

GROWTH VS DEVELOPMENT INDICATORS IN EXPLAINING NEET: COMPARATIVE PANEL EVIDENCE

INDICADORES DE CRESCIMENTO VERSUS INDICADORES DE DESENVOLVIMENTO NA EXPLICAÇÃO DA TAXA DE NEET: EVIDÊNCIAS COMPARATIVAS COM DADOS EM PAINEL

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Abstract

This study examines the global phenomenon of young people Not in Education, Employment, or Training (NEET) through the distinction between economic growth and development. To address a gap in the literature, it conducts a comparative econometric analysis using panel data for 2005–2019 covering 23 middle-income and 23 high-income countries, based on the World Bank classification. Turkey is included in the middle-income group. The findings show that the effects of growth and development indicators on NEET rates differ across income groups. In middle-income countries, GDP growth reduces NEET rates, but its effect is weaker than that of development indicators, particularly the Human Development Index (HDI). Contrary to expectations, capital investment and health expenditure increase NEET rates in middle-income countries, whereas capital investment has the expected reducing effect in high-income countries. These results suggest that middle-

Resumo

Este estudo examina o fenômeno global dos jovens que não estudam, não trabalham nem participam de formação profissional (Not in Education, Employment, or Training – NEET), a partir da distinção entre crescimento econômico e desenvolvimento. Para preencher uma lacuna na literatura, realiza-se uma análise econométrica comparativa com dados em painel de 2005 a 2019, abrangendo 23 países de renda média e 23 países de alta renda, conforme a classificação do Banco Mundial. A Turquia integra o grupo de países de renda média. Os resultados mostram que os efeitos dos indicadores de crescimento e desenvolvimento sobre as taxas de NEET diferem entre os grupos de renda. Nos países de renda média, o crescimento do PIB reduz a taxa de NEET, mas seu efeito é inferior ao dos indicadores de desenvolvimento, especialmente o Índice de Desenvolvimento Humano (IDH). Contrariamente às expectativas, o investimento



income countries face difficulties in translating economic growth into employment opportunities and social development. The study concludes that the NEET problem in middle-income countries is not merely a growth issue, but a broader development problem. Accordingly, policy responses should prioritize human capital, education quality, and institutional effectiveness rather than growth-oriented strategies alone.

Keywords: NEET. Developed Countries. Developing Countries. Growth. Development.
JEL Classifications: J13, C23, D63.

de capital e os gastos com saúde aumentam a taxa de NEET nos países de renda média, enquanto o investimento de capital apresenta o efeito redutor esperado nos países de alta renda. Esses resultados sugerem que os países de renda média enfrentam dificuldades para converter crescimento econômico em oportunidades de emprego e desenvolvimento social. Conclui-se que o problema dos NEET nesses países é menos uma questão de crescimento e mais um problema amplo de desenvolvimento. Assim, as políticas públicas devem priorizar capital humano, qualidade da educação e efetividade institucional, em vez de estratégias exclusivamente orientadas ao crescimento.

Palavras-chave: NEET. Países Desenvolvidos. Países em Desenvolvimento. Crescimento. Desenvolvimento.
Classificação JEL: J13; C23; D63.

1 INTRODUCTION

One of the most significant challenges facing today's global economy and social structures is the phenomenon of young people being Not in Education, Employment, or Training (NEET). This situation increasingly poses a problem in youth labor markets and prevents countries from fully utilizing their human capital potential (Dasgupta, 2022). At the individual level, NEET increases the risks of long-term unemployment, low wages, and social exclusion; at the macroeconomic level, it constitutes a substantial impediment that slows down economic growth, diminishes productivity, and exacerbates the public financial burden (World Bank, 2016). Particularly in recent years, the transformative effects of the COVID-19 pandemic on global labor markets have further heightened the risk of young people falling into NEET status (UNICEF, 2021; World Bank, 2022). In this context, a thorough understanding of the factors influencing NEET rates is vital for developing effective policy strategies.

The multidimensional nature of NEET manifests with varying dynamics across countries and at different levels of development. While existing literature has examined the macroeconomic determinants of NEET from diverse perspectives (e.g., Amendola, 2022; Bruno *et al.*, 2014; Caroleo *et al.*, 2020), it often overlooks the nuanced distinction

between the concepts of economic growth and development. Growth is typically associated with quantitative indicators such as an increase in Gross Domestic Product (GDP); development, however, denotes a broader concept encompassing qualitative improvements, including human capital investments, health, education quality, and institutional effectiveness. Comparative econometric analyses on how NEET differentiates with respect to these two concepts based on countries' development levels are notably limited in the literature. Specifically, the question of how the dynamics of the NEET problem change in situations where economic growth alone does not guarantee holistic development has not been sufficiently addressed.

This study aims to bridge the aforementioned literature gap. It employs a comparative econometric analysis to determine whether NEET has a stronger relationship with growth or development indicators for high-income and middle-income countries, as classified by the World Bank. Utilizing two distinct models, the study examines panel data from 23 high-income and 23 middle-income countries spanning the period 2005-2019, measuring the convergence of NEET with growth and development based on the countries' respective development levels. Understanding the effects of this distinction on NEET is particularly crucial, given that middle-income countries, often characterized as developing economies, tend to experience a more intense tension between growth and development. The analyses primarily compare the direction and magnitude of variable coefficients across country groups. Secondly, they delve into which growth and development variable holds a stronger relationship with NEET specifically for middle-income countries. This comprehensive approach not only enhances the robustness of the primary assessment but also sheds light on the unique NEET dynamics prevalent in developing economies.

The remainder of the paper is structured as follows: Section 2 details the materials and methods of the study, outlining the dataset used and the econometric modeling approach. Section 3 presents the findings derived from the empirical analysis and includes the relevant statistical test results. Finally, Section 4 discusses the obtained results within the context of growth and development, interprets the effects of each variable on NEET, and provides policy recommendations.

2 LITERATURE REVIEW

The existing literature extensively investigates the factors influencing NEET rates from various angles. Atabey (2021) analyzed the relationship between growth and NEET in Turkey, examining the causality with the Toda-Yamamoto test and finding that NEET impacts growth. Bingöl (2020) used development and growth data for Indonesia, South Africa, Turkey, Russia, India, and Brazil. Bingöl's panel data analysis showed that the effect of the Human Development Index, as a development variable, on NEET is higher than the effect of GDP. Similarly, Bingöl and Ayhan (2020) examined the impact of education, unemployment, and NEET on human development in 28 EU countries; while NEET was found to be statistically insignificant, education and unemployment indicators were significant.

In the study by Bruno *et al.* (2014) using the Generalized Method of Moments and Least Squares Dummy Variables, it was observed that the NEET rate responds to changes in GDP at the lowest level, especially in Southern European countries. Caroleo *et al.* (2020) analyzed various macro determinants of NEET status in 21 European countries in two selected years, 2007 and 2016, and found an inverse relationship between NEET rate and GDP, as well as between education expenditure and NEET. Additionally, Amendola (2022) emphasized that economic growth should be increased to reduce NEET rates. While social expenditures, social inequality, and poverty are positively correlated with the NEET rate, an increase in education expenditures can be a protective factor in country-level analysis, suggesting that reducing inequality, improving economic opportunities, and increasing education expenditures can help control and reduce the NEET rate. Complementing this macro perspective, Bostanci *et al.* (2024) provide evidence of a two-way transition channel between youth unemployment and NEET rates, with notable gender heterogeneity across Baltic and Mediterranean countries.

More recently, research has begun to explore the connection between NEET rates and broader development frameworks, such as the Sustainable Development Goals (SDGs). For instance, the study by Çolak (2025) specifically investigated the relationship between NEET rates, economic growth, and SDG indicators in OECD countries using dynamic panel data models. Their findings highlight the importance of not only economic growth but also progress in specific SDGs -such as quality education (SDG 4), decent

work and economic growth (SDG 8), and reduced inequalities (SDG 10)- in influencing NEET outcomes. This work suggests that a holistic development approach, beyond mere economic growth, is crucial for effectively addressing the NEET problem. Other studies, such as Cieslik *et al.* (2020), Castillo *et al.* (2020), Fabris and Longobardi (2023), Carmichael-Murphy *et al.* (2022), Ingutia (2022) and Berigel *et al.* (2024), have also underscored the relevance of sustainable development aspects in tackling youth employment challenges.

It can be said that existing econometric analyses focusing on NEET do not have sufficient breadth and depth, particularly in explicitly distinguishing between growth and development impacts and analyzing them according to countries' development levels. Furthermore, studies integrating SDG performance as a direct "development" measure in the context of NEET are still emerging. This gap is consistent with bibliometric evidence indicating that the NEET literature is relatively new but rapidly expanding, with substantial thematic areas still underexplored (Çolak & Koç, 2023)..At this point, it is envisaged that this study will contribute to the literature both in terms of attempting to classify growth and development and in terms of identifying the characteristics of NEET by level of development, informed by the multidimensional perspective provided by SDG-related research.

3 THEORETICAL FRAMEWORK AND HYPOTHESES

This study aims to bridge a critical gap in the existing literature by distinguishing between the impacts of economic growth and development on the NEET (Not in Education, Employment, or Training) phenomenon, particularly across different income levels. While economic growth typically refers to quantitative increases in output and income, often measured by Gross Domestic Product (GDP) (Barro & Sala-i-Martin, 2004), economic development encompasses a broader set of qualitative improvements that enhance human well-being and societal capabilities. These include advancements in human capital, health outcomes, education quality, institutional effectiveness, and progress towards Sustainable Development Goals (SDGs) (Sen, 1999; United Nations Development Programme [UNDP], 1990). This conceptual distinction is crucial, as sustained economic growth does not always translate into equitable development,

especially in middle-income economies where structural inequalities and human capital deficiencies may persist (World Bank, 2016).

The theoretical underpinning of the relationship between economic activity and NEET rates can be rooted in various economic and social theories. From a macroeconomic perspective, the aggregate demand theory suggests that robust economic growth leads to increased demand for labor, thereby creating more employment opportunities for young people and reducing NEET rates. Conversely, periods of slow growth or recession typically correlate with higher youth unemployment and NEET figures (Blanchard, 2017). However, this growth-centric view often overlooks the supply-side factors and structural issues that development indicators address.

The human capital theory posits that investments in education, health, and skills enhance an individual's productivity and employability, leading to better labor market outcomes (Heckman, 2006). Therefore, countries with higher levels of human capital development are expected to have lower NEET rates, as their youth are better equipped to enter and remain in the workforce. Development indicators such as the Human Capital Index (HCI) and public health expenditures directly reflect these investments. Similarly, improvements in education quality (proxied by educational attainment or expenditure) are theorized to reduce NEET rates by fostering relevant skills and facilitating smoother transitions from education to employment (Caroleo *et al.*, 2020, Çolak&Koç, 2023).

Furthermore, institutional effectiveness and social welfare theories suggest that robust governance, effective social protection systems, and equitable distribution of resources play a significant role in reducing vulnerabilities that push young people into NEET status. High levels of rural population or persistent inequalities, for instance, can limit access to quality education and job opportunities, thus exacerbating the NEET problem (Castillo *et al.*, 2020; Cieslik *et al.*, 2021). The pursuit of Sustainable Development Goals (SDGs), as highlighted by recent research (e.g., Çolak, 2025; Berigel *et al.*, 2024), provides a comprehensive framework for understanding development's multifaceted impact on NEET rates. SDG targets related to quality education (SDG 4), decent work (SDG 8), and reduced inequalities (SDG 10) directly address the systemic issues underlying youth disengagement.

Based on this theoretical framework, the following hypotheses guide our empirical investigation:

- **H1:** Economic growth indicators will have a significant negative relationship with NEET rates across both high-income and middle-income countries.
- **H2:** Development indicators will have a stronger negative relationship with NEET rates in middle-income countries compared to high-income countries.
- **H3:** Specifically for middle-income countries, improvements in human capital development (e.g., HCI, health expenditure) and progress towards relevant Sustainable Development Goals will be more strongly associated with a reduction in NEET rates than solely economic growth.

These hypotheses will be tested using distinct econometric models for each country group, allowing for a nuanced comparative analysis of growth and development impacts on the NEET phenomenon.

4 METHODOLOGY

This study analyses the relationship between growth and development variables and NEET using panel data analysis. In econometric analysis involving panel data, certain basic data formats are mentioned. Horizontal cross-sectional data, time series data and panel data are the three data formats used in econometric analysis (Tatoğlu, 2021). Time series data show how units change over time. In addition, cross-sectional data are formed by elements collected from different fields at a certain time, while panel data analysis is formed by combining time series observations of economic units into cross-sections (Tatoğlu, 2020).

4.1 Models

This study rigorously examines the relationship between economic growth and development variables and the phenomenon of Not in Education, Employment, or Training (NEET) among young people, utilizing panel data analysis, one of the most robust approaches in econometric research. Unlike the limitations of traditional cross-sectional and time-series data, panel data offers the unique ability to simultaneously observe and analyze both the heterogeneity across different units (countries) and the dynamic changes over time (Hsiao, 2014; Wooldridge, 2010). This comprehensive

approach significantly enhances the accuracy of estimations by providing more data points, thereby enabling more reliable statistical inferences (Baltagi, 2021).

Furthermore, panel data's capacity to control unobserved individual heterogeneity minimizes the risk of biased estimates that might arise from using only cross-sectional or time-series data. This allows for a purer identification of the true interactions between variables and the testing of more complex behavioral models under less restrictive assumptions (Baltagi, 2021; Wooldridge, 2010). It is also a superior tool for examining dynamic behavior and more effectively demonstrating how rates change over time compared to repeated cross-sections (Baltagi, 2021). Given the completeness of our dataset, the analysis was conducted using a balanced panel structure, reinforcing the robustness of our findings (Wooldridge, 2010). The panel data model to be applied is shown in Equation 1

$$Y_{it} = a_{it} + B_{0it} + B_{1it}X_{1it} + B_{2it}X_{2it} + B_{3it}X_{3it} + \dots + B_{kit}X_{kit} + u_{it}$$

$$t = 1, \dots, T; i = 1, \dots, N \quad (1)$$

In this model, Y is the dependent variable of the observation. 't' indicates the time series dimension, and 'i' indicates the cross-sectional dimension such as families, individuals, and businesses, while X represents the independent variables. 'a' is the constant term, 'u' is the error term, and β represents the parameters to be estimated. The presence of 'i' and 't' terms confirms the existence of panel data, indicating that they take values according to time and units.

Drawing from this, the research's model equations are formulated across three distinct models within the analytical framework of the study. Specifically, the model established for middle-income countries (Model 1) is presented in Equation 2:

$$NEET_{it} = B_0 + \mu_i + \beta_1 GDP_{it} + \beta_2 Capital_{it} + \beta_3 Govt_{it} + \beta_4 Health_{it} + \beta_5 Rural_{it} + \beta_6 HDI_{it} + \beta_7 HCI_{it} + u_{it} \quad (2)$$

For high-income countries, the model established (Model 2) is presented in Equation 3:

$$NEET_{it} = B_0 + \mu_i + \beta_1 GDP_{it} + \beta_2 Capital_{it} + \beta_3 Govt_{it} + \beta_4 Health_{it} + \beta_5 Rural_{it} + \beta_6 HDI_{it} + \beta_7 HCI_{it} + u_{it} \quad (3)$$

As Model 2 contained statistically insignificant variables, it could not be interpreted. The two-way model constructed for Model 2A, derived by excluding these insignificant variables from Model 2, is presented in Equation 4:

$$NEET_{it} = B_0 + \mu_i + \beta_1 GDP_{it} + \beta_2 Capital_{it} + \beta_3 Health_{it} + u_{it} \quad (4)$$

4.2 Data set and variables

The sample selection in the research was based on the level of development of the countries per the research question. In particular, the World Bank's development ranking is based on income. This ranking is realised as countries in the high-income, upper-middle-income, lower-middle-income and low-income groups (The World Bank, 2023). Within these groups, the averages of countries' NEET rates by year were taken and the countries with the highest rates were selected. In making this selection, the accessibility of the countries' data was also considered. Accordingly, countries with no data were excluded from the list. Thus, 23 high-income countries and 23 middle-income countries, including upper-middle and lower-middle countries, were selected. The low-income group is not included because of the more specific problems associated with these countries.

Table 1

Selected Countries

High-Income Countries					Middle-Income Countries						
1	Austria	9	Hungary	17	Slovakia	1	Albany	9	Ecuador	17	Moldova
2	Canada	10	Ireland	18	Spain	2	Argentina	10	Egypt	18	Serbia
3	Chile	11	Israel	19	South Cyprus	3	Bolivia	11	Indonesia	19	South Africa
4	Croatia	12	Italy	20	South Korea	4	Brazil	12	Iran	20	Pakistan
5	Czech Rep	13	Lithuania	21	UK	5	Bulgaria	13	Kazakhstan	21	Paraguay

6	Estonia	14	New Zealand	22	US	6	Colombia	14	Kyrgyzstan	22	Peru
7	France	15	Poland	23	Uruguay	7	Costa Rica	15	Mauritius	23	Turkiye
8	Greece	16	Romania			8	Dominic Rep.	16	Mexico		

Source: Authors' calculations

In Table 1, the high-income and middle-income countries that were mentioned above and that constitute our research sample can be seen. It should be noted that Turkey, Kazakhstan, and Kyrgyzstan are among the middle-income countries.

The study attempted to identify the dimensions affecting NEET in the light of the theoretical background and to categorise and use developmental and growth variables separately. Few studies in the literature directly point to this distinction or make the distinction that the variable used in the analysis is a development or growth variable. For example, in a study analysing development variables and growth for a group of less developed and developing countries, Kubar (2016) categorised variables such as "annual increase in GDP per capita, agricultural sector value added, fixed capital consumption, consumer price index, exports of goods and services, final consumption expenditure, imports of goods and services, and industrial sector value added" as development variables.

It can be said that this study does not distinguish between development and growth and uses the concepts interchangeably. None of the studies deal with this issue in detail in the context analysed in this study. In this respect, although this study tries to classify the variables related to development and growth according to the theoretical background of the study, it makes use of the classifications of international organisations and deals with the literature obtained in this respect.

This study examines the NEET phenomenon, which is the dependent variable, for 23 middle-income and 23 high-income countries over a period of 16 years, from 2005 to 2020. The selection of this specific time frame is primarily due to the availability of a complete dataset for all 46 countries. Furthermore, the period was intentionally limited to 2020 to avoid the structural breaks and significant disruptions caused by the global pandemic in the subsequent years.

Table 2*Variables and Sources*

Variable	Variable type	Description	Source
NEET	Dependent	Share of young people not in education, employment or training, Total (% of young population)	World Bank
GDP	Independent	GDP per capita (constant 2015 USD)	World Bank
Rural Population	Independent	Rural Population (% of total population)	World Bank
Health	Independent	Current Health Expenditure (% of GDP)	World Bank
HCI	Independent	Human Capital Index	Penn World Table
Capital	Independent	GDP Capital Formation (2015 US\$)	World Bank
Govt	Independent	Government Effectiveness	World Bank
HDI	Independent	Human Development Index	UNDP

Source: Authors' calculations

4.2.1 GDP

In the light of the literature, it can be stated that GDP is one of the variables used to measure economic growth. Therefore, in this study, GDP is considered as a growth variable in terms of economic indicators.

4.2.2 Capital

While Gross Domestic Product (GDP) is a widely used and fundamental indicator for economic growth, it is crucial to incorporate other variables to achieve a more comprehensive analysis. In this context, capital, particularly capital formation, is considered as a growth variable to better understand the dynamics between investments and the NEET rate. The scale of the investments included in capital formation is theoretically linked to its potential to influence labor market outcomes. Therefore, in this study, capital is treated as a key economic growth indicator.

4.2.3 *Population (rural-urban)*

It is also stated in the theoretical part of the study that rural-urban migration is significant on being NEET both for the generation that migrated and for subsequent generations. In this respect, the rural population in the population is considered as a development indicator with its population dimension. At this point, urban population or rural population/urban population change rates can also be used, but they express the same change in context.

4.2.4 *Human capital theory*

The Human Capital Index is based on three main components: survival, expected years of schooling adapted to learning, and health (Kraay, 2018: 1-3). The survival dimension is measured by mortality rates under the age of 5; the schooling dimension assesses both the quantity and quality of education through expected years of schooling from school entry to age 18; and the health dimension is measured by adult survival rates and the development of children under the age of 5 (Kraay, 2018:3). While this index is multifaceted, this study primarily focuses on its role as a comprehensive development indicator. The distinct contributions of its education and health components, including the impact of health on productivity, are considered to provide a more nuanced analysis of their relationship with the NEET rate.

4.2.5 *Government effectiveness*

In addition to the studies showing that government effectiveness has both positive and negative effects on economic development in the literature, a study conducted for developing countries has stated that the effect is positive (Güney, 2017). In addition, government effectiveness has a role in ensuring both economic and social development and can affect development in many dimensions such as legal regulations (Şaşmaz, 2019:11). Government effectiveness is considered as a development indicator with an institutional dimension.

4.2.6 Health expenditure

It is possible to say that health expenditures are an important indicator of the development of countries (AlBayrak & Öztürk, 2021; Demirgil *et al.* 2018). In line with the theoretical background, it is possible to state that health expenditures are vital for human development conditions and constitute one of the most fundamental dimensions together with education. The relationship between both of these dimensions and NEET should be stated in the same context. Therefore, in this study, this variable is considered as a development indicator with its social dimension.

4.2.7 HDI

Based on the theoretical background, it is possible to state that HDI, which is accepted as a very basic development indicator, is related to NEET in many aspects. For example, schooling rate has a direct relationship with NEET as a data on education. In this respect, it can be seen that it is used both as a growth and development variable. For example, in the study of Sayın (2011), which analyses the effect of education and growth on youth unemployment between 1988-2010 with the Vector Autoregressive (VAR) Model, it is stated that there is a causality relationship between schooling rate, growth and youth unemployment. In the context of this study, HDI, which allows deepening the analysis with its different dimensions, is considered as a development indicator in a multidimensional manner.

4.3 Analysis and relevance tests

A panel data analysis was conducted to measure the impact of growth and development variables on NEET for two groups of countries in 15 years between 2005-2019 for 23 high-income and 23 Middle-Income countries, which are the research sample. A number of tests were carried out to decide which panel data model to apply to this analysis. In general, in the process until the selection of the final model; LR test was used to test the unit and time effect together. And again, the LM test was used to test them separately. Hausman test was used to decide whether the model would be a fixed effects

model or a random effects model, Hausman test was used to test the identification error and Modified Wald test was used to determine the presence of heteroskedasticity, Durbin-Watson test of Franzini, Bhargava and Narendranithan was used to test autocorrelation and Frees test was used for self-correlation/autocorrelation between units.

Table 3

A Priori Tests Used in Determining the Model to be Established

Models	A Priori Tests
Testing for Time and Unit Effect	LR Test (Maximum Likelihood Estimator)
Test for the Unit Effect	LM Test (Lagrange Multipliers Test)
Testing for the Time Effect	LM Test (Lagrange Multipliers Test)

Source: Authors' calculations

It has been stated that the existence of unit and time effects together or separately has a direct impact on which model to use. In this context, the LR test was used to determine this and the results are given in the table 4.

Table 4

Testing Time and Unit Effects Together LR Tests

	Statistics of Tests	Probability Values
Model 1	chi2(2) = 478.17	0.0000
Model 2	chi2(2) = 224.05	0.0000
Model 2A	chi2(2) = 349.05	0.0000

H₀: Model 1: Model 2: Model 2A: $\mu_i = \xi_i = 0$

H₁: For each model, at least one is different from 0

Source: Authors' calculations

Hypothesis H₀ states that unit and time effects do not co-exist for each model. According to the results of the tests in Table 3, the null hypothesis of zero unit and time effects is statistically rejected at 95% confidence level for Model 1, Model 2 and Model 2A. According to the test results, there are three probable results for each model. Accordingly, the model may contain either unit effect or time effect alone or both effects together. As a result, the models are not classical. Thus, all three models should be tested separately for unit and time effects. At this point, the LM test can be applied. Because, depending on the presence of unit or time effect, the model to be established may change. The results of the LM test are shown in Table 5.

Table 5*LM Test for Unit Effect*

	Statistics of Tests	Probability Values
Model 1	chibar2(01) = 931.60	0.0000
Model 2	chibar2(01) = 584.36	0.0000
Model 2A	chibar2(01) = 945.91	0.0000

H₀: Model 1: Model 2: Model 2A: $\mu_i=0$

H₁: Model 1: Model 2: Model 2A: $\mu_i \neq 0$

Source: Authors' calculations

According to the LM test, the H₀ hypothesis assumes that the unit effect is zero. As can be seen from Table 5, according to the LM test results, this assumption is rejected for Model 1, Model 2 and Model 2A at 95% confidence level. This result shows that there is a unit effect in the three models.

Table 6*Testing the Time Effect with LM Test*

	Statistics of Tests	Probability Values
Model 1	chibar2(01) = 0.00	1.0000
Model 2	chibar2(01) = 0.00	1.0000
Model 2A	chibar2(01) = 0.00	1.0000

H₀: Model 1: Model 2: Model 2A: $\sigma_{\lambda_t}=0$

H₁: Model 1: Model 2: Model 2A: $\sigma_{\lambda_t} \neq 0$

Source: Authors' calculations

As a result of the LM test performed to test the time effect for Model 1, Model 2 and Model 2A, the null hypothesis (H₀: $\sigma(\mu_i) = 0$) is not rejected. This shows that the unit effect should be present in the model to be constructed, and the time effect should not be present in the model. Thus, it would be appropriate to prefer one-way unit effect models for Model 1, Model 2 and Model 2A.

After testing whether there are unit and/or time effects for each model, it is necessary to determine whether the effect that emerges for all three models is fixed or random. Hausman test was conducted in order to decide which is the emerging effect.

The Hausman test hypothesis is as follows:

H₀: Random effects model can be used.

H₁: Random effects model cannot be used (Therefore, fixed effects model should be used in the analysis).

Table 7*Hausman Test Results*

	Statistics of Tests	Probability Values
Model 1	48.38	0.0000
Model 2	58.78	0.0000
Model 2A	72.85	0.0000

Source: Authors' calculations

In the Hausman test, the null hypothesis is 'The Random Effects Model is efficient' while the alternative hypothesis is 'The Fixed Effects Model is consistent'.

According to the Hausman test results for Model 1, Model 2 and Model 2A in Table 8, the null hypothesis that the Random Effects Model is effective is rejected at 1% significance level in all models. Thus, it is concluded that the models should be constructed as Fixed Effects Model.

At this stage, the assumptions that should be in static panel data models should be tested. These assumptions are that the error term has constant variance, no autocorrelation and no correlation between units. In order to test these assumptions; Modified Wald Test, Bhargava, Franzini and Narendranithan's Durbin-Watson Test and Frees' Inter-unit Correlation Test will be used.

Table 8*Testing Assumptions*

	Model 1	Model 2	Model 2A
Test	Test Statistic (Probability Value)	Test Statistic (Probability Value)	Test Statistic (Probability Value)
Modified Wald Test	1452.46 (0.0000)	2074.98 (0.0000)	2863.02 (0.0000)
Bhargava, Franzini and Narendranithan's Durbin-Watson Test	0.54188 0.75411	0.54205 0.80531	0.53764 0.80464
Frees Inter-unit Correlation Test	alpha = 0.05:0.226 8 (3.262>0.226) The critical value for Frees test at 5% significance level is 0.226	alpha = 0.05 : 0.2262 (2.607>0.2262) The critical value for Frees test at 5% significance level is 0.226	alpha = 0.05 : 0.2262 (2.655>0.2262) The critical value for Frees test at 5% significance level is 0.226

Source: Authors' calculations

In Table 8, in the context of the results of the Modified Wald test, it is found that heteroskedasticity exists for all models. The modified Wald test is a method used for

hypothesis testing of coefficients in regression models. This test can be used especially in cases such as small sample sizes and heteroskedastic data sets (Greene, 2012). The modified Wald test was developed as a more powerful alternative to the standard Wald test and provides a more flexible method using robust variance estimation (Williams, 2000).

In the context of Narendranithan's Durbin-Watson, Bhargava and Franzini test results in Table 8, the test statistic is very close to 2, indicating that autocorrelation is present in all models. These tests are hypothesis tests used to detect autocorrelation (inter-series dependence) problems. This test is particularly used in econometric models, regression analysis and time series (Bhargava *et al.*, 1982). The Durbin-Watson test is a test used to detect the presence or absence of autocorrelation. The test statistics are a null hypothesis test against the presence of autocorrelation. The test statistics give a measure of the correlation of regression errors with each other and is used in a number of assumptions. The test statistics take values between 0 and 4. A test statistic of 0 indicates the highest possible negative autocorrelation, while 4 indicates the highest possible positive autocorrelation. A test statistic close to 2 indicates the absence of autocorrelation, while a test statistic close to 0 or close to 4 indicates the presence of autocorrelation (Albayrak, 2014). Bhargava, Franzini and Narendranithan played an important role in the development of the Durbin-Watson test. This test has a very wide usage percentage for the results regarding the presence of autocorrelation and has an important place in the econometrics literature.

According to the Frees test in Table 8, all models are found to have inter-unit correlation. According to the Frees test in Table 11, which is the last test, it is found that there is inter-unit correlation in all models. Frees Inter-unit Correlation Test is a frequently used test in Financial Econometrics. This test was introduced by Richard Frees in 1995 in his article 'Assessing Cross-Sectional Correlation in Panel Data'. The Frees test is used to estimate the inter-unit correlation between variables in a panel data set. Panel data are data with multiple observations on different units at the same time (Frees, 1995). The Frees test is a test of the null hypothesis that the inter-unit correlation is zero. The test statistic is calculated using the standard deviations and covariances of the variables in the data set. The result of the test gives an indication of whether correlation

between units exists. The results of the test have a value from 0 to 1 and the larger the value, the higher the correlation between units (Wooldridge 2010).

According to Table 9, the presence of autocorrelation, heteroskedasticity and inter-unit correlation problems does not affect the coefficients, but it may affect the statistical significance. Therefore, it seems meaningful to use the Driscoll-Kraay model, which is resistant to all of these problems (Driscoll & Kraay, 1998). Because, Driscoll-Kraay model corrects all of these problems. The results obtained by using the Driscoll-Kraay model are shown in Table 9.

Table 9

Final Model with Correction for Deviations from Assumptions (Driscoll-Kraay)

Variables	Model 1 (Middle Income Level)	Model 2 (High Income Level)	Model 2A (High Income Level)
LnNEET	Coefficient (Standard Error)	Coefficient (Standard Error)	Coefficient (Standard Error)
LnGDP	-0.6280* (0.1359)	-0.3710 (0.2922)	-0.5130*** (0.27280)
LnRural	-0.2988* (0.0648)	0.1962 (0.3480)	
LnHealth	0.1949* (0.0549)	0.3387* (0.1137)	0.2980* (.07987)
LnHCI	0.3546* (0.1192)	0.5365 (0.9229)	
LnCapital	0.1256** (0.05404)	-0.3075** (0.13225)	-0.2875*** (0.14261)
LnGovt	0.1593** (0.06342)	0.0046 (0.2538)	
LnHDI	-0.8910*** (0.5109)	-1.1844 (1.5569)	
Fixed	5.3391* (0.8659)	11.8396* (2.9502)	14.288 (1.3467)
	R² =0.3456	R² =0.3762	R² =0.3718
	F-test statistic 76.00 (0.0000)	F-test statistic 90.13 (0.0000)	F-test statistic 81.79 (0.0000)
	Number of Observations 345	Number of Observations 345	Number of Observations 345

Note: * indicates 99% confidence level, ** indicates 95% confidence level, *** indicates 90% confidence level, respectively.

Source: Authors' calculations

The final model, in which deviations from the assumptions in Model 1 are corrected using Driscoll-Kraay standard errors, is statistically significant (F-Test). In addition, when the independent variables LnGDP, LnRural, LnHealth, LnHCI, LnCapital,

LnGovt, LnHDI were tested individually in Model 1, statistically significant results were also obtained (t-tests).

After all these steps; the results of the analysis, in which the relationship between NEET and development and growth variables for the period 2005-2019 is tried to be seen for high-income and middle-income countries, for Model 1, that is, for middle-income countries, are as follows:

- The coefficient of the LnGDP variable is negative in the expected direction. When there is a one-unit increase in LNGDP, there is a decrease of approximately 0.628 in the NEET rate.
- The coefficient of the LnRural variable is negative. When there is a one-unit increase in the LnRural variable, there is a decrease of 0.299 in the NEET rate.
- The coefficient of the LnHealth variable is positive and thus, a one-unit increase in the Lnhealth variable leads to an increase of 0.195 in the NEET rate.
- The coefficient of the LnHCI variable is also positive and a one-unit increase in the Lnhci variable leads to an increase of 0.355 in the NEET ratio.
- The coefficient of the LnCapital variable is positive and a one-unit increase in the LnCapital variable leads to an increase of 0.126 in the NEET ratio.
- The coefficient of the LnGovt variable is positive and a one-unit increase in the LnGovt variable leads to an increase of 0.159 in the NEET ratio.
- The coefficient of the LnHDI variable is negative and a one-unit increase in the LnHDI variable leads to a decrease in the NEET ratio by 0.891.

In Model 2, the final model in which deviations from the assumptions are corrected using Driscoll-Kraay standard errors is statistically significant (F-Test). However, when the same variables in Model 1 were analysed with the panel data set of high-income countries, it was found that the independent variables were not statistically significant (t-tests). Therefore, since Model 2 cannot be interpreted, Model 2A was reached by removing the insignificant variables from Model 2 in order to construct a meaningful model with the same variables for high-income countries.

The final model in Model 2A, in which deviations from the assumptions are corrected by using Driscoll-Kraay standard errors, is statistically significant in its entirety according to the F test result. In addition, when the independent variables LnGDP,

LnHealth, LnCapital were tested individually in Model 2A, statistically significant results were obtained as a result of t-tests.

- The coefficient of the LnGDP variable is negative and a one-unit increase in the LnGDP variable leads to a decrease of 0.513 in the NEET rate.
- The coefficient of the LnHealth variable is positive and a one-unit increase in the LnHealth variable leads to an increase of 0.298 in the NEET ratio.
- In addition, the coefficient of LnCapital variable is negative and a one-unit increase in LnCapital variable causes a decrease of 0.288 in NEET ratio.

5 FINDINGS

At this stage, the key findings of the econometric analysis are presented and discussed. The results reveal that the selected growth and development indicators have varying impacts on the NEET rate, with distinct patterns observed between middle-income and high-income country groups. The following subsections delve into the specific effects of each variable, comparing the findings with theoretical expectations and existing literature, while also addressing the nuanced contexts of both country clusters.

5.1 The impact of GDP on NEET in growth context

As a result of the analysis, it is seen that GDP for middle-income countries has more impact on NEET than high-income countries. Discussing the reasons for this is important for the context of the study. It should be noted that each country in the country clusters has specific characteristics that require a separate assessment of its internal conditions. Many factors can be influential in shaping the economic structure, ranging from the impact of periodic policies to the prevailing approach in the country concerned. In addition, it is possible to say that, in general, labour market regulations and bureaucratic control are higher in high-income countries. This may help to explain the lower multiplier effect of capacity expansion of enterprises compared to middle-income countries. For example, social protection practices, the tightness of labour market policies, and the concentration of firms on the obligation to protect workers at the expense

of time that could be spent focusing on production may have an inhibitory effect on performance to increase employment capacity (World Bank, 2019).

5.2 The impact of capital on NEET in growth context

The capital formation variable, included in the analysis under the growth subheading, is theoretically expected to have a reducing effect on the NEET rate. This is based on the general assumption that increased investment and production capacity lead to job creation. However, the analysis shows a result contrary to this expectation, indicating that capital formation **increases** the NEET rate for middle-income countries.

This unexpected outcome can be explained by several factors. In developing countries, there is often a preference for capital-intensive production methods over labor-intensive ones, which can lead to a contraction in employment in the short run (Özsoy & Tosunoğlu, 2020). This phenomenon is related to the concept of technological unemployment in the labor economics literature. Furthermore, a mismatch between the quality of the labor force and the demands of the labor market can also contribute to this result. While developed countries are better equipped to adapt to technological advancements and mitigate their negative effects on employment, middle-income countries may face challenges in this regard. Consistent with this, the analysis indicates that capital formation has a mitigating effect on the NEET rate for high-income countries in Model 2A.

5.3 The impact of rural population on NEET in development context

The variable showing the change in the rural population in the general population, which is included in the analysis under the population dimension and development subheading, can be expected to show a positive relationship with NEET according to the general expectations. This is because cities can be expected to have a decreasing effect on NEET with their industrial areas, access to social services provided to individuals, and more opportunities to participate in education and employment.

When the overall decrease in the proportion of rural population in the total population and the increase in investments in agriculture are considered together, it can

be foreseen that access to employment opportunities among the rural population has become easier. Therefore, this can be considered to have a mitigating effect on the NEET rate. For example, in Turkey, studies and projects are being carried out to support rural development and to balance rural-urban mobility in line with the convergence of welfare and socio-economic conditions. In a study evaluating the results of these projects, it was observed that an increase of 350% in employment was achieved in general with the support of the Turkish Rural Development Support Institution (Gülçubuk *et al.* 2017).

5.4 The impact of health expenditures on NEET in development context

Health expenditures are widely regarded as a crucial indicator of a country's development level. From a theoretical perspective, an increase in health expenditures is generally expected to have a reducing effect on the NEET rate by improving public health and labor productivity (Albayrak & Öztürk, 2021; Demirgil *et al.*, 2018). However, the econometric analysis of this study reveals an outcome contrary to this expectation, showing that health expenditures have an increasing effect on the NEET rate in both middle-income and high-income countries.

This unexpected finding can be attributed to several factors. For middle-income countries, this result may stem from existing inequalities in access to health services, where a portion of the population, particularly lower-income groups, struggles to benefit from these expenditures. Such deficiencies can lead to labor force losses and reduced participation (Albayrak & Öztürk, 2021). The World Health Organization's Macroeconomics and Health Commission, established to address the link between health investments and economic growth in developing economies, serves as a testament to the magnitude of these challenges.

Additionally, the finding aligns with the observation by Raghupathi & Raghupathi (2020), who noted that while some high-income countries with high health expenditures have low NEET rates (as expected), this relationship is not consistent across all countries, with several exhibiting both high health spending and high NEET rates. This suggests that the relationship is more complex than a simple direct correlation and is likely mediated by other country-specific factors such as the structure of the health system, the nature of job markets, and social protection policies.

5.5 The impact of human capital on NEET in development context

As stated in the variables context section, human capital is primarily addressed through its education dimension within this study. Human capital can be defined as increasing and improving the qualifications of human resources, encompassing education, health, and social skills. Logically, investments in human capital are expected to encourage young people's participation in the labor force, thereby having a reducing effect on the NEET rate. However, the analysis shows a result contrary to this expectation: for middle-income countries, the increase in human capital has a positive relationship with the NEET rate. Understanding the reasons behind this counterintuitive finding is crucial for grasping the dynamics of NEET in these countries.

Human capital, by its nature, aims to enhance the quality of the labor force. However, this may lead to increased competition for higher-skilled jobs, which can, in turn, contribute to a rise in the NEET rate. For instance, as the demand for educated labor grows, low-skilled or inexperienced job seekers may find it harder to secure employment. The alignment of labor demand and supply, both in terms of quantity and quality, is essential for successful employment outcomes. A study on unemployed university students in Ankara found that high wage expectations among recent graduates can prolong their unemployment, naturally contributing to a higher NEET rate (Erikli & Bayat, 2019:308). In summary, factors such as elevated wage expectations driven by increased human capital and a mismatch between the skills of the workforce and the available jobs can be considered valid reasons for the observed increase in the NEET rate.

5.6 The multifaceted impact of human development on NEETs

The Human Development Index (HDI), as a multidimensional indicator, is generally expected to have a reducing effect on the NEET rate by capturing a country's overall development level. The econometric analysis confirms this expectation, finding a negative relationship. However, this relationship is not uniform across all contexts; for instance, Bingöl and Ayhan (2020) found that the relationship between HDI and NEET can be both positive and negative depending on the specific country. This highlights the

complex nature of human development and its varying impact on labor market outcomes, which requires a detailed examination of the index's constituent dimensions.

The first dimension, health, is measured by life expectancy at birth. A higher life expectancy is often associated with better overall health, which in turn enhances an individual's capacity to participate in education and the labor force. The analysis reveals that as the NEET rate increases, life expectancy at birth tends to decrease, a finding consistent with Raghupathi and Raghupathi (2020). Beyond this, recent research underscores that health barriers, particularly mental health challenges, are significant impediments to youth labor force participation, directly affecting a young person's ability to find and retain employment (Hemmings & Prinz, 2020; Strandh *et al.*, 2019). This provides a more nuanced explanation for the link between the HDI's health component and the NEET rate.

Figure 1.

Schematic Summary of Article Findings

Variable	Middle-Income Countries	High-Income Countries	Main Findings and Implications
Economic Growth (GDP)	✖ Negative effect (stronger)	✖ Negative effect	Growth reduces NEET for both groups, but the effect is more pronounced in middle-income countries.
Capital	✔ Positive effect (against expectations)	✖ Negative effect	In middle-income countries, capital investments do not translate into employment. In high-income countries, they increase employment as expected.
Health Expenditures	✔ Positive effect (against expectations)	✔ Positive effect (stronger)	Unexpectedly increases NEET for both groups. The effect is stronger in high-income countries. This may suggest that health spending doesn't directly boost employment or reflects inequalities.
Human Development Index (HDI)	✖ Negative effect (strongest)	✖ Negative effect	The most powerful mitigating factor for middle-income countries. It emphasizes that development, not just growth, is the key.
General Conclusion	Development Problem: Growth exists but does not translate into employment and social welfare.	Developed Economy Challenge: Growth and development are aligned, but specific challenges persist.	NEET should be addressed primarily as a development problem in middle-income countries.

Source: Authors' calculations

The second dimension, education, is captured by average years of schooling for adults and expected years of schooling for children. While a simple theoretical link suggests that being in education means not being NEET, a more robust explanation involves the quality of education and its relevance to the labor market. A key challenge, especially in developing economies, is the "skills mismatch," where the skills acquired through the education system do not align with the demands of the labor market (International Labour Organization, 2019). This mismatch can lead to a rise in the NEET rate, as even highly educated youth may struggle to find suitable employment, leading to prolonged job searching and discouragement.

The third dimension, income, is represented by a country's Gross Domestic Product (GDP) per capita. The analysis confirms the negative relationship between GDP and the NEET rate for both middle- and high-income countries, a finding that is in line with the existing literature (Amendola, 2022). Economic growth creates more job opportunities and increases incomes, which in turn leads to higher investments in education and a greater incentive for young people to participate in the workforce. Below is a summary of all these findings, compiled and summarized by us.

6 CONCLUSIONS

This study examined how growth and development-related factors shape NEET rates across middle- and high-income country groups, and the evidence supports a clear overarching message: economic growth is important, yet its NEET-reducing capacity depends on whether growth is converted into inclusive development and employment-generating dynamics. In both groups, GDP is associated with lower NEET rates, indicating that macroeconomic expansion generally facilitates youth labor market absorption. The effect, however, is substantially stronger in middle-income countries, suggesting that growth can deliver larger marginal improvements where economies still have considerable scope for structural expansion and labor-market deepening.

At the same time, the results indicate that the NEET challenge differs in its underlying nature across development levels. In middle-income countries, development variables carry particularly strong explanatory power, and the Human Development Index emerges as the most dominant mitigating factor—stronger than GDP and other indicators.

This pattern implies that reductions in NEET are more closely tied to improvements in multidimensional human development (education quality and attainment, health outcomes, and living standards) than to growth alone. Put differently, growth appears necessary but not sufficient: without broad capability formation and improved school-to-work transitions, aggregate expansion does not reliably translate into lower NEET rates.

Two counterintuitive findings further highlight this growth–development disconnect. First, health expenditures display a positive association with NEET rates in both groups, with a larger coefficient in high-income economies. Rather than indicating that health spending “raises NEET,” this pattern points to the limits of aggregate expenditure measures: spending levels may reflect cost pressures and demographic structure, may be unevenly distributed, or may be oriented toward curative care rather than preventive and youth-relevant services. In such cases, higher outlays do not automatically translate into improved labor-market attachment among youth. Second, the role of capital formation diverges sharply by income group. In high-income countries, capital formation is associated with lower NEET rates, consistent with the expectation that investment upgrades productive capacity and supports job creation through mature financial, institutional, and labor-market channels. In middle-income countries, by contrast, capital formation is positively associated with NEET rates, plausibly reflecting more capital-intensive growth patterns, automation-biased investment, and short-run labor displacement that can weaken youth employment absorption if complementary policies (skills formation, active labor market programs, and sectoral transformation toward job-rich activities) are insufficient.

Taken together, the comparative results suggest that in middle-income countries the NEET problem behaves more like a development constraint, whereas in high-income countries it is more consistent with the specific frictions of developed labor markets, where growth and investment are more predictably transmitted into employment opportunities. This does not imply a strict separation between growth and development; rather, it highlights that the transmission mechanism from growth to NEET reduction is more robust and expectation-consistent in high-income settings, while middle-income economies face a more fragile conversion of economic gains into human development and youth employment.

From a policy standpoint, the findings emphasize that middle-income countries should treat human development as a core NEET strategy, not merely a long-run complement to growth. Strengthening education–skills matching, improving the equity and effectiveness of health systems (including youth-relevant preventive and mental health services), and reorienting investment incentives toward employment-intensive and youth-absorbing sectors are likely to be central for transforming growth into sustained reductions in NEET. For high-income countries, where the investment channel appears more reliably NEET-reducing, the policy priority shifts toward addressing residual barriers such as skills mismatch, regional disparities, and disadvantaged youth subgroups through targeted activation, training, and inclusion-oriented labor market programs.

Finally, several limitations warrant caution and motivate future research. The estimates should primarily be interpreted as associations rather than definitive causal effects, and key aggregates such as health expenditures and capital formation may conceal important composition effects. Future studies could disaggregate these indicators (e.g., preventive vs. curative health spending; sectoral/technology composition of investment), test interaction and nonlinearity/threshold mechanisms, and incorporate institutional and policy variables that govern the growth-to-development translation. Extending the analysis along these lines would clarify the conditions under which growth becomes systematically inclusive and, in turn, more reliably NEET-reducing across development levels.

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