The influence of vocational education parameters on economic growth in European Union member states

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Abstract

This study investigates the impact of professional education on the economic growth of European countries between 2013 and 2020. Industrialized nations have made it feasible for students of various levels to acquire training in a number of professional courses that are suitable for the labor market since professional education is one of the major factors contributing to a country's economic progress. The multiple regression OLS, Fixed, Random, and Hausman test econometric models form the foundation of the research approach. The GDP is presented as the dependent variable, while other factors related to professional education serve as independent variables. The data has been arranged in panel form, previously logarithmized, and tested accordingly. The study's findings indicate that young people's participation has little impact on economic growth, whereas students enrolled in non-tertiary vocational upper secondary and post-secondary education, regardless of their educational background, gender, or field of study, have a positive effect on the economies of European Union member states. In addition to spending by educational level, program orientation, institution type, and expenditure category on vocational education, the first aspect has a beneficial influence and includes things such as upper secondary and post-secondary non-tertiary education – vocational. In conclusion, we can assert that professional education has substantial correlations with economic growth, necessitating a thorough examination of these correlations, as well as their practical application and careful observation of their impacts on economic development.

1. Introduction

The growth of vocational education is seen to be less uniform, but this is due to the diversity of its programs, states, institutions, and aims, each of which is distinct from the others. The growth of the economy is one of several state goals served by vocational education. Since professional education varies from nation to country and no two programs are nearly the same, except for their aim in the professional upbringing of candidates or students, it is impossible to provide a comprehensive description of it. Individuals and various capacities have been shaped in part by vocational education. It has perhaps been the longest-standing organized educational service and has long played a crucial role in developing the capabilities that communities and cultures require, which has helped with personal growth and fulfilled a number of specific educational concerns that other education sectors do not address (Fuller, 2015). It also has the best ability to involve the broadest spectrum of learners inside its programs, institutions, and experiences in its modern incarnations in many countries (Billett, 2011). Since economic development has made market demands very specific, there have been times when vocational education has not been able to keep up with the challenges of the times due to the various paradigms that are becoming more and more prevalent in lifelong learning. As a result, states have had to develop models that mold people with the appropriate skills for the current demands of the labor market (McCoshan, Drozd, Nelissen, & Nevala, 2008). Programs for vocational education have also expanded into higher education or have been upgraded to tertiary programs (an aspect that will be the

subject of later papers). As a result, credentialing frameworks for lifelong learning are starting to acknowledge VET (Vocational Education and Training) that was previously only classed at lower and intermediate levels at higher levels. The benefits of professional practice are highlighted by Eichhorst, Rodríguez-Planas, Schmidl, and Zimmermann (2013) where 60–80 percent of vocational school students' school practice is completed in businesses. This immediately impacts the development of services and high quality in the professional aspect as well as in the evaluation of students. The provision of VET places a strong emphasis on the vocational component in various European nations. Some programs focus solely on preparing school-leavers for careers, while others have a much broader educational goal, such as promoting people's employability throughout their working life. According to Beach and Puaca (2014), the degree to which vocational education pathways should prepare young people for specific jobs, that is, more broadly for a changing labor market, more dynamic and at the global level, as well as for active citizenship in the democracies of the XXI century, is being questioned in the context of contemporary social and economic imperatives at the level of policymakers and researchers. In a time of economic hardship and fierce worldwide competition for available employment, we have assistance at the global level within the vocational education system that can help and smooth the transition of young people from education to work and adulthood. The current resurgence of interest in the profession on a global scale, the creation of national policies to encourage the growth and extension of programs, and the development of instruments to evaluate their quality are signs of this (Fuller, 2015).

The study's factors included GDP, distribution of children and students engaged in vocational programs (lower secondary, upper secondary, non-tertiary post-secondary, short-cycle tertiary education - vocational/vocational), Students by educational level, gender, and topic of study enrolled in higher secondary vocational and post-secondary non-tertiary education (Higher secondary education - vocational), higher secondary and post-secondary non-tertiary - professional education (levels 35 and 45), secondary education, vocational students, secondary education, vocational students (% female), and expenditures of educational institutions for vocational education by educational level, programmatic orientation, type of institution, and expenditure category.

The aim of the study is to determine how professional education affects the development of the economies of the member states of the European Union. The data were gathered from 2013 to 2020 and cover a total of 27 European Union nations (excluding the United Kingdom).

1. What effect does secondary vocational education have on the economies of the member states of the European Union?
2. What impact does the percentage of students and teachers engaged in vocational programs have on GDP economic growth?
3. What effects do students enrolled in vocational upper secondary and post-secondary non-tertiary education have on GDP economic growth, according to their educational background, gender, and field of study?
4. What impact does spending on vocational education by educational level, program orientation, institution type, and expenditure category have on GDP economic growth?
5. Are there notable effects on GDP growth from Secondary Education, Vocational Students, and Secondary Education, Vocational Students (% Female)?

H₁. The proportion of students and children participating in vocational programs has a beneficial impact on the economic expansion of EU member states.

H₂. Students enrolled in vocational upper secondary and post-secondary non-tertiary education have a positive impact on the economies of European Union member states, regardless of education level, gender, or subject of study.

H₃. Secondary education, vocational students, and female vocational students have a positive impact on the economic growth of European Union member countries. This holds true regardless of educational level, program orientation, institution type, or budget category.

Since professional education accounts for the majority of the labor force in the European Union, it is clear that professional education is crucial to the stability of the European Union and that it must be given high priority. This is where the scientific impact and significance of the research lie. Additionally, since this is one of the few works on this subject and there are no other works that measure the consequences of vocational education, readers must comprehend the significance of these elements. The research has some data gaps, which are evident in the methodology section, which details the countries lacking certain data and those that have all the data for the annual period 2013-2020.

2. Theoretical Framework and Research Hypothesis

The theoretical context is built within the research hypotheses to better orient the issue of my study. With this, various studies have been conducted around the world, which have addressed the issue of professional education as a matter of great importance for the economic development of countries.

Hypothesis 1. The distribution of youngsters and students participating in vocational programs has a favorable impact on the economic growth of European Union member states.

The issue of youth participation in vocational education programs has been studied by a number of authors, including Schoof and Creation (2006), who demonstrate that entrepreneurship and self-employment

are sources of new jobs and dynamic economic growth in developing countries and have significantly improved the social and economic well-being of the younger generations due to their high levels of professional education participation. According to Matlay (2008), entrepreneurship education has a favorable effect on the generation of entrepreneurs, as evidenced by the fact that many graduates began their own enterprises and eventually built them into powerful corporations. On the other hand, writers like (Besterfield-Sacre, Zappe, Shartrand, & Hochstedt, 2016) underline that young people's active engagement in vocational schools has an impact on their ability to be flexible, adjust to a learning environment, and recognize the change. As a result, several European nations are working to modernize their systems for technical and vocational training abilities, integrating vocational education into their curricula for technical education (Hanushek, Schwerdt, Woessmann, & Zhang, 2017). Ledman, Rosvall, and Nylund (2018) note that the challenges and competition of the future demand that the young generation of today has a repertoire of knowledge, skills, personality, and personal qualities that are suitable and valuable for increasing the country's competitiveness and strengthening the country's position (national competitiveness) compared to other nations (Bolli, Oswald-Egg, & Rageth, 2021). Additionally, young people's participation in professional education programs is accompanied by a variety of challenges. The pupils of today are not passive recipients of knowledge. While one in three Internet users are students, and they spend an increasing amount of time on social media, playing online games, and using mobile apps, Stoll, Bolam, McMahon, Wallace, and Thomas (2006) technology supports new pedagogies that emphasize students as active participants with research-based pedagogy tools and collaborative workspaces Abdullahi, Khalid, Ahmed, Ahmed, and Gumawa (2021).

Hypothesis 2. Pupils engaged in vocational upper secondary and post-secondary non-tertiary education, regardless of education level, gender, or subject of study, have a favorable impact on the economic growth of European Union member states.

The importance of young people's involvement in professional education has been emphasized in several studies (Marques, Ferreira, Gomes, & Gouveia Rodrigues, 2012), and this has a direct impact on how satisfied individuals are with the services they receive. Especially the imposition of academic standards, the organizational framework, and the cultural practices of the school impact whether (and where) students pursue higher education (Billett, 2011). According to authors like (Beach & Puaca, 2014), a greater percentage of students in higher vocational education programs come from working or non-academic backgrounds, despite the fact that these programs offer fewer socially acceptable credentials and smaller labor market returns (Virolainen & Stenström, 2014). In other situations, they might not offer prospects for professional membership and postgraduate study (Stoll et al., 2006). Based on their study, Schleicher (2020) underlines that organizational practices, the final element of institutional habits, which relates to how the curriculum is structured and what kinds of information are available in education, are connected to us. For instance, in Finland, both sectors of the educational system prepare students for higher education in different ways because upper secondary schools have more scientific and academic curricula, while professional institutions have curricula that are much more specialized to the field and connected to working life (Marques et al., 2012). As a result, a lot of professional learning occurs in the context of working life (Haltia, Isopahkala-Bouret, & Jauhiainen, 2022). Many academics believe that vocational education acts as a "safety net" since, unlike general education, it better fulfills the demands of the job market, improving the position of its holders and reducing the possibility that graduates will be unemployed (Bol & Van de Werfhorst, 2013). Results from the most recent CEDEFOPS public opinion poll on VET2 show that, in contrast to general education, vocational education is viewed as having a low reputation among European citizens aged 15 and over (Salvatore, Villalba-Garcia, & Bank, 2018). They caution that, in the long term, vocational education may restrict a worker's mobility and render them outdated, while also impeding socioeconomic equality of access to educational and employment possibilities (Hanushek et al., 2017).

Hypothesis 3. Educational institution expenditure on vocational education by education level, program orientation, type of institution, expenditure category, Secondary education, vocational pupils, and Secondary education, vocational pupils (% female) have a positive impact on the economic growth of European Union member states.

It is generally accepted that governments manage to fund capital expenditures in vocational education institutions, while other sources, including capital investments, are used to fund recurring expenses (Avis, Orr, & Warmington, 2017). When governments fund institutes for vocational training, they are able to keep the number of resources allotted to it under control and in line with the goals of the nation's social and economic sectors. Increasing student exposure to the workforce through vocational education programs and internships with businesses is an appealing strategy for addressing these transition issues (Atkins, 2010). On the other hand, many European and emerging nations with a "dual system" offer comprehensive secondary vocational education and training, including hands-on experience in the field through apprenticeships (Fraser, Duignan, Stewart, & Rodrigues, 2019). Inequalities based on institutional goals also act as vertical differences in status and resources. The idea is that by emphasizing certain professional abilities, it is feasible to improve employees' entry into the market and make them productive at an earlier point (Ibrahim, Bakar, Asimiran, Mohamed, & Zakaria, 2015). A binary approach to emerging mass higher education is frequently used, in part to safeguard the goals (and student body) of academic institutions. Along with the system's growth, a counter-

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tendency to academic displacement has also emerged, whereby expanding second sectors try to enlarge their horizons by assuming a research role (Eichhorst, Rodríguez-Planas, Schmidl, & Zimmermann, 2015).

3. Methodology

The study examines how professional education has affected GDP in the 27 European nations that make up the European Union from 2013 to 2020. The research includes factors such as GDP, the distribution of students and children enrolled in vocational programs (Lower secondary vocational, Upper secondary vocational, post-secondary non-tertiary vocational, short-cycle tertiary vocational/professional), as well as other possibilities that exist. It also considers vocational education spending by educational level, program orientation, institution type, and expenditure category (upper secondary and post-secondary non-tertiary education - vocational (levels 35 and 45), as well as secondary education, vocational students, and secondary education, vocational students (% female).

The data was examined using the STATA software, a statistical program for data science, and the effects were validated using various statistical tests and techniques including the Hausman test, multiple linear regression, fixed effects, random effects, statistical test of normality, and correlation matrix. When combining time series data and cross-section data, the result panel data, which was analyzed in this study. The study includes Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

The statistical tests are applied based on the following scientific concepts:

The regression analysis is based on the following econometric model.

- Pooled ordinary least squares (OLS): $Y_{it} = B_0 + B_1 x_{it} + u_{it}$
- Model fixed and random effect: $itY = x_{it}B + c_i + u_{it}$
- Model Hausman-Taylor: $Y_{it} = X_{1i}B_1 + X_{2i}B_2 + Z_{1i}\lambda_1 + Z_{2i}\lambda_2 + c_i + u_{it}$

A normality test was performed using the Shapiro-Wilk model, which is based on the following model:

- $W = (\sum_{i=1}^{n} a_i x_{(i)})^2 / \sum_{i=1}^{n} (x_i - \bar{x})^2$

The correlation matrix was calculated using Spearman correlation, based on the following model:

- $r_s(X,Y)$ or $\rho(X,Y)$
- i.e., If Rx = Ranks of X and Ry = Ranks of Y, then $r_s(X,Y) = r(Rx, Ry)$

To provide proper clarifications to the readers, it is important to discuss the reasonableness of applying statistical tests in this study. Firstly, a normality test was conducted using the STATA software, which ensures reliability and helps determine the appropriate statistical tests to be used on the available data. Based on the normality test results, it was found that the data have a non-parametric distribution. Consequently, non-parametric tests, such as OLS regression analysis, should be applied.

The OLS statistical analysis employed in this study allows us to accurately examine the effects of professional education factors on the growth of the GDP of European countries. Additionally, the study incorporates other significant tests, namely the fixed and random effect models, and the Hausman-Taylor model. These tests hold high statistical significance and are globally recognized as methods for analysis. Furthermore, the correlation matrix test enables the measurement of the correlation between the variables under investigation.

By utilizing these tests, the study has been able to present the results with a high level of reliability and scientific quality. The application of these tests strengthens the validity of the findings and enhances the overall robustness of the research.

3.1. The Econometric Model of Research

$Y_{i,t} = \beta_0 + \beta_1 GDP_{i,t} + \beta_2 LSE_{i,t} + \beta_3 USE_{,t} + \beta_4 PSNTE_{i,t} + \beta_5 SCTE_{i,t} + \beta_4 UPE\_V_{i,t} + \beta_4 SEVP + \beta_4 SEV\_Female_{i,t} + \varepsilon_{i,t}$

- GDP – Gross domestic product.
- LSEV - Lower secondary education – vocational.
- USEV - Upper secondary education – vocational.
- PSNTEV - Post-secondary non-tertiary education – vocational.
- SCTEV - Short-cycle tertiary education - vocational/professional.
- UPE_V- Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education.
- SEVP - Secondary education, vocational pupils.
- SEV_Female - Secondary education, vocational pupils (% female).
  Y - GDP.
  β_0 – Beta.
  ε - Error term.

3.2. The Conceptual Model of Research

The research concept is also presented below, offering the readers a visual representation of the role and importance of the variables within the independent and dependent variables of the research.

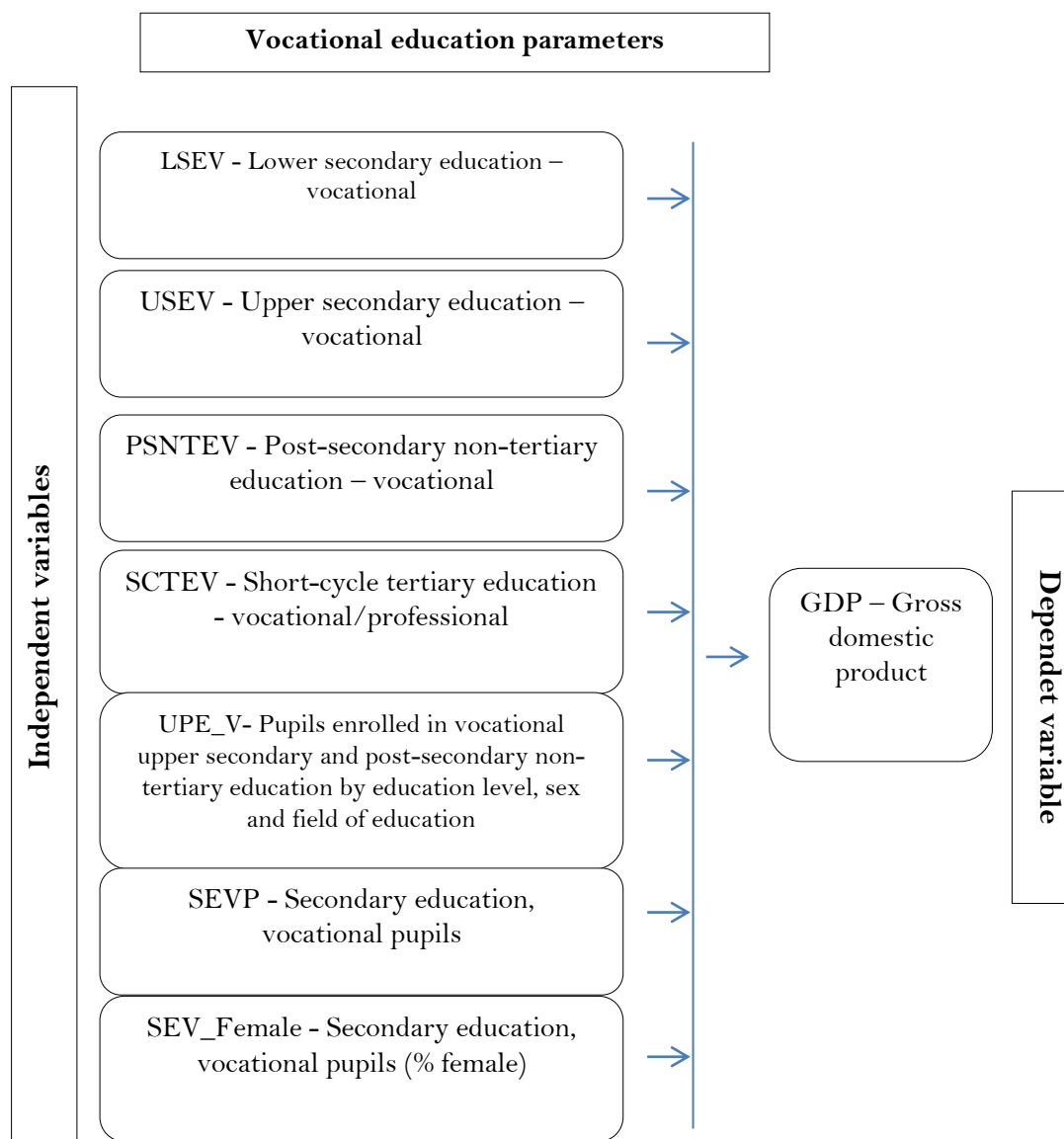Figure 1 presents the conceptual model of the research.

Figure 1. Conceptual model of research.

Table 1 explains the variables and their role in the research.

Table 1. Description of the role and importance of research variables.

Variable	The importance of variable
Dependent variable	
GDP	GDP is a variable that determines the importance of a country's general policies and how much they have worked to improve the condition of its citizens. In this context, the role of this variable in this research controls how much governments have worked for the development of vocational education, testing it with GDP as the main dependent variable.
Independent variables	
Distribution of pupils and students enrolled in vocational programs %	This variable includes several sub-variables, which represent the importance of professional education according to age.
Lower secondary education - vocational	The importance of vocational education and career orientation of young people.

Variable	The importance of variable
Upper secondary education - vocational	The final determination of young people in vocational education.
Post-secondary non-tertiary education - vocational	It contains the main element of the impact on GDP growth.
Short-cycle tertiary education - vocational/professional	It is also important in measuring GDP.
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education	Contains data on the number of students enrolled in upper secondary vocational education, who are in the workforce.
Upper secondary education - vocational	Main effects on the country's development and GDP growth.
Expenditure of the educational institutions on vocational education by education level, program orientation, type of institution and expenditure category	The level of institutional expenses in the development of professional education is of great importance in the context of my research, where we measure how interested the governments were in this aspect.
Upper secondary and post-secondary non-tertiary education - vocational (levels 35 and 45)	Measuring the effects of the age of 35-45 years as labor force, within the framework of vocational secondary education.
Secondary education, vocational pupils	The number of students in vocational education.
Secondary education, vocational pupils (% female)	The number of women in vocational education.

4. Results

The research's findings are provided experimentally, beginning with the findings of the normality test performed using Shapiro Wilk and Kolmogorov Smirnov. This is followed by the presentation of descriptive data using mean and standard deviation parameters in the second stage. The findings of the correlation matrix are reported in the fourth stage, while the analysis of multiple regression, fixed effects, random effects, and the Hausman test is presented in the third stage.

4.1. Test of Normality

According to the normality findings, which indicate the importance of data distribution, it is concluded that the presented data have a non-parametric distribution (p 0.01), which suggests that non-parametric statistical tests will be used to evaluate the data.

Table 2 displays the results of the normality test for the study variables.

Table 2. Test of normality.

Shapiro-Wilk					
Variable	Obs.	W	V	z	Prob>z
GDP	216	0.620	60.586	9.480	0.000
Lower secondary education - vocational	136	0.657	36.695	8.125	0.000
Upper secondary education - vocational	210	0.957	6.585	4.347	0.000
Post-secondary non-tertiary education - vocational	170	0.669	42.875	8.576	0.000
Short-cycle tertiary education - vocational/professional	157	0.507	59.569	9.288	0.000
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education	212	0.763	37.067	8.337	0.000
Upper secondary and post-secondary non-tertiary education - vocational (Levels 35 and 45)	180	0.561	59.719	9.359	0.000
Secondary education, vocational pupils	129	0.754	25.074	7.246	0.000
Secondary education, vocational pupils (% female)	129	0.919	8.248	4.746	0.000

4.2. Descriptive Results

The statistics for each of the nations in the research are presented, with an average GDP of 5.56e+1, an average lower secondary-vocational GPA is 5.99, and an average higher secondary-vocational GPA of 48.53.

Table 3 presents the descriptive results of the study data.

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Table 3. Descriptive statistics.

Variable	Obs.	Mean	Std	Min.	Max.
GDP	216	5.560	8.800	1.0	3.9
Lower secondary education - vocational	136	5.992	8.665	0.0	40.1
Upper secondary education - vocational	210	48.531	16.810	1.5	88.1
Post-secondary non-tertiary education - vocational	170	91.451	20.943	3.4	100
Short-cycle tertiary education - vocational/professional	157	95.285	16.000	.1	100
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education	212	323	388884.9	226	158
Upper secondary and post-secondary non-tertiary education - vocational (Levels 35 and 45)	180	2779.23	5054.859	0	24887.3
Secondary education, vocational pupils	129	343679.8	418757.4	222	165
Secondary education, vocational pupils (% female)	129	41.91582	6.394726	18.555	51.463

4.3. Multiple Regression - OLS

The OLS test, serving as the foundation for the regression analysis, yielded initial findings on variables potentially impacting GDP. The findings show that the following variables have a positive or negative impact on GDP: Upper secondary vocational education has a negative coefficient (-0.492, t=-0.297, and p-value=0.005), indicating that it has detrimental impacts on GDP at the level of a 0.5 margin. Statistical evidence shows that a significant market component, in which most nations are really underperforming in their growth, has a negative impact on the GDP of the member states of the European Union (p-value 0.05). Secondary education for vocational students negatively impacts GDP with a coefficient of -4.239, t=-4.69, p-value=0.000, that is significant at 0.1 of the margin of error, signifying issues within the member states of the European Union (p-value 0.1). Pupils enrolled in upper secondary and post-secondary non-tertiary vocational education, by education level, sex, and field of study, have a positive coefficient of 4.421, t=4.67, p-value=0.000, and the positive coefficient for upper secondary and post-secondary non-tertiary vocational education (levels 35 and 45) is significant at a margin of error of 0.01.

Table 4 displays the multiple linear regression analysis-OLS results.

Table 4. Multiple regression results – OLS.

GDP	Coef.	Std. error	T	P-value	[95%	Conf. interval]
Lower secondary education - vocational	0.083	0.052	1.59	0.122	-0.023	0.189
Upper secondary education - vocational	-0.492	0.165	-2.97	0.005	-0.828	-0.155
Post-secondary non-tertiary education - vocational	0.064	0.081	0.79	0.433	-0.100	0.230
Short-cycle tertiary education - vocational/professional	-0.017	0.046	-0.37	0.713	-0.112	0.078
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education	4.421	0.945	4.67	0.000	2.499	6.343
Upper secondary and post-secondary non-tertiary education - vocational (Levels 35 and 45)	0.841	0.068	12.22	0.000	0.701	0.981
Secondary education, vocational pupils	-4.239	0.902	-4.69	0.000	-6.078	-2.400
Secondary education, vocational pupils (% female)	-0.170	0.362	-0.47	0.642	-0.906	0.566
Number of observations	43					
F	258.64					
Prob > F	0.000					
R-squared	0.983 (98.3%)					

Throughout this case, it can be concluded that two factors, namely Upper secondary education - vocational and Secondary education, vocational pupils, have negative effects on GDP, indicated by p-values ranging from 0.01 to 0.05, while two other factors, Pupils enrolled in vocational upper secondary and post-

secondary non-tertiary education by education level, sex, and field of education, have positive effects on GDP growth.

4.3.1. Fixed Effects

The data obtained using fixed effects are shown in the findings below. In general, we obeserved a value of Sigma u = 1.522, and Sigma-e =.0574, with a P-value of 0.000. However, as a unique characteristic, fixed effects do not provide any evidence of a substantial impact on GDP.

Table 5 presents the regression test, specifically the fixed test.

Table 5. Fixed effects results.

GDP	Coef.	Std. error	T	P-value	[95% Conf. interval]	
Lower secondary education - vocational	0.023	0.073	0.32	0.751	–0.127	0.174
Upper secondary education - vocational	0.363	0.292	1.24	0.226	–0.239	0.965
Post-secondary non-tertiary education - vocational	–0.230	0.228	–1.01	0.323	–0.700	0.2398908
Short-cycle tertiary education - vocational/professional	0.057	0.054	1.05	0.302	–0.055	0.171
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex and field of education	1.012	1.142	0.89	0.384	–1.340	3.364
Upper secondary and post-secondary non-tertiary education - vocational (Levels 35 and 45)	–0.121	0.097	–1.25	0.224	–0.323	0.079
Secondary education, vocational pupils	–0.881	1.164	–0.76	0.456	–3.280	1.517
Secondary education, vocational pupils (% female)	–1.361	0.811	–1.68	0.106	–3.031	0.309
Sigma _ u	1.522					
Sigma _ e	0.0574					
rho	0.998					
Number of observations	43					
F	44.81					
P-value	0.000					

4.3.2. Random Effects

In random effects, Upper secondary and post-secondary non-tertiary education - vocational (levels 35 and 45) is found to have a significant positive impact, with a coefficient of 0.342, and a p-value of 0.000. The random effects model also indicates sigmas_u= 0.195, sigma_e= 0.057, and a p-value of 0.000.

Table 6 presents the regression test, specifically the random test.

4.3.3. Hausman Test

Based on the results of the Hausman test, we conclude that there are no significant differences between fixed and random effects regarding their impact on GDP growth.

Table 7 presents the Hausman test, with GDP as the dependent variable.

The overall findings of the regression analysis lead us to the conclusion that the most appropriate and acceptable test is the OLS multiple regression. This test provides clear insights into the factors that affect GDP in the European Union countries. Specifically, Upper secondary education - vocational and Secondary education - vocational pupils have negative effects on GDP (p-value 0.01-0.05), while students enrolled in vocational upper secondary education have positive effects on GDP growth.

4.4. Correlation Matrix

The analysis of the correlation matrix presents the links between the various factors of professional education and the GDP. Additionally, it highlights the relationship among these factors, determined through the Spearman correlation test.

1. GDP.
2. Lower secondary education – vocational.
3. Upper secondary education – vocational.

4. Post-secondary non-tertiary education – vocational.
5. Short-cycle tertiary education – vocational/professional.
6. Pupils enrolled in vocational up-per-secondary and post-secondary non-tertiary education by education level, sex, and field of education upper secondary and post-secondary non-tertiary education – vocational (levels 35 and 45).
7. Secondary education, vocational pupils.
8. Secondary education, vocational pupils (% female).

Table 6. Random effects results.

GDP	Coef	Std. error	T	P-value	[95% Conf. interval]	
Lower secondary education – vocational	0.052	0.065	0.80	0.425	-0.076	0.181
Upper secondary education – vocational	-0.143	0.231	-0.62	0.535	-0.597	0.309
Post-secondary non-tertiary education – vocational	0.111	0.164	0.68	0.498	-0.210	0.433
Short-cycle tertiary education – vocational/professional	-0.020	0.042	-0.48	0.632	-0.104	0.063
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex and field of education	1.700	1.513	1.12	0.261	-1.265	04.666
Upper secondary and post-secondary non-tertiary education – vocational (Levels 35 and 45)	0.341	0.082	4.14	0.000	0.180	0.503
Secondary education, vocational pupils	-1.083	1.486	-0.73	0.466	-3.977	1.830
Secondary education, vocational pupils (% female)	0.225	0.739	0.30	0.761	-1.225	1.675
Sigma _ u	0.195					
Sigma _ e	0.057					
rho	0.920					
Number of observations	43					
F	42.78					
P-value	0.000					

Table 7. Hausman test results.

GDP	F(b)	R(b)	Diff(b-B)	Sqrt (Diag (V_b-V_B)S.E
Lower secondary education – vocational	0.023	0.052	-0.028	0.032
Upper secondary education – vocational	0.363	-0.143	0.5066	0.178
Post-secondary non-tertiary education – vocational	-0.230	0.111	-0.341	0.158
Short-cycle tertiary education – vocational/professional	0.057	-0.020	0.078	0.034
Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education	1.012	1.700	-0.688	.
Upper secondary and post-secondary non-tertiary education – vocational (Levels 35 and 45)	-0.121	0.341	-0.463	0.052
Secondary education, vocational pupils	-0.881	-1.083	0.201	.
Secondary education, vocational pupils (% female)	-1.361	0.225	-1.586	0.332
Chie2	14.64			
Prob>chi2	0.0664			

According to the results below, we observe a strong positive correlation between GDP and factors such as Short-cycle tertiary education – vocational/professional (rho=0.157*, p-value=0.048). Furthermore, we find a high positive correlation with Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex, and field of education – upper secondary and post-secondary non-tertiary education – vocational (levels 35 and 45) (rho=0.869*, p-value=0.000), Secondary education – vocational pupils (rho=0.855, p-value=0.000), as well as Secondary education – vocational pupils (% female) (rho=0.976*, p-value=0.000). These results show a significant positive correlation among all the factors that affect GDP growth. These positive factors highlight the importance of further development in these professional education sectors within the European Union states.

Table 8 presents the results of the correlation analysis between the study variables.

Table 8. Correlation results.

Variable	Parameters	GDP	LSEV	USEV	PSNTEV	SCTEV	UPE_V	SEVP	SEV_Female
GDP	Cor	1.000							
	P-value	*							
LSEV	Cor	–0.080	1.000						
	P-value	0.352	*						
USEV	Cor	–0.001	0.363*	1.000					
	P-value	0.979	0.0000	*					
PSNTEV	Cor	–0.214*	0.153	–0.264*	1.000				
	P-value	0.004	0.105	0.000	*				
SCTEV	Cor	0.157*	0.203*	0.125	0.458*	1.000			
	P-value	0.048	0.044	0.117	0.000	*			
UPE_V	Cor	0.868*	–0.077	0.165*	–0.208*	0.183*	1.000		
	P-value	0.000	0.374	0.016	0.006	0.021	*		
SEVP	Cor	0.885*	–0.065	0.166	–0.153	0.175	0.990*	1.000	
	P-value	0.000	0.561	0.063	0.120	0.088	0.000	*	
SEV_Female	Cor	0.967*	–0.024	0.026	–0.181*	0.148	0.855*	0.886*	1.000
	P-value	0.000	0.794	0.730	0.028	0.087	0.000	0.000	*

Note: "*" No data is presented; 1- GDP, 2- LSEV, 3 – USEV, 4-PSNTEV, 5-SCTEV, 6-UPE_V, 7-SEVP, 8 –SEV_Female.

Based on the correlation data, we observe that there are correlations among various factors themselves. However, the significant aspect is that GDP, as the main factor, is supported by key factors of professional education. These factors include Short- cycle tertiary education - vocational/professional (rho=0.157*, p-value=0.048), Pupils enrolled in vocational upper secondary and post-secondary non-tertiary education by education level, sex and field of education - upper secondary and post-secondary non-tertiary education - vocational (levels 35 and 45) (rho=0.869*, p-value=0.000), Secondary education - vocational pupils (rho=0.855, p-value=0.000), as well as Secondary education - vocational pupils (% female) (rho=0.976*, p-value=0.000).

5. Discussion

According to the study's findings, the first hypothesis can be rejected as Upper secondary education in vocational fields has a negative coefficient (-0.4922), that is statistically significant at 0.005. None of the other variables have shown any statistically significant influence on GDP. Although lower secondary vocational education (.0832), post-secondary non-tertiary vocational education (0.0647), and similar factors exhibit positive correlations with GDP growth, they are not statistically significant. Consequently, the hypothesis is rejected, a new hypothesis is proposed, and it is concluded that the distribution of youth and students enrolled in professional programs does not have a FAVORABLE IMPACT on the economic development of the EU member states.

On the other hand, based on the OSL results, which show a high positive coefficient of 4.4214 with a significance of 0.000 (significant at 0.01 margin of error), the second hypothesis is fully accepted. This hypothesis states that students enrolled in vocational upper secondary and post-secondary non-tertiary education, irrespective of educational level, gender, or subject of study, have a positive impact on the economic growth of European Union member states.

This finding reveals a previously unexplored problem that has received considerable attention in the scientific literature, but has never been thoroughly examined.

Furthermore, the results of the OLS regression analysis reveal two influential factors within the expenditure of educational institutions on vocational education: upper secondary and post-secondary non-tertiary education - vocational (levels 35 and 45), with a positive coefficient (0.8418) and a significance of 0.000; and higher education (level), with a negative coefficient (-4.239) and a significance level of 0.000. Therefore, the hypothesis regarding secondary education and vocational students is only partially accepted, as it shows a negative impact on GDP growth. In contrast, upper secondary and post-secondary non-tertiary professional education (levels 35 and 45) has a positive impact on GDP growth.

6. Conclusions

The findings of the study reveal strong correlations between GDP and various variables related to vocational education. These variables include the percentage of students and pupils enrolled in vocational programs, the number of students enrolled in upper secondary and post-secondary non-tertiary vocational education by gender and field of study, and the expenditure that educational institutions spend on vocational education by educational level, program orientation, type of institution, and expenditure category. These correlations emphasize the significance of professional education and its related levels, ranging from lower secondary to post-vocational education.

Based on these findings, we concluded that three factors have a statistically significant influence on the GDP of European Union member countries: vocational upper secondary education, students enrolled in

vocational upper secondary and post-secondary non-tertiary education by education level, gender, and field of study, and vocational secondary education (levels 35 and 45).

As a recommendation, we suggest focusing on advancing professional education for women considering their percentage participation in vocational education. Additionally, there should be efforts to enhance vocational education at the lower secondary, post-secondary non-tertiary, and short-cycle tertiary levels. These measures would be instrumental in promoting vocational education, increasing accessibility for individuals from diverse backgrounds, and ultimately overall economic growth.

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