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STUDENTS' ENTREPRENEURIAL INTENTIONS DURING THE COVID-19 PANDEMIC IN THE CONTEXT OF THE DARK TRIAD TRAIT

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ABSTRACT

Aim: Despite research on how the constellation of the dark triad traits relates to entrepreneurial intention, it still remains to be seen how nuanced such relationships were during the COVID-19 pandemic in Europe. In this article, we investigate this phenomenon by elaborating on the relations between components of the dark triad traits concerning pull and push factors affecting entrepreneurial intention. **Methods:** Using 4,056 datasets from the Global University Entrepreneurial Spirit Students' Survey (GUESSS) 2021 and data on unemployment rates and GDP per capita of 22 European countries, we employed multivariate regression analysis to examine the antecedents of entrepreneurial intention. **Results:** Our results show that GDP per capita is inversely related to entrepreneurial intention, with statistical significance also found for the unemployment rate and narcissism in their influence on entrepreneurial intention. More so, we found that COVID-19 unlocked the hidden potential of student entrepreneurship for the represented European countries. We also found interesting results on how the intensities of the dark triad influence entrepreneurial intentions. **Conclusions:** Difficult situations such as COVID-19 might trigger the manifestation of dark triad traits, which – to a greater extent – influence entrepreneurial intentions.

Keywords: Dark Triad Trait, GDP per capita, unemployment rate, entrepreneurial intention

JEL codes: D81, L6, D91

INTRODUCTION

Before the COVID-19 pandemic, research attributed attitudes towards behavior, subjective norms, and perceived behavioral control as antecedents of university students' entrepreneurial intentions [Gomes et al. 2021, Prasastyoga et al. 2021]. Nevertheless, in the circumstances of social and economic uncertainty, students' dark triad personality characteristics will reinforce entrepreneurial intentions [Cai et al. 2021]. In times of crisis, the dark triad could become condition-dependent adjustments in addressing life adaptive problems [Jonason et al. 2016]. The literature has extensively studied the prevalence of these traits and how much darkness is seen as a gift in disguise [Wu

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et al. 2019]. The dark triad is made up of psychopathy, Machiavellianism, and narcissism. Psychopathy is defined by callous social attitudes and amorality, Machiavellianism by manipulation and cynicism, and narcissism by vanity and self-centeredness [Cai et al. 2021, Peixoto et al. 2021]. Scholars have examined the phenomenon of the dark triad trait from the viewpoints of career interests [Jonason et al. 2014 and Cavallo 2020], country perspective [Kajonius et al. 2015], demographics, and sociological perspectives [Dinic et al. 2018, Jonason and Davies 2018]. Kajonius et al. [2015] found narcissism and Machiavellianism to be highly linked with value achievement and a preference for power, while psychopathy corroborated with hedonism. In evaluating the paradigms of the human development index, political orientations, cultural values, and narcissism was found to have the most profound variance [Jonason et al. 2019].

The COVID-19 pandemic has had diverse economic implications globally, leading to poor economic growth, rising inflation, unemployment, and lockdowns in most countries [Liu et al. 2020]. European countries experienced varying impacts, leading to the establishment of the Rehabilitation and Resilience Fund (RRF) to support the most vulnerable nations [Watzka and Watt 2020]. The latest report from the Global Entrepreneurship Monitor revealed differing effects of the pandemic, with 12 out of 38 economies showing significantly higher levels of entrepreneurial activities in 2022 compared to the pre-pandemic period, while 16 countries reported lower levels, and the remaining countries exhibited little change [The University of Strathclyde 2023]. Amidst the pandemic's complexities, studies have focused on the influence of the dark triad traits on entrepreneurial intention within and across countries [Cai et al. 2021]. Understanding the impact of the dark triad traits is crucial in comprehending how negative personality traits may stimulate entrepreneurial intentions in the face of challenging situations such as the COVID-19 economic turmoil. Additionally, variables such as age and gender, along with country-level indicators like GDP per capita and employment rate, are vital in explaining the variability of students' entrepreneurial intentions. The authors suggest that the implications of the pandemic vary across contexts, possibly serving as a push or pull factor for university students, triggering the dark triad traits and influencing entrepreneurial intentions. This paper aims to examine this relationship by theorizing the observable situation of the COVID-19 pandemic and shed light on the dark triad traits and entrepreneurial intentions of university students within the country-specific implications of the pandemic. This paper is organized as follows: literature review, assumptions and hypotheses, methodology, results, discussions, research implications, and conclusion.

ENTREPRENEURSHIP AND ENTREPRENEURIAL INTENTION

Entrepreneurship is a process by which individuals explore and exploit opportunities that can lead to the creation of new ventures, products or services [Carsrud and Brännback 2011]. However, the process is not uniform and varies from one individual to another. These variations lie in the fact that different primary motivators prompt individuals to nurse the intentions to start a business [Carsrud and Brännback 2011]. Entrepreneurial intention is understood as a self-acknowledged conviction by a person intending to start a new business and consciously plans to do so in the future [Thompson 2009]. According to the Theory of Planned Behavior (TPB), an individual's disposition can be seen from the point of their attitude, subjective norm, and perceived behavioral control, which encourages understanding of the dynamics of entrepreneurship. Amit et al. [1995] posited that individuals are driven into entrepreneurship by situational factors (for example, poor remuneration, the prospects of a new venture, a career setback, and the loss of their job) and referred to these elements as "push and pull factors". These push and pull factors have been studied in various contexts, such as entrepreneurship education, entrepreneurship engagement, and entrepreneurial motivation [Malebana 2021]. Zainuddin and Ismail [2011] found that entrepreneurship education had greater pulling factors than salient beliefs. Karanja et al. [2018] found that push factors play a more significant role in student entrepreneurial engagement. Malebana [2021] investigated entrepreneurial motivation among final-year commerce

students in Limpopo and Mpumalanga. The results showed that entrepreneurial motivation had a statistically significant positive relationship with entrepreneurial intention and its antecedents. The push and pull variables enable contextualization of various phenomena, although their strength and outcome differ. The authors believe that age, gender, GDP per capita, and unemployment rates are antecedents of the push and pull strategy – particularly in light of the COVID-19 pandemic. This explanation will aid in understanding the variation in students' entrepreneurial goals in the context of dark triad traits.

EMPIRICAL EVIDENCE ON THE DARK TRIAD TRAIT AND ENTREPRENEURIAL INTENTIONS

The dark triad trait and entrepreneurial intentions have been extensively studied [Kramer et al. 2011, Al-Ghazali and Afsar 2021]. Kramer et al. [2011] found that narcissism and psychopathy have a positive relationship with entrepreneurial intention, while Machiavellianism has no association among 158 students involved in a business plan competition. Al-Ghazali and Afsar [2021] found that individuals with narcissistic traits display more entrepreneurial intentions and that self-efficacy mediates the effect of narcissism on entrepreneurial intentions. Their study utilized data from 362 employees in Saudi Arabia in the entrepreneurial ecosystem built by the government to support entrepreneurship. McLarty et al. [2021], using a sample of 345 adults in industries across the United States of America, found that Machiavellianism and psychopathy influence entrepreneurial intentions, while narcissism does not. They recommended that the dark triad traits are important components of the entrepreneurial process that foster excellent entrepreneurial spirit, an entrepreneurial mindset, and new venture creation orientation. Cai et al. [2021], using an extended version of the dark triad scale (dart tetrad) in China, found Machiavellianism, narcissism, psychopathy, and sadism to have a significant positive influence on entrepreneurial intention. Wu et al. [2019], in their sample of aspiring business professionals, found a negative association between narcissism, psychopathy, and entrepreneurial intention. Studies have shown that the dark triad traits align with entrepreneurial intentions. To test the variability of entrepreneurial intention, a robust empirical examination will be timely to assess the variability of variables across different contexts.

RESEARCH HYPOTHESES

Drawing on assumptions from the literature that individuals exhibit different levels of dark triad personality traits with accompanying cross-situational variabilities and consequences, the study proposes that the dark triad traits (psychopathy, Machiavellianism, and narcissism) are survival strategies in

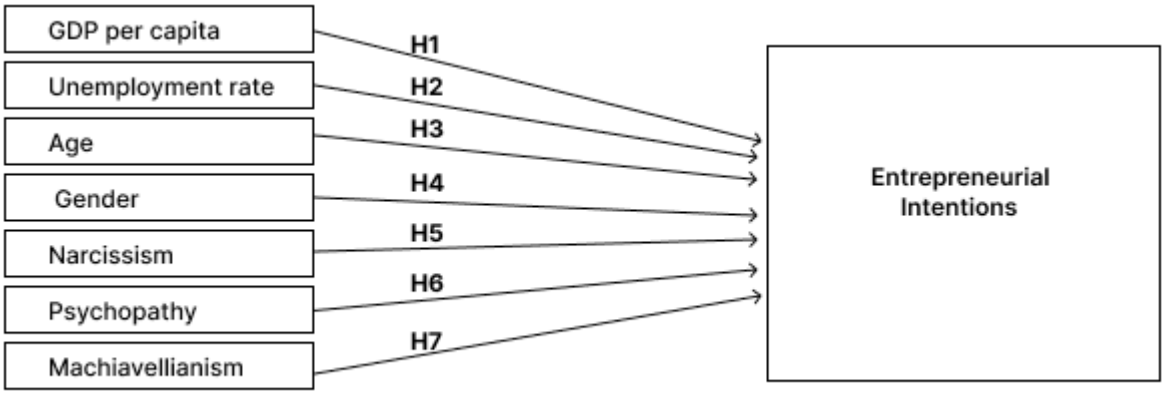

Fig. 1. Conceptual model of the study

Source: the authors.

difficult times [Birkas et al. 2016], especially given the current adversities of the COVID-19 pandemic and its implications for individuals' livelihoods. Additionally, drawing from the 'push and pull' approach of Gilad and Levine [1986] and Amit and Muller [1955], we propose that individuals who want to start a business out of necessity exhibit push behavior, while those who exhibit pull behavior are opportunity-driven and seek prospects for growth and independence.

Based on the previous, the current study assumes that students' entrepreneurial intentions can be explained in the context of their dark triad traits. Hence, the following hypotheses are made:

H_1: In countries with a higher GDP per capita, students present higher entrepreneurial intentions.

H_2: In countries with a high unemployment rate, students present higher entrepreneurial intentions.

H_3: Younger students often present higher entrepreneurial intentions.

H_4: Males more often display higher entrepreneurial intentions.

H_5: There is no statistically significant positive relationship between narcissism and entrepreneurial intention.

H_6: There is no statistically significant positive relationship between psychopathy and entrepreneurial intention.

H_7: There is no statistically significant positive relationship between Machiavellianism and entrepreneurial intention.

RESEARCH METHODS

To test the hypotheses, we used the ninth data collection wave of the GUESSS (Global University Entrepreneurial Spirit Students' Survey) database in spring 2021, one of the world's most significant entrepreneurship research endeavors. The survey, involving 58 countries on a global scale, measures student entrepreneurial intentions, activity, and the main influencing factors of students' decisions. For every data collection, the GUESSS core team at the University of St. Gallen and the University of Bern develops the online survey instrument, and then survey invitations are sent to country teams (one per country) – for which the Department of Economics and Economics Policy in Agribusiness, Poznan University of Life Sciences, Poznan, Poland, carried out the survey for Poland (under the supervision of Joanna Kosmaczewska). In Poland, the number of respondents was determined based on the number of students in the voivodeship (region) and calculated proportionally to the number of students. After that, partner institutions forward the survey to their students. Data is collected, stored, and prepared by the GUESSS core team. For this study, a sample was chosen for each country based on the completed observations for the dependent and independent variables espoused in the study to allow for within-country variability and reliable estimates of country-level effects amongst the respondents, as with Guerrero and Marozau [2023]. This resulted in a final sample of 4,056 observations. Our research is based on the self-reporting of respondents from the student population who fully completed the survey. Each country selected from the database was coded with a specific identification number. The selection criteria were based on the participation of the countries in the survey. Of the 28 EU member countries, only 22 were actively involved in the survey. The final sample was 4,056 students after excluding observations with missing values for the dependent and independent variables for quantitative data analysis. Austria (n = 101), Belgium (n = 68), Bulgaria (n = 48), Croatia (n = 30), Czech Republic (n = 74), Estonia (n = 29), Finland (n = 60), France (n = 15), Germany (n = 272), Greece (n = 59), Hungary (n = 387), Ireland (n = 6), Italy (n = 165), Latvia (n = 6), Lithuania (n = 95), the Netherlands (n = 32), Poland (n = 182), Portugal (n = 70), Romania (n = 4), Slovakia (n = 204), Spain (n = 2304), and Sweden (n = 8). It should be noted that countries with less than 10 samples were merely imputed for computational purposes. In addition, statistical information on economic indices (GDP per capita and unemployment rates) for the year 2021 was sourced from Eurostat for the participating countries. Entrepreneurial intention was measured using a six-item scale adapted from Linan and Chen [2009]. A seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used. This scale is widely accepted and adopted in

the GUESSS project. The Short Dark Triad developed by Jonason and Webster [2010] was employed, and the scale employs 12 items. To measure age, the respondents were asked to indicate the year they were born. Gender was measured by asking the respondents to fill in their gender as 'male' or 'female'. The GDP per capita and unemployment rate of the 22 EU countries were obtained from Eurostat for the year 2021. Table 1 shows the description of the represented countries.

Table 1 provides demographic and economic indicators for the 22 European countries. The computed mean age and standard deviation (STD) of the respondents in each country, unemployment rate (%), and GDP per capita (current USD) of 2021 of the respective countries.

RESULTS

To analyze the results of this study, multivariable regression analysis was applied to test the hypotheses earlier postulated at the onset of the study. The results of the tests are reported as follows:

H_1: In countries with a higher GDP per capita, students present statistically significant higher entrepreneurial intentions – rejected.

H_2: In countries with a high unemployment rate, students present statistically significant higher entrepreneurial intentions – accepted.

Table 1. Pull and Push Factors

Country	Age [Mean]	Age [STD]	Unemployment rate [%]	GDP per capita [Current USD]
Austria	31.98	10.02	4.8	48,586.80
Belgium	22.85	2.61	5.7	45,159.30
Bulgaria	27.81	8.35	4.8	10,079.20
Croatia	31.43	9.10	7.0	14,134.20
Czech Republic	24.88	5.79	2.1	22,931.30
Estonia	33.76	10.20	5.2	23,027.00
Finland	34.07	9.58	7.1	48,745.00
France	30.73	9.71	7.4	39,030.40
Germany	28.20	7.24	3.2	46,208.40
Greece	32.73	11.35	12.7	17,622.50
Hungary	30.91	9.15	3.7	15,980.70
Ireland	23.17	4.75	5.1	85,267.80
Italy	27.33	7.30	9.0	31,714.20
Latvia	32.00	0.00	7.5	17,726.30
Lithuania	27.69	8.39	5.6	20,233.60
Netherlands	25.03	7.48	3.8	52,397.10
Poland	25.18	5.79	2.9	15,721.00
Portugal	31.19	10.42	5.9	22,176.30
Romania	26.00	5.60	5.4	12,896.10
Slovakia	25.54	6.27	6.4	19,266.50
Spain	28.70	9.80	13	27,063.20
Sweden	24.88	2.59	8.2	52,274.40

Source: own elaboration.

Table 2. Impact of GDP, Unemployment rate on entrepreneurial intention levels

Model variables	B	s.e	T	LCI1	UCI1	P	β	LCI2	UCI2
Constant	0.00	0.02	0.00	–0.03	0.03	>0.05	0.00	–0.03	0.03
GDP	–0.11	0.02	–7.25	–0.14	–0.08	<0.001	–0.11	–0.14	–0.08
Unemployment rate	0.18	0.02	11.65	0.15	0.21	<0.001	0.18	0.15	0.21

Note: *B* = non-standardized coefficient of regression; *s.e.* = standard error for B; *t* = Student's t statistic; *LCI* = lower confidence interval; *UCI* = upper confidence interval; *LCI1*/*UCI1* = 95% confidence intervals for *B*; *p* = statistical significance; β = standardized coefficient of regression; *LCI2*/*UCI2* = 95% confidence intervals for β.

Source: authors' calculation.

A linear regression analysis was carried out to verify the hypotheses stated above. The relationships examined by the study were verified based on a multivariable linear regression analysis covering a total of $N = 4056$ observations. As shown by the regression analysis, there is a significant prediction with $F(2, 4053) = 93.59$; $p < 0.001$. The analysis of the R^2 coefficient demonstrated that the regression model for the independent variables considered (GDP, Unemployment rate) explained approximately 4% (4% after adjustment) of the variation in entrepreneurial intention. The non-adjusted and adjusted coefficients of variance explained were $R^2 = 0.04$ and adj.$R^2 = 0.04$, respectively. There were two significant predictors in the model. As shown by the analysis, the mean level of entrepreneurial intention was $M = 0.00$. In turn, the analysis of statistics for each predictor in the model resulted in the following findings:

An increase in GDP entailed a decrease in entrepreneurial intention, and the relationship was statistically significant, $B = –0.11$; $t = –7.25$; $p < 0.001$; $\beta = –0.11$, 95%CI = [–0.14 – –0.08]. In view of the above, H_1 needs to be rejected. An increase in the unemployment rate entailed a rise in entrepreneurial intention, and the relationship was statistically significant, $B = 0.18$; $t = 11.65$; $p < 0.001$; ß = 0.18, 95%CI = [0.15 – – 0.21]. In view of the above, H_2 is accepted.

The estimation results for the model tested are presented in Table 2.

H_3: Younger students statistically significant higher entrepreneurial intentions – accepted (Austria) and rejected (Lithuania), as shown in Table 3. The analysis of the regression model for Austria indicates that an increase in age entailed an increase in entrepreneurial intention, and the relationship was statistically significant, $B = 0.02$; t = 2.10; $p < 0.05$; $\beta = 0.24$, 95%*CI* = [0.22 – 0.26]. However, the analysis carried out for Lithuania demonstrated that an increase in age entailed a decrease in entrepreneurial intention, and the relationship was statistically significant, $B = –0.05$; $t = –3.20$; $p < 0.01$; ß = –0.36, 95%*CI* = [–0.39 – –0.33].

H_4: Males more often display higher entrepreneurial intentions – rejected.

H_5: There is no statistically positive significant relationship between narcissism and entrepreneurial intention – rejected.

H_6: There is no statistically positive significant relationship between psychopathy and entrepreneurial intention – accepted.

H_7: There is no statistically positive significant relationship between Machiavellianism and entrepreneurial intention – accepted, we found a negative relation.

The series of linear regression analyses for data collected in each country demonstrated the non-significance of particular regression models regarding the impact of variables such as age, gender, narcissism, psychopathy and Machiavellianism on entrepreneurial intention. Hence, H3, H4, H5, H6, and H7 need to be rejected. Nevertheless, the detailed analysis of coefficients of regression estimates for H7 in Slovakia demonstrated that an increase in Machiavellianism

Table 3. Influence of age on entrepreneurial intention

Country	Variables in the Model	*B*	*s.e*	*T*	*DPU1*	*GPU1*	*P*	β	*DPU2*	*GPU2*	Model Relevance
Lithuania	constant	1.62	0.72	2.26	0.19	3.05	<0.05	0	–1.43	1.43	$F(9, 85) = 1.52$; $p > 0.05$
	age	–0.05	0.01	–3.2	–0.08	–0.02	<0.01	–0.36	–0.39	–0.33	
	gender-male	0.03	0.25	0.13	–0.46	0.52	>0.05	0.01	–0.48	0.51	
	machiavellianism	0	0.03	–0.15	–0.05	0.05	>0.05	–0.02	–0.07	0.03	
	psychopathy	0	0.02	0.07	–0.05	0.05	>0.05	0.01	–0.04	0.06	
	narcissism	0	0.02	–0.17	–0.05	0.04	>0.05	–0.02	–0.07	0.02	
Austria	constant	–1	0.46	–2.18	–1.91	–0.09	<0.05	0	–0.91	0.91	$F(9, 90) = 1.37$; $p > 0.05$
	age	**0.02**	**0.01**	**2.1**	**0**	**0.04**	**<0.05**	**0.24**	**0.22**	**0.26**	
	gender-male	–0.13	0.2	–0.67	–0.53	0.26	>0.05	–0.07	–0.47	0.33	
	machiavellianism	0.03	0.02	1.9	0	0.07	<0.10	0.23	0.19	0.26	
	psychopathy	–0.03	0.02	–1.34	–0.07	0.01	>0.05	–0.16	–0.2	–0.12	
	narcissism	0	0.02	–0.3	–0.04	0.03	>0.05	–0.04	–0.07	0	

Note: *B* = Non-standardized regression coefficient*; s.e.* = standard error for *B*; *t* = Student's t statistic; *DPU* = Lower confidence interval; *GPU* = Upper confidence interval; *DPU1* / *GPU1* = 95% confidence intervals for *B*; p = Statistical significance; β = Standardized regression coefficient; *DPU2* / *GPU2* = 95% confidence intervals for β.

Source: authors' calculation.

entailed a decrease in entrepreneurial intention, and the relationship was statistically significant, $B = –0.03$; $t = –2.37$; $p < 0.05$; $\beta = –0.21$, 95%*CI* = [–0.24 – –0.18]. Thus, the conclusion that there is no statistically positive significant relationship between Machiavellianism and entrepreneurial intention is not the only finding from this paper. Slovakia's example demonstrated an opposite, statistically significant relationship between Machiavellianism and entrepreneurial intention (Table 4).

A similar result was observed in the Czech Republic: an increase in Machiavellianism entailed a decrease in entrepreneurial intention, but the relationship

Table 4. Machiavellianism and entrepreneurial intention

Country	Variables in the model	*B*	*s.e*	*T*	*DPU1*	*GPU1*	*P*	β	*DPU2*	*GPU2*	Model relevance
Slovakia	Constant	–0.71	0.4	–1.77	–1.49	0.08	<0.10	0	–0.78	0.78	$F(9, 194) = 1.56$; $p > 0.05$
	Age	0.02	0.01	1.92	0	0.04	<0.10	0.14	0.11	0.16	
	Gender-Male	–0.1	0.14	–0.72	–0.38	0.18	>0.05	–0.05	–0.33	0.23	
	Machiavellianism	**–0.03**	**0.01**	**–2.37**	**–0.06**	**–0.01**	**<0.05**	**–0.21**	**–0.24**	**–0.18**	
	Psychopathy	0.03	0.01	1.89	0	0.06	<0.10	0.16	0.13	0.19	
	Narcissism	0.02	0.01	1.94	0	0.04	<0.10	0.14	0.12	0.17	

Table 4. Machiavellianism and entrepreneurial intention (cont.)

Country	Variables in the model	*B*	*s.e*	*T*	*DPU1*	*GPU1*	*P*	β	*DPU2*	*GPU2*	Model relevance
Czech Republic	Constant	–0.22	0.67	–0.33	–1.56	1.11	>0.05	0	–1.34	1.34	$F(9, 64) = 0.87$; $p > 0.05$
	Age	0.01	0.02	0.7	–0.02	0.05	>0.05	0.09	0.05	0.13	
	Gender-Male	–0.02	0.24	–0.08	–0.49	0.45	>0.05	–0.01	–0.48	0.46	
	Machiavellianism	–0.04	0.02	–1.61	–0.09	0.01	>0.05	–0.26	–0.31	–0.21	
	Psychopathy	0	0.03	–0.07	–0.05	0.05	>0.05	–0.01	–0.06	0.04	
	Narcissism	0.01	0.02	0.34	–0.04	0.06	>0.05	0.05	0	0.1	

Note: *B* = Non-standardized regression coefficient*; s.e.* = standard error for *B*; *t* = Student's t statistic; *DPU* = Lower confidence interval; *GPU* = Upper confidence interval; *DPU1* / *GPU1* = 95% confidence intervals for *B*; p = Statistical significance; β = Standardized regression coefficient; *DPU2* / *GPU2* = 95% confidence intervals for β.

Source: authors' calculation.

was not statistically significant, $B = –0.04$; $t = –1.61$; $p < 0.05$; ß = –0.26, 95%*CI* = [–0.31; –0.21]. In other countries, that predictor was found not to be significant in the analyses of regression estimates.

DISCUSSION

The study aimed to examine students' entrepreneurial intentions in the context of dark triad traits mirroring the 'push and pull' approach. Seven hypotheses were tested to understand the relationship between these variables. There was no sufficient statistical evidence to accept the first hypothesis as results indicated that countries with higher GDP per capita create a decrease in entrepreneurial intention. This corroborates with the findings of Sansone et al. [2020]. From the push and pull perspective, there is an overlap of necessity and opportunity entrepreneurship, indicating that entrepreneurial intention is a dynamic continuum. The second hypothesis tested revealed a statistically significant relationship between the unemployment rate and entrepreneurial intention. This implies that an increase in the unemployment rate will cause a subsequent increase in entrepreneurial intention. Unemployment is generally seen as unfavorable in the job market, which tends to encourage necessity entrepreneurship. Within the EU, statistics show varying levels of unemployment, which suggests cyclical movements [Eurostat 2022]. Our findings imply that an increasing unemployment rate is a push factor that makes students tilt towards self-reliance, creating positive entrepreneurial intentions to start a venture. The COVID-19 pandemic increased the level of unemployment across countries, with most people losing their jobs. Within this context, entrepreneurship could be perceived as an option to escape the adverse labor market conditions posed by the economic turmoil.

Results from the third hypothesis suggest that H3 should be rejected for all countries. We conducted further analyses for each country's student group and found interesting cases for Austria and Lithuania. To reiterate, similar to the rejection of H3, we believe that entrepreneurship is not limited by age, and that the psychological makeup of individuals serves as the primary indicator for all age groups. In Austria, our results indicate that younger students indeed exhibit a higher level of entrepreneurial intention. This finding supports the work of Schwarz et al. [2009], which suggests that younger students in Austria tend to have high levels of ambition and risk-taking tendencies that could lead to entrepreneurial ventures. The study also indicates that at age 35, students become more risk-averse and conservative when it comes to engaging in undertakings associated with high levels of uncertainty and risk. In contrast, in the case of Lithuania, we made a rather interesting discovery that differs significantly from the findings in Austria. Our results suggest that entrepreneurial intention decreases with increasing age. While our previous result for

Austria and our current finding are complementary in the sense that entrepreneurial intention increases with age, this is true for Austria but not for Lithuania. We argue that the findings of Schwarz et al. [2009] may also apply to Lithuania.

Moreover, contrary to the widely-reported findings that males exhibit higher entrepreneurial intention than females, our study produced a different result. The assertion does not hold true in our study, leading to the rejection of the null hypothesis. Although existing discussions on the masculinity and femininity debate have emphasized that a high level of masculinity facilitates higher levels of entrepreneurial intention, which in turn leads to entrepreneurial behavior [Newbery et al. 2018], we found a different outcome. From a national standpoint, while culture plays an important role in nurturing entrepreneurial identity and explaining national differences in entrepreneurial intention levels, only a small portion of students' entrepreneurial intentions can be explained by these situational factors. Our results suggest that females find entrepreneurial ventures to be financially rewarding and appealing, and as a result, this orientation leads to an increase in entrepreneurial intention, particularly during the COVID-19 pandemic. To further elaborate on our findings, we observed that, based on our sample, the debate on masculinity and femininity appears to be more prevalent in feminine societies (Netherlands, Lithuania, Latvia, Sweden, Spain, Romania, Portugal, Bulgaria, Belgium, Croatia, Estonia, Finland, and France) compared to masculine societies (Austria, the Czech Republic, Germany, Greece, Hungary, Ireland, Slovakia, Italy, and Poland), according to Hofstede's national culture [Hofstede Insights, 2022].In addition, results from hypothesis five indicate that students showing a higher level of narcissistic tendencies reported a higher level of entrepreneurial intention. This suggests that the dark triad component (narcissism) predicts entrepreneurial intention. Our results are quite different from those of prior works that reported a negative relationship between narcissism and entrepreneurial intention [Al-Ghazali and Afsa 2021]. Even though individuals with narcissistic tendencies have been widely acclaimed as highly manipulative and deceptive, the life history theory suggests that those with a high level of the dark triad traits tend to be more disposed to a fast-life approach and taking risks [Wu et al. 2019]. Moreover, students with such traits tend to be more risk-seeking and thrive very well in their endeavors, especially in highly volatile environments [Jonason and Webster 2010, Wu et al. 2019]. The choice of entrepreneurship becomes more appealing for such individuals [Jonason et al. 2010]. Our findings corroborate the findings of Hmieleski and Lerner [2016], indicating that a higher level of narcissism increases the level of entrepreneurial intention. This could inform the impetus as to why such individuals tend to take more risks during the COVID-19 pandemic.

Moving on, our results revealed no statistically significant relationship between psychopathy and entrepreneurial intention. This finding contrasts with previous studies' results [Wu et al. 2019, Cai et al. 2021], which found a significant relationship between the variables. Within the context of these studies, our study revealed that manipulative psychopathic students are less likely to pursue an entrepreneurial venture for which they have a great passion, especially in the unprecedented circumstances of the COVID-19 pandemic. As such, psychopathy, which was reported to be an essential trigger for advancing an entrepreneurial plan, did not predict entrepreneurial intention in our sample.

Finally, based on the results of H_7, our study found a negative relationship between Machiavellianism and entrepreneurial intention. This implies that students with a high level of Machiavellianism tend to have low entrepreneurial intentions, especially in our sample in Slovakia and the Czech Republic. Other countries, however, showed no statistical significance in the association of these variables. On one hand, in the case of Slovakia, we allude to the cultural and ethical transformation in the country during the transition from a totalitarian to a democratic regime as an explanation for the higher level of Machiavellian traits [Bogdanovi et al. 2018]. On the other hand, in the case of the Czech Republic, our findings suggest that an increase in Machiavellianism led to a decrease in entrepreneurial intention. This result is not far-fetched from that of Slovakia. From a historical perspective, the Czech Republic and Slovakia shared similar cultural traits and ideologies as

part of their once independent country, Czechoslovakia, which became necessary with the collapse of the Habsburg monarchy at the end of World War I [Whitefield and Evans 1999, Mysíková et al. 2019].

IMPLICATIONS FOR THEORY AND PRACTICE

The primary aim of this study was to investigate students' entrepreneurial intentions in the context of dark triad traits using push-pull orientation. This study presents relevant insights and practical implications for theory and practice. Theoretically, it suggests that the dark triad traits may influence students' entrepreneurial intentions. By clarifying the relationship between negative personality traits and students' entrepreneurial intentions, this study presents evidence of personality differences in entrepreneurship – especially in unprecedented situations like the COVID-19 pandemic, where individuals are expected to dig deeper into their reserves of resilience, adaptability, and self-motivation. Recognizing the influence of dark triad traits in entrepreneurship underscores the importance of understanding the multi-faceted nature of entrepreneurial decision-making. This implies that in times of crisis, individuals' personalities provide valuable insights into how they may respond to uncertainties in the entrepreneurial environment.

The empirical results of the study highlight significant implications for practice in two key areas. First, it allows the identification of at-risk groups among students who exhibit high dark triad trait scores, making them potentially more susceptible to negative entrepreneurial outcomes [Hanson et al. 2023]. Our findings suggest that an increase in Machiavellianism resulted in a decrease in entrepreneurial intention. This finding has significant implications for promoting entrepreneurial venturing among students with high Machiavellian tendencies, especially during an economic recession that could result from lockdown during the COVID-19 pandemic. Students in this category may require support and guidance to improve their ethical decision-making and interpersonal skills to reduce potential negative consequences in their entrepreneurial pursuits. Finally, in the second area, the study highlights the need for psychological screening for entrepreneurial programs or making investments in start-ups. This goes beyond traditional curricula and emphasizes the development of support structures, including ethical mentoring, to enhance entrepreneurial personality traits, instill ethical values, and equip students with the necessary skills and mindset to succeed in an ever-evolving business landscape.

CONCLUSIONS

Our study delves into a pressing concern of our times: the impact of negative personality traits on students' entrepreneurial intentions in the face of global crises like the COVID-19 pandemic. The research highlights the relevance of psychological factors in entrepreneurial decision-making and suggests that certain dark triad traits can play a pivotal role in shaping students' entrepreneurial drive. The study identified an overlap between necessity- and opportunity-driven entrepreneurial activities, providing strong evidence that a high GDP per capita does not reduce students' entrepreneurial intentions. As societies grapple with economic uncertainty and job market fluctuations, understanding how these traits – as well as contextual factors – influence entrepreneurship is crucial. This insight paves the way for a more holistic approach to entrepreneurial decision-making and support, ensuring students can harness their unique characteristics to succeed in the entrepreneurial realm, even amidst adversity. The study also carries a broader implication for entrepreneurship by highlighting that beyond skill sets, market knowledge, and resources, understanding the role of personality traits in students' entrepreneurial intentions is crucial for our sample.

The major limitation of the study is the non-representativeness of the sample, which limits the generalization of the study to any country (not just Romania, Latvia, and Sweden). As such, the results apply only to the respondents (the study group). Although we found a general trend in the surveyed group of respondents, which shows that the dark triad trait components serve as a valuable predictor of entrepreneurial intention (especially when considering the push-pull orientation in times of crisis), this should not be interpreted as a generalization to any country.

Future research should examine the dark triad's impact on the transition from intention to entrepreneurial action, particularly during challenging economic situations. Researchers should also explore how cognitive biases interact with negative personality traits and influence entrepreneurial outcomes in guiding tailored interventions.

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INTENCJE PRZEDSIĘBIORCZE STUDENTÓW W CZASIE PANDEMII COVID-19 W KONTEKŚCIE CECH CIEMNEJ TRIADY

STRESZCZENIE

Cel: W pracy przeanalizowano związek cech ciemnej triady i intencji przedsiębiorczych wśród studentów w kontekście wystąpienia pandemii COVID-19 w wybranych krajach w Europie. **Metody:** W pracy wykorzystano dane empiryczne zebrane w ramach projektu GUESSS 2021 oraz dane wtórne charakteryzujące bezrobocie i PKB per capita dla 22 krajów europejskich. Do analizy danych wykorzystano wielowymiarową

analizę regresji. **Wyniki:** Otrzymane wyniki pozwoliły ustalić, że badani studenci z krajów o wyższym PKB per capita wykazywali niższy poziom intencji przedsiębiorczych. Ponadto ustalono statystycznie istotne zależności także dla wskaźnika bezrobocia i narcyzmu w kontekście intencji przedsiębiorczych badanych studentów. **Wnioski:** Trudne sytuacje, takie jak pandemia COVID-19, mogą wywoływać manifestację cech ciemnej triady, które w większym stopniu wpływają na intencje przedsiębiorcze wśród studentów.

Słowa kluczowe: cechy ciemnej triady, PKB per capita, wskaźnik bezrobocia, intencje przedsiębiorcze studentów

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THE CROSS-SECTORAL TECHNOLOGICAL INTERDEPENDENCIES OF CENTRAL AND EASTERN EUROPE IN THE ERA OF INDUSTRY 4.0 AND CHINESE DIGITAL SILK ROAD

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ABSTRACT

Aim: The article aims to assess the flows of value added in the servicification of manufacturing within the two most critical value-added providers for Central and Eastern Europe (CEE): Germany and China in the era of Industry 4.0 and the Digital Silk Road (DSR). **Methods:** The input-output model for the decomposition of gross exports was applied to evaluate the cross-sectoral links between analyzed economies. **Results:** The CEE economies are increasingly dependent on high-quality services from Germany and China for their manufacturing, while analogous flows from CEE to Germany and China are decreasing or remaining stable. German manufacturing is starting to depend more on Chinese services' value-added in advanced sectors. There was no direct trade-off between pairs of economies, but a decrease in German value-added flows to China led to a significantly larger increase in Chinese value-added in German manufacturing. **Conclusions:** Bearing in mind the limitations of the study, the deepened imbalance in value-added flows between economies was proved. Moreover, the study proved the effectiveness of China's Industry 4.0 and DSR in terms of enhancing the sophistication of Chinese value-added exports and making key economies reliant on this value-added

Keywords: ICT, servicification of manufacturing, China, Germany, CEE
JEL codes: DF0, F14.

INTRODUCTION

Over the recent decades, the production process has become more geographically and vertically fragmented. It means that intermediate products are shipped across boarders many times and every exporting economy provides some value added according to its competitive advantage. As a result, global value chains (GVCs) have become one of the most important features of international trade. Following [Gereffi and Fernandez-Stark 2011], in this study, GVCs are defined as "the full range of activities that firms and workers do to bring a product from its conception to its end use". Humphrey and Schmitz [2002] pointed out four types of upgrading in GVCs: product, process, functional, and chain. The fragmentation of production has led to a rapid increase in trade in intermediate goods as companies often offshore an intermediate stage of the production process. While offshoring has been typical in manufacturing [Timmer et al. 2012], services have often been overlooked despite playing a major role in supporting GVCs [Kommerskollegium 2013].

Nowadays, the Central and Eastern European (CEE) economies are becoming more heavily involved in

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GVCs. Many empirical studies have shown these countries' close and dynamic integration with the EU market (especially the EU-15) and, to a more limited extent, with the global economy [Behar and Freund 2011]. Democratization, strengthening political and economic relations (particularly with the EU), and modernizing many sectors (including finance and more advanced industries) were common elements of long-term development policies in CEE countries. Recently, the role of an economy in GVCs has been determined more by the advancement of value added that it offers. Companies move toward services and innovations in the business model [Nenenen and Storbacka 2010] and introduce Industry 4.0 [Bundesministerium fur Bildung und Forschung 2016]. A symptom of these novelties is the concept of 'servicification' of manufacturing (sometimes called "servitization of manufacturing" in the literature) [Neely et al. 2011], which has reconstructed traditional GVCs [Naude et al. 2019] and, together with Industry 4.0, is expected to change the landscape of global manufacturing. As a result of the facilitation of manufacturing, economies placed in the downstream market (e.g., CEE economies) can improve their role in GVCs.

The Chinese answer to new tendencies in international trade was the Belt and Road Initiative and then the Digital Silk Road (DSR), introduced in 2015 as a significant part of this initiative[1]. This strategy, part of China's long-term technological plan, provides support to its exporters – including many well-known technology companies – and builds a network of cooperation with selected countries in the field of technology, including ICT infrastructure, services, 5G networks, e-commerce, etc. The DSR's mission is to increase China's presence in more advanced areas of the global economy, especially with those connected to Industry 4.0 [Nouwens 2020]. In almost all official documents and events related to the Belt and Road Initiative, the DSR has been on the agenda. The original goal of the DSR was to develop a digital infrastructure in member countries. This was emphasized in the thirteenth 'Five-Year Plan' [Xinhua 2017]. The processes of servicification of manufacturing with ICT services can be considered an important element of the initiative [Brown 2017, Sen and Bingqin 2019].

China's rapid technological changes have not gone unnoticed by its trading partners. These include European countries which are increasing their technological advancement and enhancing market protection against Chinese technology to maintain international competitiveness. Until recently, the value added from China to European countries was concentrated mainly on medium-technology industries, while value added from Europe to China focused more on advanced goods and services. However, there is now a redirection of the Chinese value added towards high-tech activities (including service activities), reflecting China's ambition to build an economy leading to innovation and Industry 4.0.

The CEE economies and their relations with China and Germany in the context of the DSR are particularly interesting subjects for the study of production networks. CEE is still in the catch-up stage with Germany [Szalavetz 2020]. It is observed that CEE is facing unfavorable effects of the transformation towards Industry 4.0. More and more advanced technologies are replacing labor-intensive production, which harms the location of greenfield investments and labor-saving technologies. Consequently, the position of CEE in GVCs is deteriorating [Pavičić 2019]. However, access to digital technologies (including ICT services) seems to be of key importance for CEE economies and entry into the Industry 4.0 phase. One of the important suppliers of such technologies is Germany, the economy with which CEE ties are the strongest [Popławski and Bajczuk 2019]. However, the strategies of "going into the world" introduced by China, which has increasingly advanced products and services, mean that the country can be considered an important non-European supplier of technologies for CEE [OECD 2022]. This process has been strengthened by the DSR (CEE belongs to the '17+1' format, which can be interpreted as indirect belonging to the DSR through the Belt and Road Initiative). Its main channel of presence in CEE countries is the development of ICT services, including the 5G network, IT services, and other advanced services enriching manufacturing. At this level, China may appear as a competitor to Germany in CEE [Le Corre 2023]., CEE has become an important destination for the Chinese DSR in Europe because this region could be a "bridgehead" of Chinese technological projects

[1] The DSR is a part of the Belt and Road Initiative. Both initiatives include the Chinese Going Out Strategy. The DSR is also part of China's digitization strategies and programs related to the implementation of Industry 4.0 and Industry.

in Europe and a bridge for acquiring technology from Western Europe [Krpata 2023]., Chinese presence in Germany means two opposing strategies. On the one hand, Germany is also indirectly and informally involved in the DSR and has strong cooperation with China. The most visible connections can be found in the automotive and electronics industries. The country does not want to completely exclude China from the technology market in Europe as it uses these services directly in country-located factories or factories abroad (e.g., in CEE). On the other hand, Germany wants to protect its critical industries from Chinese value added and, therefore, protect the economy from too much influence from the DRS [CNN 2023, Reuters 2023].

Therefore, when analyzing changes in the role of CEE economies in GVCs, it is vital to consider their two most significant value-added suppliers: China and Germany. These three economies have established a triangle of value-added flows. Germany's regional supply chains in the CEE have allowed it to maintain a comparative advantage in important economic sectors while helping the CEE countries join GVCs, positively influencing their economic growth but also reducing them to entities operating in less advanced stages of production [Jacoby 2010, Fortwengel 2011].

In light of the above-mentioned relations, the purpose of the article is to assess the flows of value added in the servicification of manufacturing within the two most important value-added providers for CEE: Germany and China in the era of Industry 4.0 and the DSR. In this context, the question arises: How strong are these links in the servicification of manufacturing, and are there visible trends in value-added flows within this triangle in the era of Industry 4.0 and the Chinese DSR? The research question seems to be relevant; thus, in the subject literature, little is known about the mentioned relations [Roland Berger, 2021]. Moreover, in light of the possible establishment of the EU-China Comprehensive Agreement on Investment [European Commission 2021], these relations might be crucial for Europe.

A multi-regional input-output model was devised, encompassing the incorporation of value-added flows between industries. The study used Inter-Country Input-Output (ICIO) databases collected from OECD databases for the years 2005–2018 [OECD 2022].

The study covered 14 economies: China, Germany, and the CEE economies (i.e., Czech Republic, Estonia, Hungary, Poland, Slovakia, Slovenia, Bulgaria, Croatia, Lithuania, Latvia, and Romania).

The study proved the rising role of China in the analyzed triangle and the growing asymmetry in value-added flows. In most cases, the increasing dependence of manufacturing on Chinese ICT value added was proved. Unfortunately, the opposite tendency occurred relatively rarely.

This article is divided into four sections. The first section provides a justification of the topic undertaken, followed by a brief overview of the methodology used in the paper. The third section discusses the results of the estimations. Finally, the fourth section presents the conclusions drawn from the analysis.

JUSTIFICATION OF THE TOPIC

There have been limited studies to date regarding China's involvement in servicification. Virtually all studies on this subject point to similar conclusions. Du and Agbola [2022] explored the servicification of manufacturing in China, noting that FDI, capital intensity, and institutions are improving due to production links. However, they also found that the growing global market share of the Chinese manufacturing industry has led to a decrease in the role of manufacturing firms in China that use foreign servicification of manufacturing. Similar conclusions were drawn from the study conducted by Huang et al. [2022] and Chen et al. [2023].. They demonstrated that the servicification of manufacturing, whether commercial or non-commercial, positively affects the competitiveness of value-added exports and shapes the standing of Chinese enterprises in the global network. They emphasized that the servicification of China's manufacturing sector is still in its early stages of development. Guo et al. [2018] built a model for the Chinese economy from 1981–2014 and conducted counterfactual experiments, demonstrating the significant role of the servicification of investment. Similarly, Liu and Kim [2020] used an input-output model to determine that the service sector is a key driver for economic development. All

cited studies focused on the internal servicification of manufacturing and did not confront international flows. Only Pomfret [2019] offered a case study on servicification as a part of increased trade between China and Europe in the 20th century, utilizing the Eurasian Landbridge Corridor.

These studies have some limitations. Firstly, they did not provide an investigation of interdependencies in the servicification of manufacturing between strong-linked economies: China, Germany, and CEE. Moreover, all of them focused on holistic services rather than classifying them according to their level of sophistication. This study aims to address these gaps.

The second reason for taking up the topic is the growing role of Chinese services in German and CEE manufacturing [Liu and Li 2022, OECD 2022]. The expansion of China's services market has significant repercussions for the country's recent shift away from a reliance on exports and toward domestic consumption promotion [Grimes and Sun 2014]. Analyzing the years 2005–2018, it can be seen that the share of Chinese services flowing to German and CEE manufacturing is growing dynamically. It does not yet reach average annual values at a level similar to the flows of value added in manufacturing, but these increases between the period 2010–2014 and 2015–2018 (i.e., after the introduction of the DSR) are much greater on the side of servicification of manufacturing (Table 1). If this pace is maintained, services will soon overtake manufacturing.

METHOD[2]

The input-output model for the decomposition of gross exports (Fig. 1) was used to evaluate the cross-sectoral links between the analyzed economies. For the aim of the study, the foreign value added embodied in gross exports was evaluated. The applied approach was a combination of methods developed by Koopman et al. [2014], Hummels et al. [2001], and Timmer et al. [2019]; however, it was extended to cross-sectoral links.

The chosen research method was based on analyzing data from the OECD, specifically the trade in value-added databases that contain world input-output tables for 2005-2018. The study used ICIO databases collected from OECD databases. The 2021 version of the ICIO features 45 distinct industries, classified according to the ISIC Revision 4 [OECD 2022].

The input-output model's balance equations system for a single economy was adapted to a multi-economy model based on the decomposition of gross exports. The method includes estimates of total value-added in GVCs in addition to calculations at the mezoeconomic level and cross-sectoral flows of value-added, including the servicification of manufacturing.

We have S sectors and N economies. Each sector produces a single differentiated product: SN goods:

$$\begin{bmatrix} X_{11} & \cdots & X_{1N} \\ \vdots & \ddots & \vdots \\ X_{N1} & \cdots & X_{NN} \end{bmatrix} = \begin{bmatrix} B_{11} & \cdots & B_{1N} \\ \vdots & \ddots & \vdots \\ B_{N1} & \cdots & B_{NN} \end{bmatrix} \begin{bmatrix} Y_{11} & \cdots & Y_{1N} \\ \vdots & \ddots & \vdots \\ Y_{N1} & \cdots & Y_{NN} \end{bmatrix}$$

Table 1. An average Chinese total and services' value-added share in foreign value added in German and CEE's manufacturing in 2005–2018 [%]

Specification	2005–2009	2010–2014	2015–2018
Chinese manufacturing value added directed to partner's manufacturing			
Germany	5.9	8.7	10.2
CEE	7.3	10.2	10.6
Chinese total services' value added directed to partner's manufacturing (servicification of manufacturing)			
Germany	2.9	4.3	5.9
CEE	4.0	5.8	7.1

Source: based on OECD [2022].

[2] This method was first applied in [Cieślik 2021].

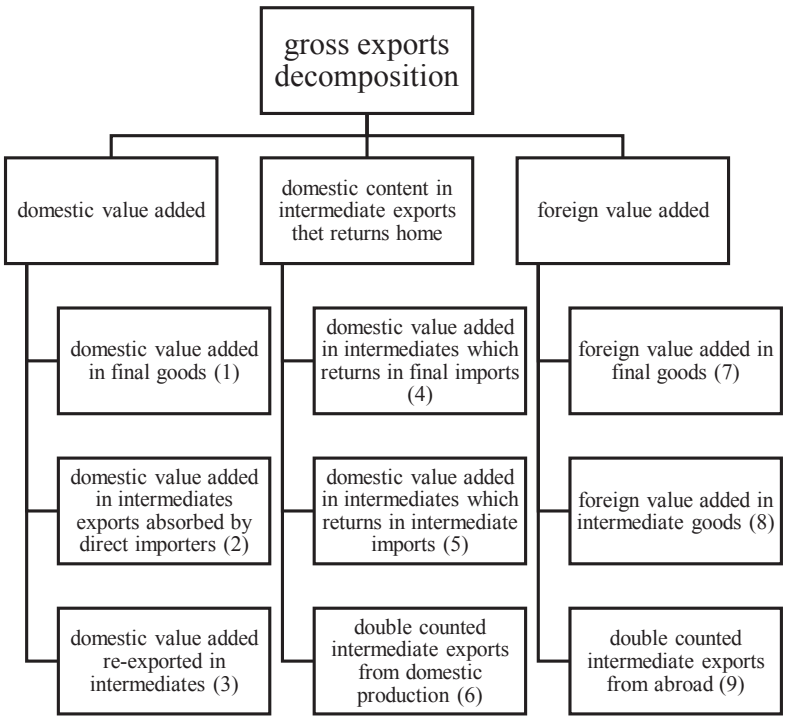


Fig. 1. Decomposition of gross exports scheme

Note: in parentheses, there are the number of equations.
Source: Koopman et al. [2012].

Where: G – Total amount of gross production in the economy (i) needed to meet the final demand in the economy (j); X – Gross output produced in the economy (i) and absorbed in the economy (j); Y – Gross output produced in the economy (i) and consumed in the economy (j).

Then, we create the value-added production matrix $\hat{V}GY$.

$$\begin{bmatrix} \hat{V}_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \hat{V}_N \end{bmatrix} \begin{bmatrix} X_{11} & \cdots & X_{1N} \\ \vdots & \ddots & \vdots \\ X_{N1} & \cdots & X_{NN} \end{bmatrix} =$$

$$= \begin{bmatrix} \hat{V}_1 \Sigma_j^N G_{1j} Y_{j1} & \cdots & \hat{V}_1 \Sigma_j^N G_{1j} Y_{jN} \\ \vdots & \ddots & \vdots \\ \hat{V}_N \Sigma_j^N G_{Nj} Y_{j1} & \cdots & \hat{V}_N \Sigma_j^N G_{Nj} Y_{jN} \end{bmatrix}$$

Elements in the diagonal matrix mean the value added absorbed at home. All elements of the diagonal matrix mean value added embodied in the partner's gross exports.

Because we focused on the foreign value added embodied in gross exports, we omitted some equitation related to domestic contents.

The foreign value added embodied in the gross exports can be formulated as follows:

$$\text{FV} = \Sigma_{j \neq i}^N V_j G_{ji} E_{i*} = \sum_{t \neq i}^N \Sigma_{j \neq i}^N V_t G_{ti} Y_{ij} +$$
$$+ \sum_{t \neq i}^N \Sigma_{j \neq i}^N V_t G_{ti} A_{ij} (I - A_{jj})^{-1} Y_{jj} +$$
$$+ \Sigma_{j \neq i}^N V_t G_{ti} (I - A_{jj})^{-1} E_{j*}$$

Where: $\sum_{t \neq i}^N \Sigma_{j \neq i}^N V_t G_{ti} Y_{ij}$ – foreign value added embodied in final goods exports; $\sum_{t \neq i}^N \Sigma_{j \neq i}^N V_t G_{ti} A_{ij} (I - A_{jj})^{-1} Y_{jj}$ – foreign value added embodied in gross exports of intermediate products; $\Sigma_{j \neq i}^N V_t G_{ti} (I - A_{jj})^{-1} E_{j*}$ – double-counted value added of intermediate goods produced abroad.

Ultimately, the decomposition of gross exports may be formulated as follows:

$$GEX = [V_i \Sigma_{j \neq i} G_{ii} Y_{ij} + V_i \Sigma_{j \neq 1} G_{ij} Y_{jj} +$$

$$+ V_i \sum_{j \neq i} \Sigma_{t \neq ij} G_{tj} Y_{jt}] + [\sum_{t \neq i} \Sigma_{j \neq i} V_t G_{ti} Y_{ij} +$$

$$+ \sum_{t \neq i}^{N} \Sigma_{j \neq i}^{N} V_t G_{ij} A_{ij} (I - A_{jj})^{-1} Y_{jj} +$$

$$+ \Sigma_{j \neq i}^{N} V_t G_{ti} (I - A_{jj})^{-1} E_{j*}] + [V_i \sum_{t \neq ij}^{N} \Sigma_{j \neq i}^{N} G_{ij} Y_{ij} +$$

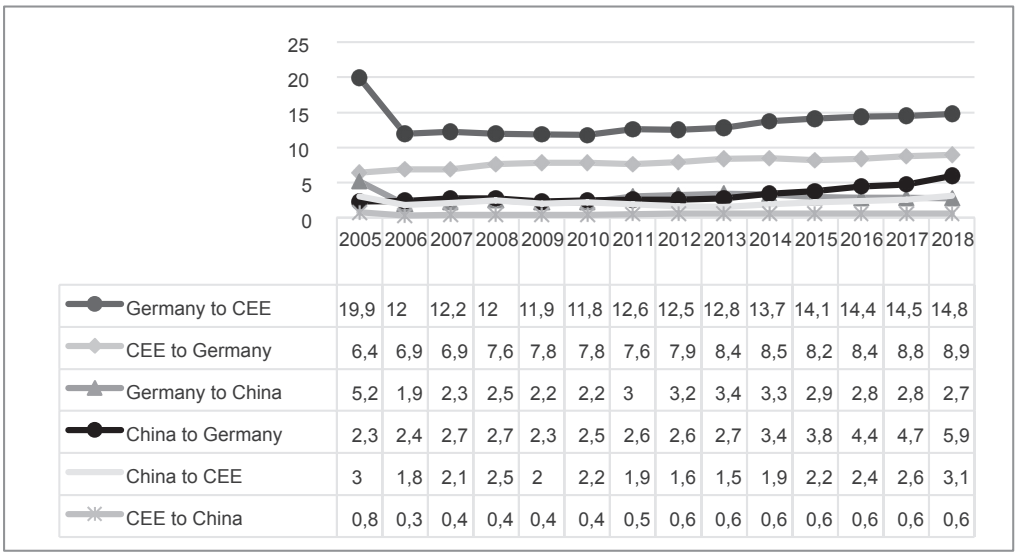
$$+ V_i \sum_{t \neq ij}^{N} \Sigma_{j \neq i}^{N} G_{ij} A_{ji} (I - A_{iix})^{-1} Y_{ii}$$

$$+ V_i \sum_{t \neq ij}^{N} G_{ij} A_{jt} (I - A_{ii})^{-1} E_{j*}$$

DISCUSSION

Germany has established a regional production network in CEE, particularly in the Visegrád Group countries (V4) – which has allowed it to maintain a comparative advantage in key economic sectors. This has also helped CEE countries to join GVCs, positively impacting their economic growth and development. However, this has also reduced them to entities operating in less advanced stages of production. Currently, Germany also has strong cooperation with China, and CEE economies are becoming increasingly dependent on the Chinese value added. This has created a linkage triangle, particularly in the automotive and electronics industries.

In general, when analyzing the production connections between CEE, China, and Germany, it is generally not surprising to find that the strongest flows occur between Germany and CEE. However, the ties between Germany and China, as well as between China and CEE, are comparatively weaker. There is an imbalance in all flows, but the situation is slightly better in the case of CEE-Germany and Germany-China connections. China has made Germany and CEE similarly dependent on its value added. In fact, 28.4% of CEE's total production is based on value added from Germany and China, the highest dependence among the analyzed economies. However, the opposite does not occur – the analyzed partners, especially China, do not rely as much on the value added generated in the CEE region [Cieślik 2022, OECD 2022].



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany to CEE	19,9	12	12,2	12	11,9	11,8	12,6	12,5	12,8	13,7	14,1	14,4	14,5	14,8
CEE to Germany	6,4	6,9	6,9	7,6	7,8	7,8	7,6	7,9	8,4	8,5	8,2	8,4	8,8	8,9
Germany to China	5,2	1,9	2,3	2,5	2,2	2,2	3	3,2	3,4	3,3	2,9	2,8	2,8	2,7
China to Germany	2,3	2,4	2,7	2,7	2,3	2,5	2,6	2,6	2,7	3,4	3,8	4,4	4,7	5,9
China to CEE	3	1,8	2,1	2,5	2	2,2	1,9	1,6	1,5	1,9	2,2	2,4	2,6	3,1
CEE to China	0,8	0,3	0,4	0,4	0,4	0,4	0,5	0,6	0,6	0,6	0,6	0,6	0,6	0,6

Fig. 2. Value added flows in total ICT services in manufacturing of the triangle in 2005–2018 (% of gross exports of the recipient country)

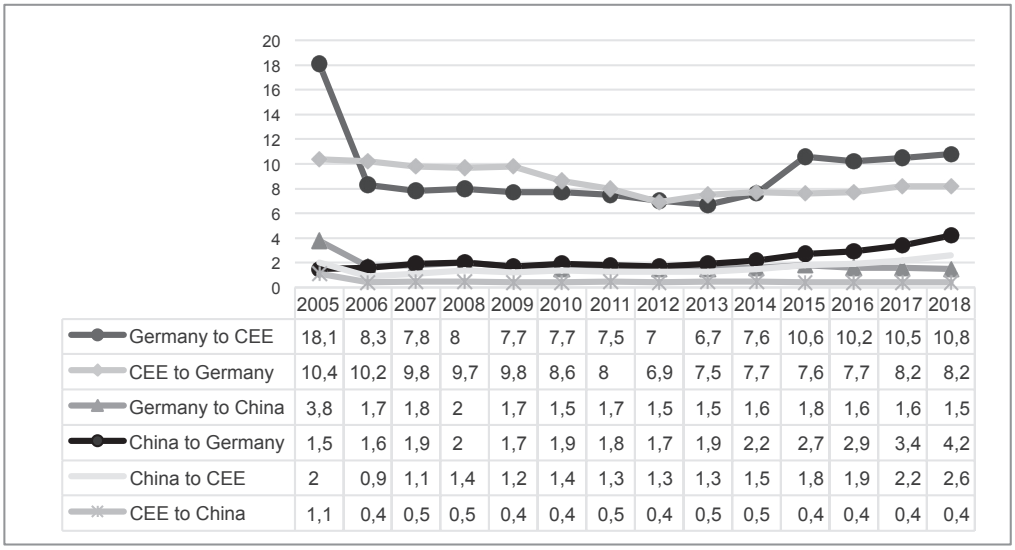
Source: author's calculations [OECD 2022].

After CEE countries joined the EU, there were high inflows of German value-added to the region, which resulted largely from these countries' favorable economic and social features. Over time, these value-added flows normalized, usually amounting to over a dozen percent. Additionally, the role of Chinese ICT services in cross-sectoral connections with both Germany and CEE was limited due to their underdevelopment, usually below 5%[3] (Fig. 2).

There is a notable imbalance between pairs of economies. The cross-sector flows from Germany to CEE are significantly greater than the value-added flows from CEE to Germany. In contrast, the value-added connections between Germany and China are much lower, indicating limited DSR impact. There is an upward trend in the flows of value-added Chinese ICT services to German industries. Still, this trend is not visible in the flows of German ICT services to Chinese industries, indicating a deeper imbalance in Chinese-German cross-sectoral relations. The largest asymmetry occurs between CEE and China, where the DSR strategy is achieving its intended results. China's ICT sectors add significant value to CEE's industries, while the opposite trend is not visible. Overall, Germany and CEE are becoming increasingly dependent on Chinese value added in their manufacturing and its subgroups (Fig. 2).

The gaps between the countries analyzed increased in the value-added flows of ICT services and their subgroups in manufacturing. The relationships between economies are becoming more imbalanced but in different ways. In terms of telecommunications in manufacturing, both CEE economies and Germany became more dependent on the Chinese value added. Moreover, the role of CEE's telecommunications services in German manufacturing grew. Therefore, in these intersectoral flows, Germany was more and more dependent on CEE and China (12.4% of foreign value added). However, the highest fluctuations of value-added flows occurred between German telecommunications and CEE manufacturing (the standard deviation amounted to 2.9%), (Fig. 3).

CEE manufacturing has become more dependent on both German and Chinese computer programming, consultancy, and information services activities. However, in the relationship between Germany and China, there was



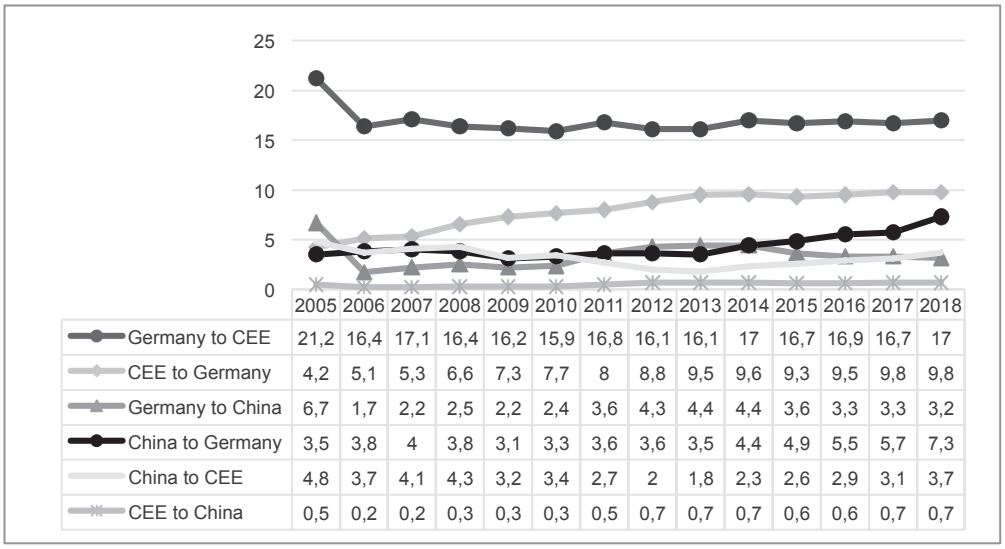
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany to CEE	18,1	8,3	7,8	8	7,7	7,7	7,5	7	6,7	7,6	10,6	10,2	10,5	10,8
CEE to Germany	10,4	10,2	9,8	9,7	9,8	8,6	8	6,9	7,5	7,7	7,6	7,7	8,2	8,2
Germany to China	3,8	1,7	1,8	2	1,7	1,5	1,7	1,5	1,5	1,6	1,8	1,6	1,6	1,5
China to Germany	1,5	1,6	1,9	2	1,7	1,9	1,8	1,7	1,9	2,2	2,7	2,9	3,4	4,2
China to CEE	2	0,9	1,1	1,4	1,2	1,4	1,3	1,3	1,3	1,5	1,8	1,9	2,2	2,6
CEE to China	1,1	0,4	0,5	0,5	0,4	0,4	0,5	0,4	0,5	0,5	0,4	0,4	0,4	0,4

Fig. 3. Value-added flows in telecommunications in manufacturing of the triangle in 2005–2018 (% of gross exports of the recipient country)

Source: author's calculations [OECD 2022].

[4] It is important to note that China has recently implemented several programs and strategies aimed at developing Industry 4.0, such as Made in China 2025 and the DSR. These initiatives are focused on advancing China's technological capabilities and competitiveness on the global market.

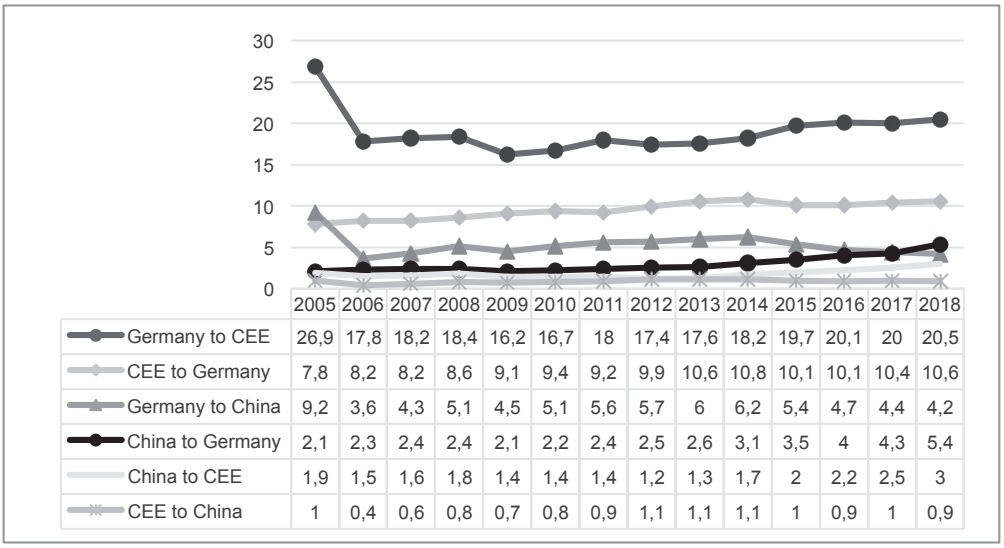
a reverse trend in computer programming, consultancy, and information services activities in manufacturing. Previously, Germany provided more services to Chinese manufacturing but, over time, China has become a larger source of advanced services for German manufacturing. While CEE has become more dependent on the Chinese value added in this case, they also increase the interdependence of the German market (Fig. 4).



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany to CEE	21,2	16,4	17,1	16,4	16,2	15,9	16,8	16,1	16,1	17	16,7	16,9	16,7	17
CEE to Germany	4,2	5,1	5,3	6,6	7,3	7,7	8	8,8	9,5	9,6	9,3	9,5	9,8	9,8
Germany to China	6,7	1,7	2,2	2,5	2,2	2,4	3,6	4,3	4,4	4,4	3,6	3,3	3,3	3,2
China to Germany	3,5	3,8	4	3,8	3,1	3,3	3,6	3,6	3,5	4,4	4,9	5,5	5,7	7,3
China to CEE	4,8	3,7	4,1	4,3	3,2	3,4	2,7	2	1,8	2,3	2,6	2,9	3,1	3,7
CEE to China	0,5	0,2	0,2	0,3	0,3	0,3	0,5	0,7	0,7	0,7	0,6	0,6	0,7	0,7

Fig. 4. Value-added flows in computer programming, consultancy, and information services activities in manufacturing of the triangle in 2005–2018 (% of gross exports of the recipient country)

Source: author's calculations [OECD 2022].



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany to CEE	26,9	17,8	18,2	18,4	16,2	16,7	18	17,4	17,6	18,2	19,7	20,1	20	20,5
CEE to Germany	7,8	8,2	8,2	8,6	9,1	9,4	9,2	9,9	10,6	10,8	10,1	10,1	10,4	10,6
Germany to China	9,2	3,6	4,3	5,1	4,5	5,1	5,6	5,7	6	6,2	5,4	4,7	4,4	4,2
China to Germany	2,1	2,3	2,4	2,4	2,1	2,2	2,4	2,5	2,6	3,1	3,5	4	4,3	5,4
China to CEE	1,9	1,5	1,6	1,8	1,4	1,4	1,4	1,2	1,3	1,7	2	2,2	2,5	3
CEE to China	1	0,4	0,6	0,8	0,7	0,8	0,9	1,1	1,1	1,1	1	0,9	1	0,9

Fig. 5. Value-added flows in ICT services in transport equipment of the triangle in 2005–2018 (% of gross exports of the recipient country)

Source: author's calculations [OECD 2022].

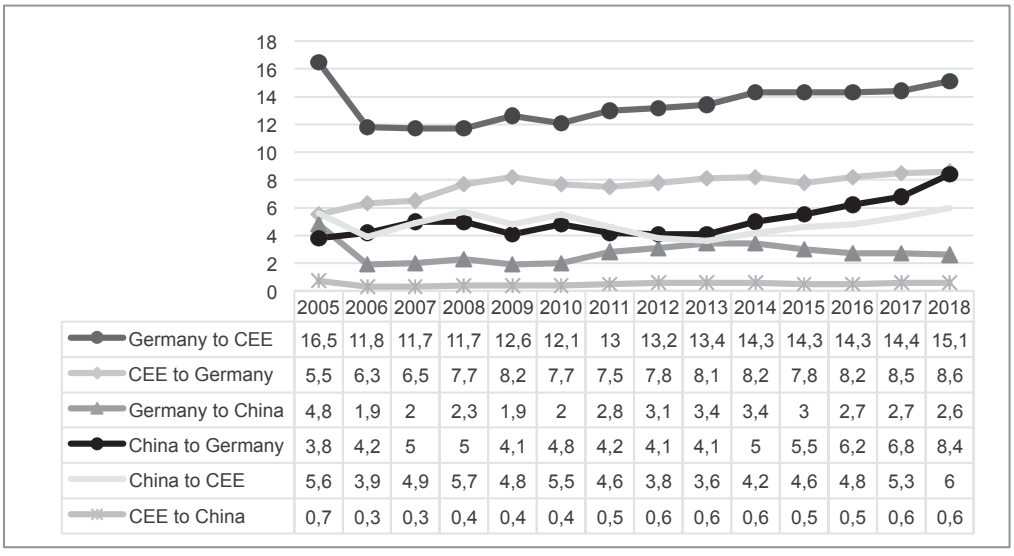
In the transport equipment industry, there was a significant decrease in the share of value-added inflows from Germany's ICT services to CEE – by 6.4% between 2005 and 2018 – and a notable increase in the share of Chinese value added to Germany – by 3.3%. However, the role of CEE in providing value-added to Germany and China did not increase significantly. China slightly increased its value-added inflows to German transport equipment, but the reverse was not observed. Additionally, there was no compensation for the decrease in flows between Germany and CEE by flows between Germany and China (Fig. 5).

In the value added of ICT services in transport equipment, the gaps between China and CEE increased and are heading toward a deeper imbalance, while between Germany and China, a reverse trend and a smaller gap occurred (perhaps it will increase) (Fig. 5).

In ICT services in computers, electronic, and electrical equipment, all pairs of economies noted growth in imbalance. The largest one occurred between CEE and Germany. In both Germany and CEE, significant growth in Chinese value added was observed. Also, both CEE and Germany have become more dependent on Chinese value added, while Chinese dependence on German and CEE stayed at a very low level (Fig. 6).

In 2018, the most considerable differences in the value-added flows of ICT services were between Germany and CEE in the value-added flows of ICT services to transport equipment (Fig 5) and the value-added flows of computer programming, consultancy, and information services activities to manufacturing (Fig. 4) – with gaps of 9.9% and 7.2%, respectively. On the other hand, the most balanced flows were between China and CEE in the value-added flows of ICT services to transport equipment, with a difference of only 2.1% (Fig. 5).

The value-added flows between CEE and Germany are much more intense than those between Germany and China. In most cases, the flows from Germany to CEE are greater than the others, except flows from German telecommunications to CEE's manufacturing in certain years (Fig. 3) and Chinese ICT services flows to German computers, electronic, and electrical equipment – which are almost equal to those from CEE (Fig. 6). The highest average share of value-added was between German ICT services and CEE transport equipment (19% on average dur-



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany to CEE	16,5	11,8	11,7	11,7	12,6	12,1	13	13,2	13,4	14,3	14,3	14,3	14,4	15,1
CEE to Germany	5,5	6,3	6,5	7,7	8,2	7,7	7,5	7,8	8,1	8,2	7,8	8,2	8,5	8,6
Germany to China	4,8	1,9	2	2,3	1,9	2	2,8	3,1	3,4	3,4	3	2,7	2,7	2,6
China to Germany	3,8	4,2	5	5	4,1	4,8	4,2	4,1	4,1	5	5,5	6,2	6,8	8,4
China to CEE	5,6	3,9	4,9	5,7	4,8	5,5	4,6	3,8	3,6	4,2	4,6	4,8	5,3	6
CEE to China	0,7	0,3	0,3	0,4	0,4	0,4	0,5	0,6	0,6	0,6	0,5	0,5	0,6	0,6

FFig. 6. Value-added flows in ICT services in computers, electronic and electrical equipment of the triangle in 2005–2018 (% of gross exports of the recipient country)

Source: author's calculations [OECD 2022].

ing the analyzed period) (Fig. 5), while the lowest average flows were between CEE's ICT services and German computers, electronic, and electrical equipment (7.6%), (Fig. 6).

The increase in Chinese value-added flows into Germany is not directly interchangeable with the decline in flows from CEE. However, as relations between Germany and China strengthen – including through visits by German politicians and China's expansion under the DSR – the inflows of value-added from advanced Chinese services are catching up to those from CEE directed to Germany (Fig. 2–6).

CONCLUSIONS

Referring directly to the research question, the following phenomena can be observed. The study found that the imbalance in value-added flows between economies continued to deepen, especially between CEE and China and, to some extent, between Germany and China. CEE economies increasingly rely on advanced services from China for the analyzed sectors, while the share of CEE services to Chinese manufacturing usually remains steady. Most of the analyzed German sectors relied more on Chinese value-added. Only two of the analyzed sectors did not experience this tendency. Previously, the inequality between Germany and China was not so obvious because Germany provided more services to China. Between CEE and Germany, we observed a larger dependence of CEE exports on the German market and vice versa in most of the analyzed industries. However, there was no direct compensation between pairs of economies (e.g., the decrease in German value-added flows to China did not result in a similar increase in value-added from German to CEE manufacturing).

If the presented changes in flows were to reflect the effectiveness of Chinese Industry 4.0 and the DSR, it should be recognized that it fulfills its role and increases not only the advancement of Chinese value-added exports, but also makes important economies dependent on this value added. However, the DSR should be considered only as a strategy supporting current trends and not as a factor that caused sudden changes in the relationships in the studied triad. Moreover, one expects that China will change the DSR strategy to adjust to international markets [Cook et al. 2018]. On the contrary, the Industry 4.0 strategy in CEE has not improved its position. Germany still has a strong position as a provider of value added, but its dependence on foreign value added is high, which derives from the links with CEE. However, it is not only the DSR and Industry 4.0 that influence relationships between the triad. Political relations between countries are also of great (possibly the greatest) importance. From the CEE perspective, the interconnections in analyzed sectors would depend on Germany's position toward Chinese technology and China's capability of aligning with European requirements. However, the exclusion of Chinese advanced services from the European technology market will not fundamentally change the role of CEE as a recipient of ICT services. It will not improve the process of transition to the Industry 4.0 phase. Moreover, it does not transform CEE into a supplier of ICT services to former Chinese trade recipients. CEE economies will still rely largely on foreign ICT services, but their diversification will decrease as they will mainly be European suppliers. In addition, the cost of obtaining services used in manufacturing may increase because the presence of China on the market may have influenced prices [Bloom et al. 2010, European Parliament 2020].

In the end, we should be aware of some limitations of the study. First, the analyzed period is relatively short and, in a long-term analysis, there could be some significant changes in interdependencies among the three economies. Second, the COVID-19 pandemic, war in Ukraine, and technological decoupling between China and the U.S. have changed the landscape of production networks; the only question is whether the changes are short-term or long-term. Another important limitation results from the deteriorating technological relations between the European Union and China and the difficulty in predicting the direction in which restrictions on the flow of technology will take. There is a danger that Europe, including CEE, will follow the U.S. and decouple from Chinese technology.

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MIĘDZYSEKTOROWE WSPÓŁZALEŻNOŚCI TECHNOLOGICZNE EUROPY ŚRODKOWEJ I WSCHODNIEJ W DOBIE PRZEMYSŁU 4.0 I CHIŃSKIEGO CYFROWEGO JEDWABNEGO SZLAKU

STRESZCZENIE

Cel: Celem artykułu jest ocena przepływów wartości dodanej w zakresie serwicyzacji produkcji przemysłowej w obrębie dwóch najważniejszych dostawców wartości dodanej dla Europy Środkowej i Wschodniej (EŚW): Niemiec i Chin w dobie przemysłu 4.0 oraz chińskiego Cyfrowego Jedwabnego Szlaku. **Metody:**

Do oceny powiązań międzysektorowych pomiędzy analizowanymi gospodarkami zastosowano model rozkładu przepływów międzysektorowych. **Wyniki:** Gospodarki EŚW coraz silniej uzależniają swój przemysł przetwórczy od wysokiej jakości usług z Niemiec i Chin, podczas gdy analogiczne przepływy z EŚW do Niemiec i Chin maleją lub utrzymują się na stałym poziomie. Niemiecka produkcja zaczyna w większym stopniu zależeć od wartości dodanej chińskich usług w zaawansowanych sektorach. Nie było bezpośredniego trade-off między parami gospodarek, ale spadek niemieckich przepływów wartości dodanej do Chin doprowadził do znacznie większego wzrostu chińskiej wartości dodanej w niemieckiej produkcji przemysłowej. **Wnioski:** Mając na uwadze ograniczenia badania, wykazano pogłębioną nierównowagę w przepływach wartości dodanej pomiędzy gospodarkami. Co więcej, badanie wykazało efektywność chińskiego Przemysłu 4.0 i Cyfrowego Jedwabnego Szlaku pod względem udoskonalenia chińskiego eksportu o wartości dodanej i uzależniania kluczowych gospodarek od tej wartości dodanej.

Słowa kluczowe: ICT, serwicyzacja produkcji przemysłowej, Chiny, Niemcy, EŚW

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INCREASE IN THE MARKET VALUE OF LAND AS AN EFFECT OF LAND CONSOLIDATION PROJECTS

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ABSTRACT

Aim: The economic effect of an increase in the market value of land is a factor usually neglected in the assessment of land consolidation projects. However, it should be expected after procedures aimed at reorganizing the spatial structure of land plots. To fill the research gap in this area, a study was carried out to identify potential changes in land values as a result of completed land consolidation projects. **Methods:** Data from nine land consolidation projects carried out in Poland between 2007 and 2013 was used in addition to the results of an artificial neural network model developed within the framework of statistical analyses of agricultural real estate markets for municipalities where land consolidation projects were carried out. **Results:** Taking into account the increase in the market value of land as a result of consolidation, the balance of costs and benefits of planned or implemented projects significantly improved. The increase ranged from 1.2% to as much as 28.4%. **Conclusions:** The effect of increased land values would be a serious argument in assessing the profitability of implementing land consolidation projects. The increase in land value as an economic and social effect of land consolidation increases the probability of revitalizing local property markets and contributes to the wealth and creditworthiness of landowners. Exposing this effect can increase public interest and support for the implementation of consolidation projects, which is a very important step on the way to village renewal and activation.

Keywords: land consolidation, market value of land, statistical methods, land valuation, neural networks

JEL codes: Q15, R32, C45

INTRODUCTION

Among the factors taken into consideration when evaluating consolidation projects, the economic effect of the increase in the market value of land tends to be overlooked. Although the aspects of production values – which are determined by the surface area, shape and quality of agricultural land [Leń 2018, Colombo and Perujo-Villanueva 2019, Nguyen and Warr 2020] – are usually addressed, these characteristics do not exhaust the list of important determinants of the market value of agricultural land [Marks-Bielska 2013]. There is no practice of analyzing the agricultural land market prices in the consolidated areas. No one poses the question of how these prices will increase upon the improvement of the layout of the village in question, although this is to be expected. Market value change seems vital, especially from the perspective of landowners [Wojewodzic

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et al. 2021]. This effect can be considered potential since it will only be monetized when transactions are made or farmers apply for mortgages or contribute land as assets to a company. Therefore, the awareness that the market value of possessed land will increase can already serve as an important incentive for increased social acceptance of land consolidation projects [Lisec et al. 2014], especially since agricultural land is an essential element of estate for most farmers [Krupowicz et al. 2020]. An increase in the market value of land leads to an increased amount of a potential sales transaction or a potential loan, with the land serving as mortgage collateral. The improvement of agricultural suitability and an increase in potential market value itself may prevent farmers from abandoning land cultivation. Where the value of land is high, it is more reasonable to cultivate – even sporadically – or lease it. A revival of the real estate market and its main functions can also be expected – above all, the correction of space [Kucharska-Stasiak 2000].

The existing research also indicates that one of the positive long-term effects of consolidation project implementation is a noticeably lower percentage of areas permanently set aside and abandoned [Janus and Markuszewska 2019, Janus and Bozek 2018] (i.e., areas where market value is depreciated). Reduction of land fragmentation and improvement of access to fields, which is connected with the process of land consolidation, constitutes a significant benefit to landowners [Muchová and Jusková 2017, Lisec et al. 2014]. Indeed, convenient access to property is regarded as one of its most important features on the local market [Schilbach 2001, Wojewodzic et al. 2021, Dacko et al. 2021]. This refers to both agricultural plots and those intended for construction purposes in the future. It is worth remembering that changes in the layout of farms [Leń and Król 2016], a new network of roads [Krupowicz et al. 2017], and an increase in property value are factors that increase the interest in agricultural land among potential buyers from outside the area.

The impact of land consolidation implementation on the value of agricultural land is a complex issue. This is because the implementation of consolidation projects involves a change in the aspect that is key to land value, namely the location and geometric features of the plots of individual owners [Lazić et al. 2020, Uyan et al. 2020]. Due to the use of land-value maps in the process of executing consolidation projects and the principle of equivalence before and after consolidation [Muchová et al. 2018], which is commonly applied in such projects, it appears that the value of land should remain unchanged [Tezcan et al. 2020]. However, value maps used in consolidation projects usually show the agricultural suitability of land in a given region of the village being consolidated, not the market value of the individual plots or whole properties. According to the assumptions of consolidation projects, plots' average surface area, their distance from farm buildings, and shape and access to roads are the parameters that should improve by implementing a land consolidation project [Krupowicz et al. 2017, Ertunç 2020]. Other things that often get improved (depending on the scope of the investments) are water conditions and the quality of accessways [Kirmikil and Arici 2013]. In many cases, the plots' spatial parameters qualify them for construction purposes, provided that their location meets the local conditions of spatial planning [Salata et al. 2015]. Consolidation also improves the land's farming conditions as a result of such activities as the elimination of escarpments, shrub removal, or other rehabilitation measures [Pijanowski et al. 2021]. Consequently, there are many actual and potential benefits of consolidation projects, which, when taken into consideration, may significantly improve economic assessments of the efficiency of such endeavors. In addition to the above, there is another generally overlooked effect. This is the aspect the authors addressed by analyzing local agricultural land markets and using data from nine consolidation projects carried out in Poland between 2007 and 2013. The research was conducted in 2019 as part of implementing the KSOW project 'Economic Efficiency of Land Consolidation in Poland'.

DETERMINANTS OF THE VALUE OF AGRICULTURAL LAND

A key element in considering the value of land is its location. The origins of the economic theory of location and the rent of land theory are associated with the work of classical economists, who based their work

[2] Directive 2009/28/EC of the European Parliament and of the Council has been substantially amended several times. From the need for further amendments, the directive had to be recast for the sake of clarity

on the observation of activities in agriculture and farm operations. Smith's thesis that doing business in different locations entails different costs and yields different results was developed by Ricardo, Thünen, and Weber, laying the foundations for land rent theories [Wojewodzic 2017]. Agricultural production space, through its quality and location, significantly affects the economic results obtained. Therefore, compared to other characteristics, the location of agricultural land is of primary importance to market participants – especially with respect to neighbor trade. Śnieg [2003] noted that location is one of the most critical factors impacting the market value of any property, including agricultural ones. One may even state that the location of an agricultural plot determines its other characteristics (i.e., neighborhood, surface area, and access. As pointed out by Woch et al. [2011], in Polish conditions, driving over one kilometer to a plot smaller than 1 ha is not economically viable. Croplands that are too small hinder the intensification of production and, thus, limit the possibility of generating the differential rent due to the quality and location of the land [Wojewodzic 2017].

Agricultural properties, in addition to attributes that are common to properties in general (i.e., location or surface area [Tomić et al. 2021, Demetriou 2016]) also have attributes that are specific to them because they create conditions for agricultural production. Consequently, the professional Polish standards of asset valuers recommend that the following characteristics are taken into consideration when describing and evaluating the state of undeveloped agricultural properties not intended for construction and not having the potential for land-use change:

- location, position, and neighborhood;
- value in use (soil valuation) and land diversity;
- surface area, shape of the property, and topography;
- accessibility as well as availability of structures and equipment used for agricultural production;
- obstacles to cultivation (e.g., flintiness, infrastructure network, etc.);
- agricultural condition.

As research by Śnieg [2003] demonstrates, the layout of a farm's fields in the aspect of its shape is an important factor impacting the value of agricultural properties. An agricultural plot may take the form of various geometric figures [Akkaya Aslan 2021]. It may have an elongated or compact shape, regular or irregular. These shapes may be more or less advantageous from the perspective of agricultural activity, which is not unimportant to market participants. Other important factors determining the value of agricultural land include, according to Śnieg, surface area, land quality and its accessibility, the neighborhood of the agricultural plot and its distance from a built-up area, as well as the factor of time.

According to Woś [1996], agricultural land is worth what the buyer offering the highest price is willing to pay for it. Acting rationally, they will condition the price on expected benefits, which are determined by the property's market features (attributes).

Bud-Gusain [2005] noted that the degree of usability of both a single plot and a larger complex of plots is determined (in spatial and economic terms) by the layout, surface area and structure of agricultural land, soil valuation, and share of the different soil valuation classes in the agricultural land, as well as water conditions and climate for farming [Ertunç et al. 2021]. Schilbach [2001] points to such features as location, shape and size of an agricultural plot, quality of land, distance from the center, accessibility, and agricultural condition. Marks-Bielska and Lizińska [2015] noted in their research that in Polish conditions, location (relative to rural buildings), soil quality, and surface area have the most considerable impact on the prices of agricultural properties. However, the market prices of land showed that market participants also took into consideration the area's forest cover in addition to the occurrence of adverse farming conditions. Kempa [2010] also highlighted the importance of the surface area of agricultural plots but with respect to using them for non-agricultural purposes, as well as the price-impacting roles of soil quality and distance from a densely built-up area.

What emerges from the above-cited studies dedicated to the issues of agricultural land value in Polish conditions is a set of recurrent factors and attributes that should be obligatorily considered in analyzing and modelling local markets [Dacko et al. 2021]. Over

a short period of time, these elements remain practically unchanged for all the plots in a given village, although they certainly undergo slow, evolutionary changes. However, consolidation changes the situation radically. It results in the creation of new plots with more advantageous variants of market features [Wojewodzic et al. 2021]. This change cannot occur without impacting the value of agricultural land in the village where a consolidation project is carried out.

In the case of land consolidation, awareness of the potential increase in the market value of agricultural land can be an important argument for the local community to proceed with consolidation.

Estimating a potential change in land value due to consolidation project implementation seems to be a valuable complement to the existing studies on the effectiveness of the execution of land consolidation projects [Kirmikil and Arici 2013]. To fill the research gap in terms of covering all the actual and potential effects of consolidation project implementation, a study was designed and conducted, which involved a group of nine consolidation projects carried out in Poland from 2007-2013. A comprehensive examination of the factors impacting the value of agricultural properties within the municipalities covered by the consolidation projects, along with an analysis of the changes in the plots' features as a result of a consolidation project, allowed the authors to determine potential changes in land value as a result of consolidation project implementation.

STUDY AREA, DATA SOURCE, AND METHODS

The evaluation of the impact of consolidation projects on land value changes was preceded by the acquisition and processing of data on nine consolidation projects located in six Polish voivodeships:

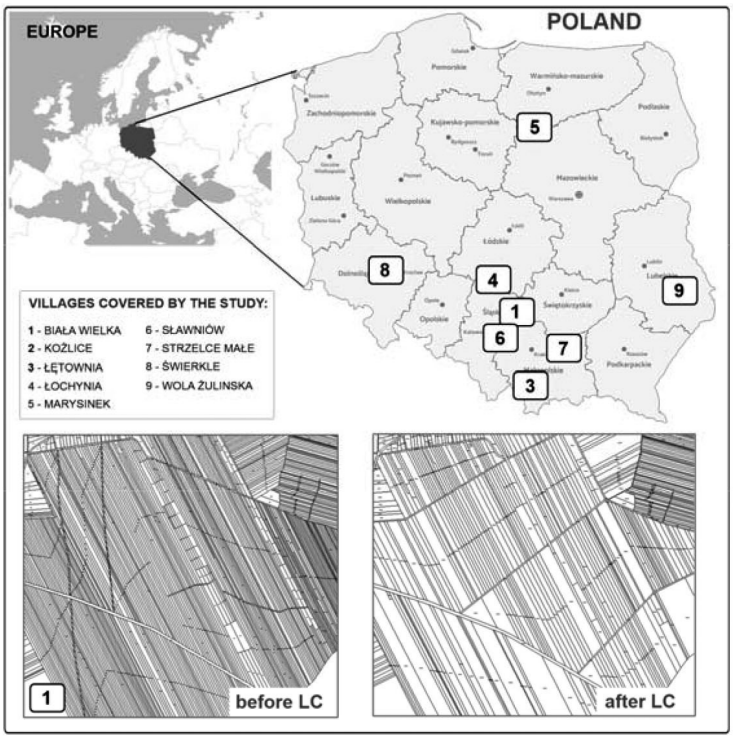

Fig. 1. Location of the areas under consolidation covered by the study with an example of changes resulting from a land consolidation project

Source: own study.

Lesser Poland, Lublin, Silesian, Lower Silesian, Masovian, and Opole (Fig. 1). Also, data on the market trade in agricultural properties in the municipalities where the consolidation projects where implemented was used. The data came from all the precincts in the municipality where the consolidation project was implemented.

Based on data obtained from official registers of property prices and values (maintained in Poland at the level of *powiat*, i.e., the second-level unit of an administrative division of Poland), a database was created containing the prices of unbuilt agricultural plots sold on the market in 2018–2019 (292 transactions in total). Each transaction was described using parameters that, in light of the literature review, were regarded as potentially significant in modelling the values of agricultural plots. The information included market price, surface area and structure of the agricultural areas, transaction date, location (voivodeship, tax district, municipality, village, plot number), and geometry (length, width, and perimeter) of the plots. Moreover, each plot was assessed in terms of shape, precise location, neighborhood, access to a public road, obstacles to usage, level of agricultural condition, and distance from the nearest built-up area. In summary, all relevant market characteristics of undeveloped agricultural land were taken into account, including three key characteristics that change due to the land consolidation project (plot area, plot elongation, and road access).

Statistical analysis of the market was adopted to determine changes in agricultural land value. It was carried out using neural networks. The reason for selecting this tool was the fact that on the real estate markets, the relationships between the analyzed features are usually non-linear and non-monotonic. In such situations, neural networks work well [Lanillos et al. 2020]. The criterion taken into account when choosing a neural network model was the principle simplicity of modelling [Szaleniec 2008]: if several different models explain a given phenomenon to a similar extent, the model that is conceptually simpler should be chosen. As McCluskey [1996] noted, a more complex network analyzes more input variables but also requires more observations. Therefore, the simplest possible network architecture was searched for, with a moderate number of neurons in the input and hidden layers (Fig. 2).

The aim of the study also necessitated taking into account the market features that change significantly

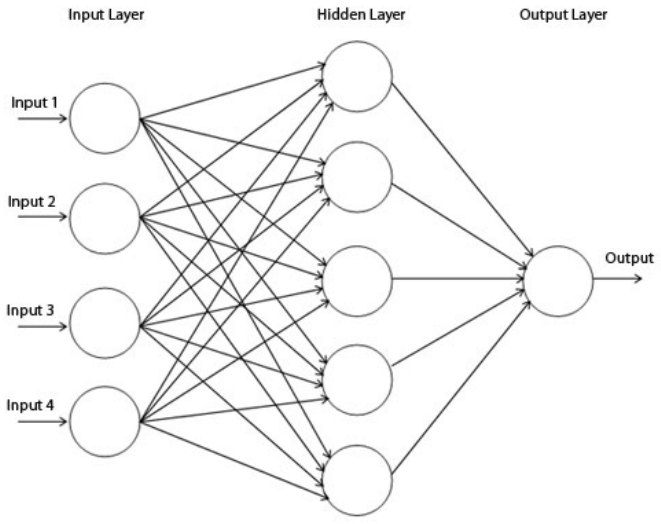

Fig. 2. Neural network illustrative structure
Source: own study.

Table 1. The list of predictors used for an artificial neural network model

Item	Name	Predictor values or variants
1	Tax district	1, 2, 3, 4 – pursuant to the Act of 15 November 1984 on agricultural tax and the Regulation of the Minister of Finance of 10 December 2001 on assigning municipalities and cities to one of four tax districts
2	Location (general)	Average level of unit prices (PLN/m2) for municipalities from which the data on transactions involving agricultural plots were obtained: Szczurowa (2.4), Jordanów (4.2), Lelów (2.3), Mykanów (1.6), Łopiennik Górny (2.3), Mściwojów (4.8), Pilica (2.8), Praszka (2.4), Gaworzyce (3.2), Dobrzeń Wielki (3.6), Opole (2.9), Strzegowo (2.7)
3	Location (detailed)	1 – peripheral (away from settlement development clusters) 2 – indirect (bordering settlement development clusters) 3 – built-up zone (location within settlement development clusters)
4	Quality of land (soil)	Variants of calculated soil valuation index Wb (quotient of the surface area calculated for agricultural tax and the physical surface area): 1 – poor (Wb to 0.8) 2 – average (Wb above 0.8 to 1.2) 3 – good (Wb above 1.2 to 1.6) 4 – very good (Wb above 1.6)
5	Share of arable land	Values from the range of 0.00 to 1.00, calculated as the quotient of the surface area of arable land and the total area of a parcel of land
6	Observed limitations in use	1 – large (simultaneous occurrence of at least two aspects such as: flintiness, wetness, noticeable soil variability, bushes and coppices, wasteland, proximity of forests, sharp angles of plot boundaries) 2 – moderate (one of the above) 3 – lacking
7	Neighborhood	0 – not directly bordering a built-up area 1 – directly bordering a built-up area
8	Plot area	up to 0.5 ha (very small plots) from 0.5 ha to 1 ha (small) from 1 ha to 2 ha (middle-sized) from 2 ha to 3 ha (large) above 3 ha (very large)
9	Plot elongation	Values in a range from 1.0 to 114.6, calculated as a quotient of a parcel's sides (longer/shorter)
10	Road access	0 – no access to a road 1 – access to a road

Source: own study.

as a result of the implementation of a land consolidation project and, in accordance with the theoretical premises and initial data analysis, have the largest impact on the value of agricultural land (Table 1).

The model was developed using the Statistica 13 package with a Data Mining module. The size and structure of a neural network is always determined by the complexity of the phenomenon under study, particularly the number of explanatory variables considered [McCluskey 1996, Szaleniec 2008]. For the purpose of building the network, the data is divided into three subsets [Migut 2019]. In this case, the division was as follows:

- training set – 70%;
- test set – 15%;
- validation set – 15%.

Of the several dozen networks tested in parallel within 200 epochs, the best results were achieved by multilayer perceptron (MLP). As indicated by Szaleniec [2008] and Tadeusiewicz and Szaleniec [2015], this neural network model is currently very popular. The multilayer perceptron had one hidden layer numbering 11 neurons. For hidden neurons, a hyperbolic tangent (tgh_x) was selected for the activation function:

$$tgh_x = \frac{\sinh_x}{\cosh_x} = \frac{e^x - e^{-x}}{e^x + e^{-x}} \quad (1)$$

where:

x – neuron's total excitation signal

e – Euler's number

For the output neuron, the activation linear function (y) was selected:

$$y = ax + b \quad (2)$$

where:

x – neuron's total excitation signal

a – slope

b – intercept

These settings are recommended for multilayer perceptron resolving regression problems using the sum of squares (SoS) as an error function:

$$E_{SoS} = \Sigma_{i=1}^{n}(Y_i - t_i)^2 \quad (3)$$

where:

Y_i – predicted values

ti – actual values

n – number of observation

RESULTS

To ensure the necessary minimum of predictors (equivalent to the number of neurons in the input layer), an analysis of network sensitivity (N_s) was conducted. This neural network functionality shows which input data are most relevant. The sensitivity analysis indicates an error increase due to the elimination of individual predictors from the neural network model [Tadeusiewicz and Szaleniec 2015]. Sensitivity analysis indicates the role of a given predictor in the model. In light of sensitivity analysis, particularly relevant were access to a road (N_s= 6.70) and location factors – general location (N_s = 2.57), specific location (N_s = 2.52), and tax district (N_s = 2.18). Relatively important factors were soil quality (N_s = 2.07), obstacles to usage (N_s = 2.05), and a parcel's vicinity (N_s = 2.03). A less important role was played by surface area (N_s = 1.34), the share of arable land (N_s = 1.20), and plot elongation (N_s = 1.05).

Regarding the accuracy of the model, it was found that the correlation levels between the actual and predicted values were as follows: 0.89 – for the training set, 0.82 – for the test set, and 0.80 – for the validation set. These results were acceptable because, according to theory, the results for the validation set should not be significantly different from the test set [Szaleniec 2008, Migut 2019].

Once the model was developed, changes in selected features of plots before and after consolidation were examined for nine consolidation projects (Table 2).

Table 2. Changes in selected features of plots in the analyzed group of land consolidation projects

Village name	average area of the plot (ha)		average elongation of the plot		number of plots without access	
	before consolidation	after consolidation	before consolidation	after consolidation	before consolidation	after consolidation
Biała Wielka	0.32	0.54	31	24	102	17
Koźlice	0.71	1.03	6	5	2	0
Łętownia	0.12	0.23	5	4	1400	169
Łochynia	0.44	0.99	12	10	51	3
Marysinek	0.87	1.88	7	6	16	0
Sławniów	0.35	0.62	7	9	226	14
Strzelce Małe	0.41	0.66	12	8	178	16
Świerkle	0.93	2.95	12	7	41	1
Wola Żulińska	0.37	0.75	16	15	100	3

Source: own study.

Table 3. Changes in land value as a result of land consolidation project implementation

Village name	Eligible costs of the consolidation project and post-consolidation management	Market value of the land (2019)		Change in the market value of the land	
		before consolidation	after consolidation		
	mln PLN*	[PLN/ha] *	[PLN/ha]*	[%]	mln PLN*
Biała Wielka	10.495	19461	20499	5.3	0.989
Koźlice	2.883	34764	36087	3.8	0.704
Łętownia	5.545	29459	37820	28.4	6.307
Łochynia	1.792	21929	23877	8.9	0.651
Marysinek	1.603	24736	25628	3.6	0.362
Sławniów	4.282	24419	24717	1.2	0.203
Strzelce Małe	3.418	19195	21575	12.4	1.312
Świerkle	0.774	32074	35415	10.4	0.796
Wola Żulińska	3.125	19693	20971	6.5	0.601

* In nominal prices.

Source: own study.

The villages varied significantly regarding the average surface area and elongation of a plot before and after consolidation (Table 4). Also, the percentage of plots without access to a public road varied markedly. Especially high fragmentation of plots was recorded in the village of Łętownia. The average surface area of plots in this village increased twice as a result of land consolidation, but it was still insufficient from the perspective of modern requirements of farming (0.23 ha). The villages of Marysinek and Świerkle compared favorably in terms of post-consolidation plot size. The surface areas of the plots in these villages were already large before the implementation of consolidation projects and, as a result of consolidation, their size increased even further. In Marysinek, the surface area of plots grew to 1.88 ha. Meanwhile, in Świerkle, the average size of a plot after consolidation was almost 3 ha.

The worst average plot elongation (31:1) before consolidation was recorded in the village of Biała Wielka. After consolidation, the elongation was reduced by 21%, but it still remained the largest compared to the other villages. Plot elongation was most reduced in the villages Świerkle (by 39%) and Strzelce Małe (by 35%). It is worth noting that in the village of Sławniów, this parameter (with a moderate value of 7:1) increased by 19% after consolidation. A relatively smaller elongation was recorded in the villages Łętownia (5:1) and Koźlice (6:1). Nonetheless, consolidation projects improved this parameter – by 28% in Łętownia and by 17% in Koźlice.

Plots without access were most numerous in the village of Łętownia (1,400 cases). As a result of consolidation, their number fell to 169. It is worth repeating that the issue of access was very important in the valuation of agricultural land in the ANN model. A significant reduction in the cases of a lack of road access was achieved in the following villages: Sławniów, Strzelce Małe, Biała Wielka, and Wola Żulińska (Table 2). Projected changes in value were made for each of the nine areas separately (Table 3). There was no statistically significant effect-of-time trend on changes in market prices of agricultural land during the period studied. The value of 1ha of land before and after consolidation was presented for each village.

Changes in land value was most noticeable in the village of Łętownia, where the increase was 28.4% – which, in the case of this consolidation project, corresponded to a total amount of PLN 6.3 million. A large increase in value (12.4%) was also recorded in the

village of Strzelce Małe. It was estimated at PLN 1.3 million. A relatively smaller effect was recorded in the villages Sławniów (1.2%) and Marysinek (3.6%), where the value of land increased by PLN 203,000 and PLN 362,000, respectively.

Creating an increase in land value is not fundamentally the aim of land consolidation projects; it is an aspect that is usually overlooked. However, changes in land market value in light of the ANN model with respect to eligible costs of land consolidation projects indicate that public funds can also be spent more efficiently in this context. The investment in the villages Łętownia and Świerkle showed a very good ratio of investment to effect, which was almost 1:1.

CONCLUSIONS

The elaborated model indicated that the impact of a land consolidation project on land value, though it varies, proved to be significant and should not to be overlooked in the process of evaluating the effects of such activities. The average extent of land value changes at the level of the entire villages analyzed was large and indicated the reasonableness of analyzing each completed consolidation project on an individual basis. Agricultural real estate prices were determined in a neural networks model by many different predictors. Some of them were improved by land consolidation. Such changes, according to the model results, have contributed to an increase in land value.

Based on the studies, it can be stated that land value change was largely determined by the extent of changes in the analyzed features of parcels of land, such as their size, shape, and access to a road. An important aspect was also the varying extent to which the analyzed features impacted land value in different municipalities.

Changes in land value as a result of consolidation projects can be treated as one of the effects included in a direct economic analysis of the costs and benefits of consolidation project implementation. They can also be viewed in social terms as a long-term factor impacting the development directions of a given locality and landowners' decisions about land uses or sales.

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WZROST WARTOŚCI RYNKOWEJ ZIEMI JAKO EFEKT REALIZACJI PROJEKTÓW SCALENIOWYCH

STRESZCZENIE

Cel: Ekonomiczny efekt w postaci wzrostu wartości rynkowej gruntów rolnych jest czynnikiem zwykle pomijanym w ocenie projektów scaleniowych, choć należałoby się go spodziewać jako następstwa zabiegów porządkujących strukturę przestrzenną działek. Dążąc do wypełnienia luki w badaniach naukowych podejmowanych w tym zakresie, autorzy artykułu zrealizowali projekt, którego celem była identyfikacja i określenie w wymiarze kwotowym oraz procentowym potencjalnych zmian wartości gruntów w wyniku wykonanych projektów scalenia gruntów. **Metody:** W opracowaniu wykorzystano dane z 9 projektów scalenia gruntów zrealizowanych w Polsce w okresie od 2007 do 2013 roku oraz wyniki modelu sztucznej sieci neuronowej opracowanego w ramach analiz statystycznych rynków nieruchomości rolnych dla gmin, w których przeprowadzono projekty scalenia gruntów. **Wyniki:** Z przeprowadzonych badań wynikało, że w efekcie scalenia dochodzi do wyraźnego wzrostu wartości rynkowej gruntów rolnych, a uwzględnienie tego faktu znacząco poprawiłoby bilans kosztów i korzyści realizowanych projektów scaleniowych. Wzrost ten zawierał się w przedziale od 1,2% do nawet 28,4%. **Wnioski:** Efekt wzrostu wartości gruntów rolnych byłby poważnym argumentem w procesie oceny opłacalności realizacji projektów scaleniowych. Wzrost wartości ziemi jako ekonomiczny i społeczny efekt scaleń gruntów zwiększa prawdopodobieństwo ożywienia lokalnych rynków nieruchomości przyczyniając się do wzrostu zamożności i zdolności kredytowej właścicieli tych gruntów. Zdaniem autorów opracowania, eksponując ten skutek można zwiększyć społeczne zainteresowanie i poparcie dla realizacji projektów scaleniowych, które są bardzo ważnym krokiem na drodze do odnowy i aktywizacji wsi.

Słowa kluczowe: scalanie gruntów, wartość rynkowa gruntów, metody statystyczne, wycena gruntów, sieci neuronowe

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PUBLIC SECTOR WAGE PREMIUM IN POLAND: A HUMAN CAPITAL APPROACH

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ABSTRACT

Aim: The aim of the article is to estimate the value of the public sector wage premium. It is an important issue both in the area of wage management in an organization and labor market performance. **Methods:** The research method is based on measuring the rates of return on human capital in the public and private sectors. It assumes that human capital is a function of the cost of living, education, and work experience. The average value of human capital was calculated in a model sample of employees in the public, private, and total sectors in each of the analyzed periods. In order to calculate the rate of return, its value was compared with the average wage in each of the sectors. **Results:** The results indicate the existence of a small average negative public sector wage premium in Poland. However, in some periods, the observed wage gap widens significantly, reducing the wage competitiveness of the public sector. The results of measuring the return on human capital of employees of both sectors is about 8% per year. **Conclusions:** The paper's findings can be used to optimize the wage policy and analyze wage competitiveness in public sector entities. The paper contributes to the sector wage differentials literature by developing an original methodology based on a human capital rate of return and also contributes to the research paradigm on normative return on capital. Findings in the second field are consistent with the concept of an 8% economic constant of potential growth.

Keywords: sectoral wage premium, public sector, wage differentials, private sector, human capital, rate of return on human capital, economic constant of potential growth

JEL codes: J24, J31, E24

INTRODUCTION

The ability to divide the public and private sectors is what distinguishes modern economies. The characteristics of the goods and services provided by these industries, as well as how they are funded, serve as the axis around which these economic sectors are divided. These variations have a significant effect on how the hiring process is structured in both industries. The impact of the public sector is different from that of the private sector. According to Dobrzański [1992], in the case of private companies, it is the impact on material objects. On the other hand, a public sector entity affects people and society, which is usually associated with higher complexity of the implemented organizational processes. This means that public sector employees face higher requirements in terms of qualifications, responsibility, and often a sense of professional mission. As a result of such significant differences in the specificity of functioning of both sectors, the question

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arises about the level of wage competitiveness (i.e., the level of remuneration in the public and private sectors). According to the neoclassical economic theory, the labor market performs an allocative function, balancing demand and supply in all labor market segments. However, as pointed out by Pigou [1933], the automatism of market processes requires certain conditions: 1) labor market participants act in accordance with the principle of rationality, striving to maximize their own benefits; 2) there is a large number of entities on the labor market that do not have the power to interfere in the market mechanisms; 3) the labor market is perfectly transparent and its participants have entire and always up-to-date market information; 4) homogeneity of the labor market (i.e., homogeneity of jobs and employees' qualifications); 5) the labor force is characterized by perfect occupational and spatial mobility, and wages have perfect flexibility from the point of view of sensitivity to changes in the relation between demand and supply in the labor market. These conditions are often collectively described as labor market mobility because the last of the postulates is largely dependent on the fulfillment of the previous ones. A perfectly mobile labor market does not assume the existence of a wage premium (positive or negative) in any sector.

The issue of the wage gap between the public and private sectors at the national and even international levels is a frequently discussed topic in economic research. The results of some studies indicate the presence of a positive wage premium for employment in the public sector (e.g., in the Netherlands [Hartog and Oosterbeek 1993], Germany [Melly 2005], Canada [Mueller 1998], Scotland [Heitmueller 2006], Ireland [Foley and O'Callaghan 2010, Flannery and Turner 2019], Italy [Dell'Aringa et al. 2007], Greece [Papapetrou 2006], Spain [Antón and Muñoz de Bustillo 2015], and Turkey [San and Polat 2012]). The common feature of these countries is that they belong to the group of developed countries. Different results were found when analyzing the wage premium in less developed countries or in economic transition. Studies conducted for the Czech Republic [Flanagan 1995], Russia [Brainerd 2002], Hungary [Lausev 2012], and Estonia [Leping 2005] indicate the existence of a negative public sector wage premium.

In many countries with a low level of economic development, the informal sector is a significant and sometimes dominant employer. In this case, it is reasonable to separate the area of wage analysis in the private sector into the formal and informal sectors. The results indicate that – in countries such as Brazil, Mexico, South Africa [Bargain and Kwenda 2014], India [Glinskaya and Lokshin 2007], and Egypt [Shahen et al. 2020] – the highest level of wages is in the public sector and the lowest in the informal sector.

The Polish economy was also the subject of research on the public sector wage premium. Research indicates that in 1996, wages were significantly higher in the private sector. This effect was particularly visible in the case of employees with higher education, where the pay gap reached 20% [Adamchik and Bedi 2000]. Socha and Weisberg [2002] came to similar conclusions when estimating the negative 10% public sector wage premium in 1995. Later research led to a certain decline in the negative wage premium to 4.7% in 2010 [Grotkowska and Wincenciak 2014, Grotkowska 2016].

The authors of all the cited studies noted significant differences in the qualifications of employees in the private and public sectors, making it impossible to compare average salaries in sectors. To eliminate this problem, methods based on data decomposition are used. The literature on wage gap offers various decomposition methods, ranging from parametric (e.g., Oaxaca - Blinder [Blinder 1973, Oaxaca 1973]) and semi-parametric [DiNardo et al. 1996], to non-parametric methods (e.g., propensity score matching method [Rosenbaum and Rubin 1983]). This methodology not only allows for estimating a possible wage premium in a given sector, but also enables an in-depth comparative analysis of remuneration for individual groups of employees. Most of the cited studies indicate that in developed countries, low-skilled workers receive lower wages in the private sector than in the public sector. Conversely, highly skilled workers earn more in the private sector.

This paper presents a different method of examining cross-sector differences in wage levels. This method assumes measuring the rates of return on the human capital of employees of the surveyed sectors.

The rate of return is defined as the relationship between the remuneration received by an employee and the value of their human capital. Employee qualifications can be valued in monetary units by using a suitable human capital measuring model. In this way, such a research approach makes it possible to solve the issue of differences in the level of education between employees of the analyzed sectors.

The aim of the article is to calculate the level of the public sector wage premium in Poland over the last several years. Research on the pay gap between the public and private sectors falls under the area of research on labor resource mobility. Identifying significant differences may lead to the conclusion that there are either significant barriers to labor resource mobility or non-wage benefits from employment that compensate for the observed wage gap. Additionally, calculating the rate of return on human capital for a wide range of data contributes to the scientific discussion on norms and the nature of rates of return on capital and human capital. The part describing the method of measuring human capital has a short outline of research in that field.

The article consists of four parts and a conclusion. The first part is an introduction, which outlines the issue of wage differences between sectors of the economy – in particular, between the public and private sectors. The second part presents the specificity of work and employment in the public sector in Poland. Specifically, the scope of this sector, working conditions, competency requirements for employees, and the level of remuneration are briefly discussed. The third part is methodical. The presentation of the method for measuring the rates of return on human capital in individual sectors required, first and foremost, the specification of the method of human capital valuation and the provision of the necessary data for a reliable measurement. The fourth part presents the research results, while the last part contains conclusions, including a discussion of the empirical research results and conclusions regarding the research method used, as well as suggestions for its improvement and further application in analyses.

CHARACTERISTICS OF EMPLOYMENT IN THE PUBLIC SECTOR IN POLAND

According to the Polish statistical classification used by Statistics Poland (formerly the Central Statistical Office), the public sector is defined as all entities of the national economy that group together state property, specifically the state treasury and state legal persons, ownership of local government units or local government legal persons, and mixed ownership – with a predominance of capital of public sector entities. Over 20% of people are employed in the public sector in Poland. Since the economic transformation that began in the early 1990s, the public sector's employment share has been declining. The first stage of the transition saw the biggest decline in the number of workers in this industry, and since 2011, it has stabilized at a level of about 3.4 million people. After 2011, the proportion of workers in the public sector decreased as a result of an increase in the overall workforce, combined with a relatively stable number of workers in this sector (Table 1).

According to the data in Table 1, the employment structure in Poland in the analyzed period tended

Table 1. People working in Poland by ownership sector in the years 1995–2020

Year	total employment	public sector employment		private sector employment	
	thous. pers.	thous. pers.	share in%	thous. pers.	share in %
2020	16 021.4	3 399.4	21.22	12 622.0	78.78
2019	16 120.6	3 423.4	21.24	12 697.1	78.76
2018	15 949.7	3 403.7	21.34	12 546.0	78.66
2017	15 710.8	3 371.3	21.46	12 339.5	78.54

Table 1. (cont.)

Year	total employment	public sector employment		private sector employment	
	thous. pers.	thous. pers.	share in%	thous. pers.	share in %
2016	15 293.3	3 356.3	21.95	11 937.0	78.05
2015	14 829.8	3 343.6	22.55	11 486.2	77.45
2014	14 563.4	3 377.1	23.19	11 186.3	76.81
2013	14 244.3	3 375.0	23.69	10 869.3	76.31
2012	14 172.0	3 427.0	24.18	10 745.0	75.82
2011	14 232.6	3 496.5	24.57	10 736.1	75.43
2010	14 106.9	3 570.7	25.31	10 536.2	74.69
2009	13 782.3	3 606.5	26.17	10 175.8	73.83
2008	14 037.2	3 621.2	25.80	10 416.0	74.20
2007	13 771.1	3 619.8	26.29	10 151.3	73.71
2006	13 220.0	3 635.3	27.50	9 584.7	72.50
2005	12 890.7	3 660.4	28.40	9 230.3	71.60
2004	12 720.2	3 695.6	29.05	9 024.6	70.95
2003	12 640.7	3 780.2	29.90	8 860.5	70.10
2002	12 803.3	3 905.1	30.50	8 898.2	69.50
2001	14 995.6	4 027.7	26.86	10 967.9	73.14
2000	15 488.8	4 318.1	27.88	11 170.7	72.12
1999	16 008.9	4 656.0	29.08	11 352.9	70.92
1998	16 267.1	5 017.3	30.84	11 249.8	69.16
1997	16 294.5	5 426.5	33.30	10 868.0	66.70
1996	15 841.9	5 767.0	36.40	10 074.9	63.60
1995	15 485.7	5 979.7	38.61	9 506.0	61.39

Source: own elaboration based on Statistics Poland data [GUS 2011 GUS 2021a].

to be similar to the proportions found in developed countries and the OECD. According to statistical data, the main employer in this group of countries is the private sector, employing – on average – 79% of the working population, while the rest is employed in the public sector [ILO News 2018]. The public sector greatly impacts the labor market, economic growth, and the shape of public finances.

The quantity and composition of wages paid to Poland's 3.4 million public sector employees have a significant impact on both the private and public sectors of the labor market. In particular, it is affected by wage-setting mechanisms in the public sector. In turn, the quality of public services provided shapes the institutional environment in the country and, thus, affects both the living conditions of the society and the efficiency and productivity of the economy. Numerous theories in the area of wage motivation and behavioral aspects of remuneration indicate that one of the conditions for ensuring the expected quality of products and services is the appropriate level of employee involvement. These mechanisms are also applicable in the public sector.

Wages and salaries in the public sector are largely financed from the central budget and the budgets of local government units. Therefore, their amount affects the shape of public finances. The key factor in maximizing the relationship between the quality of the public product and the costs of functioning of the

Table 2. Educational percentage structure of employees in the private and public sectors [%]

	2006			2012			2022		
	total	**public**	**private**	**total**	**public**	**private**	**total**	**public**	**private**
Higher education (tertiary)	22.3	40.2	16.5	30.1	50.6	24.7	36.8	59.3	29.7
Vocational secondary	29.9	31.6	30.8	27.8	25.8	28.3	27.3	21.9	29.6
General secondary	8.1	7.2	9.4	8.5	6.3	10.3	9.4	6.6	10.8
Basic vocational	30.4	16.9	35.6	26.9	14.3	30.4	22.0	10.2	24.9
Primary	9.4	4.1	7.6	6.7	2.9	6.3	4.5	2.1	5.1

Source: own elaboration based on Statistics Poland data [GUS 2011, 2021a].

public sector (and, thus, the level of taxation) is to find a balance between the four functions of wages: cost, income, motivation, and social.

The higher level of complexity of work in the public sector is an additional factor of high expectations on employees in terms of education and other skills, such as knowledge of foreign languages. In this sector, there is also the majority of statutorily regulated professions, where the necessary qualifications are defined by law [Czajka 2009]. The data in Table 2 confirms this observation. The share of employees with tertiary education is higher in the public than in the private sector. In 2006, this share was 2.5 times higher, while in 2012, this ratio decreased to two times and remained at this level in 2022.

Wage-setting mechanisms in the public sector often differ from those in the private sector, mainly due to the specific mission of entities in this sector. These units are usually not focused on maximizing the increase in equity or profit but, most often, their goal is to provide public goods and services and achieve social or political goals. According to the data of Statistics Poland, the majority of employees in the public sector are employees of public administration and national defense, social security, education, as well as health care and social assistance. Some progress in privatization is also noticeable in such sections as education or health care. Between 2011 and 2020, the share of the public sector in these sections decreased by about 10 p.p. [GUS 2011, GUS 2021a]. The domination of the public sector in these sections means that non-market mechanisms, mainly political ones, determine the amount of remuneration. The public sector also includes commercial companies with a total or predominant share of public ownership. These businesses typically deal with the provision of public goods and services, such as energy, water, and municipal transportation. As such, they carry out operations targeted at maximizing the ratio of product quality to price – making a profit is only secondary.

Remuneration in the public sector depends on how wage funds are shaped in units. In the state budgetary units, these funds come directly from the state budget, while entities outside this sphere have a certain degree of freedom in this area as they must organize funds for salaries on their own. However, this flexibility appears to be restricted because these units mostly carry out duties for the public and have little influence on the total amount of money received for the services rendered. Public sector organizations have similar limitations. Despite being in the market, these units' missions make it challenging to maximize profits and expenses. For example, a communal transport company should provide all necessary local connections, regardless of their profitability and, at the same time, is limited by the ticket price list adopted by the commune council.

Remuneration in the public sector is characterized by less volatility and little pressure to make it dependent on market realities such as market wages, market conditions, or productivity of a given unit. This is impacted not just by the previously noted uniqueness of the goods and services provided, but also by elements

like increased unionization and laxer ownership oversight, as well as social wage control [Czajka, 2009].

The principles of formulating remuneration in the public sector are described in numerous legal acts, which makes them formal and complex. First of all, the remuneration system in the public sector is multi-component. In addition to the basic pay and the mandatory components provided for by labor law, employees may receive numerous fixed components of pay such as seniority pay, an annual bonus (the so-called "thirteenth salary"), a jubilee bonus, and – in the case of defense services such as the police or fire department – a rank allowance. Employment in the public sector is associated with a higher level of social security. In the public sector, almost 100% of people are employed based on an employment contract, while in the private sector, this percentage does not exceed 60%. The remaining part of private sector employees perform work as part of individual business activity or on the basis of civil law contracts [GUS 2021b]. This fact means that salaries in the public sector are, to a greater extent, burdened with tax and insurance contributions. As a result, net standard salaries seem lower compared to the private sector. The data analysis presented in Table 3 clearly indicates a higher level of gross wages in the public sector.

The sufficiency and competitiveness of pay in the public sector are called into question by a quick examination of the unique nature of work and compensation in this sector. The public sector has an edge, as demonstrated by a straightforward comparison of average salaries in the public and private sectors. It is necessary to consider the disparities in the educational attainment of workers in both industries in order to obtain more reliable conclusions. The further part of the article presents a human capital measurement model that allows the quantification of employee qualifications in monetary units. The next step is to calculate the relationship between the remuneration and the value of employees' human capital in both sectors.

Table 3. Average gross monthly salary (in PLN) in public and private sectors in Poland in 2006–2020

Year	Average gross monthly salary [PLN]			Public/private [%]
	public	private	total	
2020	5 893.61	4 969.88	5 167.47	118.59
2019	5 511.11	4 695.06	4 918.17	117.38
2018	5 105.29	4 390.91	4 585.03	116.27
2017	4 796.06	4 081.07	4 271.51	117.52
2016	4 615.61	3 823.66	4 047.21	120.71
2015	4 482.55	3 664.68	3 899.78	122.32
2014	4 366.30	3 517.30	3 783.46	124.14
2013	4 249.19	3 389.76	3 650.06	125.35
2012	4 120.72	3 245.55	3 521.67	126.97
2011	3 978.80	3 129.86	3 399.52	127.12
2010	3 770.19	2 952.35	3 224.98	127.70
2009	3 607.05	2 846.72	3 102.96	126.71
2008	3 407.23	2 709.57	2 943.88	125.75
2007	3044.96	2 470.65	2 672.58	123.25
2006	2 823.49	2 272.09	2 475.88	124.27

Source: own elaboration based on Statistics Poland data [GUS 2021b].

RESEARCH DESIGN

The analysis of the public sector wage premium in Poland, due to the small share of the informal sector, may be limited to a comparison with the formal private sector. According to Statistics Poland [GUS 2018], unregistered work (informal sector) is performed by 5.4% of employees. 53% of this group declare unregistered work as additional employment. Unregistered work is marginal in terms of the amount of work performed; only 6.8% of those working in the informal sector declare working more than 90 days a year, while 28% work up to 5 days a year.

HUMAN CAPITAL MODEL

The aim of the article is to calculate the level of human capital remuneration, which is defined as the relationship between the salaries received by employees and the level of employees' human capital. The general capital model, which distinguishes between homogeneous and heterogeneous capital, is the foundation for the human capital model employed in this article. It is founded on key accounting principles, the most significant of which is asset-capital dualism. Assets are a carrier of capital, and the value of assets determines capital value. The value of capital is a dynamic category that changes over time. A general model of capital developed by Dobija can be presented with the following formula [Dobija 2007]:

$$C_1 = C_0 e^{(p - s + m)t} \quad (1)$$

Where: C_1 – the value of capital on t-moment, C_0 – the initial value of capital, p – economic constant of potential growth, s – natural diffusion of capital, m – managerial actions variable, t – time variable.

This model assumes the separation of three forces affecting the value of capital:

- natural diffusion of capital (s). Natural destructive forces affect objects containing capital, causing a random decrease in its value;
- managerial activity (m), such as factors preserving from natural diffusion of capital value;
- the impact of natural growth potential (p).

An economic constant of potential growth (p) is the most important factor that positively affects the value of capital. Studies on capital market rates of return [Kurek 2009], agricultural product pricing assessments [Kucharczyk and Cieslak 2005], rates of return on human capital [Kozioł 2011], and wage expectations surveys [Kurek and Górowski 2020] have all been undertaken. The findings show that the natural rate of return on capital is valued at roughly 8% annually. The similarity of the obtained results allowed determining this factor as the economic constant of potential growth. As a result of these three factors, the initial value of capital (C_0) may increase or decrease. In extreme cases, the value of capital can be completely dispersed. Another implication of the presented model is the fact that the value of capital has its source in the initial capital and periodic increases due to managerial activity and impact of the economic constant (p).

Human capital is understood as capital embodied in human resources. Capital determines an employee's ability to perform productive and creative work. As an object performing work, a human must have skills and a body which are a physical carrier of these skills. The human capital value is the derivative of the socially justified level of the costs of obtaining these skills, like the costs of education, but also takes into consideration the cost of living – which is necessary for the proper development of the human body. The costs of living are incurred from birth until humans gain sufficient readiness to perform a given profession. In Formulas (2) and (3), the costs of education and living constitute initial capital (*HC0*). The cost is usually covered by parents. When a person grows up, all three factors affect the value of human capital. The management factor (m) is primarily the activity of parents. It aims to reduce or compensate for destructive forces (s). For example, due to the parents' decision or random events, the real living costs significantly exceeded the normative costs. In this case, the additional amount of cost of living is not socially and economically justified; the market will not recognize these costs as an extra value.

Therefore, these additional costs do not enhance the value of human capital. The same principle holds true for the expenses associated with professional

education. If a young individual's physical development aligns with current standards and they have achieved their desired level of education, it signifies that the challenges of natural capital diffusion (random losses *s*) have been successfully addressed (balanced) by the efforts and choices made by their parents (*m*). Thus, the ultimate value of human capital (HC_1) after $t = x$ years can be presented in the following formula [Dobija 2015, Kozioł and Mikos 2020]:

$$HC_1 = HC_0 e^{p\,t} \tag{2}$$

Finally, human capital can be described as a function of initial outlays and an 8% economic constant of potential growth. The human capital model requires operationalization. According to this model, the value of human capital consists of three components: capitalized costs of living (*K*), capitalized costs of education (*E*), and human capital from gained professional experience (*D*). Supplementary formulas present the process of constitution of human capital from the cost of living (*K*) and education (*E*) [Dobija 2015, Kozioł and Mikos 2020]:

$$HC = K + E + D \tag{3}$$

With annual capitalization of costs, the individual components of human capital can be represented by the following formula:

$$K = k \cdot 12\,\frac{ep - 1}{p} \tag{3a}$$

$$E = e \cdot 12\,\frac{ep - 1}{p} \tag{3b}$$

k – monthly costs of living, *e* – monthly education costs, *p* – 8% economic constant of potential growth, *t* – capitalization time.

Gaining experience in the work process can be illustrated based on the concept of the learning curve. It assumes a diminishing increase in the ability to perform work with the following professional cycle. When a person performs activities familiar to them, repetition increases their efficiency in performing them. However, during subsequent repetitions, the increases are smaller and smaller. This relationship can be expressed on a logarithmic scale, which leads to the simple function presented by Blackburn in 1936 [Anderson 1985]:

$$Y_i = a\,i^{-b} \tag{4}$$

Where: *Yi* – efficiency of task performance, *i* – number of repetitions, *a*, *b* – learning parameters.

In the management area, the above formula represents the average labor cost of (*i*) units of product. In the case of the production of the first unit, the equality $Y_1 = a$ occurs. Taking into account this observation and replacing the number of products with the number of years of work, as well as the fact that the labor cost of performing a given task indicates an increase in the employee's ability to perform work, an experience factor formula was developed representing the increase in human capital as a result of performing work [Dobija 2005]:

$$Q(T) = 1 - T^{\frac{ln(1-w)}{ln2}} \tag{5}$$

where: $Q(T)$ – experience factor, w = learning factor, T = years of professional experience, $T>1$

Therefore, it can be assumed that the employee will perform the same work in the following year by (*w*) percentage more easily, but this increase will be smaller every year. This additional value of human capital from gained experience (*D*) is a function of the initial value of human capital (i.e., human capital at the beginning of a professional career (no experience)):

$$D = (K + E)(Q(T) \tag{6}$$

$$HC = K + E + D = (K + E)(1 + Q(T)) \tag{7}$$

DATA AND RESEARCH METHOD

Calculating the average rate of return on human capital employed in the analyzed sectors of the economy requires comparing the average salary recorded in a given year in the surveyed region (i.e., country) with the average value of human capital of employed persons (estimated for that year). Data on the average wage broken down by the private and public sectors is published annually by Statistics Poland (Table 3). Calculations require the average value of human capital employed in both sectors. In the previous part of the paper, the model of individual human capital was characterized as a derivative of the cost of living, education, and time of professional experience. It is the value of individual human capital, so each employee is the subject of the

model calculation. Calculation of the average value of human capital will require an analysis of the distribution of arguments affecting the value of human capital. As presented in the previous section, human capital consists of three components: capitalized cost of living (K), capitalized cost of education (E), and capital from work experience (D).

The cost of living is capitalized in the period from the birth of the employee until they are ready to work (i.e., until they complete the planned educational path). Table 4 shows the period of capitalization of living costs depending on the educational path planned by the employee. This period results from the education standards in Poland. The cost of living standard used in the calculation is the social minimum, reported regularly by the Institute of Labor and Social Affairs [IPiSS] on a regional and national basis. The value of the social minimum per person in a four-person household is used for the calculations. In Poland, education is free, but in the case of higher education, there are additional costs resulting from living in another city or purchasing teaching materials. During interviews with students of selected faculties, these costs were estimated to be half the cost of living. The time of capitalization of these costs is equal to the duration of studies (i.e., according to the standard adopted in Poland) is 5 years (Table 4).

The capital from work experience is a function of the period of professional work and the learning factor. This coefficient depends on the complexity of the work performed. This is indicated by the research of Hirschmann [1964], which concludes that the more complex task leads to the greater rate of learning and "the rate of learning can be sufficiently regular to be predictive". Many empirical studies confirm this observation.

Investigating the learning effects of employees engaged in the order picking process in online stores has indicated an average individual annual learning rate of 0.07 [Grosse and Glock 2013]. Similar results are obtained in research on the learning rate of manual workers on an assembly line. The estimated learning rate was 0.085 [Pasquale et al. 2016]. In contrast, in Israeli kibbutz farms, the absence of complex tasks led to a learning rate of below one percent [Barkai and Levhari 1973]. Some indirect data for estimating the learning rate provides research on the relation between the salaries of IT professionals and tenure profiles [Slaughter et al. 2007]. Based on this data, one can estimate the learning rate range to be about 0.05–0.15, depending on the specificity of performed IT job. On the basis of research in this area, including my own research [Kozioł 2016], ranges of the learning coefficient were defined for each level of professional education (Table 4). It was assumed that more complex work is usually performed by people with a higher level of education.

Table 4. Parameters used to calculate the model distribution of human capital among the economically active persons in Poland

Parameter	Higher education	Vocational secondary	General secondary	Basic vocational	Primary
k – monthly costs of living	They are provided by the Institute of Labor and Social Affairs				
$t(k)$ – capitalization time of living cost	24 years	20 years	19 years	18 years	16 years
e – monthly education costs	Assumed to be half the cost of living.				
$t(e)$ – capitalization time of education cost	5 years	0	0	0	0
w – learning factor	0.08–0.12	0.05–0.07	0.04–0.06	0.03–0.05	0.01–0.02

Source: own study.

Table 5 presents an exemplary distribution of public sector employees in 2012. The decomposition procedure is a three-stage process. In the first, employees were divided according to the level of education, then divided equally according to the adopted values of the learning factor (w). For example, the learning factor range for employees with higher education was 0.08–0.12. There are five classes of values, so the percentage of employees with tertiary education was divided into five equal parts (subclasses). Each was assigned to each of the five values of the learning factor. In the third and final stage, the employees were divided into sub-subclasses representing the number of years of professional experience. It was assumed that the period of professional experience was evenly distributed, which means that the size of these classes is equal. In Poland, the retirement age is 65 for men and 60 for women. Because men slightly outnumber women in the labor market, the maximum employee age was set at 63 years. Under the assumption that individuals with higher education typically commence work at the age of 24, employees from this educational background, distributed across the five ranges of the learning factor, are evenly assigned to 39 groups based on professional experience (calculated as 63–24 years).

In the case of the analysis of capital from professional experience, further simplifications of the model can be applied because a significant increase in human capital from experience occurs in the first years of a professional career and decreases in later years. As an illustration, consider an individual with higher education, for whom the job's complexity justifies the application of a learning factor of 0.1. Over the initial five years of employment, the overall increase in human capital, attributed to the development of the experience component, amounts to 21.7%. Over the next five years, human capital grows by only 6.4%.Table 5 presents data on the structure of education and experience of public sector employees in 2012. Among 1,000 employees in the public sector in Poland, 506 people had higher education, 258 had vocational secondary education, 63 had general secondary education, 146 had basic vocational education and 29 had primary education. The information from Table 4 is used to determine the worth of each employee in each of these five employee classifications. The first step is to compute the human capital for an individual without professional experience. This is capital that may be divided into two categories: education (E) and the capitalized cost of living (K). The computation results for each of the examined periods, divided down by educational groups, are shown in Table 6. Then, using Formulas (6) and (7), the third component of human capital, experience capital (D), may be computed for each sub-subclass having the same level of education, learning factor, and job experience.

The experience factor (Q(T)) presented in the previous part of the article is a function of professional experience expressed in years of work (T) and learn-

Table 5. The number of individual groups of employees by education and work experience per 1,000 employees in the public sector in 2012 and their breakdown by the value of learning factor

Education level	Higher education (tertiary)					Vocational secondary			General secondary			Basic vocational			Primary	
Size of classes	506					258			63			146			29	
Value of learning factor	0.08	0.09	0.10	0.11	0.12	0.05	0.06	0.07	0.04	0.05	0.06	0.03	0.04	0.05	00.1	00.2
Size of subclasses	101.20	101.20	101.20	101.20	101.20	86.00	86.00	86.00	21.00	21.00	21.00	48.67	48.67	48.67	14.5	14.5
Size of sub--subclasses	$2.59 = \frac{101.20}{39}$					$2.00 = \frac{86}{43}$			$0.48 = \frac{21}{44}$			$1.08 = \frac{48.67}{45}$			$0.31 = \frac{14.5}{47}$	

Source: own study.

ing factor (w). It can be stated that in the presented sample of 1,000 public sector employees in Poland in 2012, one of the sub-subclasses is 2.59 persons with higher education, as well as the same learning factor value (from range 0.08–0.12 – e.g., 0.1) and years of professional experience (from range 0–39, – e.g., 15).

In this way, the sample's average value of human capital is calculated using data on educational percentage structure, partially presented in Table 2, for consecutive years (Table 6). In the next step, the average value of human capital is compared with the average wage in this sector. Data on average salaries is reported annually by Statistics Poland. The relation between the average salary and the average value of human capital is the rate of return on human capital (Table 7). It should also be taken into account that Polish law requires the employer to pay part of the cost of the employee's compulsory social insurance in addition to the gross salary. This part of the insurance costs 21% of the gross salary. Social insurance is an element of direct material benefit obtained by the employee, so it is understood as part of their remuneration. As a result, when calculating the rate of return on human capital, the average salary rate should be increased by 21%. When conducting research in other countries, national solutions in the pay structure should be identified at this stage.

To fulfill the objectives of the study, it is recommended to prepare forty-five samples, each consisting of 1,000 individuals, in a systematic manner. This is necessary due to the analysis period spanning 15 years (from 2006 to 2020) and encompassing both the public and private sectors, as well as the entire economy (denoted as 'total' in tables).

Table 6. The value of human capital of an employee with no professional experience (starting a career) in particular years, depending on education (in PLN)

Year	Social minimum per person in a 4-person household	Value of human capital per employee without work experience					Average value of human capital		
		higher education (tertiary)	vocat. second.	general second.	basic vocat.	primary	total	private	public
2006	626.55	570 049	371 439	335 659	302 630	243 994	445 474	401 347	534 512
2007	646.78	588 455	383 432	346 497	312 401	251 872	465 298	424 542	549 228
2008	685.39	623 583	406 321	367 181	331 050	266 907	493 593	449 634	587 565
2009	709.81	645 801	420 798	380 264	342 845	276 417	521 470	474 018	622 023
2010	754.64	686 588	447 375	404 280	364 499	293 875	574 561	524 060	678 354
2011	805.37	732 743	477 449	431 458	389 002	313 630	619 335	568 781	729 447
2012	844.75	768 572	500 795	452 555	408 023	328 966	648 917	604 172	775 037
2013	862.49	784 712	511 312	462 058	416 591	335 874	675 145	623 029	804 410
2014	852.27	775 414	505 253	456 583	411 655	331 894	677 384	624 342	804 552
2015	855.39	778 253	507 103	458 255	413 162	333 109	680 587	633 466	809 535
2016	872.32	793 656	517 139	467 325	421 339	339 702	699 589	654 712	827 391
2017	908.23	826 328	538 428	486 562	438 684	353 687	732 259	688 236	873 761
2018	932.46	848 373	552 792	499 543	450 388	363 122	755 671	709 978	906 220
2019	972.55	884 847	576 559	521 020	469 751	378 734	795 232	747 503	948 120
2020	1 013.6	922 196	600 895	543 012	489 579	394 720	826 340	782 675	997 380

Source: own study Social minimum (cost of living) value is provided by the Institute of Labor and Social Affairs.

MAIN FINDINGS

The analysis of the rate of return on human capital in the economic sectors indicated that in each of the analyzed periods, there was a negative public sector wage premium. The value of the wage premium ranges from –0.9% (2011) to –9.8% (2018), reaching an average value of –4.8% in the analyzed period (Table 7). A certain cyclical nature of the dynamics of this value is clearly visible (Fig.1). Until 2016, the wage premium had a notably low value, averaging at –3.5% from 2006 to 2016. However, since 2017, there has been a significant increase in the negative wage premium. Between 2017 and 2020, the average value of the wage premium plummeted to –8.1%.

The identified wage gap can be partly justified by non-wage benefits accompanying employment in the public sector. First of all, there is greater employment stability.

However, the consistent level of these benefits during the analyzed period leads to the conclusion that justifying the higher level of the negative wage premium observed in the last four years with non-wage benefits is challenging. The enduring existence of a wider wage gap could be attributed to certain obstacles to inter-sectoral mobility. The documented rise in wage disparities may result in reduced wage competitiveness within the public sector, influencing the career choices of young professionals. If wage differences continue to increase, it could potentially facilitate the gradual removal of barriers to cross-sector mobility, allowing for the transition of specific employee groups to the private sector.

The calculated value of the rate of return on human capital is also a significant contribution to the study of return on capital norms. Its value has certain dynamics and sectoral differentiation, but its value is about 8% per year (Fig. 1). This observation is consistent with the research on the natural rate of return on capital cited in the third part. These studies also concern human capital, characterized by the fact that its carrier is not traditional assets, but employees. Due to the convergence of the obtained results within this research paradigm, the calculated rate of return on capital is called the economic constant of potential growth. Research indicates that human capital remuneration at this 8% constant level is optimal for employees and a sustainable economy [Dobija 2015]. Wages that are too low may result in reproduction problems and the long-term development of human capital in society. However, its excessive value may cause inflation.

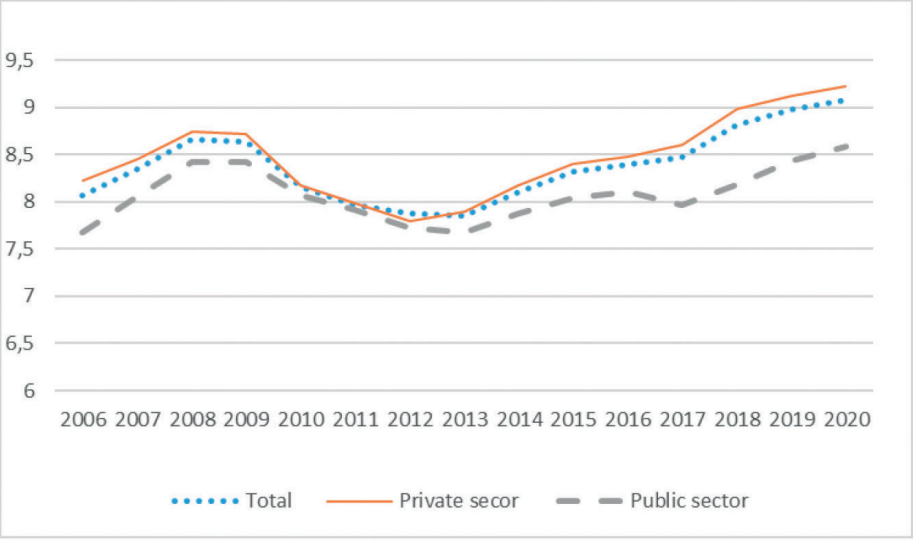

Figure 1. Dynamics of rate of return on human capital in Poland by economic sectors in 2006–2020
Source: own study.

CONCLUSIONS

The research indicates that in the analyzed period, the bonus for employment in the public sector is –4.8%. Its value should be considered low; however, the analysis of dynamics shows an upward trend, which may suggest a decrease in the wage competitiveness of the public sector in Poland. The obtained results are largely consistent with the results of the previous studies. Research [in this field] for Poland was carried out using decomposition methods. Results showed that in the 1990s, there was an approximately 10% negative wage premium for employment in the public sector [Adamchik and Bedi 2000, Socha and Weisberg 2002]. Later research led to a certain decline in the negative wage premium to 4.7% in 2010 [Grotkowska and Wincenciak 2014, Grotkowska 2016]. It should also be noted that a different, original method of analyzing the wage difference was used in the study. Instead of wage decomposition, the rate of return on the human capital of employees of the surveyed sectors was measured. The obtained results also contribute to the research on identifying the natural, fair rate of return on capital. According to the research results, its value is 8% per year.

The research method developed, and the results obtained are a contribution to further research areas.

It may encompass the economies of other nations, although it is crucial to acknowledge that in the context of developing countries, the private sector should be delineated into formal and informal segments. Within this category of countries, the informal private sector typically constitutes the largest employer of the workforce, followed by the public sector, while the formal private sector employs the fewest individuals. In addition, an in-depth analysis of the structure of wage differences between individual employee groups in the public and private sectors or between industry sections of the economy can be carried out.

The main limitation of the presented method is the availability of reliable and regularly presented statistical data. The calculations are influenced by the precision of the estimation of the data used to calculate the value of human capital, particularly the value of the cost of living and education. In Poland, there is a reliable and regularly calculated social minimum, and such data is not always available in other countries. The cost of living often published on economic websites does not meet the accounting definition of cost, particularly the criteria of objectivity and necessity.

An attempt to evaluate the non-wage benefits of employment may be a particularly interesting research thread. If the negative bonus from employment in the public sector is an element of equilibrium in the labor market, the natural hypothesis is that non-wage benefits compensate for the wage gap.

The analysis of the dynamics of the rate of return on human capital indicates its increase in the years 2013–2020. At the end of the analyzed period, its value slightly exceeded 9%. This may mean an excessive level of remuneration in the scale of the economy. The long-term persistence of excess levels may be one of the reasons for inflation, which has been growing dynamically in Poland since 2020.

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PREMIA PŁACOWA Z TYTUŁU ZATRUDNIENIA W SEKTORZE PUBLICZNYM W POLSCE: PODEJŚCIE OPARTE NA POMIARZE KAPITAŁU LUDZKIEGO

STRESZCZENIE

Cel: Celem artykułu jest oszacowanie wartości premii płacowej tytułu zatrudnienia w sektorze publicznym. Jest to istotną kwestią zarówno w obszarze zarządzania płacami, jak i funkcjonowania rynku pracy. **Metody:** Metoda badawcza opiera się na pomiarze stóp zwrotu z kapitału ludzkiego w sektorze publicznym i prywatnym.

Zakłada, że kapitał ludzki jest funkcją kosztów utrzymania, wykształcenia i doświadczenia zawodowego. W każdym z analizowanych okresów obliczono średnią wartość kapitału ludzkiego w modelowej próbie pracowników sektora publicznego, prywatnego i pracowników ogółem. W celu obliczenia stopy zwrotu porównano jej wartość z przeciętnym wynagrodzeniem w sektorach. **Wyniki:** Wyniki wskazują na istnienie w Polsce niewielkiej ujemnej premii płacowej w sektorze publicznym. Jednak w niektórych okresach obserwowana luka płacowa znacznie się pogłębia, ograniczając konkurencyjność płacową sektora publicznego. Wyniki pomiaru stopy zwrotu z kapitału ludzkiego pracowników obu sektorów kształtują się na poziomie około 8% rocznie. **Wnioski:** Rezultaty te mogą zostać wykorzystane do optymalizacji polityki płacowej oraz analizy konkurencyjności płac w podmiotach sektora publicznego. Wykorzystanie oryginalnej metody opartej na pomiarze stóp zwrotu z kapitału ludzkiego sprawia, że artykuł poszerza literaturę dotyczącą sektorowych różnic płacowych, a także uzupełnia paradygmat badawczy dotyczący poszukiwania norm rentowności kapitału. Wyniki na drugim polu są zgodne z koncepcją 8% stałej ekonomicznej potencjalnego wzrostu.

Słowa kluczowe: sektorowa premia płacowa, sektor publiczny, zróżnicowanie płac, sektor prywatny, kapitał ludzki, stopa zwrotu z kapitału ludzkiego, stała ekonomiczna potencjalnego wzrostu

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SOCIAL ENTREPRENEURSHIP IN RURAL AREAS: OPPORTUNITIES FOR THE DEVELOPMENT OF CARE FARMS

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ABSTRACT

Aim: The aim of the research was to find the advantages and disadvantages of running care farms, one of the forms of entrepreneurship in rural areas that drive social innovation. **Methods:** The study's analyses consisted of secondary research and a qualitative approach. The target group reached were people interested in or already running care farms in Poland (n = 17). The research was conducted between December 2022 and March 2023. **Results:** The findings reveal the observed advantages and disadvantages of care farms as reported by those overseeing these centers. Operators of such facilities emphasize the importance of their centers being part of a network of similar entities. **Conclusions:** The most important conclusions were the need for further regulation to help social farming actors stay in business through networking, better marketing and advertising of social farming operators that support the local community, creating jobs, and improving the quality of life of those in need.

Keywords: social innovation in rural areas, networking, social farming, local community, support for rural areas

JEL codes: L26, O13, O18

INTRODUCTION

Social farming encompasses activities that use the opportunities provided by agriculture to support therapy, rehabilitation, social inclusion, education, and social services in rural areas [Hine et al. 2008, Chmielewska 2018, Wojcieszak and Wojcieszak, 2018]. The understanding of the concept of social farming varies from country to country, depending on the specific conditions of its development. Most of the case studies described in the existing literature concern Italy, the Netherlands, the UK, and Norway [Leck et al. 2014, Guirado et al. 2017]. The beneficiaries of social farming try to publicize the benefits for both sides: social benefits, health benefits, educational, environmental, and economic advantages. Green care farms (social farming) are significant actors in rural development, work, and social inclusion. They can respond immediately and innovatively to local needs.

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Despite the popularity of social farming around the world and its potential role in developing effective services for people in need, as far as we know, only a few studies have examined how organizations are developing social innovation in services for people with disabilities, the socially excluded, seniors in general, and in social farming (in particular).

According to Ewers and Eweret [2015], among the social innovations potentially implementable by NGOs are:

1. Innovations in the sphere of services involving their individualization, tailoring them to the needs of specific groups of recipients, aimed at increasing their subjectivity;
2. Innovations in the sphere of regulations and laws on forms of assistance aimed at their activation on an ad-hoc basis, in emergency situations, and innovations in the sphere of social contacts on the rights and obligations of assisted persons in solving the social problems affecting them;
3. Innovations in the sphere of local development management strengthening the cooperation of various entities, building their coalitions, and partnerships;
4. innovations in working methods and ways of financing them involving, for example, combining various knowledge resources for solving social problems;
5. Innovations concerning the entire functioning of social policy aimed at achieving the involvement of representatives of all sectors (especially local entities) in activity on their behalf.

Zajda [2022] defines "social innovation" as changes introduced in the area of social problem-solving, involving the emergence of alternative social practices to the dominant ones.

Driving factors of social innovation in rural services may be a focus on social farming in the form of various forms of social economy businesses. Furthermore, given that certain normative requirements – together with the need to achieve economies of scale – necessitate networking between non-profit organizations, this study aims to explore the role of networking in the development of social innovation.

The network approach, as a new concept for the analysis of economic reality and cooperation between entities, emerged in the late 1970s in the wake of technological changes in the market. It exposes the importance of the totality of an organization's contacts with the environment, forming an extensive network of relationships [Bogusz et al. 2021].

The main distinguishing feature of the network approach is the consideration of the social context of the behavior of organizations, which is that they are seen as a fragment of a broader system of many actors, activities, and resources that influence each other.

A network is a set of long-term formal and informal relationships (direct and indirect) between two or more actors, and "networking" implies a focus on the links between an enterprise and the entities in its environment. All relationships are taken into account, including those that go beyond typical organizational and formal contracts, encompassing the totality of relationships relevant to the organization [Ministerstwo Rodziny i Polityki Społecznej 2021].

The aim of our study suggests adopting a qualitative research approach applied to the case of service research. Although several previous studies have focused on innovation and its driving factors [Joao Roland and Granados 2020], few researchers have addressed the topic of services in rural areas. This study aimed to answer the following two research questions: What are the causes of social innovation in rural areas? (RQ1); What characteristics make networks a driver of social innovation in rural care farm services? (RQ2)

THEORETICAL BACKGROUND

Beginning at the end of the 20th century, the influence of the European community has led to a redefinition of the agency of nation-states: the regulatory power of national governments is decreasing, while the powers of Brussels and regional/provincial authorities are increasing. As a result of decentralization, local and regional authorities are becoming more independent political actors with greater responsibility. At the same time, the presence of European bodies limits the scope of national, regional, and local decision-making in many areas – agricultural policy being one example [Wickerke et al. 2003, Pomianek and Kowalczyk 2016].

Social farming – objectives, beneficiaries

The main initiatives to define social farming in the EU were the Cost Action 866 – Green Care – European Cooperation in Science and Technology project and the follow-up actions of the European Economic and Social Committee [Jarobkova et al. 2022]. The European Economic and Social Committee defines social farming as an innovative approach combining two concepts: 1) multifunctional agriculture; 2) social services/health care at the local level, contributing to the well-being and social inclusion of people with special needs.

Farms can not only be providers of agricultural products, but they can also offer various services with a social dimension. These services can relate to various spheres such as culture, education and upbringing, social assistance, or healthcare. Farms, therefore, have the potential to provide educational services such as after-school activities, activities for children with special educational needs, or full-time pre-school care – as in Norway, for example [Hassink et al. 2016, Kalinowski et al. 2021]. They are a good place for using nature-based therapy (silvotherapy ["forest bathing"]) to support and treat people with mental disorders. Lastly, they can also act as refuges for older people often struggling with reduced independence and illnesses, including dementia, and requiring care as a result.

Social farming, including care farms in particular, plays a crucial role in the context of the challenges posed by an aging population, resulting in a shrinking workforce and an increase in the number of people requiring support. To tackle these challenges, a range of innovative initiatives is currently underway. These efforts aim to provide support for individuals with disabilities, those facing the risk of exclusion, the elderly, and those who are dependent. The initiatives encompass diverse forms of assistance, including education, vocational activation, socialization, therapy, and, notably, care services. Social farming is just such an initiative, undertaken in a rural environment and combining not only the desire to achieve social objectives, but also the desire to diversify agricultural activities, activate people in rural areas, and make use of human capital – the undeveloped resources, potential, and skills of rural people [Karanikolos et al. 2013].

Benefits of social farming

The concept of socially involved agriculture boasts numerous strengths. Engaging in outdoor activities, participating in economic endeavors, and recognizing one's contribution as a valuable member of a community are all pivotal elements that significantly contribute to well-being and enhance health, irrespective of age. The care farm allows available labor resources in the villages to be used for the good cause of providing care for the elderly living in less populated areas. The countryside is a source of knowledge and experience in caring for the elderly, given the deficiencies in infrastructure in institutional and residential forms of care. Combined with the human intrinsic motivation to do the socially right thing and the financial motivation associated with increasing non-agricultural income, care farms seem to be a win-win solution for all parties involved. The multidimensional benefits of social farming can be grouped as follows [Sekuła et al. 2022]:

- the economic benefits are more jobs in rural areas and a source of livelihood for families involved in agriculture. On the one hand, it is the activation of the elderly, the disabled or those distanced from the labor market who can realize the need to be useful through valuable work in agriculture. On the other hand, it is also an additional motivation to develop professionally and professionalize one's role in providing care services for people – mainly women – caring for dependents at home;
- the social benefits are not only the improved well-being and health of the care beneficiaries, but also the increased awareness of the local community living near the farms about the disability or other ailments of the farm's residents;
- the technological benefits are the opportunity to create a new function for the farm without investing in costly technologies to improve agricultural production while reducing the environmental impact;
- the benefits of agriculture are not only the opportunity to run a farm with a multifunctional character, allowing for entry into new areas of activity and diversification of agricultural income. It is also an opportunity to promote a new image of agriculture among representatives of all generations.

Problems and challenges of social farming

It is important to bear in mind that the intrinsic diversity of the phenomenon of inclusive agriculture means that the challenges or problems in this area depend on the form of farm run. Social farming is an idea still insufficiently described in the literature and still in the beginning stage of development in most countries. It is still a social innovation rather than a widely implemented practice. In some countries – due to the development still being in the beginning phase and the lack of legal conditions – there may be problems with the public (co-)financing of the social services provided by the farms. Due to the still innovative aspect of care farms in many countries, there is a gap between supply and demand [Hassink et al. 2016]. In an era of increasing care needs for an increasing number of elderly and dependent people in ageing societies, few places in rural areas offer such profiled services. In addition, the gap between potential clients and potential providers is exacerbated by the fact that this is an unfamiliar form of care services. Unaware of possible solutions, seniors and their family members look for different options to meet their need for support in the local environment, in various forms of assisted housing (also still innovative in Poland) or care homes, without turning their attention towards rural areas. Both areas require extensive information and awareness-raising efforts for both farmers and potential users of their services. Running a care farm is not only a response to the need to provide work for the people there, but also to provide a variety of classes and activities, transport, accommodation, food, and professional care appropriate to the needs and profile of the farm [Elsey et al. 2018]. These responsibilities require different competencies, an appropriate division of roles, and some management skills. From a strategic planning perspective, it is also important to prepare for the challenge of succession and the implications of ageing on the farm, especially for care farms providing long-term and 24-hour care.

The concept of care farms in Poland

As care farms are a form of farming that combines agricultural activity with care for people in need of support, the participation of farmers or homemakers is recommended in the process of setting up and properly functioning of such a facility. The current legal conditions restrict the possibility of combining agricultural activity with the provision of care services [Stępnik 2022]. Therefore, there are two possible forms of providing such services – as a social economy entity (foundation, association, social cooperative) and as an economic activity. Who can be service recipients? Those who receive services include senior citizens, who are elderly and require care, therapy, rehabilitation, and integration activities due to their age; people who are physically and mentally disabled; the unemployed; people who suffer from addictions; people who have been released from prison; so-called "difficult young people"; and children with special educational needs.

Despite their diversity due to their farming activity profile and target group, care farms have common features. Every farm has resources that can be used when providing services. These include livestock farming, cultivation of commodity crops, forestry, herbalism, and horticulture. In the initial stages of a farm's existence, it is recommended that the main recipients are elderly, economically inactive, or dependent people [Ministerstwo Rolnictwa… 2021].

RESEARCH MATERIALS AND METHODS

This study adopts a qualitative approach. This was considered appropriate as it enables the study of a social phenomenon, such as "social innovation", in rural services and the collection of relevant data in its natural environment. In addition, for the purpose of this article, secondary data taken from internet sources was used, including those prepared by the EU, national and local government institutions, government administrations, and other actors (including local community organizations in rural areas) involved in the development of social farming. The analysis also included reports and studies prepared for EU-funded projects. The data method used was a "desk research" tabular presentation.

Face-to-face interviews were used to collect in-depth qualitative data [Fisher 2007]. To explore the data, thematic analysis was used to identify common themes – namely, the driving factors of social innovation in rural services. The research was conducted between Decem-

ber 2022 and March 2023. The target group reached were people who were interested in or already running care farms in Poland ($n = 17$). The survey had a pilot character because the authors wanted to see if there is interest in social activities among owners of active farms in rural areas. The people who took part in the survey were recruited among those who participated in the training and webinar conducted by the Agricultural Advisory Center. Due to the fact that they were from different ends of the country, the interview was conducted by telephone. It was an attempt to define a research problem, which will be developed and analyzed in depth later.

FINDINGS AND DISCUSSION

Care farm services mostly target the elderly (senior policy) and people with disabilities, who require a group setting for therapy support [Krzyżanowska 2018].

The driving factors presented in Table 1 were analyzed.

The number of points does not add up to 100% as respondents were able to indicate between one and three factors in each group. The questions were based on research by Mion et al. [2022] conducted in Italy, where social farming is quite developed.

RQ1. What are the causes of social innovation in rural areas?

At the individual level, the driving factors of social innovation are the following three factors: entrepreneurs' and employees' motivation and commitment to the social mission, individual commitment and passion for social benefit creation, and a cooperative attitude. Those taking part in the survey emphasized that entrepreneurs and employees are deeply motivated to create social value, share this value with users, and integrate care farm users into a broader human rights framework – as some respondents (care farm employees) explained:

- "We strive to develop services that fit the specificities of the local communities in which we operate.

Table 1. Driving factors influencing social farming innovation in rural areas

Driving factors	Indications of supply-side actors in social farming services	
	($n = 17$)	%
Individual		
Motivations to achieve the social mission	12	70.58
Individual commitment and passion for creating a community of benefit	10	58.82
Collaborative attitude	16	94.11
Organizational		
Hybrid business models	10	58.82
Social education	9	52.94
Organizational flexibility and employee engagement	17	100.00
Experimentation	12	70.59
Networking		
Cooperation with entities and organizations in the same sector and with public authorities responsible for services for persons with disabilities	12	70.59
Cooperation between public and private bodies that are competent in the same service area	16	94.12
Cross-sectoral partnerships and collaboration with various stakeholders and profit-making companies	17	100.00

Source: own research.

In order for our beneficiaries to actively participate in the life of the community, we prefer access to inclusive and supportive spaces in local communities." (Respondents <R> 1,8).

- "We are becoming a community that does things together. There is no longer an 'I' who comes in and tells the wards what to do, but we all work together, doing specific tasks to achieve a common goal." (R2).
- "The satisfaction is to gradually see people coming to improve their self-esteem and sense of autonomy and develop relationships." (R3–7).

The involvement of people representing the supply of social agriculture and staff has made it possible to sense a social need and translate it into a product/service that provides a solution to a social need. Since the main beneficiaries of care farm services are the elderly or disabled, this involvement has become one of the pillars of care for the socially excluded.

- "The main thing that unites us as partners and employees is passion. We want to go home satisfied with what we do." (R4–11).

Another investigated driver of innovation, developing in the context of social farming, is a cooperative attitude – which provides a more suitable environment to identify opportunities, as well as to accelerate the spread of the innovation process, as described by the respondents:

- "These services work and offer a certain added value precisely because there is close cooperation between families. It's the foundation without which the service becomes complicated." (R9).
- "In order to start a project like this, one should have an aptitude for networking with people." (R10).

Four organizationally related driving drivers of social innovation were identified by the analysis: employee commitment, organizational flexibility and flexibility, social education, and hybrid business models. In particular, the Innovation Networks' business models discussed in the interviews highlight their hybrid nature, which is determined by operating in line with both market and social orientation, as stated by the following respondent:

- "My goods and services are bought not only because they are produced and provided by people with disabilities, but also because they are of good quality and are appreciated in the market." (R13).

Adopting a hybrid business model enables social entrepreneurs to collaborate with multiple partners to access the resources, knowledge, and competencies required to develop and scale up the Innovation Network.

- "The environment in which we work is like a process of continuous improvement because we learn from other farms, and they learn from us. This way of working leads us to network the human side." (R11).
- "We have created something new out of the exchange of good practices. And this is because a specific model is in place – sharing knowledge and skills." (R13).

Further factors that emerged from the analysis were organizational flexibility and employee commitment. To achieve these goals, the commitment and involvement of laborers was important. Everyone contributed much more than just working hours.

- "It takes a certain attitude not to lose patience, to understand how communication works with a disabled person, and to understand how their learning process works. It requires a certain ability to listen and multiple diverse skills belonging to both agrarian and social domains" (R6).

Experimentation is the final driver of the organization and was mentioned by many respondents, who emphasized the importance of engaging in this practice on a daily basis for continuous improvement:

- "The specific nature and peculiarities of innovation lie in the dimension of the willingness to experiment to improve oneself and the willingness to experience improvements in spaces, resources, and even services." (R10).

In their study, Moriggi et al. [2020] highlight the importance of social innovation in rural areas, extending it to include elements of sustainable development. They emphasize the importance of community involvement and combining the good practices of other actors in the market. The relevance of and positive qualities for both

service providers and receivers of care farms' services are demonstrated by comparisons of Finland's rural social care providers. Conversely, Scartazza et al. [2020] stress the value of the setting in which social innovations are developed as well as the advantages of incorporating the environment and chances to take advantage of nature via horticultural therapy, zootherapies, and sylvotherapies – which are limited to rural areas.

RQ2. What characteristics make networks a driver of social innovation in rural care farm services?

Networks – more or less structured – are the "normal" state of organizations providing services to people with disabilities. Relational and networking capabilities play a key role in the whole process of social innovation, which involves three steps: (1) opportunity recognition; (2) innovation implementation; (3) innovation consolidation. Regarding the recognition of opportunities, several respondents confirmed the impact of the legislation on the creation of networks between different service businesses in a specific territory that had previously operated individually [Hassink 2016]. In these cases, it was through social networks that entrepreneurs were able to sense opportunities with strong social value and facilitate the process of social innovation, as stated by the interviewed respondents:

- "At the beginning, many small social enterprises were created. Later they were put on a network (R6-R10). This gave them many growth opportunities (R8-R13)".

Among the persons interviewed who were interested in running care farms, the identification of opportunities was possible. For these interviewees, the fact that they were already in a network with other organizations gave rise to a process of experimentation that would have otherwise been much more difficult. Strong links with the territory and external interested parties allowed the social entrepreneurs to see an opportunity in the needs of the families themselves, who were not satisfied with the existing solutions, as shown in the following excerpts from the interviews:

- "The need comes from the families, and with this project (EU funding for the activities of the care farms), we were able to have families discover forms of care for their relatives". (R1–R10).

When it comes to implementing social innovation, networks are essential to seize opportunities because they enable the integration of different approaches to innovation that are not always identifiable within a single organization. Firstly, networks enable access to economic and material resources, ensuring their equal distribution and increasing the overall economic sustainability of a social innovation project. Respondents highlighted how the network made up for the lack of resources:

- "In terms of economic viability, we work with the companies we trade with (R2–R8). The network gives economic viability (R8–R15)".

Firstly, networks are essential to the social innovation process because they provide access to intangible resources such as knowledge and competencies. Networks provide opportunities for organizational learning and knowledge sharing.

Several interviewees acknowledged that networks are a source of assistance and make work much easier: Networks enable good cooperation between social enterprises.

- "This openness and this collaboration between farms facilitates work that would otherwise be difficult (R9). We have been successful only because we have established cooperation and sharing of the project with other care farms (R12)".

Another aspect confirming the importance of networks in the implementation phase of social innovation, mentioned by some respondents, was the role of networks in increasing the project's overall value. In fact, the collaboration with other local social enterprises enabled the diversification of the services provided in order to reach more users and improve the end-user experience:

- "The service is innovative because it is an alternative to the existing solution (daycare center). It is based on contact with the natural environment: I believe that these services can work and contribute some added value precisely because, at their core,

there is a close collaboration and sharing of intentions with families, people, and colleagues (R9)."

Concerning the final stage of the process, the consolidation of social innovations to create a successful practice, networking, and collaboration were extremely important. Several respondents acknowledged that the support of the local community was essential for disseminating social innovation. Some respondents described it as follows:

- "Creating educational products together as a future tool to improve the quality of life (R7). Transformation of owned assets is a social collaboration process that goes back to the community (R11). The goal is to design all services with the relationship of service recipients with the community in mind (R12)."

On the other hand, institutional support is important in the initial phase of opportunity identification but seemed insufficient in the innovation consolidation phase. Many respondents confirmed that the regulatory system was poorly structured:

- "We started the project with funding. So, the law gave us the financial basis to start the project. Then we have to look for funds and resources from other sources – e.g., sponsors." (R7).

Networks are recognized as an important driver of social innovation at all stages of the innovation process, although with different functions and dimensions. There is an emerging need for better marketing and promotion of the services provided by social farming actors (care farms):

- "We need to involve the local authorities to make this new service known (R5). We have always acted alone, only sharing good practice (R13)."

Hassink et al. [2018] and Dell'Olio et al. [2017], in their research in both the Netherlands and Italy, who are pioneering the development of care farms, demonstrates the validity of considering care farms at the level of linking them to an economic sector with elements of a social movement. Undoubtedly, solutions from more experienced countries should be used to develop and support social economy actors in rural areas.

CONCLUSIONS

Social farming is an innovative approach to agriculture in which the essence is its multifunctionality – understood as the possibility of satisfying on the farm not only production and market needs, but also non-agricultural needs: environmental, cultural, economic, and social. The economic dimension of the operation of care farms should be considered not only from the point of view of potentially reducing the costs of care borne by local authorities and the families of those in need. In the context of rural development, it is vital that the care service can be a profitable form of non-agricultural activity. It is an opportunity for small family farms to survive and thrive. Consequently, care farms should be seen not only as an instrument of social policy, but also as part of rural development policy. Thus, it can be concluded that the idea of developing care farms in Poland is a response to the needs of the market and the social and economic development risks facing rural areas.

In terms of social implications, the results of this study show that organizations involved in social farming can create social value beyond the system's capacity. In this respect, social innovators are certainly responding to the unmet needs of those in need of care by providing opportunities for improved well-being and integration in the workplace. Therefore, the whole community benefits from the value created by social innovators. Furthermore, social innovation contributes to better use of tangible and intangible resources, which is a prerequisite for achieving the goals of social and cultural sustainability goals. The study is not without limitations. Firstly, the sample for the analysis included people interested in social farming in one of the developing countries in Eastern Europe, where social farming is only just being introduced to the care market and great incentive is needed for this type of service from both service providers and service recipients. Secondly, the qualitative methodology of the current study is consistent with the exploratory nature of the research questions but does not lead to insights into the characteristics of the nodes and links in the network of interested parties involved in the social innovation process. Thirdly, the importance of

each social innovation factor is expected to change at different stages of the process [Oeij et al. 2019] – an issue that was partially ignored in the current study. Starting from these limitations, the present study opens up further research on social innovation in services for people in need of care. This study also has important practical implications. Social farming is a valuable response to social problems not adequately addressed by existing solutions. As with technological innovation, social entrepreneurs cannot act in isolation; they need to network to achieve a better reach for their offer [Penco et al. 2021, Vezina et al. 2019]. The presented research is a small fragment, so the obtained results cannot be generalized and transferred to the entire population. Because the study was a pilot, it was possible to identify the future course of research that needed to be established.

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SPOŁECZNA NA OBSZARACH WIEJSKICH: SZANSE ROZWOJU GOSPODARSTW OPIEKUŃCZYCH

STRESZCZENIE

Cel: Celem badania było znalezienie zalet i wad prowadzenia gospodarstw opiekuńczych, które są jedną z form przedsiębiorczości na obszarach wiejskich, napędzających innowacje społeczne. **Metody:** Analizy zastosowane w badaniu polegały na badaniach źródeł wtórnych i podejściu jakościowym. Docelową grupą

badawczą były osoby zainteresowane lub już prowadzące gospodarstwa opiekuńcze w Polsce (n = 17). Badania prowadzono w okresie grudzień 2022 marzec 2023 roku. **Wyniki:** Wyniki pokazują, jakie wady i zalety gospodarstw opiekuńczych dostrzegają prowadzący takie ośrodki. Wskazują na potrzebę przynależności ich placówek do sieci podobnych podmiotów. **Wnioski:** Najważniejszymi wnioskami była potrzeba dalszych regulacji prawnych, aby pomóc podmiotom zajmującym się rolnictwem społecznym utrzymać się na rynku poprzez tworzenie sieci współpracy, lepszy marketing i reklamę oferentów rolnictwa społecznego, którzy wspierają lokalną społeczność, tworzą miejsca pracy i poprawiają jakość życia potrzebujących.

Słowa kluczowe: innowacje społeczne na obszarach wiejskich; tworzenie sieci; rolnictwo społeczne; lokalna społeczność; wsparcie dla obszarów wiejskich

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STUDENTS AS THE TARGET GROUP OF THE CITY'S MARKETING ACTIVITIES – THE EXAMPLE OF LUBLIN

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ABSTRACT

Aim: The aim of the study was to determine the specificity of marketing activities of the city, which is an academic center, aimed at students. **Methods:** The study covered the city of Lublin. The literature on the subject was analyzed, and the benefits for the development of cities resulting from the presence of students were indicated. Based on the analysis of the Lublin Development Strategy for 2013–2020 and its implementation, promotional activities in shaping the city's academic character were presented. Using the results of the survey, students' opinions on the promotional activities are presented. **Results:** Students are an important target group for promotional activities in the city of Lublin. The authorities undertake several activities aimed at improving the quality of education, cooperation between universities, improving the quality of life of students, or creating the atmosphere of an academic city. Students perceive the city of Lublin as conducive to studying. **Conclusions:** In order to better use the development potential associated with the presence of students, the Lublin authorities should strengthen information activities aimed at retaining students after graduation.

Keywords: territorial marketing, educational sub-product, students, Lublin

JEL codes: I25, M31, M38

INTRODUCTION

In recent years, territorial marketing has been gaining more and more importance in Poland, a tool that allows for the effective management of territorial units. Thanks to its application, the authorities of territorial units shape appropriate relations with the environment and can deal with emerging challenges related to socio-economic development. Territorial marketing aims to satisfy the identified needs and desires of residents and "guests" using all available resources [Szromnik 2007]. The significant resources of a territorial unit include the presence of universities in a given area, which are often an important component of a mega-product. The academic nature of the place means that cities or regions, apart from the classic target groups (i.e., residents, investors, or tourists), also distinguish students [Stanowicka-Traczyk 2008, Domański 2011] and direct their product offer to them. The intensification of activities of cities aimed

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at attracting students, observed in recent years, results from the fact that city authorities notice unfavorable changes in the population (e.g., the problem of decreasing population, including the number of students) [Gębarowski 2012, Adamczuk 2015, Rokita-Poskart 2016]. On the other hand, city authorities notice many benefits for the functioning and development of the city, which come from attracting a large number of students to the city. Research on the impact of students on cities intensified in the 1990s and mainly concerns the transformation of urban structures related to the presence of students [Jakóbczyk-Gryszkiewicz, et al. 2014, Bajerski 2015] and the specificity of students as users of the city and their relations with other residents [Sage, et al. 2012, Smith, Hubbard, 2014, Kotus et al. 2015]. "Studentification" [Jakubczyk-Gryszkiewicz et al. 2014, Rewers 2015] is treated as a strategic challenge in the management of academic cities [Bajerski 2015], which should offer students not only the opportunity to study, but also to meet other needs [Gębarowski 2012]. These needs may be similar to those of other city residents [Murzyn-Kupisz and Szmytkowska 2015] (e.g., purchasing food) or they may differ significantly – the need for a flexible form of employment, the choice of location of residence, the dominance of using public transport, spending time in bars, pubs, and clubs [Kotus et al. 2015]. Based on the literature analysis, it can be concluded that the consequences for the city resulting from the presence of students are a complex issue and concern many dimensions [Bajerski 2015]. The research problem this study focuses on is the issue of designing marketing activities aimed at students, which seems to be underrepresented in research conducted so far [Gębarowski 2012, Rokita-Poskart 2016]. Moreover, the topic discussed is also significant from a practical point of view because academic cities often do not consider in their development strategies the need to take action to encourage students to take up education in the city [Rokita-Poskart 2015].

Universities' presence, specificity, and reputation allow cities or regions to shape an educational sub-product (academic – after [Domański 2011]; educational and cultural – [Gębarowski 2012]). Its role in the city's functioning and development may vary and depends on the degree of complexity of the mega-product – which is the entire territorial unit, and results directly from the importance and level of development of other sub-products. The tools that the city can use to influence the market are subordinated to the educational sub-product and its features; they determine the final effect of the entire marketing process [Dyczkowska 2010]. It is critical to market the location, which is defined as all actions associated with a territorial unit's communication with the environment. These actions include providing information about the location, persuading others of its allure, and promoting the purchase or consumption of territorial sub-products. The promotional goal is to maintain the current number of students and attract new ones – as current recipients of local universities, trade and other services, and future residents. The target group is extensive, encompassing future, current, and former students, spanning across local, regional, national, and even international levels [Domański 2011]. Depending on the development goals adopted by the city resulting from the presence of students, cities may adopt a specific development strategy [Rokita-Poskart 2015], where they emphasize the features of cities that are also attractive from the point of view of young people. The principles of sustainable development, including innovative concepts like the smart city paradigm integrating information and communication technologies, play a crucial role. This approach extends across various domains, including education, as highlighted by Żukowska and Chmiel [2022]. Other noteworthy sustainable development concepts include ecological and participatory cities, as explored by Masik et al. [2021]. Implementing these approaches has the potential to enhance the quality of life for residents, a goal that aligns with the desires of students and graduates, as emphasized in the findings by Kotus et al. [2015].

Various entities are involved in activities to attract potential students to study in a specific place. In addition to the activities of the city authorities, an important role is played by marketing conducted by universities (i.e., academic marketing [Krzyżanowska 2004]), the directions and methods of which are the basis for creat-

ing an attractive and sustainable competitive advantage for the city [Domański 2011, Gębarowski 2012, 2013]. Universities are often entities on the market that generate the largest influx of people from outside; therefore, it is crucial for territorial marketing to which recipients universities direct their offer – what fields and forms of study they offer, and the spatial range of marketing activities undertaken. The form of education results in an inflow of people strongly concentrated in time and characterized by a specific life cycle (e.g., 5-year, 3-year, or 2-year). The attractiveness of studies, combined with the attractiveness of living in a given city, may result in the extension of this cycle and a permanent influx of people to the city when students decide to stay after graduation [Domański 2011].

In order to attract potential students with the educational offer, the authorities of academic cities, similarly to universities, use various promotional activities [Rokita-Poskart 2016], use communication channels (i.e., television, radio, daily press, magazines, monographs, direct media, external media, the internet, cinema, and fair events). Each of these forms of media is assigned a specific group of recipients. Among young people, the most popular medium, and at the same time the most effective communication channel, is the Internet. Universities wanting to attract students focus primarily on creating websites where they promote their offer and running accounts on social networking sites. An effective way to reach the city of students is also organizing events (i.e., educational fairs).

City marketing activities aimed at students can be carried out as part of internal and external marketing [Domański 2011], depending on the goals to achieve. Internal marketing refers to a situation in which the university's offer is targeted at local recipients. To maximize demand, complementary activities should be activities on defined external markets. In this case, it is particularly important to integrate activities carried out by universities and city authorities because the choice of a place to study is determined by both factors related to the university's brand (e.g., unique fields of study) and the image of the city – i.e., its attractiveness as a place of residence or long academic traditions. The image of universities co-creates the image of the city in which they are located [Sobocińska 2011]. The city is considered an attractive place to live during studies, where the most important factors are related to the conditions and quality of life [Chrąchol-Barczyk 2016], cultural life, entertainment, transport accessibility, or the possibility of finding an additional job (also after graduation).

The subject of research in this article is the city of Lublin, which is the largest academic center in the eastern part of Poland. There are currently nine universities in Lublin: 5 public universities – Maria Curie-Skłodowska University, The John Paul II Catholic University of Lublin, The Lublin University of Technology, The University of Life Sciences, and The Medical University; and four non-public universities – The Lublin Academy of WSEI (former University of Economics and Innovation), The Academy of Applied Sciences (former University of Social and Life Sciences), The University of Entrepreneurship, and The Administration and University of Social Sciences. These academic centers are based in Lublin and gather 87.8% of all students from the Lubelskie region [GUS 2022]. The number of students in Lublin has been growing steadily since the 1940s, reaching 86,900 in the academic year 2004/2005 and remained at a similar level in subsequent years [Jakubowski 2018]. However, starting from the academic year 2010/2011, the number of students began to drop sharply. In 2015/2016, 67,300 students studied in Lublin, which accounted for 4.8% of the total number of students in Poland [Jakubowski 2018]. In recent years, despite a nationwide decrease in the number of students in Poland, the student population in Lublin has remained relatively stable. As of 2019, the city hosted 65,000 students, constituting 5% of the national student body. When considering student enrollment, Lublin secured the seventh position among academic centers in Poland [Nowak and Wieteska 2019]. Between 2011–2020, over 220,000 people from all over Poland came to Lublin to study in the city [Analiza… 2023]. In total, about 60,000 people study in Lublin (data for the academic year 2021/2022), of which 13.8% are international students; their number is increasing year by year [Potencjał… 2023]. In the years 2011–2020, students from 114 countries studied in Lublin, with the largest number of students coming

from Ukraine (4,209), China (797), and Belarus (497) [Analiza… 2021]. The significance of higher education and the academic community in the life of the city becomes evident when examining the ratio of the number of students to the population. In the academic year 2004/2005, this ratio stood at 250 students per 1000 residents. However, by the academic year 2015/2016, this ratio had slightly decreased to 204 students per 1000 residents. This metric serves as an illustrative measure of the integral role that higher education plays in the fabric of the city over the years [Jakubowski 2018]. In 2019, the indicator was equal to 188 people per 1,000 inhabitants; it is worth mentioning that in terms of its value, Lublin was ranked fifth in the country, giving way only to the centers (i.e., Podkowa Leśna, Poznań, Rzeszów, and Katowice) [Nowak and Wieteska 2019]. Every fourth inhabitant of Lublin is a student, and universities are the largest employers [Nowak and Wieteska 2019]. The academic nature of the city of Lublin is related to the operation of many universities with a rich offer and is of significant importance in the city's development. As a result, the city of Lublin was chosen to present the problem of designing marketing activities targeted at students by the city acting as an academic center.

METHOD

The aim of the work was to determine the specificity of marketing activities of the city being an academic center aimed at students, including: (1) identifying the main possible benefits for the development of cities resulting from the presence of students in the city; (2) presenting promotional activities in the field of building academic character on the example of the city of Lublin; (3) presentation of students' opinions on the academic character of the city of Lublin and the promotional activities undertaken. The following hypotheses were accepted for verification: H_1: The authorities of the city of Lublin focus on promotional activities aimed mainly at potential students and cooperate with universities; H_2: In the opinion of students, the city of Lublin has the characteristics of an academic city; H_3: The knowledge of promotional activities among students is low.

To achieve the goals, the literature on the subject was analyzed, and the data of the Lublin Development Strategy for 2013–2020 and its implementation were used [Lublin... 2013, Materials... 2019]. To obtain students' opinions on the academic character of the city, a survey was conducted in 2019 among students of Lublin's universities. The electronic version of the questionnaire was made available on the Facebook social network in closed groups associating students from Lublin universities. The questionnaire was completed by 156 students representing seven universities; the largest number of people were from Maria Curie-Skłodowska University (38%), from the University of Life Sciences (28%), from the John Paul II Catholic University of Lublin (23%), and from the Lublin University of Technology (7%). The survey exhibited a predominant representation of women, constituting 84% of the respondents. Additionally, a significant portion of the participants were students in their first or second year of studies (39%), with an equal percentage from the fourth and fifth years (39%). Geographically, a majority of respondents hailed from the Lubelskie region (62%), followed by the Mazowieckie region (12%). The analysis of the survey results delved into students' perspectives on Lublin as an academic city and evaluated the effectiveness of marketing initiatives undertaken by the city targeting this specific demographic.

The limitations of the study should be mentioned, including the non-representative sample that does not include international students. Moreover, the study did not cover the time of the Covid-2019 pandemic, which could have significantly changed the city of Lublin's marketing activities towards students.

ACADEMIC CHARACTER OF THE CITY IN THE CONTEXT OF DEVELOPMENT

The benefits resulting from the presence of universities and students can be both short-term and long-term. These include issues such as:

- changing the population structure of the city to a favorable one [Herbst 2009, Rokita-Poskart 2017] and increasing the level of human capital in the city [Brańka 2013, Nowak and Wieteska 2019];

- gentrification of the place (district) [Romanowski 2014], multifaceted changes in the city's economy, and its restructuring [Zasina et al. 2021];
- shaping the real estate market (flats for sale and rent) [Murzyn-Kupisz and Szmytkowska 2015] and development of trade and services (gastronomic, cultural, transport) [Kotus et al. 2015, Rewers 2015; Burlita and Błoński 2016];
- stimulating the city's economic growth through student consumption [Materials… 2019] and increasing local demand [Berg and Russo 2003, Domański 2011, Brańka 2016];
- increasing local labor resources thanks to qualified staff on the labor market [Burlita and Błoński 2016, Brańka 2016];
- development of entrepreneurship and attracting investors [Brańka 2016];
- generating regional development by academic centers where universities are a key link in the process of creating knowledge [Marszałek 2010];
- creating [by universities] an expert base for pro-development initiatives of city authorities and business [Burlita and Błoński 2016] and developing the potential of the city to organize events (i.e., congresses, conferences, seminars) that attract the so-called "group business tourists" [Borodako 2013];
- stimulating cultural life by universities [Rewers 2015; Burlita and Błoński 2016];
- offering jobs by universities [Burlita and Błoński 2016] and institutions related to student service;
- deciding on the competitive advantage of a city compared to other cities [Domański 2011], acquiring attributes of the city's image [Lisiecki 2006, Burlita and Błoński 2016] related to the university and the entire academic community (learning region, university-knowledge producer) [Szmit 2011], and connection with innovation and creativity ("science and youth") [Burlita and Błoński 2016];
- impact on other territorial sub-products, apart from education, and on the investments undertaken to adjust the city to the expectations of students;
- generating intangible values through the academic climate; cities are vibrant and diverse [Van den Berg and Russo 2003].

The location of universities is an important asset and distinguishing feature for cities, which positively impacts the city's development. Cities can achieve certain benefits resulting from the presence of students, among which the university's positive impact on the city's general image and building the advantage of the academic center over other cities should be mentioned.

THE CITY'S ACADEMIC CHARACTER IN THE LUBLIN DEVELOPMENT STRATEGY FOR 2013–2020

For many years, Lublin has been taking advantage of the fact that many universities are located in the city in its pro-development activities, which can be reflected in the provisions of strategic documents [Rokita-Poskart 2015]. In the Lublin Development Strategy for 2013––2020 [Lublin… 2013], in force until the end of 2021, the city's academic character was recognized as one of the four areas of Lublin's development. Within this area, the city undertook activities focusing on four development goals: (1) internationalization of the university; (2) symbiosis with the environment; (3) *genius loci* of the university city; (4) attracting and retaining talents in Lublin. In the strategy, the academic character of the city was treated as a Lublin product, thanks to which the city is known on a regional and national scale.

The first objective, 'Internationalization of the university', concerned increasing the attractiveness of studying in Lublin among foreign candidates, which included encouraging them to study in Lublin, meeting their needs through multilingual access to information, improving service, integration activities, or creating an atmosphere of openness to other cultures. The international rank of a university is also the participation in international research and cooperation networks, cooperation with prestigious universities around the world, co-organization or participation in international conferences, promoting the achievements of Lublin scientists abroad and the presence of foreign scientists at Lublin universities (e.g., giving lectures). The key to achieving the university's international rank is the universities' activities, with which the city cooperates and supports in each of the presented areas. One of the most important

activities undertaken as part of the implementation of the first objective (1) 'Internationalization of universities' was the 'Study in Lublin' project, implemented in 2011 by the City Hall in cooperation with universities in Lublin, which aimed to encourage foreigners to study in the city. An integral part of the project was the portal [Lublin is… 2023], where potential students could obtain the necessary information about studying in Lublin (e.g., learn about the educational offer, scholarship programs, and procedures before coming to Poland or other formalities related to the organization of your stay). One of the website's tabs contained practical information on everyday life in the city (such as public transport in Lublin, prices of dormitories and rooms in private apartments, or average prices of basic food products). The portal was available in four languages: English, Russian, Ukrainian, and Polish. It also included pages on social networking sites (Facebook and Vkontakte). As part of the project, representatives of the City Hall in Lublin appeared at annual educational fairs – e.g., in Ukraine (Kyiv), Kazakhstan (Almaty), Georgia (Tbilisi), Turkey (Istanbul), Czech Republic (Prague), and Belarus (Minsk). In addition to fairs, meetings with young people in Poland and abroad were organized several times a year in schools, Polish homes and consulates, or in rented rooms where the educational offer of Lublin universities was presented [Report… 2017].

The second objective (2) of the strategy, 'Symbiosis with the environment', is understood as building cooperation by universities on three levels (i.e., universities-business, universities-city, and universities-universities). The city's role in university-business cooperation includes stimulating the entrepreneurship of students and graduates, supporting the creation of infrastructural facilities for the development and transfer of innovation from universities to businesses, collaborating with the Science and Technology Park and other partners to establish innovation incubators, and supporting the adaptation of educational courses to meet the needs of employers. Activities on the university-city level include developing municipal scholarship programs for students, competitions for diploma theses, and creating communication tools (e.g., Internet portals) to help find internship offers or job placement. In turn, cooperation at the university-university level can be implemented by involving universities in urban projects requiring the cooperation of various fields of science and supporting the processes of collaboration and consolidation of Lublin universities. An example of the implementation of this goal (2) was the project 'Lubelska Wyżyna IT' [Projekt… 2023], initiated by the Lublin City Hall, aimed at highlighting the potential and creating favorable conditions for the development of the IT industry in Lublin. The activities within the project were grounded in the close collaboration of three key groups: local government authorities, the scientific community, and enterprises/business environment institutions. The overarching aim was to enhance the competitiveness of each of these entities through synergistic cooperation. Lubelska Wyżyna IT consists primarily of activities addressed to the inhabitants of Lublin and the entire Lubelskie region, consisting of promoting the local IT market among residents and students, and encouraging high school students to study computer science. As part of the project, a special platform was created, with a list of Lublin companies from the IT industry along with their short characteristics. The 'Lublin IT events' tab presented the most important events in the IT industry. An important element of the project for potential students is the 'Check IT' event, organized for the seventh time in 2022. As part of the conference, primarily designed for high school students and IT teachers, participants have the option to select from a range of lectures, workshops, and activities in the game zone. Attendees can explore the offerings of IT studies in Lublin, gain insights into various applications of IT and technological innovations, and even have the opportunity to create their own applications and games. The speakers include entrepreneurs, IT industry specialists, programmers, personnel from IT departments in Lublin universities, and students from IT faculties themselves, as outlined in the program [Check IT 2023].

The third objective (3), the '*Genius loci* of the university city', differed from the preceding goals in that it did not center around the development of an enticing educational package. Instead, its focus was on shaping a cultural and social environment, encouraging student involvement in leisure-time activities [Burlita and Błoński 2016]. The initiatives included programs that provided information

about events and activities available at the university and in the city. There was a focus on promoting the concept of educational student volunteering for local communities, collaborating in the organization of student events with distinct social and educational components. Additionally, efforts were directed towards establishing scientific and educational cafes and clubs, magazines, portals, and supporting investments that fostered creative and innovative thinking within creative groups. The city's initiatives were predominantly concentrated on two key areas: the development of internship and volunteering opportunities and the provision of a cultural and educational program tailored for students in the city. Students had the chance to undertake internships and engage in volunteering at various municipal institutions, including the City Hall, the Municipal Labor Office in Lublin, the Municipal Family Support Center in Lublin, the Municipal Water and Sewage Company Ltd, the Municipal Transport Authority in Lublin, and cultural institutions affiliated with the municipality. The city's efforts to provide opportunities for students' personal development encompass the support of projects initiated by the academic community in the realm of cultural and leisure development. These projects offer a chance for holistic development beyond the university setting. Notably, the city prioritizes support for university-led initiatives, extending assistance to its own projects in a secondary capacity.

The fourth objective, 'Attracting and retaining talents in Lublin' (4), focused on activities aimed at retaining [in the city] the most talented and ambitious people starting and completing studies. The initial focus was on activities targeting students with the objective of acquainting them with the history, culture, and surroundings of the city. The goal was to help them become familiar with their "small homeland" and actively engage students in initiatives benefiting their local community. The second area was to support all activities and successes of high school students (e.g., through scholarships and other prizes for students who will study in Lublin) or supporting the cooperation of schools with scouts, tourist clubs, etc. Contacts between Lublin universities and schools were also developed (e.g., as part of university open days), directing the activities of current students for future students, and developing and improving student educational events in terms of students' needs. The fourth area is to keep talented university graduates in the city and, thus, support them when starting on the labor market (e.g., development of internship programs in municipal institutions, support for research on the relationship between education and future careers of students, and organization of meetings with employers at universities). A significant initiative involved recognizing the achievements of highly talented students by presenting awards, such as the Mayor of the City Award. This recognition was extended to those excelling in subject and thematic competitions, olympiads, professional tournaments, as well as nationwide artistic or literary competitions. Students and doctoral students living in Lublin who conduct scientific or artistic activities that may contribute to the development of the city and the region or make a significant contribution to the development of science could apply for a scholarship from the city's president. Since 2010, an annual competition has been established to recognize the best diploma theses across various categories, specifically focusing on the subject of Lublin's economic development. Cash prizes are awarded to the winners, and the authors of the winning theses have the opportunity to apply for internships at the Lublin City Hall. The announcement of results and prize distribution occurs annually at the Lublin Entrepreneurship Gala.

Lublin is persisting in the ongoing initiatives, as outlined in the Strategy for the Development of the City of Lublin until 2030, where creative, academic, and entrepreneurial aspects have been identified as one of the five key development areas. The city is constantly implementing various image campaigns aimed at students [Kampanie… 2023], the presentation of which goes beyond the scope of this study. It is worth noting that promotional activities were also carried out during the COVID-19 pandemic (e.g., the Lublin Academic Program from 2021), when the consequences of students' absence from universities were clearly visible in the city. In Lublin City Hall, within the structure of one of the departments, there is a department for supporting academics. In 2021 and 2022, the City Hall, in cooperation with public universities in Lublin, implemented the project 'Analysis of the influx of students to Lublin' [Analiza napływu… 2021], which

shows and confirms the great importance of the target group of students for the development of the city.

THE ACADEMIC CHARACTER OF THE CITY OF LUBLIN IN THE OPINION OF STUDENTS

Students decide to study in Lublin for many reasons. For the majority of respondents (62% of answers), the main motivation was the proximity to the place of residence [Kotus et al. 2015], the educational offer of the university (51%), the location of the city (30%), the "climate of the city" (18%), and the cultural and entertainment events indicated by 8% of the respondents. Students outside Lublin most often considered studying in Warsaw, Wrocław, and Kraków. Interestingly, 30% of the respondents did not consider any other city to study than Lublin. The surveyed students were satisfied that they were studying in Lublin, which was indicated by 85% of the respondents. A high level of education, interesting fields of study, an interesting city (atmosphere, monuments, cheap living), and a short distance from the family home were indicated as justifications for the answers. On the other hand, people who were not satisfied with studying in Lublin cited the low level of education, difficulties in finding a job or lack of prospects after graduation as reasons, which shows that apart from the quality of teaching, economic issues are important to them [Gębarowski 2012]. Nearly all respondents perceived the city of Lublin as favorable for studying, with 40% providing a definite "yes" and 56% leaning towards "rather yes". This positive sentiment is primarily attributed to the multitude of universities, the diverse range of courses offered, and the abundance of cultural and entertainment events tailored for students. The advantages of the city were also discounts for students in premises and institutions, a good location of the university in the city (near the city center), and good public transport connections – which confirms the conclusions of other researchers [Sage et al. 2012, Kotus et al. 2015]. Moreover, attractive prices for renting apartments [Jakubczyk-Gryszkiewicz et al. 2014] and lower maintenance costs than in other cities were indicated. There were also responses that Lublin has long been perceived as an academic city, so many activities are dedicated to students, allowing us to verify the hypothesis H_2 positively. Conversely, the minority of respondents (4%) who did not view Lublin as a city conducive to studying expressed concerns. Their reasons included the rising costs of rented apartments, which they felt did not align with the living standard. Additionally, they cited challenges in finding part-time jobs for students and perceived Lublin as a city similar to others, lacking distinctive support systems for students. When analyzing the results of the obtained research, it should be taken into account that students' expectations and preferences change over time and depend on the year of study [Holton and Riley 2014].

The surveyed students had various knowledge of promotional activities undertaken by the city of Lublin. It turned out that 54% of respondents had not encountered any forms of promotion, which confirms our assumptions (H_3) and reveals a low knowledge of promotional activities. This problem was also noticed by other researchers [Kotus et al. 2015] in the case of Poznań and the Tri-city, where the image of the city presented in advertisements was an insignificant criterion determining the choice of the city as a place of study. The majority of students gained information about studying in Lublin through articles in the press. Additionally, students were knowledgeable about initiatives such as the 'Study in Lublin' project, the competition for theses on Lublin, and activities related to 'Lublin walks with a soul', or the 'Lublin IT Upland project' (Fig. 1).

Marketing activities aimed at students reached the respondents through various means of communication used by the city (Fig. 2). Most often, the surveyed students saw these activities on the internet (answers "very often" and often accounted for 53% of responses). Another important source was the urban space (44%). The results confirm the dominance of searching for information on the internet [Kotus et al. 2015] – especially by young people, which is accompanied by a reorientation of cities' promotional activities from traditional media towards the internet [Rokita-Poskart 2016]. The respondents had relatively little or no information from television, radio, or press.

In response to the question of what Lublin lacks, in order to provide a "studying atmosphere", students

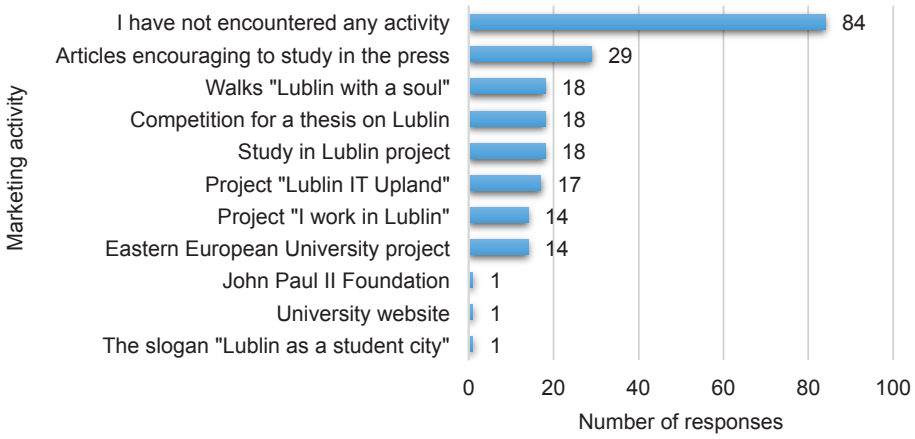

Fig 1. Knowledge of marketing activities of the city of Lublin in the opinion of students
Source: own elaboration.

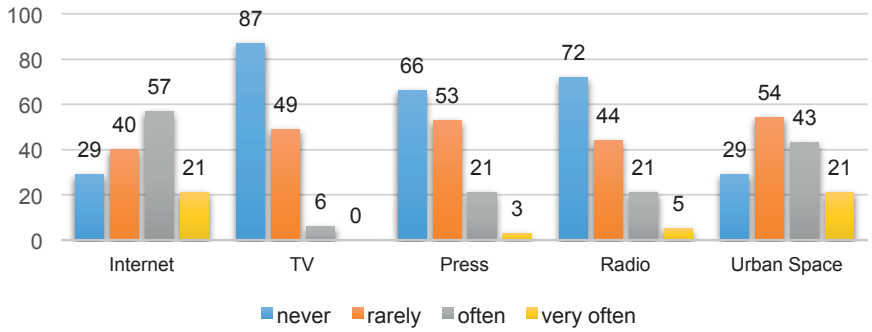

Fig 2. The surveyed students' knowledge of the marketing channels used by the city of Lublin to encourage them to study in the city (number of responses)

Note: complete responses were included (n = 147)
Source: own elaboration.

most often pointed to a lack of opportunities to work during or after studies (16% of responses), an insufficient number of cultural and entertainment events (16%), la ack of car parks near the university (14%), and a small number of paid offers practices consistent with the direction of education (9%). There were also answers that the "study climate" alone is not enough and that Lublin universities do not have the appropriate reputation and do not occupy high positions in rankings.

Every third respondent planned to stay in Lublin after graduation, mainly because they like the city. They have already found a good job in their profession here and feel an emotional connection with the city. This observation may lend support to the notion that the increase in the student population serves as an indicator of potential gentrification for cities [Romanowski 2014, Kotus et al. 2015]. The respondents also replied that they would stay in Lublin because of their family/ /friends; some of them had already lived here before starting their studies and did not intend to move away from Lublin. On the other hand, people who "probably not" (28%) or "definitely not" (21%) planned to stay in

Lublin after graduation cited the following reasons for their decision: a lack of opportunities to work in their profession, difficulties in finding a job (also due to the high number of students and graduates), low earnings, high flat prices, the high cost of living, a willingness to return to one's hometown, the choice of Lublin only because of the field of study and no connection with this city of the future, high unemployment, the poor economic situation of the city and the Lublin Voivodeship, or little opportunity for personal development. Every fifth respondent was undecided whether to stay in Lublin after graduation, which depends on whether they manage to find a job in the city and how their private life will develop. Therefore, in the context of using the potential resulting from the presence of students, the city needs to undertake marketing activities aimed at both students and graduates [Rokita-Poskart 2015]. The results confirm that it is important for students to have a job, earnings [Gębarowski 2012], and the presence of a family [Brańka 2013].

CONCLUSIONS

The presence of students in the city allows for many different benefits directly related to the implementation of socio-economic development goals. Developing the academic potential, including attracting future students to the city, may bring benefits not only to local universities, but also to the entire city community – both in the short and long term. The city authorities should cooperate with the university authorities in shaping the educational sub-product and building the image of the academic city.

Students constitute 20% of Lublin's inhabitants and are an important target group for Lublin's promotional activities. The authorities acknowledge that the future of Lublin is significantly tied to the effective harnessing of the intellectual potential of its young population. This recognition is evident in the provisions of strategic documents, where the city's academic character stands out as one of the fundamental areas of development. The authorities undertake a number of activities aimed at improving the quality of education, improving cooperation between universities, improving the quality of life of students, or creating the atmosphere of an academic city (i.e., the *genius loci* of a university city) – which confirms hypothesis H1. Lublin consistently focuses its promotional efforts on attracting foreign students, leading to a yearly increase in the percentage of international students. The predominant countries of origin for these students are Ukraine and Belarus, a trend influenced by the geographical proximity of these nations. Therefore, foreign students' assessment of the city's marketing activities may be the subject of future research. In addition, future research should be focused on identifying the academic nature specified in the Development Strategy of the City of Lublin for 2022–2030 and revealing the place of the target group (i.e., students) and their specific needs in the overall concept of city development. The research revealed that most of the surveyed students are satisfied with the choice of Lublin as a city to study and perceive it as a city conducive to studying. This trend is associated with the educational offerings provided by Lublin's universities and the perceived "climate of the city". Respondents, as anticipated, characterize the city as distinctly academic, featuring a wealth of cultural and entertainment events, along with venues specifically catering to students. Taking into account the identified low knowledge of promotional activities, Lublin's authorities should strengthen information and image-building activities. Issues related to work and living conditions after graduation are crucial for students, and this particularly applies to activities aimed at retaining students after completing their education. It is crucial to enhance connections with universities, entrepreneurs, and other collaborators whilst also striving to improve the overall economic landscape of Lublin. This concerted effort aims to offer young individuals embarking on their professional journeys the optimal conditions for personal and career development.

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STUDENCI JAKO ADRESACI DZIAŁAŃ MARKETINGOWYCH MIASTA–PRZYKŁAD LUBLINA

STRESZCZENIE

Cel: Celem pracy było określenie specyfiki działań marketingowych miasta będącego ośrodkiem akademickim, skierowanych wobec studentów. **Metody:** Badaniem objęto miasto Lublin. Dokonano analizy literatury przedmiotu i wskazano korzyści dla rozwoju miast jakie płyną z obecności studentów. Na podstawie analizy Strategii rozwoju Lublina na lata 2013–2020 i jej realizacji przedstawiono działania promocyjne w zakresie budowania akademickości miasta. Wykorzystując wyniki badania ankietowego przedstawieniowo opinię studentów na temat podejmowanych działań promocyjnych. **Wyniki:** Studenci stanowią ważną grupą docelową działań promocyjnych miasta Lublin. Władze podejmują szereg działań, które mają na celu poprawę jakości kształcenia, współpracę między uczelniami, podniesienie jakości życia studentów czy też stworzenie klimatu miasta akademickiego. Studenci postrzegają miasto Lublin jako sprzyjające studiowaniu. **Wnioski:** Aby lepiej wykorzystać potencjał rozwojowy związany z obecnością studentów władze Lublina powinny wzmocnić działania informacyjne celem zatrzymywania studentów po ukończeniu edukacji.

Słowa kluczowe: marketing terytorialny, subprodukt edukacyjny, studenci, Lublin

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ANTICIPATED FOOD EXPENDITURE ACCORDING TO PERSONALITY TRAITS DURING THE COVID-19 PANDEMIC IN POLAND

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ABSTRACT

Aim: The practical aim of the study is to recognize the changes in consumers' purchasing patterns according to personality traits, which can be used for higher purposes (e.g., to consciously influence sustainable consumption by government agencies on a country level). **Methods:** The subject scope of the research was the systematic literature review of determinants of food expenditure and the assessment of consumer behavior. The research sample is representative (N = 1,000), and the study met the criterion of representativeness. The article presented only statistically significant dependencies between anticipated changes in food expenditure according to personality traits measured by Big Five analysis. **Results:** The study's applicative findings are that there are significant statistical dependencies between different types of personalities along with the gender of a consumer and anticipated food expenditure during the COVID-19 pandemic in Poland. The research shows how to restore sustainable consumption in Poland after the COVID-19 pandemic. **Conclusions:** Thoughtfully crafted food policy strategies, such as subsidizing specific priority food items, can impact the consumption patterns of selected foods. These strategies have the potential to either increase or decrease the intake of particular food items and can exert influence over both the quantity and quality of the food consumed by citizens. State institutions can make beneficial changes in citizens' diets by subsidizing low-processed and organic foods and/or imposing additional fees on stimulants and unhealthy food items. The research adds valuable insights to the existing knowledge on food expenditure and consumer behaviors. It also offers practical advice and guidance to effectively support the post-pandemic era in Poland and Europe.

Keywords: food expenditure, consumer behavior, personality traits, Big Five analysis, COVID-19 pandemic, Poland

JEL codes: D12, D91, E27, H72

INTRODUCTION

According to European Union law, the term "food" (or "foodstuff") is defined as any substance or product, whether it is processed, partially processed, or unprocessed. This includes items intended for human consumption or those that can be reasonably expected to be consumed by humans. Foodstuff includes beverages, chewing gum, and any substance – including water – knowingly added to food during its manufacture, preparation, or processing [EU 2002]. Food does not include feed, medicinal products, cosmetics, tobacco products,

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or narcotics [Dz.U. 2006 nr 171 poz. 1225 z późn. zm]. The purpose of food consumption is to supply the human body with essential nutrients, encompassing those needed for building and repairing tissues, providing energy, and supporting regulatory functions [Carpenter et al. 2023]. When taken orally, foodstuffs are digested in the digestive tract, and the nutrients are absorbed into the body, which is nutrition [Sensoy 2021].

Food has been mostly studied qualitatively [Horta et al. 2013, Lepkowska-White and Chang 2017]. Arbit, Ruby, and Rozin [2017] turned to presenting the importance of food in a quantitative way. Consumer behavior science is a young scientific discipline that, due to its interdisciplinary nature, provides a broad spectrum of analysis opportunities [Światowy 2006, Ozimek and Żakowska-Biemans 2011, Ozimek 2006]. Depending on the scope and purpose of the research, the concept of consumer behavior may take on different meanings [Woods 2010].

The pandemic induced by COVID-19 has put the global agrifood system under enormous pressure [Vargas-Lopez et al. 2020]. Producers, processors, wholesalers, and retailers were forced to throw away tons of fresh food due to the disruption of supply chains, the overnight closure of food services, and the lack of employees available for land work [Ipes-Food 2020, FAO 2020]. Unfortunately, the impossibility of selling goods as usual has increased food losses. Rodgers et al. [2021] asserted that the pandemic has impacted the four pillars of food security: availability, access, utilization (the assimilation of nutrients), and stability (ensuring permanent access to food). The majority of individuals had to stay at home, preparing and consuming meals indoors [Principato et al. 2022].

However, the biggest challenge of a pandemic is the lower wealth of households' wallets. This is due to job losses, fewer hours worked by household members, and lower disposable income of the population. Laborde, Martin, and Vos [2021], along with Laborde et al. [2020], suggest that households with lower incomes are likely to transition from consuming fresh fruits and vegetables, which are rich in nutrients and micronutrients, to relying more on staple foods. Bracale and Vaccaro [2020] have shown a shift toward consumption of more processed foods. Furthermore, in North America, there is a resurgence in Community-Supported Agriculture [CSA], driven by an increasing concern among people about the reliability of supermarket purchases. This trend reflects a growing desire for more direct access to fresh fruits and vegetables, as well as meat and fish products [Worstell 2020]. According to Szustak et al. [2022], a loss of jobs and income and uncertainty about the future have contributed to a reduction in the growth rate of consumer spending in Poland. Additionally, in some countries, a growing interest in home and community gardening was observed, as people sought to grow their own food for food security and nutrition [Lal 2020]. These changes in the food environment have had a variable impact on food diversity and nutrition [Yue et al. 2021].

From a consumer point of view, the increase in food expenditure leads to difficulties in meeting life needs in the long run [Sajdakowska et al. 2018, Springmann et al. 2016]. Climate changes are of great importance to evaluating changes in food consumption and consumers' behavior, which have been influencing cost of food production [Nelson et al. 2018]. Higher food production costs can lead to increased food expenditure, potentially reducing the availability of food for consumers with lower incomes [Mbow et al. 2019, Springmann et al. 2016]. Most likely, a less healthy diet with less availability of key micronutrients will characterize the global population [Gustafson 2013], which can evolve into higher malnutrition among people in lower- and middle-income countries [FAO 2008, FAO et al. 2021]

According to Furst et al. [1996], Lindeman and Sirelius [2001], Rozin [2007], and Kokkoris and Stavrova [2021], factors influencing changes in the level of food consumption and personal traits towards food consumption include dietary restrictions, ethical food choices, perception of food vs food-related emotions, lifestyle, perceptions of food. Firstly, health-conscious eating behaviors, such as adhering to a healthy diet, eating fruits and vegetables frequently, buying seasonal and regional foods, and cooking by following medical recommendations for nutrition are driven by the social and moral significance of food [Cally 2020]. Secondly, indulgent eating behaviors, buying organic products, shopping at small stores or local markets, avoiding meat products,

and favoring quality over quantity are predicted by the moral significance of food [Samli 2013]. Thirdly, indulgent eating behaviors, eating salty and sugary snacks, prepared meals, eating on the go, and overeating are driven by the aesthetic importance of food and the reduced importance of the health importance of food [Chinea et al. 2020, Arbit et al. 2017]. Finally, functional eating behaviors, consuming functional foods such as dietary supplements, fortified foods or "light" products, paying attention to food labels, buying groceries with a shopping list, and buying groceries online are driven by the sacred meaning of food and reduced appreciation of the aesthetic meaning of food [NC Solutions 2020a]. To summarize, the significance of food can serve as a useful framework for understanding different food consumption patterns, generating new insights, and providing practical recommendations [Forbes 2017].

Personality can be presented as a construct designed to describe, explain, and predict how people function in various aspects of life [Kusnier et al. 2020]. In the literature [Awais et al. 2020, Otero-López et al. 2021, Khatri et al. 2022, Tarka et al. 2022], individuals' personality traits may play a role in determining consumer behavior. DiCrosta [2021] showed that the "Big Five" personality traits can predict consumer behavior. This model proposes the following five factors that capture individual differences in how people think, feel and behave [Tovanich et al. 2021]:

- extraversion – the tendency to seek stimulation in the company of others, to be sociable and energetic;
- agreeableness – the tendency to be warm, compassionate and cooperative;
- conscientiousness – the tendency to show self-discipline, strive for achievement and be organized;
- neuroticism [emotional stability] – the tendency to experience unpleasant emotions easily;
- openness to experience – the tendency to be intellectually curious, creative and open to feelings.

Tovanich et al. [2021] applied an abbreviated form of Goldberg's questionnaire to measure the Big Five personality traits in their research. The questionnaire measures the five traits mentioned above and consists of 20 items. It is a shortened version of the 50-item Big Five Markers questionnaire from the International Personality Item Pool resource – the Polish version of which was prepared by Strus et al. [2014]. The construction of the short version used the procedure of Donnellan and co-authors [Donnellan et al. 2006]. The findings from the abbreviated version of the Big Five Factors of Personality demonstrate that the Polish iteration of the IPIP-BFM-20 is at least as effective as its English-language equivalent in measuring the Big Five. Moreover, it serves as a valuable tool for a concise assessment of these personality factors. Notably, it has been highlighted that the 20-item mini-IPIP is nearly as reliable and valid as the more extensive 50-item parent instrument IPIP-FFM [Topolewska-Siedzik et al. 2014].

Few authors [Stein and Nemeroff 1995, Arbit et al. 2017, Palcu et al. 2019] point out that changes in food expenditure and, thus, in consumption go far beyond hunger or nutrition factors – which often include personal, cultural, and religious values and ideals.

The novelty of the manuscript is the presentation, analyses, and assessment of anticipated changes in food expenditure during the COVID-19 pandemic in Poland in 2022. The research includes a theoretical and practical parts using quantitative and qualitative measures. The quantitative methods are a CAWI questionnaire and Logit model analysis. The qualitative methods are Big Five analysis and case studies. The appeal of the article is heightened by the utilization of the Big Five method to investigate the influence of personality profiles on changes in food expenditure during the 2022 pandemic in Poland.

The article is structured as follows: the introduction indicates the problem, motivates its importance, and advances the main findings; the second section describes the research sample, materials, and methods; the third section presents the results and discussion; the final section summarizes the main contributions and outlines future research directions.

RESEARCH SAMPLE, MATERIALS, AND METHODS

The scientific aim of the study is to evaluate anticipated changes in food expenditure and consumer behavior measured by Big Five personality traits during

the COVID-19 pandemic in Poland. The practical aim is to recognize directions of consumers' purchasing patterns according to personality types and respondents' metrics, which can be used for higher purposes such as consciously influencing sustainable consumption at country level. The authors' empirical studies have led to the following hypothesis:

H_0: There are statistically significant relationships between the anticipated changes in food spending and personality profiles during the COVID-19 pandemic in Poland in 2022.

H_1: There are no statistically significant relationships between anticipated changes in food spending and personality profiles during the COVID-19 pandemic in Poland in 2022.

The necessity of the research can be included in three research questions:

1. Are there any statistically significant dependencies between anticipated changes in food expenditure and personality traits during the COVID-19 pandemic in Poland in 2022?
2. Are there any statistically significant dependencies between anticipated changes in food expenditure and respondents' metrics during the COVID-19 pandemic in Poland in 2022?
3. Are there any statistically significant dependencies between anticipated changes in food expenditure with personality traits and respondents' metrics during the COVID-19 pandemic in Poland in 2022?

The authors found a research gap in the form of methodology and understanding of detailed insight into food expenditure to support peoples' decisions on food in a wider and longer perspective [Borsellino et al. 2020, Khanam and Uppal 2020, Christelis et al. 2021, Xiong et al. 2021, Janssen et al. 2021, Ben Hassen et al. 2020]. We confirm that little is known about the different meanings people assign to food, which affects their food consumption behavior. There is a need to increase the knowledge and understanding of anticipated changes in food consumption in accordance with the personal traits of consumers.

By means of quantitative methods, the necessary data was collected, completed, and purified. By using qualitative methods, the Big Five analysis was transformed into qualitative methods. Finally, only statistically significant relationships between the anticipated changes in food expenditure and personality traits were presented, and future recommendations were given.

The study was conducted on a population of N = = 1,000 individuals (women and men) aged 16 to 83. The panel database was created to find and assess the relationships between consumers' personality traits and anticipated changes in food expenditure in Poland in 2022. The final panel database consisted of approx. 18,450 data received from 1,000 respondents in the period from 01/01/2022-31/03/2022 (from Poland). The data was processed with the statistical program Excel. The calculations for the records involved a comprehensive analysis of the overall distribution of gender, age, and the classification of township size across various voivodeships in the country. The study adhered to the criteria of representativeness. Notably, statistically significant anticipated changes in food expenditures for 2022 were identified with respect to gender, age, and traits related to conscientiousness vs stability.

For the calculation of the minimum representative sample size, the formula for qualitative tests with large sample sizes was used ($n = u_{\alpha}^2 \times (0,5)^2/d^2$). The questionnaire was underdone with the CAWI technique by SW Research Sp. z o. o. Agency. The agency applies the standards outlined in the Program for Quality Control of the Work of Interviewers (in Polish: *Program Kontroli Jakości Pracy Ankieterów* – PKJPA) in the CAWI survey category, in accordance with the quality audit of the Professional Responsibility Commission and the Board of Directors of the Organization of Opinion and Market Research Firms. The SW Research Sp. z o. o. is entitled to use the PKJPA quality mark in the awarded category. All questions were presented to the respondents in exactly the same way regarding content and form. The questionnaire contained closed questions, so-called "simple questions" (answer: yes/no), questions with options for answers (a/b/c/d), questions requiring a scale of assessment of responses (1 – least, 5 – the most), deeply closed questions (deliberately reopening the question in other parts of the survey to check the accuracy of the respondent's answers), closed ques-

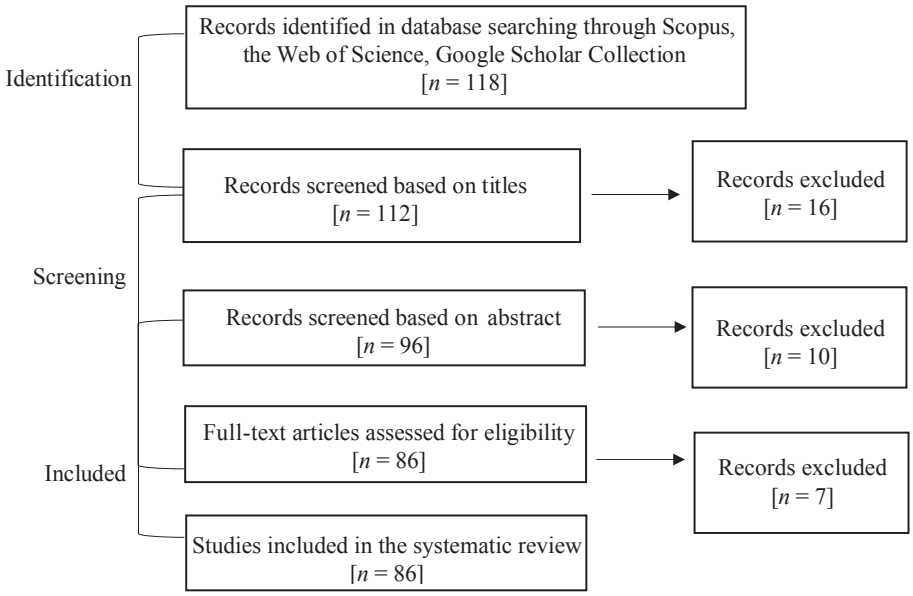

Fig. 1 presents the selection of secondary sources according to PRISMA guidelines.
Source: authors' own elaboration.

tions giving respondents the possibility of ticking and completing the answer "other – what?", and questions to track changes over time. In the questionnaire, the options for answering were not exhaustive for reasons of clarity and for the sake of mapping the diversity and ordering the measured characteristics [Corder and Foreman 2009, Mann and Whitney 1947, Wilcoxon 1945]. The study's accuracy is verified by confirmatory factor analysis and correlation analysis of the questionnaire's scales with other measures of five personality traits [Thalmayer et al. 2011, Rammstedt 2007]. The study's reliability, measured by Cronbach's index, is satisfactory – which allows the research to be used for scientific purposes [Samson and Huber 2010, Saucier 1994, Saucier and Goldberg 2002].

In the manuscript, well-thought-out and well-organized primary and secondary research sources were used. The primary research sources come from questionnaires of residents in households within the Republic of Poland. The database covered 58.047 units of raw research material. Only purified research material was taken for analyses according to the selection criteria: a) include economic and social dimension; b) have a large decision-making and information capacity; c) take into account the interests of the market actors; d) are characterized by a simple formula design. The evaluation of changes in food expenditure and traits of their personality is possible through interpretation of the results.

The secondary research sources come from scientific records such as published articles, books, bulletins, orders, identified through Scopus, the Web of Science, and Google Scholar. The search of database collection is 78. The secondary research sources were identified, screened, and finally included in the process of creating the article.

RESULTS AND DISCUSSION

In order to examine whether the personality trait of a consumer shows statistically significant dependency on anticipated changes in food expenditure in Poland in 2022, the characteristics of the values distribution of the explanatory variables of the study sample (N = 1,000) was carried out. In Table 1, there are characteristics of only correctly returned results from the respondents. According to the Big Five method, the explanatory

Table 1. Characteristics of the values distribution of the explanatory variables of the study sample [N = 1,000] – only correctly returned results

Explanatory variables	Average	Median	Standard deviation	Obliquity	Kurtosis	Min.	Max.
Extraversion	12,337	12,0	3,234	0,025	0,225	4	20
Conscientiousness	14,429	14,0	2,794	0,113	–0,451	5	20
Diligence	13,841	13,5	2,956	–0,027	–0,016	4	20
Stability	11,832	12,0	3,020	–0,028	0,267	4	20
Intellect	14,170	14,0	2,754	0,218	–0,613	6	20

Source: authors' own research.

variable is five personality traits such as Extraversion, Conscientiousness, Diligence, Stability, and Intellect.

The study revealed statistically significant dependencies only between the variable Conscientiousness vs Stability and both gender and varying age groups among consumers. To maintain statistical accuracy, the authors exclusively presented and discussed the statistically significant outcomes related to the Conscientiousness vs Stability variable. Furthermore, the variable Conscientiousness vs Stability was stratified into three size groups (low, medium, and high) to provide a more nuanced description of the differences between them.

Table 2. Characteristics of the values distribution of the explanatory variables of the study sample [N = 1,000] – only correctly returned results

Explanatory variables	Low	Medium	High
Extraversion	(4; 11 >	(11; 13 >	more than 13
Conscientiousness	(5; 13 >	(13 ;16 >	more than 16
Diligence	(4; 12 >	(12; 15 >	more than15
Stability	(4: 11 >	(11; 13 >	more than 13
Intellect	(4; 12 >	(12; 15 >	more than 15

Source: authors' own research.

Table 3 provides the results of panel data modelling with a Logit Model estimation for 1,000 observations, time series length (minimum 4, maximum 20), and robust standard errors (robust HAC). The decision criterion is p ($p < 0{,}050$), which checks whether there is a significant difference in the level of Conscientiousness vs Stability with gender and range of age.

Studies by Janssen et al. [2021] and Bodirsky et al. [2020] prove that dietary choices change over the course of one's life. Food expenditure is stable and usually follow consumer habits. Shifts in consumers' food purchasing patterns often stem from pivotal life events, such as starting a family, the arrival of a newborn child, the inclusion of an elderly person in the family, or illness. These events can necessitate permanent changes in household eating habits. Numerous studies [Janssen et al. 2021, Kartari et al. 2021, Eftimov et al. 2021, Skalkos and Kalyva 2023, Dolati et al. 2022] prove that the pandemic and the associated restrictions have affected changes in the population's food choice patterns.

To clarify Result 1, it is worth pointing out that conscientiousness and stability can influence food purchasing and financial management patterns, and those with lower conscientiousness and stability may be more likely to increase their food spending. Consumers with lower conscientiousness and stability spend more on food. They are more likely to make impulsive purchasing decisions or ill-considered food purchases that don't fit their budget plan. People with lower conscientiousness and stability may face difficulties managing their finances and controlling spending. They may be more susceptible to advertising and impulsive purchases, leading to excessive food consumption and potentially affecting their health and finances. Additionally, consumers with lower conscientiousness and stability may be more likely to invest in temporary pleasures, such as food, at the expense of long-term financial stability [Li et al. 2021]. This may mean they are more likely to choose to spend more on food. People with lower conscientiousness and financial stabili-

Table 3. Panel data estimation results for the variable Conscientiousness vs Stability – Logit Model estimation

Models 1–2–3: Logit model estimation for 1,000 observations Time series length: minimum 4, maximum 20 Robust standard errors [robust HAC]				
Variables	***Coefficient***	***Standared error***	***Z***	***Critical signifance level***
Const[1]				
Q 1 | Option 1: a sharp decrease in food spending	–2,005	0,3356	–1,348	< 0
Q 1 | Option 2: a slight decrease in food spending	–1,048	0,3284	–0,404	< 0,001
Q 1 | Option 3: unchanged food spending	1,728	0,3331	2,381	< 0
Q 1 | Option 4: a slight increase in food spending	3,009	0,3494	3,694	< 0
Interpretation of the model	Gender (male/female) and/or age of a respondent and his/her level of conscientiousness (low, medium, high) vs stability (low, medium, high) has/have an influence on his/her likelihood to change the level of spending (small, medium, high) on food items.			
Hypothesis H_1	There are statistically significant relationships between the personality profiles of a consumer [male/female] and his/her age in anticipated changes in food expenditure.			
Result 1	Respondents (male/female) with the lowest conscientiousness and lowest stability are more likely to increase the level of spending on food items than those with the highest conscientiousness and highest stability.			
Conscientiousness vs Stability	0,993	0,5353	2,042	< 0
Test *Wald chi*-kwadrat (2) = 3,439, *critical significance level* = 0,064				
Result 2	Respondents (male/female) aged 50–59 with the medium conscientiousness and medium stability are more likely to increase the level of spending on food items than those aged 16–19 with medium stability and medium conscientiousness.			
Conscientiousness vs Stability contra age of respondents	3,651	1,653	6,891	< 0
Test *Wald chi*-kwadrat (2) = 3,439, *critical significance level* = 0,027				
Result 3	Women aged 20–29 with small stability are less likely to increase the level of spending on food items than women aged 60+ with small stability.			
Stability contra gender and age of respondents	2,759	1,503	5,711	< 0
Test *Wald chi*-kwadrat (2) = 3,439, *critical significance level* = 0,067				
Conclusions	There are statistically significant differences in anticipated changes in food expenditure in Poland in 2022 according to: – personality traits (Conscientiousness vs Stability); – age of a respondent (20–29; 50–59; 60+); – gender of a respondent (male/female) .			
Decision on H_1	Accept			
Summary	The level conscientiousness vs stability plays a crucial role in anticipated changes in the respondents' food expenditure in Poland in 2022. Moreover, the gender and age of the respondents are statistically dependent variables. The results of the Logit Model estimations explain H_1.			

Q 1 Option 5 is the base
[a] *is tested for consistency with the normal distribution;*
[b] *was calculated from the data;*
[c] *Lilliefors significance correction;*
[d] *is the lower limit of true significance.*

Source: authors' own research.

ty may be less disciplined in managing their finances. They may make impulsive purchasing decisions that lead to increased food spending [Chen et al. 2021].

In Result 2, the groups of respondents are characterized by average stability and conscientiousness, which are not key factors influencing differences in food spending between age groups. The results suggest that respondents' levels of conscientiousness and stability are similar between age groups, so these personality traits do not drive differences in food spending. Respondents over the age of 50 are more likely to increase their food spending compared to the 16–19 age group with similar levels of conscientiousness and stability. Elderly people tend to invest more money in food, which can be explained by the fact that older respondents may be more conscientious in their food purchasing decisions due to longer life experience and accumulation of knowledge on healthy eating. Respondents over the age of 50 tend to lead different lifestyles in comparison to respondents in the age of 16–19, which have an impact on their dietary needs and food preferences.

To explain Results 3, it should be noted that younger women aged 20–29 are focused on other financial priorities, such as paying rent, repaying student loans, or investing in education – which all affect their ability to increase spending on food. By definition, younger people may have less experience managing budgets and finances than older ones. Younger respondents were more inclined to save money on food items. Women of different ages may have different dietary needs. Elderly people are more likely to invest in healthy foods or specialty nutrition products, while younger people are more driven by price and availability. Result 3 demonstrates differences in sociodemographic situations between the two analyzed age groups: education level, family, place of residence, etc.

CONCLUSIONS

Based on the obtained results, it can be concluded that the pandemic period had different effects on peoples' lifestyles and food consumption patterns. Respondents, both male and female, exhibiting the lowest levels of conscientiousness and stability were found to have the highest probability of increasing their spending on food items. This could potentially be attributed to elevated levels of perceived anxiety among this particular group. Respondents (male/female) aged 50-59 with medium conscientiousness and medium stability are more likely to increase spending on food items than those aged 16–19 with medium stability and medium conscientiousness. Experiencing negative feelings (i.e., fear and anxiety) increases spending on necessities, which includes food. To reduce negative feelings, people buy more because, in this way, they feel more secure and regain a substitute of control and agency. In the pandemic, age and gender affected food spending.

Pandemic restrictions have led to changes in purchasing behavior through increased food spending and increased food stocks. Women aged 20–29 with small stability are less likely to increase spending on food items than women aged 60+ with small stability. Elderly people were less likely to increase their food expenditure, which was linked to their diminished appetite.

It is necessary to point out possible limitations of the study. Firstly, the accurate identification, meticulous selection, and thorough evaluation of both quantitative and qualitative measures are crucial steps towards achieving success in obtaining accurate results and drawing valid conclusions. The results command the attention that, under certain conditions, there are differences in attitudes toward food expenditure between the two analyzed age groups. Further research will help to better understand these differences and their causes.

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PRZEWIDYWANE WYDATKI NA ŻYWNOŚĆ WEDŁUG CECH OSOBOWOŚCI KONSUMENTÓW PODCZAS PANDEMII COVID-19 W POLSCE

STRESZCZENIE

Cel: Głównym celem artykułu jest poznanie przewidywanych wydatkach na żywność według cech osobowości konsumentów mierzonych metodą wielkiej piątki w pandemii COVID-19 w Polsce w 2022 roku. **Metody:** W artykule wykorzystano pierwotne i wtórne źródła danych przy użyciu jakościowych i ilościowych metod badawczych. Przeprowadzono staranny przegląd krajowej i zagranicznej literatury o wydatkach na żywność według zachowań konsumentów. Próba badawcza w badanu ilościowym jest reprezentatywna (n = 1000). W artykule przedstawiono tylko statystycznie istotne zależności między przewidywanymi zmianami wydatków na żywność według cech osobowości konsumentów. **Wyniki:** Zaobserwowano statystycznie istotne zależności względem płci i/oraz wieku a typem osobowości. Wyniki badań mogą być wykorzystane do prowadzenia celowej, świadomej i długofalowej polityki zrównoważonej konsumpcji w kraju po pandemii COVID-19. **Wnioski:** Odpowiednio dobrana polityka żywnościowa państwa, np. subsydiowanie priorytetowych artykułów żywnościowych, subsydiowanie żywności nisko przetworzonej, nakładanie dodatkowych opłat na niezdrowe produkty, mogą przyczynić się do zwiększenia bądź zmniejszenia spożycia tych artykułów przez konsumentów. Wyniki badań wypełniają lukę badawczą na temat wydatków na żywność i zachowań konsumentów oraz są cennym źródłem wiedzy na temat efektywnej realizacji polityki żywnościowej państwa w Polsce i w Europie.

Słowa kluczowe: wydatki na żywność, zachowania konsumentów, cechy osobowości Wielkiej Piątki, pandemia COVID-19, Polska

CONTENTS
SPIS TREŚCI

INSTRUCTIONS TO AUTHORS

The journal *Acta Scientiarum Polonorum Oeconomia* features original scientific articles related to all aspects of economy, for example: food economy, European consumer goods market, sustainable regional development, development of culture environment, post crises political and social processes, human and social capital, labour market – gender perspective, public finances, rural development and entrepreneurship, social and innovative entrepreneurship, tourist economy.

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Pisulewski, P., Strzetelski, J., Antoniewicz, A. (2009). Podstawowe założenia IZ PIB-INRA norm żywienia przeżuwaczy (Basic objectives of nutritional standards for ruminants of the IZ PIB-INRA). [In:] J. Strzetelski (Ed.), IZ PIB-INRA. Normy żywienia przeżuwaczy. Wartość pokarmowa francuskich i krajowych pasz dla przeżuwaczy. Wyd. IZ PIB, Kraków, 11–20.

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