objective: The objective of this article is to evaluate the role of specialisation in the export success of counties (powiats) (LAU 1) in Poland between 2004 and 2015.

Research Design & Methods: Using panel fixed-effects regressions with Driscoll and Kraay standard errors, the authors investigate the role of export specialisation and product concentration, as well as comparative advantages on the value of log exports per capita, controlling for other important export determinants.

Findings: Estimations of the panel model bring the conclusion that specialisation in a positive way contributes to the value of exports per capita, assessed at county level. The robustness of the obtained results has been verified by the use of several concentration and specialisation measures, incl. HHI, Krugman specialisation index, weighted RCA and concentration ratio.

Implications & Recommendations: Further research is recommended to capture the consequences of differentiation in the patterns of exports among counties in terms of agricultural vs. industrial goods as well as the low-tech vs. high-tech products. Similar research is recommended to be done at NUTS-2 level in order to inquire into the rationale of smart specialisation(s).

Contribution & Value Added: The main contribution of the research is showing the lumpiness of Poland's exports at county level in terms of product specialisation and concentration. The value added is depicting the positive role of specialisation for the exports success, understood as exports per capita.

Article type:	research paper
Keywords:	internationalisation; regional trade; export specialisation; export concentration; LAU 1; panel
JEL codes:	F14, R12

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INTRODUCTION

Exporting activity is traditionally analysed at country level. However, as data for exports of regions become more available, a new perspective of research emerges. Moreover, regional authorities are more interested in discovering the character of export patterns – as the increasing openness of Poland's economy brings higher sensitivity and vulnerability of regional economies to external economic impulses and shocks.

Although the EU commercial policy – according to the Treaty on the Functioning of the EU – is a common one (Art. 207 TFEU), export policy has not been effectively uniformed yet. Its consequence is that exporters are promoted at country level and also at the regional level, also with the use of the European structural funds.

Having said that exporting activity assessed at regional level is focusing more attention – an interesting question arises: whether export specialisation translates into 'export success'. Thus, the main objective of the article is to verify the role of specialisation in the export success of counties (LAU 1) in Poland between 2004 and 2015.

Export specialisation can be assessed with the use of many measures, related to concentration, revealed comparative advantages or the differentiation of the export pattern a particular region vs. other regions. The 'export success' of a region can also be understood in many ways, including the dynamics of exports, the number of jobs depending on exports, the share of high-tech products and exports per capita. We decided to refer to the latter, however, in further research, the use of other measures of export competitiveness would be interesting.

Using the export data for the econometric model in which the dependent variable and some of the independent variables are related to the same dataset (confounding factor) raises the risk of endogeneity problem. In fact, we expected this issue in the modelling. In the initial stage of the research, many estimation methods were used and specification of the models prepared. Endogeneity was tested in many ways, however it turned out to be non-existent. Due to the lack of endogeneity problem, and the existence of cross-sectional dependence, serial correlation as well as heteroscedasticity in our balanced panel (with N>T) – the authors decided to estimate the fixed-effects (within) regression with Driscoll and Kraay standard errors to overcome the existing issues.

The remainder of the article is structured as follows: in section 2 literature overview is provided, data and methods used are presented in section 3, results are discussed in section 4, while section 5 concludes.

LITERATURE REVIEW

Specialisation in Trade Theories

The conceptual foundations defining the role of specialisation in regional exporting activity can be found in several theoretical strands. The problem, however, is that the theories (for instance international trade ones) were predominantly formulated at the country level of analysis and shall be therefore adapted to the regional dimension. The following concepts seem to be interesting: (a) international trade theory, (b) regional economics that deals with the issues of locating economic activity, (c) investment portfolio theory that deals with risk diversification.

The idea of specialisation in foreign trade dates back to the times of the work of Adam Smith (1776). With the use of a relatively simple framework, Smith tried to convey the explanation for the directions of foreign trade flows between countries, finding that trade can be beneficial for two sides of the exchange, as opposed to the Mercantilist point of view. Specialisation through the division of labour led to improvements in labour productivity, which enabled more efficient use of resources (workforce). Thus, specialisation could lead to the concentration of production in industries having an absolute advantage, however regions were not present in that theory. David Ricardo (1817) together with Robert Torrens (1829) also sharing a credit to the discovery theory (Aldrich, 2004), put the trade theory into relative terms, revealing the role of relative productivity. The idea of comparative advantage is heavily discussed in the debate on the competitiveness of regions (Armstrong & Taylor, 2000; Behrens & Thisse, 2007; Dixon, 1973). Although there are many doubts about the 'transposition' of the comparative advantages concept to regional level, empirical research shows that a particular region always has comparative advantages in some products (Cassey, 2011), however other authors (Armstrong & Taylor, 2000) point to its little explanatory power, when applied to the regions. In the spatial Ricardo model of comparative advantage developed by Rossi-Hansberg (2005) for a series of regions, two industries, constant return-to-scale – spatial specialisation patterns affect inter-regional technological differences.

Another flagship theory, factor proportions Heckscher-Ohlin (H-O) model, is also applied to the regional level analysis of trade. Davis, Weinstein, Bradford and Shimpo (1997) suggest, basing on the case of Japanese regions, that the H-O model tends to give better results when applied to interregional trade as compared to international trade. However, its predictions on the patterns of regional sectoral specialisation can be misleading, because the interregional mobility of inputs (capital and labour) equalises cross-regional factor abundance, reducing the regional comparative advantage and erode the cause stemming behind inter-regional trade (Hewings & Oosterhaven, 2014). The predictive abilities of the H-O model can be frequently improved by utilising additional factors (like human capital or natural resources) (Armstrong & Taylor, 2000; Kim, 1995; Kim, 1999). The idea of regional specialisation was further developed by Courant and Deardorff (1992) in their lumpy countries theory, indicating interior diversification of regions, in which regions are treated as small open economies. Due to the differences in proportional factor abundance, their exports specialisation patterns may be dissimilar, apart from country's (low) specialisation. The factor endowment concept is deeply embodied not only in international trade literature but also in regional economics, with focus on specialisation. Capello (2016) treats space as an important production factor, that is a source of economic advantages or disadvantages.

The New Trade Theory (NTT) introduced by the works of Dixit and Norman (1980), Ethier (1982), Helpman (1981), Helpman and Krugman (1985), Krugman (1979), Krugman (1980), Lancaster (1980), dropped former classical assumptions in trade pertaining full competition (to imperfect competition) and constant returns to scale, whereas the presumption of homogenous products was replaced with product differentiation. The economies of scale together with the love for variety at the demand side, were decisive in determining the observed increase in intra-industry trade. The NTT theory stresses the role of productivity and tries to explain the benefits resulting from: (1) specialisation and

economies of scale, (2) first mover advantage that can create entry barriers to next players entering the same market, (3) the role of governments in supporting home-based firms (Aswathappa, 2008). Increasing returns can provide a clear explanation for the existence of specialisation, also if the theory is applied to regions that owing to increasing returns tend to specialise in order to achieve lower costs of production. Increasing returns and trade costs contribute to the location of economic activity within regions close to foreign markets and economic centres, fostering inter-industry trade specialisation between the core regions (Ehnts & Trautwein, 2012).

New Economic Geography (NEG) represents a theoretical perspective that can hardly be classified as purely related to international trade or regional economics. It brings together the trade and location aspects, with economies of scale conditions. NEG stresses the role of benefits originating from the proximity of cooperating firms (agglomeration effects) in determining social and economic processes and the interplay between agglomeration and trade (Fujita & Krugman, 2003). NEG focuses on distribution of economic activity in space. Agglomeration effects, forward or backward linkages are driving forces of spatial concentration. Transport costs, congestions, costs of immobile factors in the suburbs – are contributing to its dispersion (Aiginger & Davies, 2004).

Industries with higher returns to scale also have a higher probability to become exporters and tend to localise closer to the markets (Krugman, 1991). The same rule applies to industries having revealed comparative advantages, which decide to establish close to international gates of transportation (Coşar & Fajgelbaum, 2016). The resulting pattern of regional specialisation may therefore be the effect of spatial agglomeration of economic entities (Krugman, 1991; Krugman, 1991). Lowering costs encourage more firms to locate in particular areas, which in turn accelerates the process of industry concentration. The initial distribution of manufacturing seems to be crucial in the emergence of regional specialisation, which can be furtherly magnified by a strong economic integration among regions due to firm-level vertical linkages, resulting in the agglomeration process, which leads to regional specialisation (Krugman & Venables, 1996).

The new new trade theory put the emphasis on the firm-level behaviour, stemming from firms' differentiated characteristics that induce export activity of firms with the role of sunk costs and fixed costs in entering the international market. Starting from the seminal work of Melitz (2003), scholars have put more attention to the firm's productivity differentials, in explaining exporting behaviour of firms. These selected characteristics (i.e. larger firm size, higher productivity, imports, being a part of MNC) increase the probability of exporting, among other motives of internationalisation studied in the literature (Ďaďo, Wiktor, & Źbikowska, 2015).

The latest trade models also highlight the importance of the reallocation of resources (within one sector), as a consequence of changes observed in the trade costs, and the interplay between export performance and firms' innovation capacity or productivity (Altomonte, Aquilante, Békés, & Ottaviano, 2013; Brodzicki, 2017; Cieślik, Michałek, & Szczygielski, 2016; Ciuriak, Lapham, Wolfe, Collins-Williams, & Curtis, 2015; Gajewski & Tchorek, 2017). These reallocations, i.e. as a consequence of trade liberalisation, imply productivity increases within a sector rather than inter-sectoral growth. The smallest or the least productive firms are wiped out the market (or decide to operate on the internal market only). The remaining market share is distributed from the non-exporters towards more productive or larger firms

(Melitz, 2008). Hence, a country or possibly a region that is more exposed to trade will further specialise in exporting goods as a result of the reallocation. The sectoral productivity increases, being influenced by the latter market process, and cannot be directly attributed to the sole effect of exporting (at least at the initial stage) (Bernard & Jensen, 1997; Clerides, Lach, & Tybout, 1996; Pavcnik, 2002). According to Bos and Zhang (2013), the trade specialisation nexus is driven by a low number of sectors, having crucial impact on the patterns of industry concentration and being driven by highly productive firms, benefiting from the increased openness by i.e. allotting resources from the least productive firms.

Another theoretical approach is also possible, which is related to investment portfolio diversification, that can be interpreted on a regional level. There is a certain portfolio of industries in a region's economy. The region's as well as external resources have been invested into these industries, with path dependency playing its role. If this industrial mix is significantly concentrated or even dominated by one or a few industries, it might be detrimental for the region if the leading industries witness downturn in the business cycle. Specialisation brings benefits, as it is shown in NEG, because of the economies of scale. However, if the economy of a region is too specialised, it may negatively affect the labour market, a long-run stability of economic growth and the quality of life. In this moment an idea of smart specialisation (SS) shall be recalled.

SS denotes the ability of a region to improve its competitiveness through the use of opportunities stemming from local agglomeration or concentration of resources, as well as adequate competences in this regard (Foray, 2015). Inevitably, regions that have such a capacity can induce appropriate changes in their economies to modernise, transform or to alter the composition of industries or services. SS is not just a concentration of a specific industry in a region; it is rather a process of future diversification of production or services, attained through the aggregation of inputs and competences, resulting in the emergence of new domains that indicate possible paths for economy transformations. With the use of local resources and productive structures, transformed with the application of new technologies, resources or knowledge, SS denotes the emergence of a new (in many cases innovative) activity, being to some extent compliment to the existing productive structures. By the transformation of local inputs, competences, knowledge and strategic priorities – regions are encouraged to generate original and unique competitive advantages.

The SS concept stresses the role of economic potential and the mechanisms governing it (McCann & Ortega-Argilés, 2013). By the concentration of available resources and prioritisation of activities in a low number of industries in a regional economy, it can foster growth through the agglomeration process (being vital in the development of innovation-related activities) and initiate positive externalities in other economic domains, if the specialisations were selected adequately (Foray, 2015).

The interlink between SS and trade is not frequently studied. However, Landabaso, Gianelle, Goenaga, González Vázquez, and Thissen (2014) developed a practical tool to analyse the outward economic strengths and weaknesses of regions. The regional trade data were mapped, in which regions were established as the nodes of the network and the links were attributed to the volume of trade flows. With the use of three indicators (number of export destinations, total value of exports and the weighted synthetic indicator of the above two, indicating the preference of higher export volumes combined with large number of destinations) the position of a region is analysed in the flow of goods.

Krammer (2017) proposed an analytical or diagnostic tool for the investigation of priority areas in exports that are suitable for the inclusion in the smart specialisation strategy of a country. The exemplified candidate areas in exports for Bulgaria had high potential for benefiting from the fundaments of smart specialisation strategy. They featured high reference to the existing smart specialisations of the country – only one of six areas was missing in the final programme. However, the study was conducted at a high level of trade data aggregation.

An important implication for the SS policy emerges from the analysis of the empirical data on regional trade in the EU. Regions being well-positioned within a specific industry, should strengthen its role within the RIS3 policy or at least try to find a synergy with complementary industries in the future development strategic plans. Isolation hampers the global competitiveness of a specific industry.

Cordes *et al*. (2016) using national trade data disaggregated to NUTS 2 regions found different specialisation patterns in high- and low-income EU regions: (i) in high-technology-intensive products, (ii) in medium-low or low-technology-intensive goods, respectively. The geographical distribution of comparative advantages in high-technology-intensive goods to some extent was in line with the EU core-periphery spatial pattern. The research has also revealed that specialisation trade patterns are stable over time (in the revealed comparative advantages). The magnitude of the advantage could change, but significant changes in the structure of comparative advantages were very rare. The amendments in the specialisation were not systematically correlated with the changes in regional output growth rates. Thus, globalisation creates a favourable process to the development of the core regions (Pietrzak, Balcerzak, Gajdos, Arendt, & Tvaronavičienė, 2017).

SS can also be interpreted in the framework of international trade in which a region (firms of a region) are engaged. SS usually reveals itself in a region's export profile, assessed for instance with the use of revealed comparative advantages (RCA) (Krammer, 2017). SS is a relatively new concept that has been applied to regional development and to the allocation of the EU structural funds. However, the attitude towards the idea of SS seems to be changing. For instance, at ERSA conference in Groningen in 2017, in high-level discussions related to the regional competitiveness and the resilience economies of regions to the global economy changes and the consequences of the financial and economic crisis, the idea of smart diversification was debated, as a 'smart' way in which region can become more resilient to external economic shocks.

MATERIAL AND METHODS

The data used in this study were collected from two main sources of information: (i) Local Data Bank, supervised by the Central Statistical Office in Poland, which provided different socio-economic indicators describing local economies, and (ii) the Customs Chamber, supplying data on foreign trade. The data were merged into one consistent dataset and aggregated to the LAU 1 level (in Polish *powiat*). However, in order to sustain fully balanced panel between 2004 and 2015, one of the counties had to be merged back due to the administrative reform introduced in 2013 that emerged the powiat of the city Walbrzych from the powiat Walbrzyski. Thus, the resulting number of counties equals 378.

Given the major objective of the paper, encompassing for the evaluation of the role of specialisation in the export success of counties (LAU 1) in Poland between 2004 and 2015, the authors set two hypotheses:

H1: Counties' specialisation determines their export success.

H2: Product concentration facilitates counties' export success.

The theoretical foundations of the relationship between product concentration or regional specialisation rely on the intensive activation of resources, spatial concentration of entities and the economy of scale. These coupled with potential externalities stemming from the agglomeration of economic entities (in general or sector-specific) result in a higher productivity that is a stimulus for exporting activity. In this regard, (smart or economic) specialisation stemming from a low number of highly productive firms significantly affecting local trade flows may reinforce the existing endogenous capabilities towards further productivity increases in selected industries, through backward and forward firm-level linkages. On the other hand, more concentrated output is to a higher extent prone to changes in the global economic cycle.

To grasp the relation between specialisation/product concentration and the value of exports per capita (logged), the authors utilise a series of indicators depicting the inter-local export specificities. Krugman specialisation index is introduced to identify the level of dissimilarities between local and national export product structure. In turn, to verify the concentration of exports among counties, the Herfindahl-Hirschman Index (HHI) index is used, as well as the Concentration Ratio (CR) index, indicating the share of exports dedicated to 3-5-10-15 main product groups in exports. Finally, to evaluate the number of product groups with comparative advantage, the authors computed the weighted revealed comparative advantage (WRCA) index, according to the following formula:

$$BRCA_{jm} = \left(X_{jm}/X_j\right)/(X_{km}/X_k) \quad (1)$$

$$WRCA_{jm} = \left(BRCA_{jm}\right)/\left[\sum BRCA_{jm}\,/N\right] \quad (2)$$

where:

X_{jm} - exports of j-th county of product group m;
X_j - total exports of j-th county;
X_k - total national exports;
X_{km} - total national exports of product group m;
$BRCA_{jm}$ - product group level *BRCA* for poviat j;
N - total number of product groups.

The calculations for WRCA were run at 4-digit HS nomenclature with ca. 1300 product groups in total. Furthermore, the share of exports in product groups with WRCA greater than 2, 5, 10, 20, as well as the quantity of such product groups was computed.

The descriptive statistics of the main covariates are presented in the Table 1. The dependent variable is the log of exports per capita (*lex_pc*). The *lcap_pc* variable is computed as a log of fixed assets per capita in constant prices, therefore represents the capital abundance in a county. The share of population with tertiary education (*sh_pop_h*) indicating human capital endowment was obtained from national censuses run in 2002 and 2011, further interpolated/extrapolated for the following years of the study due to the unavailability of the data in the whole-time span of the analysis. The

role of foreign capital is introduced by the inclusion of the share of exports generated by foreign-owned entities (*ex_sh_foe*), while the sectoral structure of the local economies is proxied with the share of employment in industry (*sh_empl_i)*. The METRO dummy depicts counties located within 8 metropolitan areas (the core and outer-sphere) in Poland, established by the ESPON MEGA classification.

Table 1. Descriptive statistics of the covariates

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
ex_cr3	Share of 3 main product groups in exports	4536	59.919	17.700	8.629	100
ex_cr5	Share of 5 main product groups in exports	4536	70.964	15.859	13.703	100
ex_cr10	Share of 10 main product groups in exports	4536	83.646	12.270	24.432	100
ex_cr15	Share of 15 main product groups in exports	4536	89.305	9.846	33.344	100
ex_sh_foe	Share of FOEs' exports	4536	41.450	30.544	0	99.398
ex_hhi	Herfindahl-Hirschman Index	4536	0.204	0.144	0.011	0.968
ex_ksi	Krugman specialisation index	4536	1.556	0.159	0.472	1.952
ex_sh_wrca2	Share of exports in product groups with WRCA > 2	4536	64.670	20.539	0	99.737
ex_sh_wrca5	Share of exports in product groups with WRCA > 5	4536	45.558	24.551	0	99.708
ex_sh_wrca10	Share of exports in product groups with WRCA > 10	4536	30.482	24.562	0	99.620
ex_sh_wrca20	Share of exports in product groups with WRCA > 20	4536	16.198	20.495	0	99.307
lex_pc	Log exports per capita	4536	8.364	1.256	2.163	11.938
lcap_pc	Log capital (fixed assets per capita)	4536	2.605	0.121	2.431	2.845
METRO	Metropolitan dummy	4536	0.140	0.347	0	1
sh_pop_h	Share of population with tertiary education	4536	27.826	7.881	10.299	49.739
sh_empl_i	Share of employed in industry	4158	29.003	11.980	0	75.383
wrca2	No. of product groups with WRCA > 2	4536	15.991	16.014	0	189
wrca5	No. of product groups with WRCA > 5	4536	8.371	7.173	0	55
wrca10	No. of product groups with WRCA > 10	4536	4.665	3.797	0	27
wrca20	No. of product groups with WRCA > 20	4536	2.189	1.904	0	15

Source: own calculations in STATA.

The overall formula of the fixed-effects panel model which we consider was of the following form:

$$y_{it} = \alpha_i + x'_{it}\beta + \epsilon_{it} \tag{3}$$

where:

y_{it} - log export per capita;
α_i - unobservable county-specific effects;
x'_{it} - vector of control variables.

The use of log export per capita as the dependent variable stemmed from the high incidence of its usage as a regional export competitiveness index. However, other indices could be also used thereof, i.e. the share of exports in GDP, the share of high-tech products in exports, dynamics of exports, the number of jobs created in exporting firms. Due to unavailability of official GDP at LAU 1 level and observed practices in empirical papers, the authors decided to utilise export per capita (logged). The usage of any GDP-dependent version of the

index would imply the necessity of regional GDP (per capita) disaggregation, which could result in biased estimates. The alternate estimation approach would be to estimate spatial panel models with i.e. spatial autoregressive component, intercepting the spatially lagged dependent variable, what could result in a higher model's goodness of fit.

The dependent variable and the some of the independent variables related to the RCA and export concentration measures are based on the same data set, thus the problem of confounding endogeneity potentially arises. Therefore, the issue was treated with caution. The endogeneity was tested with the following tests: (i) Wu-Hausman F test, (ii) C Test (GMM Distance statistic). Additionally, regressions implementing endogeneity issue were estimated and compared to the regular ones. Finally, it turned out that the problem of endogeneity does not exist.

The covariates used in the study are stationary according to Levin-Lin-Chu unit-root test. The run test of overidentifying restrictions, which enables the comparison between fixed and random effects models (according to the p-value of Sargan-Hansen statistic), was in favour of fixed effect estimation.

Series of tests on the dataset – according to the Wooldridge (2002) test for serial correlation in the idiosyncratic errors – proved that the estimation procedure has to deal with serial correlation. Additionally, the Pesaran (2004) test for cross-sectional dependence indicated that the error terms are not independent across cross-sections. The cross-sectional dependence inappropriately treated could lead to severely biased estimates (Hoechle, 2007). Knowing that in our dataset N > T, and T is rather small, the authors decided to use the fixed-effects (within) regression with Driscoll and Kraay standard errors (Driscoll & Kraay, 1998) over the panel-corrected standard error (PCSE) regressions (which is a better choice when T > N) or regular fixed-effects regression with cluster-robust standard errors to achieve consistent estimates thereof. The estimations of the latter two methods are available upon request.

RESULTS AND DISCUSSION

Figure 1 presents the stylised facts about the value of exports per capita for Poland's counties. The obtained picture reflects the main features of the economic space in Poland that can be seen on many other similar maps, which are:

- the division of Poland into western and eastern parts, with the western one having higher exports per capita,
- the exports per capita concentrating around the transportation interworks (roads infrastructure, not only highways),
- the influence of agglomerations, around which exports is concentrated,
- 'islands' of exports, meaning that in the areas with low exports per capita higher values are observed, reflecting the activity of particular enterprises, often with foreign capital.

The map on the right side of Figure 1 shows the number of product groups with WRCA>2 in the exports of counties. The comparison of these two maps shows the probable endogeneity problem, as the maps are similar in many aspects. Figure 2 depicts the spatial distribution of the two specialisation measures, which are KSI and RC3. In comparison with the maps in Figure 1, they show different spatial distribution, with the highest concentration being observed in the eastern counties. The role of transport/road

infrastructure is also visible. The comparison of the results obtained with the use of different concentration measures brings a conclusion that structural characteristics of county's exports matters. Exports concentration may have many faces: it may be due to high-tech industrial products or to agricultural ones.

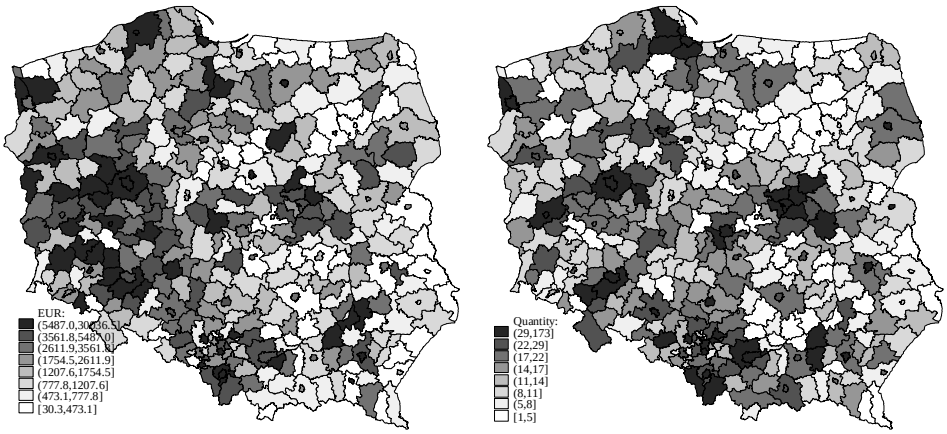

Figure 1. Export per capita in EUR in 2015 (on the left) and no. of product groups with WRCA > 2 in exports (on the right)
Source: own compilation.

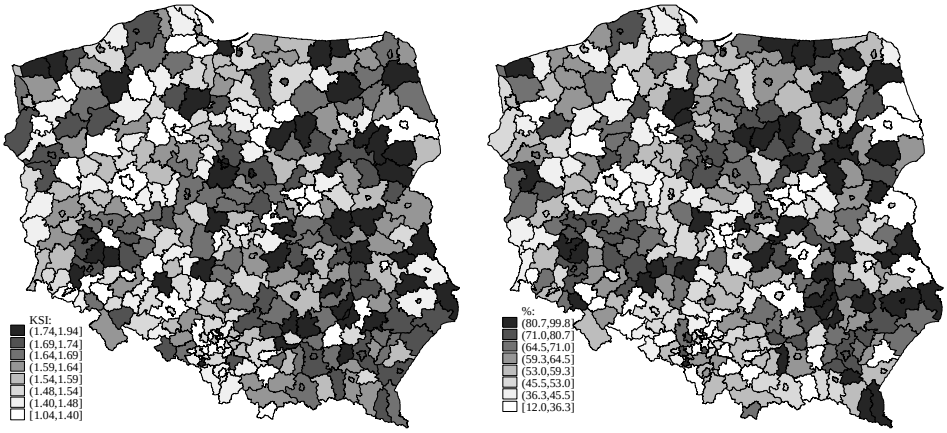

Figure 2. Krugman specialisation index (on the left) and share of exports of 3 most important export product groups (on the right)
Source: own compilation.

Tables 2 and 3 present the results of the model estimations, where the (in logs) value of exports per capita (in PLN) in counties is the dependent variable. In the basic specification of the model, the obtained direction of influence of the particular independent variable is as expected. The value of exports per capita is statistically significantly influenced by the share of the population with the tertiary education, the share of industry in total employment and

the share of FOEs in total exports. Also the fixed assets per capita value significantly, in a positive way, influences the dependent variable. In the initial specification of the model, the variable metro (metropolitan dummy) was used, however in the final version of the estimations, it is excluded from the set of the independent variables due to collinearity.

Table 2. Estimation results

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc
sh_pop_h	0.0438***	0.0441***	0.0426***	0.0428***	0.0426***	0.0430***	0.0435***
	(0.00204)	(0.00212)	(0.00202)	(0.00200)	(0.00195)	(0.00203)	(0.00201)
ex_sh_foe	0.0061***	0.0043***	0.0057***	0.0053***	0.0054***	0.0055***	0.0058***
	(0.00091)	(0.00088)	(0.00090)	(0.00086)	(0.00084)	(0.00094)	(0.00091)
sh_emp_i	0.0203***	0.0191***	0.0197***	0.0192***	0.0188***	0.0193***	0.0202***
	(0.00262)	(0.00225)	(0.00254)	(0.00254)	(0.00263)	(0.00277)	(0.00253)
lcap_pc	0.120***	0.103**	0.106**	0.104***	0.0886**	0.107***	0.121***
	(0.0390)	(0.0420)	(0.0417)	(0.0367)	(0.0405)	(0.0358)	(0.0369)
ex_eur_hhi		0.788***					
		(0.0870)					
ex_eur_ksi			0.417***				
			(0.0689)				
ex_sh_wrca2				0.0040***			
				(0.00022)			
ex_sh_wrca5					0.0044***		
					(0.00036)		
ex_sh_wrca10						0.0039***	
						(0.00029)	
ex_sh_wrca20							0.0028***
							(0.00017)
Constant	6.002***	5.981***	5.454***	5.879***	5.986***	5.988***	5.979***
	(0.0902)	(0.0880)	(0.137)	(0.0819)	(0.0850)	(0.0828)	(0.0850)
Observations	3402	3402	3402	3402	3402	3402	3402
Number of groups	378	378	378	378	378	378	378
R^2 within	0.432	0.449	0.441	0.449	0.462	0.455	0.441
F	345.6	426	610.6	383.9	799.3	866.9	299.6

Explanation: Driscoll and Kraay standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: own study.

In the next specifications, HHI and KSI are introduced, and they positively influence exports per capita. KSI reflects the dissimilarity of exports structure of a county, compared to the national structure. In fact, it reveals its unique character compared to the national average. Over the years, the KSI level changed (Figure 3). A noticeable increase was observed after the crisis started in 2008.

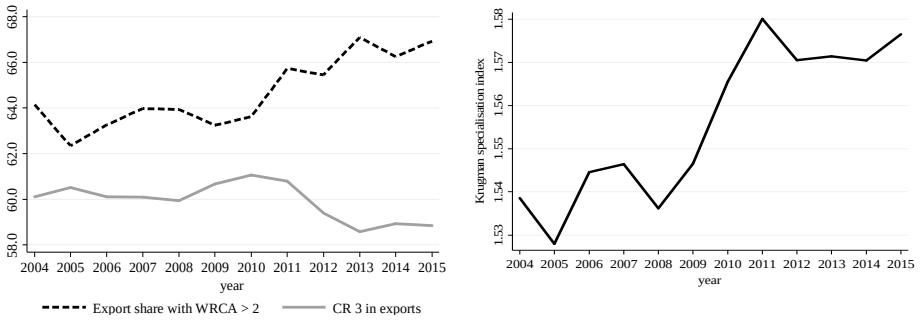

Figure 3. Concentration of exports (on the left) and Krugman specialisation index (on the right) in 2004-2015
Source: own elaboration.

Another measure used that depicts the export specialisation is a share of product groups with weighted RCA index exceeding 2 in total exports (or respectively, 5, 10, and 20). The obtained results are in line with our expectations, the higher the share of exports with WRCA indices, the greater the value of counties' exports. The RCA formula was used in the weighted variant (WRCA) to capture the unequal contribution of particular product groups to the county's overall exports. It was expected that different cut-off of RCA indices can bring different results, as regards the influence on the dependent variable. The application of a higher threshold reduces the share of exports that is covered by the revealed comparative advantage, however not significant changes can be seen if RCA cut-off is 2, 5 or 10. If 20 cut-off is used, the magnitude of influence drops.

WRCA index was used in another formula, related to the number of product groups for which RCA exceeds the cut-off threshold. The obtained results depend on the cut-off level. Increasing it from 2 to 10 results in the higher magnitude of influence on the dependent variable. For WRCA20, the magnificence of the influence drops.

Another concentration measure used in modelling is CR index which also positively influences the exports per capita. Increasing the cut-off within CR index results in the increased magnitude of the dependent variable.

Using different measures of regional specialisation and product concentration, the authors acknowledged the positive role of the two in determining the success of county export (among other factors), proxied by exports per capita (logged). By showing the robust role of specialisation/concentration, we confirm theoretical considerations of the NEG theory, the heterogeneity concept and RCA approach in terms of the consequences of regional specialisation of regional trade. The results bring important implications for regional policy, by showing the directions, in which potential stimuli should be introduced. We also propose a set of indicators that can be used in similar analyses. The portrayed theoretical/analytical framework can be also easily extended in further analyses investigating e.g. the role of smart specialisation in other regional trade evaluations.

Table 3. Estimation results (continued)

Variables	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc	lex_pc
sh_pop_h	0.0442***	0.0446***	0.0448***	0.0450***	0.0425***	0.0425***	0.0425***	0.0434***
	(0.0023)	(0.00234)	(0.00229)	(0.0022)	(0.00202)	(0.00200)	(0.00192)	(0.00203)
ex_sh_foe	0.0040***	0.0039***	0.0042***	0.0045***	0.0063***	0.0063***	0.0062***	0.0061***
	(0.00096)	(0.00098)	(0.00099)	(0.00101)	(0.00088)	(0.00089)	(0.00085)	(0.00091)
sh_emp_i	0.0187***	0.0186***	0.0183***	0.0185***	0.0200***	0.0194***	0.0196***	0.0199***
	(0.0021)	(0.00209)	(0.0023)	(0.00248)	(0.00242)	(0.00237)	(0.00255)	(0.00251)
lcap_pc	0.109**	0.115**	0.123**	0.126**	0.116***	0.109***	0.107***	0.116***
	(0.0436)	(0.0466)	(0.0483)	(0.0486)	(0.0348)	(0.0365)	(0.0360)	(0.0379)
ex_cr3	0.0099***							
	(0.0005)							
ex_cr5		0.0131***						
		(0.00056)						
ex_cr10			0.0180***					
			(0.00080)					
ex_cr15				0.0226***				
				(0.00133)				
wrca2					0.0108***			
					(0.00208)			
wrca5						0.0195***		
						(0.00277)		
wrca10							0.0315***	
							(0.00270)	
wrca20								0.0217***
								(0.00373)
Constant	5.552***	5.195***	4.591***	4.055***	5.874***	5.923***	5.941***	5.988***
	(0.0917)	(0.0965)	(0.102)	(0.127)	(0.100)	(0.0907)	(0.0903)	(0.0906)
Obs.	3402	3402	3402	3402	3402	3402	3402	3402
No.of groups	378	378	378	378	378	378	378	378
R^2 within	0.464	0.469	0.462	0.456	0.439	0.440	0.441	0.434
F	2502	2402	1626	1614	994.4	556.4	347.2	410.8

Explanation: Driscoll and Kraay standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: own study.

CONCLUSIONS

The idea of specialisation in international trade is a fundament one, which goes back to Adam Smith and David Ricardo. Specialisation enables to concentrate on what the country can do best, meaning that the available resources are utilised most profitably. Different approaches to capture specialisation are possible, related to specialisation measures or revealed comparative advantages.

Countries are lumpy, regarding their export base, which results in different export patterns. The question we asked is whether the specialisation translates into the export success, proxied as exports per capita, controlling for regions characteristics, such as human capital, FDI, capital endowment and share of the industry. The general conclusion is that specialisation in a positive way contributes to the value of exports per capita, assessed at the county level (H1). The same conclusion applies to higher product-level concentration in exports (H2).

Obviously, the two are highly interconnected at the local level of analysis, showing the tremendous role of low number of highly productive/innovative entities in exports. These entities to a high extent utilise the initial/endogenous regional potential or are simply the fundament of it. Local authorities, by setting friendly environment for cooperation of firms, resulting in easier learning-from-exporters, can furtherly enhance the internationalisation of regions' economies. The character of the observed relations between specialisation and product concentration may entail higher importance of MAR vs. Jacobs externalities, which should, however, be further tested.

The results may also imply that the established smart specialisation approach towards setting priorities in regional policy may be beneficial for area units smaller than NUTS 2. Finding their uniqueness, fitting into the broader picture of regional specialisation, embracing highly competitive industries may be a key to the export's success. The concentration of efforts on the areas of production in which local units have some kind of advantage or are connected on the basis of forward or backward linkages, may result in the creation of new specialisations, which are highly attached to the economic base of the local area units. Given the high persistence of export specialisation, being path-dependent, as reported by Cordes *et al*. (2016), regions/local units should direct towards its initial strengths or base new specialisations around them. Yet, more research is needed to fully countercheck SS effects, due to the importance of the valid selection of regional smart specialisations.

However, there is also the downside of the excessive specialisation. If trade policy continues the ongoing trend of subsequent product concentration, the resulting image of the Polish export structure would eventually restrict to the most important ones: machinery, transport parts/vehicles, metals, chemicals, production of animal/vegetable food, wood/paper products. The increased product concentration may expose the country's economy to global shocks, especially if it is based on primary commodities (Herzer & Nowak-Lehnmann, 2006). Similarly, local economies enhancing existing manufacturing specialisation (in line with their RCA) instead of the policy stressing the role of finding new industries or product groups that could be offered on foreign markets will become more vulnerable to future downturns of the global economy or shocks witnessed in their main trade partners. Therefore, we acknowledge the view of Cordes *et al*. (2016); Zaman and Goschin (2016) thereof.

The obtained results on the role of specialisation are in line with Naudé, Bosker, and Matthee (2010) showing positive impact of trade specialisation on local economic growth, basing on the example of magisterial districts in South Africa. They also fit into the picture of trade inequalities observed in Poland by Nazarczuk and Umiński (2018).

Our study has a few limitations. Firstly, similarly to Krammer (2017), it takes under consideration export as an account of international competitiveness. One can image other fac-

tors contributing to it, witnessed e.g. in the role of: human capital, FDI, productivity, institutions, etc. Secondly, given the data restrictions for the Polish trade at LAU 1 level, only trade in manufacturing is analysed in detail. However, the role of services in the global trade flows plays more and more important role (Stefaniak-Kopoboru & Kuczewska, 2016). The availability of trade in services data would greatly increase the comprehensiveness of the study by revealing general implications of specialisation. Owing to the data, the authors could also reveal more desired patterns of specialisation (i.e. manufacturing/services).

Further research is recommended, and different level of analysis should also be applied, to test the robustness of the obtained results. The similar research would be interesting to be done at the NUTS-2 level in order to inquire into the rationale of smart specialisation). SS strategy is carried on at the NUTS-2 level, as these are the regional authorities that are responsible for distributing resources (policy efforts, financial funds) aimed and SS development. A lot of interesting further research is possible to evaluate if these efforts translate into the export success.

The comparative advantage of a region can reveal itself in many aspects. It can be high concentration of exports (measured by the HHI index) or the distinguished exports pattern that is unique (vs. national average or other regions). Different versions of RCA indices can be used, in non-weighted or weighted formulas, with different cut-off levels, the same issue being with CR indices. Moreover, specialisation can be attributed to the exported industrial products or the agricultural ones. These structural aspects deserve further inquiry.

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