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The Impact of the Public Education Expenditures on Regional Development in Turkey: Evidence from Static and Dynamic Panel Data

Altuğ Murat KÖKTAŞ[1], Şükrü APAYDIN[2] and Koray PİRÇEKLİ[3]

ABSTRACT

This study aims to analyze the impact of public education expenditures on regional economic development in Turkey. For this purpose, we test the hypothesis that there is a strong relationship between education expenditures and economic growth/development using static and dynamic panel data (system GMM) methods. In the analysis, we use annual data on central government education expenditures and regional GDP per capita data for the period 2004–2019 for 81 provinces at NUTS-III level. The findings of the study revealed a positive relationship between central government education expenditures and regional development. In other words, regional development accelerates if education expenditures increase. However, the magnitude of the effect is not as strong as is expressed in the hypothesis: a ten percent increase in education spending only increases economic development by 1.1 percent.

ملخص

تهدف هذه الدراسة إلى تحليل تأثير نفقات التعليم العام على التنمية الاقتصادية الإقليمية في تركيا. ولهذا الغرض، نختبر الفرضية القائلة بوجود علاقة قوية بين نفقات التعليم والنمو/التنمية الاقتصادية باستخدام أسلوبي البيانات الثابتة والديناميكية (نظام أسلوب اللحظات المعمم (GMM)). وفي التحليل، نستخدم البيانات السنوية حول نفقات التعليم الحكومية المركزية وبيانات نصيب الفرد من إجمالي الناتج المحلي الإقليمي لفترة 2004-2019 لـ81

[1]Corresponding Author, Necmettin Erbakan University, Konya, Turkey, E-mail: altugmkoktas@gmail.com
[2]Nevşehir Hacı Bektaş Veli University, Nevşehir, Turkey, E-mail: sukruapaydin@gmail.com
[3]Ministry of Treasury and Finance, Ankara, Turkey, E-mail: koraypircekli06@gmail.com

مقاطعة على المستوى الثالث من تسمية الوحدات الإقليمية للإحصاءات (NUTS-III). وكشفت نتائج الدراسة عن علاقة إيجابية بين نفقات التعليم الحكومية المركزية والتنمية الإقليمية. بمعنى آخر، تتسارع وتيرة التنمية الإقليمية مع زيادة نفقات التعليم. ومع ذلك، فإن حجم التأثير ليس قوياً كما تم التعبير عنه في الفرضية: إن زيادة الإنفاق على التعليم بنسبة 10% لا تؤدي إلا إلى زيادة التنمية الاقتصادية بنسبة 1.1%.

ABSTRAITE

Cette étude vise à analyser l'impact des dépenses publiques d'éducation sur le développement économique régional en Turquie. À cette fin, nous testons l'hypothèse selon laquelle il existe une relation forte entre les dépenses d'éducation et la croissance économique/le développement en utilisant des méthodes de données de panel statiques et dynamiques (système GMM). Dans l'analyse, nous utilisons des données annuelles sur les dépenses d'éducation du gouvernement central et des données sur le PIB régional par habitant pour la période 2004-2019 pour 81 provinces au niveau NUTS-III. Les résultats de l'étude ont révélé une relation positive entre les dépenses d'éducation du gouvernement central et le développement régional. En d'autres termes, le développement régional s'accélère si les dépenses en matière d'éducation augmentent. Toutefois, l'ampleur de l'effet n'est pas aussi forte que ne l'exprime l'hypothèse : une augmentation de dix pour cent des dépenses d'éducation n'accroît le développement économique que de 1,1 pour cent.

Keywords: Public education expenditures, Regional development, Static panel data, Dynamic panel data.

1. Introduction

Education is considered an indispensable component that aggravates people's knowledge in society and makes them more qualified, as well as a phenomenon that raises the living standards of individuals as a result of economic development (O'Donoghue, 2017; Barro, 2002). Accordingly, education is well-known to have multi-dimensional impacts such as developing political and democratic social awareness, comprehending complex problems, assisting technological progress, and discovering cultural dispositions (Bowen, 1943). Educated people participate in elections, take active roles in political or non-governmental organizations, usher in defense of their rights democratically, assert and express their

opinions in democratic debates and enlighten the society (Weisbrod, 1964). Therefore, in societies with advanced educational levels, crime rates tend to decline rapidly, administration attains a more democratic feature, and it becomes easier to ensure economic and political stability (Krueger & Lindahl, 2001). As a result of education, unemployment decreases, household incomes rise and, in turn, the existing crime rates in society fall (Alexander and Simmons, 1975). Similarly, it is claimed that younger people with higher educational levels are less prone to commit crimes (Spiegleman, 1968). Therefore, if individuals are not provided with enough education opportunities, the increasing population pressure would elevate the unrest of the people and consequently undermine economic development (Malthus, 1836). Therefore, the right to education was included in Article 26 of the Universal Declaration of Human Rights published on December 10, 1948, and it was emphasized that the availability of the right to education implies a human right for every individual. Therefore, education has universal importance since it involves a human right.

Improving human capital means aggravating the knowledge, skills, and capacity of every individual in society (Harbison & Myers, 1964). According to Weisbrod (1964), there was evidence of lower expenditures on education wherever migration occurred. Accordingly, the maturation of people, the transfer of knowledge, the improvement of skills, and the acquisition of human virtues are among the main benefits of education, and beyond that, it is claimed to have also individual and social gains (Atkinson, 1983). For instance, an additional rise in the level of education provides individuals with the opportunity to find jobs with high value-added, and the differences in incomes increase (Breton, 2003). According to empirical analyses that investigate whether allocating more resources to education positively affects the distribution of income in a country, public education expenditures reduce income inequality, and therefore it has been suggested that allocating more resources to education can be a means of reducing the level of income inequality in a country (Sylwester, 2002). Similarly, it is claimed that those with higher educational status are more successful than those with lower educational status in subjects such as effective use of tools and equipment used in daily life, bill payments, and life planning (Perlman, 1973). External benefits of education can be examined under two main categories. The first one involves the benefits of education that disperse over the entire society as a whole, and the second involves the benefits regarding the environment

and workplace (McMahon, 1994). According to Garfinkel and Haveman (1977), it is emphasized that a strong inverse relationship exists between the education of the head of the household and the degree of poverty, social assistance to the poor as well as health expenditures. Thus, it was stated that, by courtesy of the external benefit of education, there has been a reduction in the costs of medical aid, housing assistance, and aid to citizens in need of protection. Similarly, education results in extremely important externalities on public health due to increased life expectancy and lowered infant mortality rates (Kenkel, 1991). In this context, it is well-known in the literature that semipublic goods such as education and health are in the field of interest of the public economy due to external benefits with which they provide the society as a whole, as well as the private benefit with which they provide individuals. Governments, aiming at enhancing these positive externalities, intervene in education and health, in general, by supporting these sectors. As a matter of fact, A. Marshall, while mentioning the importance of education, drew attention to the investment ventured in education and described the investment as a national investment. According to Marshall, the most valuable capital is the one invested in human existence. Because education renders people more intelligent, more willing, and more reliable in their daily lives (Marshall, 1890).

Becker's seminal work on human capital, along with Schultz's analysis of education expenditures as a form of investment in the early 1960s and his complementary publication on investment ventured in people as of 1962, brought up the analysis of education expenditures and their returns, hence, triggered the studies conducted on this subject (Woodhall, 2013). In this context, it has been determined that throughout the period following the Second World War, as the national income accounts were put on the agenda and began to be calculated using more accurate methods, the rise in national income had an additional increase that not be explained by the abundance of both physical and human production factors. Later on, it was understood that such a situation was caused directly by the elevation in educational level (Mosiño, 2002). Therefore, the concept of human capital, which did not attract attention after A. Smith, re-examined by economists and led many economists such as Schultz, Denison, Becker, Harbison, Myers, Mincer, Psacharopoulos, and Barro to study in this field during the 1950s. Subsequently, the importance of education in economic development was better understood by courtesy

of the endogenous growth models developed by P.M. Romer, R.J. Barro, R.E. Lucas, and G. Mankiw (Neira et al., 1999).

In this context, the study examines the impact of public education expenditure on economic development in Turkey. Moreover, the study aims to investigate the extent to which the hypothesis, expressed in endogenous growth models, implying "a strong relationship between education expenditure and economic growth/development" in Turkey. For this purpose, the annual regional data obtained over the period 2004–2019 are used at the NUTS III level, and the dynamic panel data (system-GMM) approach is adopted as an empirical method. In this regard, our study embodies two important distinctions. First, the analysis technique in our study is the first study ever conducted in Turkey in terms of the study period as well as the data used. Second, the data of central government expenditures are used as public education expenditures in the study. As can be seen from the empirical literature reviewed below, in general, the total education expenditures made by the central and local governments are used as public education expenditures in the analyses. Therefore, it is thought that our study would contribute to the relevant empirical literature. First, the literature review is made in the following parts of the study. Then, the data and econometric methodology of our research study are introduced. Following the part in which the empirical results and findings are discussed, the overall evaluation and policy recommendations are presented in the conclusion part.

2. Literature Review

The interventions made by the public sector in the economy attract the attention of many researchers. There are various empirical studies conducted on whether or not the public expenditure is efficient (Aschauer, 1989) as well as the possible consequences of fiscal policy implementation (Nijkamp & Poot, 2004). In this context, it is seen that the relationship between public expenditures and economic growth is frequently mentioned in the literature. For instance, it is stated that a strong relationship exists between the level of development and financial structure (Easterly & Rebelo, 1993), and it is emphasized that productive public expenditures also stimulate growth (Kneller et al., 1999). According to Robert Lucas (2002), the basic engine of economic growth is human capital accumulation. Since the size, combination and socio-cultural characteristics of the population are the determinants of the

economic development rate and level of development (Linton, 1952), it is necessary to generate environments that would enable the improvement of human capital in all aspects (Staley, 1961). As in East and Southeast Asian countries, countries must invest in education to experience rapid growth in exports and per capita output and to compete with other countries (Ranis et al., 2000). In this context, it is seen that governments support policies for improving human capital in favor of the development of national economies (Linhartova, 2020).

Economic development and human capital improvement resemble a closely related chain. Empirical analysis reveals the existence of a significant relationship between public education and health expenditures and economic development as well as human improvement, especially for women. Thus, the good and bad performances of these factors affect each other in the same manner (Ranis et al., 2000). For instance, in the empirical analysis conducted by Agiomirgianakis et al. (2002) for ninety-three countries within the scope of endogenous growth theory, education was positively associated with economic growth. According to the simulation performed on Tanzania and Zambia, it was determined that public education expenditures would have increased economic growth and a well-designed expenditure model could also be effective in reducing poverty (Jung & Thorbecke, 2003). According to the results of another study conducted on nine major Latin American countries over the period 1983–1993, it was determined that public expenditures on education and health services had a significant and positive impact on economic growth (Ramirez & Nazmi, 2003). As a result, investment ventured in education is thought to be a crucial variable in explaining the rise in per capita income (Krueger, 1968). In this context, there is a great deal of evidence in the literature indicating that a positive relationship exists between public educational expenditure and economic growth (Atems & Liu, 2020; Thanh et al., 2020; Kutasi & Marton, 2020; Nijkamp & Poot, 2004; Ramirez & Nazmi, 2003; Sylwester, 2000; Şengül, 2021; Trabelsi, 2018).

In another study conducted on economic growth in Ghana over the period 1970 - 2004, it was determined that total public expenditures procrastinated economic growth, and although health and infrastructure expenditures supported economic growth, educational expenditures did not have a significant impact on the short-run (Nketiah-Amponsah, 2009). In the study by Goetz and Hu (1996), the direct and indirect contributions of the human capital level to the economic development of the southern

regions in the USA were tested. As a result of the study, it was determined that regions with higher human capital levels also had high levels of development. Martin and Herranz (2004) tried to explain the development differences of 19 regions in Spain with traditional production factors as well as human capital. Accordingly, all factors of production, including human capital, were significantly related to economic growth. In the analysis performed on 30 developing countries throughout the period from the 1970s to the 1980s, it was found that investment expenditures on education and total expenditures had significant impacts on economic growth (Bose et al., 2007). In this context, the impact of educational expenditures on economic growth may differ by country.

In the empirical analysis on the impacts of public investments ventured in Greece on regional economic growth over the period 1978–2007, different impacts of different investment types were mentioned. Accordingly, it was determined that education investments had the highest impact along with infrastructure investments, and public investments had a positive impact on regional economic growth throughout the last three decades (Rodríguez-Pose et al., 2012). The study, in which the impact of educational expenditures on growth in India over the period 1966–1996 was examined via time-series analysis, found that primary education had a strong causal impact on growth. However, the evidence obtained for secondary education was at a limited level. Nevertheless, there was evidence that women's education at all levels had economic growth potential (Self & Grabowski, 2004). For the impact of public education expenditures on growth, there was evidence that if the quality of the provided education was good, it would have been positive, whereas negative if it was of poor quality (Trabelsi, 2018). In Uganda, however, a study, which was conducted over the period 1982–2017, determined that public educational expenditures aggravated the productivity of farmers and positively affected production by adopting new technologies (Owuor et al., 2020).

Upon considering the studies in the literature regarding the impact of educational expenditures on growth, many empirical analyses attract attention. Robert J. Barro, who performed an analysis on the relationship between human capital and economic growth in the 1990s, found that an additional one-year education level increased economic growth by 0.44% (Barro, 2001). According to the empirical analysis conducted on Pakistan over the period 1972–2010, educational expenditures were found to have

a positive and significant impact (0.039) on economic growth (Riasat et al., 2011). In the empirical analysis performed on the G20 countries over the period 2000–2011, the impact of educational expenditures on economic growth was found to be positive and statistically significant (0.77) in the short-run and, also (0.69) in the long-run (Selim et al., 2014). According to the empirical analysis performed by Tomić (2015) comparatively on the EU and BRICS countries, it was found that a positive correlation existed between public educational expenditures and economic growth. Nonetheless, the impact of educational expenditures on the growth rate was determined to be 0.77 for 28 EU countries over the period 2002–2011. In the panel data analysis conducted on the determinants of macroeconomic development over the period 2010–2018 for 28 EU member countries, the impact of public education expenditures on economic growth was calculated as negative (-0.1662) (Kiselakova et al., 2020). Another study, in which the impact of educational expenditures on economic growth was tested for Azerbaijan over the period 1995–2018, detected that a 1% increase in public educational expenditures boosted economic growth by 0.44% (Mukhtarov et al., 2020).

3. Data and the Empirical Methodology

3.1. Data

Endogenous growth models assume that human capital accumulation is fundamental to economic growth and development. Accordingly, public education expenditures will encourage human capital accumulation, and thus it can play an active role in ensuring economic growth (Mankiw, et al., 1992; Blankenau, 2005; Blankenau et al., 2007). In the study, in determining the effect of public education expenditures on economic development, the following log-linear reduced form equation is used:

$$loggdppc_{it} = \alpha_0 + \alpha_1 logredu_{it} + u_{it} \quad (1)$$

where $loggdppc_{it}$ and $logredu_{it}$ represent, respectively, the real GDP per capita and public education expenditures of *i*th province at time *t*. u_{it} shows the error term and its components. μ_i and v_{it} indicate the unobservable individual-specific fixed effects and 'idiosyncratic' time-varying disturbances, respectively. Equation (1) is also the static panel data model we use in the study.

The dataset, which belongs to 81 provinces, covers the period of 2004–2019. We took regional reel GDP data from the Turkish Statistical Institute (TURKSTAT) and obtained per capita data by dividing the annual population. We have compiled public expenditure data by provinces from the website of the General Directorate of National Accounts. We used the regional consumer price index (CPI) at the NUTS-II level to deflate nominal public education expenditures, assuming that the same CPI applies to all the provinces in a specific region. Public education expenditures include only central government education expenditures. Table 1 summarizes the information about these variables, and Table 2 demonstrates the descriptive statistics.

Table 1: Definitions of The Variables

Variables	**Definitions**	**Source**
loggdppc	Output-side reel gross domestic product per capita (at 2009 constant national prices, in thousand TL, by provinces in chained volume)	Turkish Statistical Institute
logredu	Reel central government education expenditures (at 2003 constant national prices, in thousand TL, by provinces)	General Directorate of Public Accounts - Republic of Turkey Ministry of Treasury and Finance

Table 2: Descriptive Statistics of the Variables

Variables	**Observation**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
lngdppc	1296	4.277169	.3809008	3.225525	5.353405
lnredu	1296	14.50311	.896683	12.36086	17.84661

3.2. Empirical Methodology

Static and Dynamic Panel Data Models

We use the static and dynamic panel data methods in the study to analyze the effects of public education expenditures on regional economic development.

Panel data analysis, which includes both individual-specific fixed effects and time dimension, increases the degree of freedom and reduces the problem of multiple linear correlations. Also, parameter estimates are more reliable as there are many observations in panel data analysis that consider unobservable heterogeneity and time effects. In our static panel data model in Equation (1), we estimated the fixed and random-effects model and decided which model to be selected by the Hausman test.

However, most of the economic relations are dynamic, and lagged values of variables such as economic growth/development affect their current situation. In other words, static panel data models do not deal with the endogeneity issue. Therefore, it may be necessary to include lagged values of such variables in the model. Besides, adding the lagged dependent variable to the model eliminates the non-stationary residue problems in static panel data models.

Using the variables in this study, it is possible to show the dynamic panel data model as follows (Blundell and Bond, 1998):

$$loggdppc_{it} = \beta_0 loggdppc_{i,t-1} + \beta_1 logredu_{it} + u_{it} \qquad (2)$$
$$u_{it} = \mu_i + \upsilon_{it}$$

where $loggdppc_{it}$ and $logredu_{it}$ are the dependent variable and explanatory variable, respectively. Also, $\mathrm{E}(\mu_i) = \mathrm{E}(\upsilon_{it}) = \mathrm{E}(\mu_i \upsilon_{it}) = 0$ for i = 1,……,N and t = 2, …… T where μ_i and υ_{it} indicate the unobservable individual-specific fixed effects and time-varying disturbances. In other words, the explanatory variable in the model is exogenous, and the error term has zero mean and constant variance.

If the lagged dependent variable and the error term are correlated, the inconsistent coefficient estimations may arise in the fixed and random effect models. As a solution to this problem, the suggestion is to use the

instrument variable instead of the lagged dependent variable (Greene, 2012; Cameron and Trivedi, 2005). In this context, Anderson and Hsiao (1981) suggested using $y_{i,t-2}$ as an instrumental variable instead of $\Delta y_{i,t-1}$ after taking the first difference of the model (equation 2). The instrumental variable estimation method proposed for predicting the dynamic panel model is consistent. However, it is not efficient because it does not allow all moment conditions and does not consider the structure Δu_{it}. According to Arellano and Bond (1991), this situation arises because all possible instrumental variables are not used. Therefore, they suggested using all lagged values of y_{it} and x_{it} as instrumental variables and thus developed the Generalized Method of Moments (GMM). However, first, Arellano and Bover (1995) and later Blundell and Bond (1998) built up a new approach called the system GMM (system dynamic panel data), which combines the original and transformed equation into a single system. In this approach, the system-GMM estimator allows both lagged levels of y_{it} in the first difference equations and lagged differences of y_{it} in the level equations as an instrumental variable. Indeed, Blundell and Bond (1998) have shown that stationary restrictions that allow the use of a System-GMM estimator can be added to the initial conditions (Blundell and Bond, 1998; Baltagi, 2005).

The System GMM approach requires two tests for the validity of the estimation process. The first is the Arellano-Bond test, and the second is the Sargan test, which shows the adequacy of the overdetermination constraints. According to the Arellano-Bond test, there should be no second-order autocorrelation in the model. If the second test result is statistically significant, it means the model is correctly determined, and the instrumental variables are appropriate.

4. Empirical Results and Discussion

Tables 3–4 show our panel regression results. We present the static panel data estimations in Table 3. We estimate both the fixed and random-effects models. According to both models, public education expenditures have a positive and significant effect on GDP per capita. The Hausman test is statistically significant, showing that the fixed-effects estimate is consistent. Accordingly, GDP per capita increases by 5.1% when there is a 10% increase in public education expenditures. Thus, the static model provides strong evidence that public education expenditures significantly

affect regional economic development. This result corresponds to both theoretical and empirical expectations.

Table 3: Static Panel Data Estimation Results

Dependent variable: ***loggdppc***	**Fixed Effects**	**Random Effects**
logredu	0.5103236* (0.00716)	0.5006381* (0.00727)
Constant	1.97906* (0.10396)	2.11953* (0.50063)
Observations	1296	1296
Groups	81	81
Specification and Diagnostic Tests		
Hausman Test (χ^2)	70.29*	
Wooldridge Test (*F* Statistics)	376.775*	
Breusch-Pagan Test (χ^2)	796.769*	

Notes: Figures in parentheses are standard errors. * denotes significance at 1% confidence interval.

We performed the Wooldridge test for serial-correlation and the Breusch-Pagan Lagrange Multiplier test for panel heteroskedasticity in the model. According to test results, the static model has autocorrelation and heteroskedasticity. One of the possible causes of these problems is the existence of dynamic relationships between variables. However, for whatever reason, the presence of these problems can lead to the estimation of inconsistent coefficients. Thus, we conduct dynamic panel data estimates using the system-GMM procedure described above and present results in Table 4.

As stated above, the quality of the system-GMM estimator depends on the diagnostic test results. According to the Arellano-Bond test, there is no second-order autocorrelation in the model since AR (2) test statistics value is insignificant. Further, the Sargan test provides support that instrument variables are suitable in the 95% confidence interval. Finally, the probability value of the Wald Chi-squared test indicates that the models are significant. Thus, all test results show that the model meets the validity conditions.

Table 4: Dynamic Panel Data Estimation Results

Dependent variable: loggdppc	**Coefficient**	**Std. Error**	***t* Statistics**	**Probability**
loggdppc (-1)	0.8258226	0.0020728	398.41	0.000*
logredu	0.1147395	0.0013507	84.95	0.000*
Observations		1215		
Groups		81		
Diagnostic Tests				
Wald Test (χ^2)		4.94e+07* (0.0000)		
Sargan Test (χ^2)		80.9769 (0.9963)		
Arellano-Bond AR2 Test		-1.3225 (0.1860)		

Notes: Figures in parentheses () are *p*-values. * indicates significance at 1% confidence interval. In the model estimation, we have applied twostep system dynamic panel data estimation procedure. In this context, the instruments for the differenced equation are loggdp and D.logredu, and instrument for the level equation is and LD.loggdp.

According to the estimation results in Table 4, all variables are statistically significant. In other words, there is a positive relationship between public education expenditures and economic development. Estimation results show that GDP per capita increased by 1.1 percent when public education expenditures increased by 10 percent. Contrary to theoretical expectations, the impact of education expenditures on GDP per capita is relatively low. This situation is an expected result. This result is the expected case since the public education expenditures used in this study include only central government education expenditures. Central government expenditures per province are on average 3.2 million Turkish Liras annually. Moreover, in our paper, financing types of education expenditures and budgetary constraints are excluded. Therefore, what is important here is that the public education expenditures have a positive effect on GDP per capita rather than its magnitude.

This study aims to determine the effects of central government education expenditures on regional economic development. It is possible to say that the findings obtained in our study are compatible with other studies in the empirical literature if this purpose and the issues mentioned above consider. However, there are considerable differences. For example, Sylwester (2000) states that while the current period effect of public

education expenditures on economic growth is negative, it positively affects the economic growth in the next period. According to the study, the positive impact of public education expenditures in the current period on economic growth emerges approximately ten years later. Ramirez and Nazmi (2003) concluded that public education expenditures positively affect economic growth in Latin American countries. Similarly, in their paper for Tanzania and Zambia, Jung and Thorbecke (2003) showed that education expenditures increase growth with multi-sectoral computable general equilibrium models. Bose et al. (2007) examine the growth effects of total government education expenditure and education investments for 30 developing countries over the 1970s and 1980s. According to the authors, sectoral education expenditures and education investments have strong and positive impacts on growth. Atems and Liu (2020) conclude that public education spending has a positive and significant impact on growth. According to the authors, a 10 percent increase in public education expenditures increases the economic growth by about 4 percent. Also, the authors use the lagged value of the total education expenditures of central and local governments as the only explanatory variable, unlike our study. As in the study of Atems and Liu (2020), Kutasi and Marton (2020) state that the lagged values of education expenditures positively affect economic growth. Unlike other studies, Din Thanh and others (2020) conclude that while the effect of public education expenditures on growth is insignificant, the efficiency of education expenditures (lnEDU * lnK) is negative. Another difference between this study and the others is that the analysis was conducted at the provincial level in Vietnam as in our study.

In summary, although there is a general similarity between our study and other studies in the empirical literature (except Din Thanh and others, 2020), there are a few remarkable differences. First, while we examined the effect of central government education expenditures on economic growth, other studies have analyzed the impact of total education expenditures. Second, our study was at the provincial level, in other words, regional at NUTS Level III, while other studies focused on national or sectoral level analysis. Finally, in our paper, the current public education expenditures have a positive effect on growth. Alternatively, in other studies, either the impact of lagged education expenditures on economic growth was positive or was statistically insignificant.

5. Conclusion and Policy Implications

This study analyzes the effects on the economic development of public education expenditures in Turkey. In this context, we investigate the hypothesis that there is a strong relationship between education expenditures and economic growth/development. To test this hypothesis, we used annual data of 81 provinces covering the period 2004-2019. We also used the system-GMM estimator, which considers dynamic relationships between variables, to analyze the empirical relationship specified in the hypothesis.

According to the analysis findings, public expenditures affect economic growth positively as expected. However, the effect in question is not as great as is expected compared to other studies on the subject. Therefore, the empirical findings of our study did not fully support the hypothesis of endogenous growth models. Undoubtedly, the reason for this result may be that central government expenditures are included as an indicator of public education expenditures in our study. In fact, central government education expenditures are low at the NUTS III level in Turkey.

Nevertheless, the findings of our study inspire the idea that regional development will accelerate when central government education expenditures are increased. Consequently, it is thought that the central government should allocate more shares for education expenditures. It is also possible that increases in public education expenditures, considering regional development differences, will more affect both regional and national economic development.

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