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Tomas KESAREVAS,
Akvilė ALEKSANDRAVIČIENĖ

The Impact of Public Spending on Education on Unemployment: Empirical Evidence from Lithuania

This study aims to assess the impact of public spending on education on unemployment. The study also considers other factors affecting unemployment, such as gross domestic product (GDP), exports, foreign direct investment, and inflation. Hypotheses are proposed for each factor affecting unemployment. This empirical study analyses Lithuanian data from 2000 to 2023 using the ordinary least squares method. The results showed that public spending on education and foreign direct investment significantly reduces unemployment. The results also revealed that net exports have a very insignificant effect on increasing unemployment, and inflation does not have a statistically significant effect on unemployment. GDP was removed from the model due to issues encountered when testing the regression model's assumptions.

Keywords: foreign direct investment, GDP, public spending on education, inflation, unemployment.

Šio tyrimo tikslas – įvertinti vyriausybės išlaidų švietimui poveikį nedarbui. Į tyrimą įtraukiami ir kiti veiksniai (kontroliniai), veikiantys nedarbą: bendrasis vidaus produktas (BVP), eksportas, tiesioginės užsienio investicijos ir infliacija. Kiekvienam poveikį nedarbui darančiam veiksniui iškeltos hipotezės. Empirinis tyrimas atliekamas analizuojant Lietuvos 2000–2023 m. duomenis, taikant įprastą mažiausių kvadratų metodą. Tyrimo rezultatai parodė, kad Vyriausybės išlaidos švietimui ir tiesioginės užsienio investicijos turi reikšmingos įtakos nedarbo mažinimui. Tyrimo rezultatai taip pat atskleidė, kad grynasis eksportas turi nedarbą didinantį poveikį (labai neženklų), o infliacija neturi statistiškai reikšmingo poveikio nedarbui. BVP buvo pašalintas iš modelio dėl problemų, su kuriomis susidurta tikrinant regresijos modelio prielaidas.

Raktiniai žodžiai: BVP, infliacija, nedarbas, tiesioginės užsienio investicijos, Vyriausybės išlaidos švietimui.

Introduction

Various state expenditures are vital for any country. These expenditures affect a country's economic and social well-being and have a strong impact on the well-being of its population. Of all public expenditures, spending on education is considered to have the greatest impact on the lives of citizens. The state is responsible for providing quality education to anyone who wants it, which can lead to the best possible outcomes in a person's life. Effective education policies and funding not only benefit the economic well-being of the state but also provide opportunities for every citizen to realise their

Tomas KESAREVAS – Master student at the Faculty of Economics and Management, Vytautas Magnus University, Lithuania. Address: K. Donelaičio str. 52, LT-44248 Kaunas, Lithuania. Phone: +370 37 327856. Email: tomas.kesarevas@vdu.lt.

Akvilė ALEKSANDRAVIČIENĖ – PhD, associate professor at the Faculty of Economics and Management, Vytautas Magnus University, Lithuania. Address: K. Donelaičio str. 52, LT-44248 Kaunas, Lithuania. Phone: +370 37 327856. Email: akvile.aleksandraviciene@vdu.lt

potential, ideas, and dreams. In this century, rapid technological progress and the development of artificial intelligence are constantly changing the structure of the labour market. The goal for governments and policymakers is to accurately understand the link between spending on education and unemployment in order to more effectively tackle the problem of unemployment.

Despite the existence of empirical evidence on the effect of public spending on education on unemployment, the results are not straightforward. Z. Pirim, W. A. Owings and L. S. Kaplan (2014) and N. Mehmetaj and N. Xhindi (2022) found, for example, a negative relationship between spending on education and unemployment. However, D. Singh and S. Shastri (2020) found that public expenditure on education has no effect on unemployment. Thus, the results of empirical research are controversial. This paper addresses the relevant **problem:** what is the impact of public spending on education on unemployment? **The object of the research** is the impact of public spending on education on unemployment. **This paper aims** to review studies that empirically examine this relationship and assess the impact of Lithuanian public spending on education on unemployment using a developed methodology. In line with the aim of the paper, the following objectives have been set: (i) treview literature on the impact of public expenditure on education on unemployment; (ii) develop a methodology to assess the impact of public expenditure on education on unemployment; (iii) assess the impact of public expenditure on education on unemployment in Lithuania based on the developed methodology; and (iv) draw conclusions from the research. **The research methods** employed in this paper include the analysis and generalisation of scientific research and multiple regression analysis using the ordinary least squares approach.

The article is structured as follows. First, a literature review on the impact of public spending on education on unemployment is conducted. Second, the methodology for assessing the impact of public spending on education on unemployment is presented. The third section presents the results of the research. Finally, the conclusions are drawn.

Literature review on the impact of public spending on education on unemployment

The relationship between public spending on education and unemployment has attracted a lot of attention from researchers. This relationship affects the economic health of a country and the well-being of everyone living in it. It is crucial to correctly assess the impact of public spending on education. Public spending on education facilitates access to better quality education and vocational training. This improves competitiveness and the potential for innovation. These positive aspects are essential for the sustainable development of a country.

Although there is empirical evidence on the effect of public spending on education on unemployment, the results are not straightforward. N. Mehmetaj and N. Xhindi (2022) conducted a study in Albania using data from 2001 to 2020.

The study examined the impact of public spending on education on youth unemployment. The authors selected the country's economic growth as a control factor and used a vector error correction method. They found a strong negative relationship between public spending on education and youth unemployment. According to their findings, a one percent increase in public spending on education would lead to a 10.81 percent drop in the youth unemployment rate. Z. Pirim et al. (2014) carried out a similar study in the United States, analysing a 25-year period. The aim of the study was to investigate the impact of public spending on education and health on unemployment rates. The study controlled the following factors: spending on education per pupil, government fiscal effort, gross domestic product per capita, number of graduates, degree of trade unionism, choice of political party, welfare spending, and health spending. The researchers used the ordinary least squares method. The results of the study were in line with the results of the aforementioned author: public spending on education has a negative relationship with the unemployment rate. The authors argue that the best way to reduce unemployment in the long term is to invest in human capital through public spending on education and health.

O. K. Binuomoyo (2020) also sought to answer the question of how public spending on education impacts unemployment. The study used data from Nigeria for the period from 1991 to 2017. The ordinary least squares method was used, and gross domestic product (GDP) growth and government efficiency index were chosen as control factors. The results showed that public expenditure on education has no effect on the unemployment rate in the country. The author notes that, although the country's education system is improving, the economy is unable to efficiently employ graduates. For this reason, public spending on education has no impact on the unemployment rate.

As S. Tudor et al. (2023) and V. Han (2021) noticed, public spending on education improves the overall skill set and qualifications of the workforce, thereby enhancing their employability and reducing unemployment. Research shows that an increase in education spending of 1% can be correlated with a reduction in unemployment of up to 0.165% over time, suggesting a direct inverse relationship between the two variables (Han, 2021).

D. Singh and S. Shastri (2020) looked for a link between public spending on education, secondary education, and unemployment rates. The study was conducted using data from India for the period 1987-2017. The researchers constructed an autoregressive distributed lag model. The results of the study showed that public expenditure on education has no effect on unemployment. However, the authors found a statistically significant inverse relationship between the attainment of secondary education and the unemployment rate. They argued that, although the study did not find a relationship between public spending on education and the unemployment rate, there should be one in the long run.

The idea that increasing public spending on education reduces unemployment is based not only on empirical studies and their results, but also on various economic theories. Human capital theory agrees with the link between the

two phenomena, as higher spending on education provides better learning opportunities, which increase human capital (Blundell et al., 1999). Human capital provides the country with an educated workforce, which reduces unemployment. Keynesian economic theory argues that public spending creates aggregate demand, thereby increasing the number of jobs (Keynes, 1937). The theory of the universal welfare state also supports this idea. This theory states that public spending on education is not only beneficial in reducing unemployment, but also in shaping the way people in the country think about unemployment. Educated citizens are less likely to abuse government benefits for the unemployed and more likely to find work (Dekker, 2010).

An analysis of scientific articles on the impact of public spending on education on unemployment shows that most of them support the idea that public spending on education combats unemployment. The prevailing idea is that public spending on education is an investment not only in reducing unemployment, but also in the well-being of the country and its population.

Research methodology

To empirically assess the effect of spending on education on unemployment, a multiple regression model was constructed. The dependent variable is unemployment. The main independent variable in the study is public spending on education. Control variables are also included as they may influence the dependent variable. All of the variables in the study, along with their abbreviations and measurements, are presented in Table 1.

The hypotheses of the study are formulated based on scientific literature:

H1: Increasing public spending on education reduces unemployment.

The relationship between public spending on education and unemployment has been studied by other researchers in various countries. Some studies (e.g., N. Mehmetaj, N. Xhindi (2022); Z. Pirim et al. (2014)) have demonstrated that public spending on education reduces unemployment; while others (e.g., O. K. Binuomoyo (2020); D. Singh, S. Shastri (2020)) have found no relationship. This study attempts to substantiate the hypothesis that public spending on education has an unemployment-reducing effect.

Table 1. **Research variables**

Role	Variable	Abbreviation	Indicator
Dependent	Unemployment	UNEM	Unemployment rate (% of workforce)
Independent	Public spending on education	SPEN	Public spending on education (million euros)
Controls	Gross domestic product	GDP	GDP per capita ($)
	Inflation	INF	Inflation (annual, %)
	Export	EXP	Net exports (export – import, $)
	Foreign direct investment (FDI)	FDI	FDI inflows (% of GDP)

H2: As gross domestic product grows, unemployment falls.

GDP is a measure of economic output that reflects overall economic performance and growth trends, which can have a direct impact on unemployment. This relationship has been widely studied and is best captured by Okun's rule: a 1% rise in the unemployment rate leads to a 2% to 4% fall in GDP (Mandel, Liebens, 2019; Sögner, 2001). This study aims to support the hypothesis that GDP and unemployment are negatively correlated, meaning that as one increases, the other decreases.

H3: Rising inflation reduces unemployment.

The Phillips curve best describes the relationship between inflation and the unemployment rate. According to A. W. Phillips (1958), the curve defines the inverse relationship between inflation and unemployment. This study attempts to substantiate the hypothesis that rising inflation reduces unemployment.

H4: As net exports increase, unemployment decreases.

Researchers have also widely studied the relationship between exports and unemployment. The main explanation for this relationship is that countries with higher export levels have greater domestic output, which leads to more jobs, which in turn lowers the unemployment rate (Gonese, Sibanda, Ngonisa, 2023; Adam et al., 2023). I. Okeke (2021) argues that net exports should reduce unemployment because more people are employed in growth sectors. This study attempts to substantiate the hypothesis that net exports have an unemployment-reducing effect.

H5: Rising inward FDI reduces unemployment.

The relationship between FDI and unemployment is best explained by the fact that investment from other countries tends to utilise the labour force of the country receiving the inflows. Therefore, as FDI inflows increase in a country, its unemployment rate decreases (Ali, Ahmad, Khalil, 2020; Mina, Jaeck, 2015). This study attempts to substantiate the hypothesis that rising FDI inflows reduce unemployment.

The study uses time series data from 2000 to 2023 and is carried out in Lithuania. The Ordinary Least Squares (OLS) method is used to estimate a regression model. This method has also been used in previous studies on this topic by Z. Pirim et al. (2014), O. K. Binuomoyo (2020) and others. The general form of the multiple regression model is as follows (*see* Equation 1):

$$Y_t = b_0 + b_1X_{1t} + b_2X_{2t} + ... + b_kX_{kt} + u, \quad (1)$$

where: Y is a dependent variable in the model; $X_1, X_2 \ldots X_k$ are independent variables in the model; b_0 is the intercept/constant; b_1 and b_2 are the coefficients of the regression model (each coefficient on the corresponding X shows the average change in the dependent variable Y when the corresponding X increases by 1 unit and the other X's are held constant); u is the error term.

When the variables of interest are fitted into a multiple regression model, the resulting equation is obtained as follows (*see* Equation 2):

$$UNEM_t = b_0 + b_1\underbrace{SPEN_t}_{\text{core independent variable}} + \underbrace{+ b_2GDP_t + b_3INF_t + b_4EXP_t + b_5FDI_t}_{\text{controls}} + u. \quad (2)$$

To reduce the number of possible outliers in the study, make the data more similar to a normal distribution, interpret the model with the same units (percentages), and "straighten out" the relationships between the variables, almost all variables are transformed using log transformation. The export variable is the exception because it has negative values and therefore cannot be log transformed. The final form of the model is shown in Equation 3:

$$\ln(UNEMb_t) = b_0 + b_1\ln(SPEN_t) + b_2\ln(GDP_t) + b_3\ln(INF_t) + b_4EXP_t + b_5\ln(FDI_t) + u. \quad (3)$$

After analysing scatter plots and outliers (using Cook's measure) in the data, testing for normality of residuals (using the Predicted probability (P-P) plot), testing for multicollinearity (using bivariate correlation), and testing for autocorrelation (using the Durbin-Watson d statistic), the results of the estimated regression model can be interpreted. The statistical significance of the model and the parameters' estimates is tested by Fisher (F) and Student (t) criteria, respectively. The tests use 95% or 90% statistical significance, meaning the resulting test values (p-values) are compared with 0.05 or 0.1. A coefficient of determination, which indicates the proportion of the variation in the dependent variable that is explained by the selected independent variables, is also analysed.

Hence, based on this research methodology, further estimation of the model will be carried out, and the results will be presented.

Findings

A scatter plot analysis revealed that unemployment has no clear relationship with some independent variables. However, it does have a linear relationship with some other variables. As mentioned in the Research methodology section, almost all of the research variables were transformed using a logarithmic transformation. Thus, this transformation solves for all nonlinearities. To investigate outliers in the model, Cook's (influence) measure was used. One outlier was found in the model, for the year 2000, thus the observation for that year was excluded from the analysis. To check whether the residuals are normally distributed, the predicted probability plot was examined. This plot showed a normal distribution. The bivariate correlation method was used to check for multicollinearity, and the results revealed a positive correlation between public spending on education and GDP. In order to remove multicollinearity, GDP was removed from the model because it is not the core independent variable. After this procedure, the multicollinearity disappeared. The Durbin-Watson d statistic was used to test for autocorrelation and showed that there was an autocorrelation problem in the model. To remove this problem, a lagged dependent variable ($UNEM_{t-1}$) was included in the regression model. The resulting model is as follows (*see* Equation 4):

$$\ln(UNEM_t) = b_0 + b_1\ln(SPEN_t) + b_2\ln(INF_t) + b_3EXP_t + b_4\ln(FDI_t) + b_5\ln(UNEM_{t-1}) + u. \quad (4)$$

Adding a lagged dependent variable to the model eliminates autocorrelation. The regression model is statistically significant, with a p-value of 0.022, which is less than the threshold of 0.05. Table 2 shows the unstandardised coefficients, which indicate the expected (average) change in the unemployment rate after a one-unit change in the independent variable, holding all other factors constant. Thus, a one percent increase in public spending on education leads to an average 0.712 percent fall in the unemployment rate, holding all other factors constant. Public spending on education increases the skills of the labour force, improves educational opportunities for the population, and contributes to labour market stability. These factors bridge the gap between labour market demand and supply, thereby directly reducing unemployment. On average, a one percent increase in FDI leads to a 0.191 percent reduction in the unemployment rate, holding other factors constant. FDI stimulates economic development, innovation, and job creation. These factors directly impact the unemployment rate. However, a one billion dollar increase in net exports would leave the unemployment rate almost unchanged (the coefficient is not an absolute zero, but very low). Although net exports are a positive economic phenomenon, this model shows that an increase in net exports would have almost no effect on the unemployment rate. This could be due to insufficient changes in net exports or in the labour force in the exported sectors to significantly impact unemployment. Inflation and the lagged dependent variable are statistically insignificant. While the Phillips curve suggests a relationship between inflation and unemployment, economists argue that it is not always accurate. The absence of a relationship could also be due to other factors that impact unemployment more strongly.

The standardised Beta coefficient indicates the strength and direction of the relationship between the dependent and independent variables. The modulus is applied to the standardised Beta coefficient. The higher the value of the Beta coefficient, the more the dependent variable is influenced by a given independent variable. Among the statistically significant variables in the study, public

Table 2. **Regression model parameter estimates**

Variable	Unstandardised coefficients	Standardised Beta coefficients	p-value	Hypothesis testing
Constant	7.430	-	0.002	
SPEN	-0.712	-0.672	0.019	Confirmed
FDI	-0.191	-0.399	0.033	Confirmed
EXP	0.000	0.444	0.060	Not confirmed
INFL	0.290	0.087	0.724	Not confirmed
UNEMt_1	0.148	1.184	0.253	–

Notes: (1) compiled by the authors using the SPSS program; (2) Hypothesis H2, which includes gross domestic product, is not tested as this factor was removed from the model due to problems with the regression model.

expenditure on education has the strongest effect on unemployment (*see* Table 2). The coefficient of determination of the model is 0.512. It shows the percentage of variation in the dependent variable that can be explained by the independent variables. In this model, 51.2% of the variation in the unemployment rate can be explained by the chosen independent variables.

In conclusion, the model constructed in the study is statistically significant. The results confirmed two of the five hypotheses: increasing public spending on education reduces unemployment and increasing foreign direct investment also reduces unemployment. Net exports have a very small, yet unemployment-increasing effect (90% statistical significance); the same result was obtained by Okeke (2021). Inflation has no statistically significant effect on unemployment, a result also obtained by R. F. Oppong and W. Zhou (2021).

Conclusions

An analysis of research on the impact of public spending on education on unemployment showed that most studies agree that public spending on education is effective in tackling unemployment. However, the examined empirical research revealed that this relationship does not always exist in real labour markets. Thus, the aim of this study is to assess the impact of public spending on education on unemployment in Lithuania using a developed methodology. Based on the literature, additional control factors affecting unemployment were selected: gross domestic product, net exports, foreign direct investment, and inflation. Hypotheses were developed for each factor influencing unemployment. The ordinary least squares method was chosen to build a multiple regression model for the study. The research covers the period from 2000 to 2023.

The results showed that public spending on education has a significant unemployment-reducing effect in Lithuania during the period of the study. Among the selected controls, foreign direct investment is also found to have a significant unemployment-reducing effect. The study revealed an unemployment-enhancing effect of net exports. According to the research results, inflation does not have a statistically significant effect on unemployment in Lithuania. Gross domestic product was removed from the model due to issues with testing the assumptions of the regression model. The results confirmed two hypotheses: increasing public spending on education reduces unemployment (H1) and increasing foreign direct investment also reduces unemployment (H5).

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Tomas KESAREVAS, Akvilė ALEKSANDRAVIČIENĖ

VYRIAUSYBĖS IŠLAIDŲ ŠVIETIMUI POVEIKIS NEDARBUI: EMPIRINIS LIETUVOS TYRIMAS

Santrauka

Įvairios valstybės išlaidos yra gyvybiškai svarbios šalies vystymuisi. Vyriausybės sukauptos lėšos naudojamos nacionaliniam saugumui, visuomenės sveikatai ir tolesnei pažangai. Tačiau vienos iš svarbiausių valstybės išlaidų yra išlaidos švietimui. Švietimui skiriamos lėšos tiesiogiai veikia piliečių gyvenimą, sudarydamos palankias sąlygas ir lygias galimybes gauti kokybišką išsilavinimą. Kritinis mąstymas, platesnis pasaulio supratimas ir asmeninis tobulėjimas yra privalumai, kuriuos kokybiškas išsilavinimas suteikia asmenims. Tačiau ar šie privalumai turi apčiuopiamo poveikio šalies nedarbui? Šiame tyrime analizuojama problema – koks yra viešųjų išlaidų švietimui poveikis nedarbui. Tyrimo objektas – Vyriausybės išlaidų švietimui poveikis nedarbui. Tyrimo tikslas – remiantis sukurta metodika, išanalizuoti viešųjų išlaidų švietimui poveikį nedarbui Lietuvoje. Tyrimo teoriniam pagrindimui naudojama mokslinės literatūros analizė ir apibendrinimas. Empiriniam tyrimui atlikti naudojama daugialypė regresija, taikant įprastą mažiausių kvadratų metodą.

Išanalizavus mokslinius tyrimus apie Vyriausybės išlaidų švietimui poveikį nedarbui, galima pastebėti, kad daugelyje tyrimų sutinkama su idėja, jog, Vyriausybei skiriant lėšų švietimui, veiksmingai kovojama su nedarbu. Vyrauja nuomonė, kad Vyriausybės išlaidos švietimui yra investicija ne tik į nedarbo mažinimą, bet ir į šalies bei jos žmonių gerovę. Idėja, kad, didinant Vyriausybės išlaidas švietimui mažėja nedarbas, grindžiama ne tik empiriniais tyrimais ir jų rezultatais, bet ir įvairiomis ekonomikos teorijomis. Žmogiškojo kapitalo teorijoje sutinkama su ryšiu tarp šių dviejų reiškinių, nes didesnės išlaidos švietimui suteikia geresnes mokymosi galimybes, o tai didina žmogiškąjį kapitalą. Žmogiškasis kapitalas suteikia šaliai išsilavinusią darbo jėgą, o tai mažina nedarbą. Keinsistinė ekonomikos teorija teigia, kad vyriausybės išlaidos sukuria bendrą paklausą, o tai didina darbo vietų skaičių. Visuotinės gerovės valstybės teorija taip pat patvirtina šią idėją. Teorija teigia, kad vyriausybės išlaidos švietimui naudingos ne tik mažinant nedarbą, bet ir formuojant šalies žmonių požiūrį į nedarbą. Išsilavinę piliečiai rečiau piktnaudžiauja vyriausybės išmokomis bedarbiams ir turi didesnę tikimybę susirasti darbą.

Empirinis tyrimas atliekamas analizuojant Lietuvos 2000–2023 m. duomenis. Tyrimo tikslas – įvertinti Vyriausybės išlaidų švietimui poveikį nedarbui. Remiantis moksline literatūra, pasirenkami papildomi nedarbą veikiantys veiksniai (kontroliniai): bendrasis vidaus produktas, eksportas, tiesioginės užsienio investicijos ir infliacija. Kiekvienam poveikį nedarbui darančiam veiksniui iškeltos hipotezės. Tyrime naudojamas mažiausių kvadratų metodas, sudaromas daugialypės regresijos modelis. Tyrimo rezultatai parodė, kad nagrinėjamu laikotarpiu Vyriausybės išlaidos švietimui Lietuvoje turėjo reikšmingos įtakos nedarbo mažinimui (patvirtinta H1 hipotezė). Tyrimo rezultatai taip pat atskleidė, kad iš pasirinktų kontrolinių veiksnių reikšmingos įtakos nedarbo mažinimui turi ir tiesioginės užsienio investicijos (patvirtinta H5 hipotezė). Taip pat rasta, jog grynasis eksportas turi labai neženklų nedarbą didinantį poveikį. Remiantis tyrimo rezultatais, infliacija neturi statistiškai reikšmingo poveikio nedarbui Lietuvoje. BVP buvo pašalintas iš modelio dėl problemų, su kuriomis susidurta tikrinant regresijos modelio prielaidas.