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# Institutional Determinants of Regional Poverty in Turkey: Evidence from Advanced Causality Analysis

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**Abstract**

Poverty continues to be one of the major issues in Turkey, as in many other countries, with a large portion of the population – especially in rural areas – living below the poverty line. Those living in poverty have limited access to key public services such as education, healthcare and housing, which consequently exacerbates social and economic inequalities within society. The gap between wealthy and impoverished groups within society is continually expanding, primarily due to institutional factors that perpetuate this inequality. Drawing on data from 2009 to 2019, this study offers an empirical analysis of the role of institutions in shaping poverty in Turkey. The study applies the panel causality test developed by Juodis *et al*. (2021) to assess the influence of institutional structures on regional disparities. Infant mortality rates, the number of associate and bachelor's degree graduates and the number of convicts are considered key indicators of institutional performance. The statistical analysis reveals a significant correlation between these variables and the 50% poverty rate. The findings suggest that strengthening the institutional framework is essential for addressing regional poverty in Turkey.

**Keywords:** Institutions, poverty, regions, Turkey
**JEL Classification:** D02, O15, O18

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# 1. Introduction

Scientific research into income distribution focuses on two main objectives: to investigate the scope of social inequalities and to measure the variations in inequality across social groups or changes in inequality trends over time. Income distribution inequality not only deepens poverty but is also partly responsible for social tensions and political instability (Fukuyama, 2011). Examination of such structural dynamics allows researchers to identify decreasing or increasing inequalities and uncover the underlying causes of these processes. This line of research is essential for developing effective policies that aim to alleviate poverty and raise standards of living.

The issue of poverty has attracted considerable attention in both academic and political discourse. Studies on developed and developing countries suggest that effective and targeted interventions are needed for poverty reduction (Atkinson, 1991). As illustrated in the work of Bertolini (2019), demographic changes, limited access to educational resources and geographical barriers contribute to ongoing poverty in rural areas. These, in fact, are the main factors that perpetuate the intergenerational cycle of poverty through hindering access to key public services and labour market opportunities. To effectively address rural poverty, it is imperative to implement context-specific solutions that consider both international practices and the limited resources, inadequate infrastructure and governance capacities available at the local level.

However, extant literature frequently associates economic inequality with weak institutions, often overlooking the relationship between institutional quality and income distribution. Weak institutions exacerbate inequality by restricting access to justice, education and economic opportunities, especially among disadvantaged groups. In contrast, inclusive institutions generally lead to lower levels of inequality, while resource-dependent economies with exclusionary institutions experience higher levels of inequality. These economies perpetuate inequality through economically inefficient resource allocation mechanisms (Chong and Gradstein, 2007).

The prevalence of regional poverty in Turkey poses a significant challenge for policymaking, as disparities in institutional quality have an adverse effect on income distribution and impede sustainable economic growth. The slowdown in institutional reforms following the global financial crisis (Acemoğlu and Üçer, 2020) has weakened the development of effective governance structures, particularly in under-resourced regions, whereas empirical studies point out the significance of sound institutions, *i.e.*, institutions that are strengthened through accountability, regulatory quality and anti-corruption measures, for poverty

reduction. By ensuring equitable allocation of resources, such institutions equip local governments to efficiently address region-specific problems (Tebaldi and Mohan, 2010). Therefore, policy interventions that integrate institutional reforms with traditional economic strategies are necessary to alleviate the regional poverty in Turkey.

Despite the expanding body of scholarly work on the institutional determinants of development, research into the relationship between institutional factors and regional poverty in Turkey has been limited so far. The present study, with a focus on institutional dynamics at the regional level, examines structural inequalities that serve as obstacles to national development, providing valuable insights for policymaking aimed at advancing Turkey's goals of sustainable development, economic resilience and promoting social integration within the EU framework.

The panel causality test developed by Juodis *et al*. (2021) is utilized to examine the short-term relationship between institutional effectiveness and regional poverty. Using key indicators such as infant mortality rates (*IMR*) and the number of associate and bachelor's degree graduates (*ABG*) as proxy variables for institutional performance, this novel approach contributes an innovative perspective to the existing methodology by incorporating cross-sectional dependence into the analysis, thus providing a more profound comprehension of institutional impact on regional inequalities.

A detailed explanation of the relationship between institutions and poverty, including regional income distribution and income inequality in Turkey, is provided in Section 2. Section 3 presents an overview of the dataset, the essential variables and the econometric methodology employed. Section 4 constitutes the analytical section, wherein the findings are presented. Finally, Section 5 offers a comprehensive discussion of the findings and presents policy recommendations.

## 2. Relationship Between Institutions and Poverty

Institutions are defined as predictable structures that shape economic, political and social interactions and reduce uncertainty (North, 1990, 1994). Thus, institutions play a decisive role in economic performance by determining production and exchange costs. A critical debate in the literature seeks to understand whether institutions reduce or increase regional inequalities. Lane and Ersson (2000) and Prud'homme (1995) have argued that governance deficiencies may exacerbate regional inequalities by leading to inefficient resource allocation. Conversely, Beramendi (2003) contended that institutional reforms, such as decentralization, can help reduce regional inequalities by facilitating redistribution.

The relationship between weak institutions and economic inequality has been extensively studied in academic literature. According to Chong and Gradstein (2007), inequalities are perpetuated when institutions are dysfunctional bodies limiting access to justice, education and economic opportunities. Chong and Calderon (2000) found that institutional quality has a negative correlation with income inequality in developed countries, while institutional structures are responsible for persisting inequalities in developing countries. Likewise, Hartmann *et al*. (2017) revealed that countries with inclusive institutions are likely to be successful in inequality reduction, while high levels of inequality are observed in resource-dependent economies with exclusionary institutions.

While income inequality has been extensively studied, the same cannot be said of the relationship between poverty and institutional dynamics. According to Hasan *et al*. (2006), implementation of the rule of law as well as effective governance are essential in improving delivery of public services and accountability, which in turn can significantly reduce poverty. Deolalikar *et al*. (2002) found that participatory governance is successful in poverty reduction and development through more efficient allocation of resources and reduction of corruption. The importance of institutional reforms in achieving sustainable outcomes was also emphasized in the work of Tebaldi and Mohan (2010), who highlighted the essential role of accountability and mitigating the risks of expropriation in poverty reduction. Taken together, these studies suggest that poverty is an issue concerning institutional structures, extending beyond being an economic problem.

The heterogeneous nature of poverty necessitates the development of context-specific strategies. To this end, a comprehensive understanding of poverty is needed, where local vulnerabilities and strengths are taken into account, including factors such as food security and access to key public services (van Noordwijk, 2019). Pierson (2004) indicated that institutions have a path-dependent influence on such processes due to their critical role in allocation of resources, governance quality and societal expectations. Nevertheless, existing literature has rarely addressed how institutions affect poverty in the short term and in regional contexts, which the present research seeks to explore in the context of Turkey.

Drawing on the prior research and examining the regional disparities in Turkey, this study is a novel contribution to the literature on the impact of institutions on poverty and inequality. In this respect, policymaking aimed at enhancing the effectiveness of governance, strengthening accountability and promoting inclusive institutions is particularly emphasized.

## 2.1 Regional income distribution and poverty

There are four categories of income distribution: personal, functional, sectoral and regional. Among these, regional income distribution looks into both structural and institutional effects, offering insights into spatial dimensions of inequality. Disparities in economic development, institutional capacity and governance structures contribute to variations in regional income distribution. An equitable regional income distribution, however, is essential for sustainable economic growth, promoting social cohesion and maintaining political stability.

The conventional methods used in measuring income distribution, *e.g.*, the Lorenz curve, Gini coefficient, Pareto coefficient, Atkinson inequality measures and Theil index, tend to overlook local inequalities, particularly in heterogeneous contexts. For instance, a national improvement in the Gini coefficient may not be in line with stagnant or increasing poverty rates in certain regions of the studied country. Due to such limitations of the traditional measures, researchers incorporate poverty rates into analyses to achieve more precise measurements of regional inequalities. Thanks to this novel approach using region-sensitive indicators, a deeper understanding of the dynamics of wealth inequalities within and across regions can be attained.

To understand regional income inequality, a comprehensive analysis of its structural and institutional determinants is necessary. Existing literature suggests that regional income inequality is majorly influenced by factors such as trade, industrialization and local governance (Li *et al*., 2021) and socioeconomic indicators such as economic development and labour market structure (Marchand *et al*., 2020). Besides, as Rosés (2010) found, industrial infrastructure and productivity contribute to disparities in regional income distribution.

In his theory of distributive justice, Rawls (1971) provided a detailed framework as to the strong correlation between institutional arrangements and equitable income distribution. Accordingly, policymaking must primarily focus on the improvement of living standards of the most vulnerable groups in society and prioritize social justice and poverty reduction (Rawls, 2018). Rawls' approach, in practice, provides a basis for regional policies aimed at reducing disparities in infrastructure, healthcare and educational opportunities. Yet institutional reforms at a macro level are essential for the efficiency of such arrangements.

Empirical research suggests that regional investments in key public services, *e.g.*, education and healthcare, contribute to poverty reduction substantially, particularly in less developed regions (Bandiyono, 2020). In addition, expenditures on higher education, *i.e.*, technical, vocational and university education, rather than primary and secondary education, are more effective in alleviating poverty (Jha *et al*., 2000). However, even well-funded public

investments and policy initiatives may not succeed in reducing poverty rates. Historical, cultural and institutional structures tend to induce resistance to change in rural regions (Gustafsson and Shi, 2004). That is to say, regional inequalities are consequences of institutional legacies and governance practices as well as economic factors (Pierson, 2024).

As supported by the empirical evidence above, a holistic approach which integrates structural and institutional reforms is essential in poverty reduction. While investments in local services, such as education and healthcare, are of paramount importance, addressing entrenched inequalities necessitates the establishment of robust governance systems, inclusive political frameworks and an unwavering commitment to the principles of distributive justice. The integration of these elements is imperative for researchers, policymakers and stakeholders to initiate a transformation of regional income distribution patterns and achieve a lasting reduction in poverty.

## 2.2 Relationship between institutions and income distribution in Turkey

The evolution of Turkey's regional income distribution is intricately linked to the country's institutional development. Following the establishment of the Republic in 1923, state-led industrialization and infrastructure projects were predominantly concentrated in the western regions, while the eastern regions experienced comparatively limited development. Despite the objectives outlined in the 1960s Planned Period, which aimed to address regional disparities, institutional capacity and resource distribution imbalances persisted, impeding the reduction of income disparities between the affluent and the impoverished and contributing to the perpetuation of geographical disparities between the western and eastern regions (Pamuk, 2012).

Following the adoption of market-oriented reforms in 1980, Turkey underwent a significant transformation process that increased its integration into global markets. This shift, which was characterized by a transition of production to countries offering more affordable labour, resulted in a notable increase in unemployment and poverty rates within the country (Çalışkan, 2010). Concurrently, industrial centres and cities experienced rapid economic growth, while rural provinces and regions facing structural disadvantages underwent comparatively limited growth (Özdemir and İslamoğlu, 2017). Moreover, legal and institutional challenges arising from the 1982 Constitution, deficiencies in political institutions and imbalanced power relations within society further exacerbated income inequalities.

The 1990s were characterized by an escalation in political instability, particularly evident in the economic crisis of 1994 and the consequent rise in inflation, which precipitated a pronounced deterioration in income distribution. The burden of high inflation was dispropor-

tionately shouldered by unorganized and politically disempowered groups, thereby exacerbating existing income inequalities (Pamuk, 2012). In the early 2000s, reforms initiated under the influence of the EU membership process led to improvements in the institutional structure and economic indicators (Acemoğlu and Üçer, 2020). However, these reforms did not benefit all regions equally and were insufficient to eliminate inequalities in rural and disadvantaged regions. Finally, the global crisis of 2008 and domestic political turmoil brought reform processes to a halt. This was a period when both global dynamics and domestic institutional challenges shaped income inequality, contributing to the exacerbation of regional disparities.

Table 1 shows the evolution of value added per capita in NUTS 1 regions from 1913 to 2015. Istanbul, the Aegean and Eastern Marmara regions have consistently outperformed the national average (adjusted to 100) thanks to industrial investments, infrastructure development and increased governance capacity. In contrast, regions such as Northeast Anatolia and Central Eastern Anatolia have often been below average over time due to persistent structural challenges and limited institutional support.

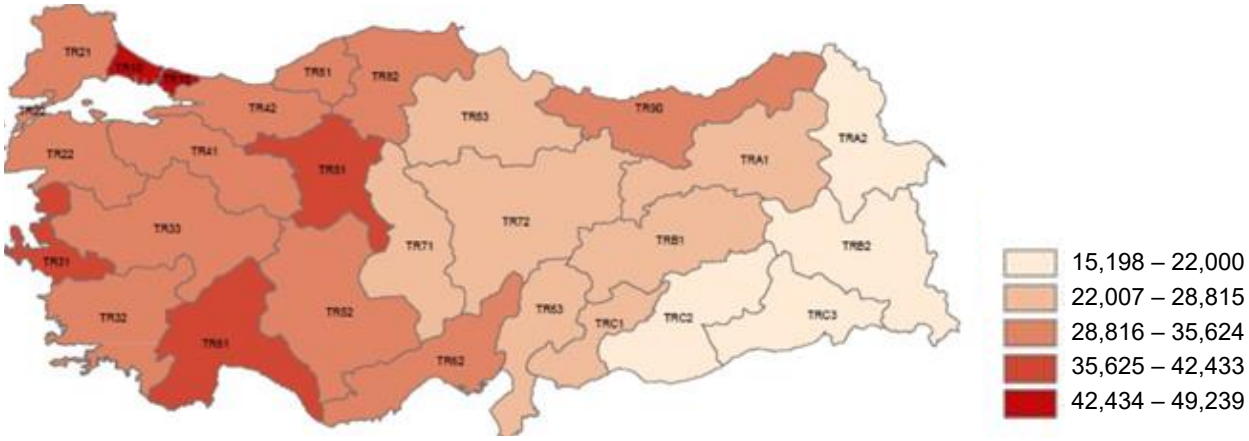
**Table1: Value added per capita of NUTS 1 regions, 1913–2015; country average = 100**

| Nuts 1 Regions | 1913 | 1927 | 1939 | 1950 | 1964 | 1970 | 1980 | 1991 | 2000 | 2010 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Istanbul** | 249.1 | 288.9 | 326.5 | 305.5 | 249.4 | 220.9 | 183.0 | 157.7 | 124.8 | 159.7 | 161.2 |
| **West Marmara** | 93.2 | 109.7 | 79.4 | 83.1 | 87.4 | 104.1 | 112.2 | 115.4 | 115.3 | 105.1 | 97.4 |
| **Aegean** | 130.2 | 110.6 | 112.0 | 119.8 | 102.7 | 106.2 | 108.6 | 120.3 | 124.8 | 96.9 | 96.5 |
| **East Marmara** | 123.1 | 98.8 | 100.1 | 103.3 | 104.8 | 111.5 | 136.0 | 148.3 | 149.6 | 121.7 | 126.6 |
| **West Anatolıa** | 108.8 | 70.6 | 110.7 | 127.9 | 135.1 | 131.0 | 117.7 | 115.9 | 119.0 | 124.1 | 116.9 |
| **Medıterranean** | 102.4 | 144.8 | 115.5 | 97.1 | 107.8 | 99.7 | 96.4 | 95.5 | 95.6 | 84.0 | 79.6 |
| **Central Anatolıa** | 86.0 | 68.4 | 78.6 | 74.1 | 81.5 | 83.1 | 84.3 | 61.7 | 69.4 | 74.2 | 74.9 |
| **West Black Sea** | 67.8 | 82.2 | 68.2 | 82.7 | 74.1 | 75.6 | 77.1 | 67.7 | 82.4 | 69.1 | 69.4 |
| **East Black Sea** | 40.4 | 56.2 | 53.8 | 42.8 | 45.7 | 61.2 | 48.3 | 59.9 | 69.9 | 70.9 | 73.9 |
| **North-East Anatolıa** | 68.6 | 45.7 | 69.3 | 52.5 | 51.1 | 33.5 | 31.9 | 33.5 | 35.1 | 54.6 | 53.2 |
| **Central East Anatolıa** | 67.5 | 50.2 | 63.5 | 59.9 | 57.5 | 47.7 | 47.3 | 50.2 | 43.0 | 49.0 | 49.1 |
| **South-East Anatolıa** | 95.7 | 85.8 | 82.2 | 84.5 | 87.2 | 81.5 | 82.3 | 60.5 | 54.1 | 49.8 | 51.3 |

Source: Asik *et al*. (2023, p. 1314)

Notwithstanding the implementation of development programmes, regional disparities persist. As illustrated in Figure 1, Istanbul (TR10) had the highest annual average of equivalized household disposable income, whereas the Van, Muş, Bitlis, Hakkari (TRB2) region had the lowest level in the year 2020. The disparity between the two regions implies the role of industrialization, skilled labour force and inequitable distribution of public resources in perpetuating economic inequality.

**Figure 1: Average annual equivalized household disposable income of regions in Turkey, 2020**




Source: TURKSTAT, Regional Results of Income and Living Survey (2020)

A growing body of research highlights the critical role of institutional factors in shaping regional inequalities. Revealing the persistent inefficiency of education and healthcare services in Southeast and Eastern Anatolia, Dönmez and Dereli (2024) suggested that industrial growth can alleviate poverty only if policies are supported by robust local institutions and equitable distribution resources. Through a mathematical programming-based cluster analysis, Sungur and Madenoğlu (2024) found significant variations in employment rates across sectors, emphasizing the human resource development strategies to reduce regional disparities. Similarly, Bilenkişi *et al*. (2015) asserted that household education levels play a crucial role in mitigating poverty risk and emphasized the significance of vocational and technical high schools in Southeast Anatolia. Based on these findings, institutional quality can engage with local labour market demands through education.

In addition to national studies, international reports have also drawn attention to the extent of inequalities in Turkey. According to OECD reports, Turkey ranks among the most unequal countries in Europe and institutional structures are indicated to be the primary drivers

behind the persistent inequalities in the country (OECD, 2023). Various issues have been highlighted in these reports, including the inefficiency of public assistance programmes and local governance as well as regulatory inconsistencies hindering the implementation of policies in certain regions. Inequalities in health indicators, particularly *IMR*, and low levels of female employment are clear evidence of systemic deficiencies in local institutional frameworks. The role of institutional frameworks and labour market structures in shaping disparities is evident, given the prevalence of informal labour in rural and peripheral regions.

A recent report by the WB indicates that high-achieving secondary schools and specialized institutes, *e.g.*, science high schools and Anatolian high schools, are concentrated in wealthier urban centres, challenging the quality of education in rural regions and significantly limiting equal opportunities in education. Furthermore, the analysis highlights that education mechanisms are heavily influenced by family income and non-competitive entrance exams, exacerbating these inequalities (Sondergaard *et al.*, 2012).

In a corresponding manner, the OECD report "How is Life? Well-being and Resilience in Times of Crisis" underscores that income inequality in Turkey escalated between 2019 and 2022, partially attributable to the inadequacy of regional development policies (OECD, 2024a). According to another report, titled "OECD Regions and Cities at a Glance 2024: Turkey", unemployment and female labour force participation exhibit pronounced regional disparities. These findings underscore the pivotal role of institutional capacity in shaping labour markets and socioeconomic outcomes (OECD, 2024b).

In essence, regional income distribution is shaped by a multifaceted interplay of historical transformations, economic reforms and institutional dynamics. While macro-level changes, such as trade liberalization, demographic shifts and political transformations, have exerted a substantial influence on the country's economic trajectory, their regional effects appear to be uneven. Evidence from national data, empirical studies and international assessments suggests that the impact of institutional factors on regional inequalities can be considerable. However, the extent to which institutional performance reduces or deepens regional poverty remains an open question.

This relationship is systematically analysed in the following section, which explores the extent to which institutional variables offer measurable insights into the mechanisms driving regional inequalities in Turkey.

## 3. Data and Methodology

To capture the institutional determinants of regional poverty, it is essential to methodologically address the depth and evolving dynamics of the issue. Towards this objective, this study examines the impact of institutional factors on poverty rates in 12 regions of Turkey. Drawing on data from 2009 to 2019, the study covers the aftermath of the global financial crisis of 2008–2009 and the pre-pandemic era of the COVID-19. This period is selected to mitigate the adverse effect of external shocks on critical econometric assumptions, such as stationarity and parameter stability. Focusing on a relatively stable period will allow the assessment of significant institutional reforms and policy modifications in Turkey, in addition to reducing the methodological challenges linked to structural breaks. Moreover, in the period covered by the study, it is possible to monitor institutional changes in various regional contexts, including shifts in the *ABG* and the improvements in healthcare indicated by the *IMR*. Therefore, the ten-year period between 2009 and 2019 provides an exceptionally suitable timeframe for examining the role of institutional factors in regional poverty.

The datasets used in the present research were rigorously selected from a single source, the data portal of the Turkish Statistical Institute (TURKSTAT; TÜİK, 2025), ensuring the coherence and systematic analysis of the data. The model was developed to fully address the scope of the study research question. The variables of *IMR* and *ABG* reflect the institutional quality across regions, by measuring institutional performance and offering insights into broader socio-economic conditions associated with poverty.

For robustness, I use the panel causality test developed by Juodis *et al*. (2021), which provides a causality analysis between institutional factors and poverty, given the possible cross-sectional dependence and heterogeneity across regions. In the following subsections, I explain the data, the methods and the findings in detail.

### 3.1 Data

The dependent and independent variables are specified so as to capture the disparities in income distribution within the pertinent regions[1]. The 50% poverty rate was selected as the dependent variable; this rate is calculated by TURKSTAT (TÜİK, 2024) based on 50% of the median income of comparable households.

1 The IBBS1 classification of TURKSTAT was used for regional distinction. The IBBS1 classification consists of 12 regions.

The first independent variable is *IMR*. A high *IMR* is associated with inadequate measures taken for public health or insufficient resources allocated by governments. As Acemoğlu and Robinson (2012) pointed out, political and economic changes in the UK have led to improvements in the quality of health services and life expectancy. The second independent variable is *ABG*. It is widely acknowledged that the socioeconomic status of families plays a pivotal role in determining children's access to quality education and advantageous positions on the labour market. In this regard, institutions are regarded as a crucial driving force that ensures the effectiveness of human capital formation from childhood and facilitates intergenerational transition (Corak, 2013). The variables employed in the model and their respective notations are shown in Table 2.

**Table 2: Variables used**

| Variables | Notation |
|---|---|
| **Poverty rate (50%)** | *Poverty* |
| **Infant mortality rate (%)** | *IMR* |
| **Associate and bachelor's degrees** | *ABG* |

Source: Author's own elaboration

In consideration of these indicators, it can be concluded that regions exhibiting lower *IMR* and higher *ABG* tend to possess more robust institutional structures. These regions have the advantage of effective health and education systems, which incorporate essential components of sound governance and institutional frameworks. The *IMR* and *ABG* indicators offer quantifiable metrics of institutional performance, thereby illuminating the effectiveness of institutions in critical domains such as health and education. Given the multidimensional nature of institutional quality, which encompasses diverse aspects of governance and public service delivery, these measures offer a tangible and substantial framework for assessing their impact on regional poverty (Sharma *et al*., 2022).

Table 3 presents the correlation values of the independent and dependent variables. The correlation values of the variables employed in the model demonstrate a positive yet relatively weak relationship between the poverty rate and the *IMR*. Furthermore, an increase in the poverty rate is associated with a decline in *ABG*. Meanwhile, a weak negative correlation is observed between the *IMR* and *ABG*.

**Table 3: Correlation table**

| | ***Poverty*** | ***IMR*** | ***ABG*** |
|---|---|---|---|
| ***Poverty*** | 1 | 0.0383 | −0.2262 |
| ***IMR*** | 0.0383 | 1 | −0.1246 |
| ***ABG*** | −0.2262 | −0.1246 | 1 |

Source: Author's own calculations

Table 4 presents the descriptive statistics of the variables. Accordingly, the average 50% poverty rate is 11.493%, the average *IMR* is 10.502 per thousand and the average number of *ABG* is 613,412.6.

**Table 4: Descriptive statistics**

| **Variable** | **Average** | **St. dev.** | **Min.** | **Max.** |
|---|---|---|---|---|
| ***Poverty*** | 11.493 | 1.7813 | 7.4 | 15.35 |
| ***IMR*** | 10.502 | 2.624 | 6.316 | 17.455 |
| ***ABG*** | 613,412.6 | 479,948 | 76,142 | 2,294,398 |

Source: Author's own calculations

The graphs of the variables are presented in Figure 2 by regions.

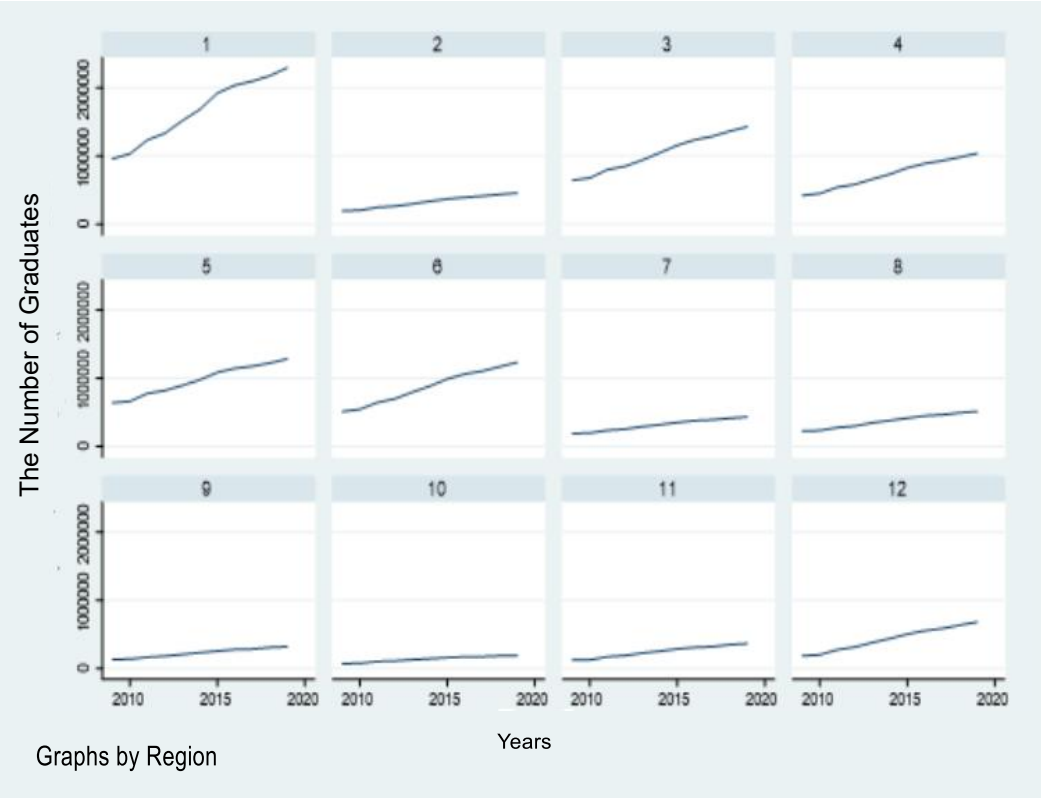
The figures demonstrate that the poverty rate has exhibited fluctuations across different regions and periods. However, the 50% poverty rate mostly remains stable or exhibits a downward trend in regions in the period from 2009 to 2019, with a slight decrease observed in Istanbul and the Mediterranean regions in 2019 compared to 2009. A similar downward trend is observed in the graphs of the *IMR*, with a more pronounced decline in regions such as Western Anatolia and the Mediterranean. However, in the Western and Black Sea regions, the *IMR* exhibited an increase in certain years, followed by a subsequent decline. *ABG* increased in all the regions, with the most significant increase observed in Istanbul. The Aegean, Eastern Marmara, Western Anatolia and Mediterranean regions also exhibited a high rate of increase, while the Eastern Black Sea and Northeastern Anatolia regions demonstrated a comparatively slower rate of growth.

**Figure 2: Graphs of variables by region[2]**



2 These graphs consist of 12 different regions. The regions from 1 to 12 are TR1 – Istanbul, TR2 – Western Marmara, TR3 – Aegean, TR4 – Eastern Marmara, TR5 – Western Anatolia, TR6 – Mediterranean, TR7 – Central Anatolia, TR8 – Western Black Sea, TR9 – Eastern Black Sea, TRA – Northeast Anatolia, TRB – Middle East Anatolia, TRC – Southeast Anatolia.

**Figure 2: Continuation**




Source: Author's own elaboration

## 3.1 Methodology

Our econometric analysis draws on a recent contribution to the field, the causality test developed by Juodis *et al*. (2021). Under the null hypothesis, this approach assumes that all Granger causality parameters are equal to zero, thus being homogeneous. The estimation of the parameters is achieved through the utilization of the split-panel jackknife method, which generates a pooled least squares (fixed effects type) estimator. Subsequent to this estimation process, a Wald test based on a bias-corrected estimator is conducted.

The analysis employs a fundamental linear dynamic panel data model, incorporating a unique explanatory variable, $x_{i,t}$, as depicted in Equation (1).

$$y_{i,t} = \theta_{p,i} + \sum_{p=1}^{P} \theta_{p,i} y_{i,t-p} + \sum_{q=1}^{Q} \beta_{q,i} x_{i,t-q} + \varepsilon_{i,t} \quad (1)$$

In this equation, $t = 1, \ldots, T$ and $i = 1, \ldots, N$, $\theta_{0,i}$, captures individual fixed effects. The term $\varepsilon_{i,t}$ denotes novelty for the individual $i$ at the time $t$. The term $\theta_{p,i}$ denotes heterogeneous

autoregressive coefficients. The term $\beta_{q,i}$ denotes heterogeneous feedback coefficients or Granger causality parameters. It is therefore assumed that $y_{i,t}$ follows an ARDL(P,Q) process and that one of the equations of a standard VAR model for $(y_{i,t}, x_{i,t})'$ is considered. The results obtained can be extended directly to multivariate systems and such bivariate systems can be presented for simplicity of exposition.

The null hypothesis states that $x_{i,t}$ is not linearly Granger-caused by $y_{i,b}$ expressed in Equation (2.1):

$$H_0: \beta_{q,i} = 0, \quad \text{for all } i \text{ and } q'\text{s} \tag{2.1}$$

The alternative hypothesis in Equation (2.2) is:

$$H_1: \beta_{q,i} \neq 0, \quad \text{for all } i \text{ and } q'\text{s} \tag{2.2}$$

In this equation, the null hypothesis and the alternative hypothesis are equivalent to those proposed by Dumitrescu and Hurlin (2012). As with the related panel unit root test, the rejection of the null hypothesis should be interpreted as evidence of the existence of a sufficiently large number of *i*-section units.

Although the present study proposes to utilize the same test statistics, a bias-corrected estimator is computed based on the jackknife principle using the half-panel jackknife (HPJ) procedure of Dhaene and Jochmans (2015). This estimator is presented in Equation (3):

$$\tilde{\beta} = 2\hat{\beta} - \frac{1}{2}(\hat{\beta}_{1/2} + \hat{\beta}_{2/1}) \tag{3}$$

Accordingly, $\hat{\beta}_1$ is estimated as in Equation (4):

$$\hat{\beta}_1 = (\sum_{i=1}^{N} x'_{i,-1} M_{Z_i} x_{i,-1})^{-1} (\sum_{i=1}^{N} x'_{i,-1} M_{Z_i} y_i) \tag{4}$$

This estimator has been regarded as both robust and reliable. Under the null hypothesis, there is no necessity to specify a value for $q$. However, it should be noted that the Wald test statistic will have fewer degrees of freedom. Furthermore, the test generates predictions that are resistant to outliers, a feature that is particularly advantageous.

Despite its strengths, the applied methodology has constraints. Firstly, it assumes that the data series are stationary. As non-stationary data potentially harm the reliability of estimation, all the variables in the model were tested for stationarity and modifications were made when necessary. Secondly, the statistical accuracy of the Wald test could be limited, particularly in small samples, given the low degrees of freedom that it offers. Thirdly, under the null hypothesis, the method assumes homogeneity across causality parameters, poten-

tially hindering its applicability on a wider scale when regions exhibit structural differences. Besides, this approach may not fully capture long-term effects or structural shifts, as it focuses on short-term causality.

To address these limitations, the methodology was implemented rigorously. Lag lengths were selected using the Bayesian information criterion (BIC), while the assessment of cross-sectional dependence is performed using the Pesaran (2004) test. The findings are interpreted considering the observed regional heterogeneities. Thus, capitalizing on the strengths and minimizing the potential drawbacks of the methodology, the study achieves robust and reliable results.

## 4. Empirical Results

The variables used in the analysis were tested for stationarity, following the approach suggested by Juodis *et al*. (2021), who emphasized the importance of using stationary data in their methodology. To achieve this, the panel unit root test of Im, Pesaran and Shin (2003) (IPS) was implemented. This test compares the null and alternative hypotheses which suggest that "all units have a unit root" and "some units are stationary", respectively. To assess the statistical significance of the model parameters, the Akaike information criterion was consulted. The results obtained from this analysis are presented in Table 5.

**Table 5: IPS unit root test**

| Variables | *W-t*-bar | *p*-value |
|---|---|---|
| ***Poverty*** | –4.546 | 0.000 |
| ***IMR*** | –2.281 | 0.000 |
| ***ABG*** | 1.511 | 0.875 |
| **log *ABG*** | –13.266 | 0.000 |

Source: Author's own calculations

The above table presents the *W-t*-bar and corresponding *p*-values. As the null hypothesis was rejected, *Poverty* and *IMR* variables are stationary. However, the *ABG* variable was found to be non-stationary, given that the null hypothesis could not be rejected. In response, the natural logarithm of *ABG* was taken and the unit root test was reapplied. The results indicate that log *ABG* is stationary. Thus, the following analysis employs the stationary variables of *Poverty*, *IMR* and log *ABG*.

At this stage, a cross-sectional relationship was identified by examining the error term. To conduct this test, Pesaran's (2004) CD test was employed. The results are presented in Table 6.

**Table 6: CD cross-sectional test**

| Variables | CD test value | *p*-value |
|---|---|---|
| ***Poverty*** | 5.7 | 0.000 |
| ***Poverty* – log *ABG*** | 9.14 | 0.000 |
| ***IMR* – log *ABG*** | 16.25 | 0.000 |

Source: Author's own calculations

The null hypothesis in the cross-sectional dependence (CD) test posits the absence of a correlation between units. The CD test results indicate that the null hypothesis was rejected, thereby suggesting that the variables are cross-sectionally dependent.

The study builds three causality models, each of which uses a robust variance estimator (half-panel jackknife estimator) that accounts for cross-sectional dependencies. This causality test indicates that $H_0$ the poverty rate is not a Granger cause, whereas $H_1$ indicates that the poverty rate is a Granger cause in at least one panel (region). The results are shown in Table 7.

**Table 7: Causality test**

| HPJ Wald test | | Coefficients | *p*-value | Coefficients | Lags of coefficients |
|---|---|---|---|---|---|
| ***IMR*** | → ***Poverty*** | 39.857 | 0.000*** | 0.322 | −0.218; 0.714***; −0.175 |
| **log *ABG*** | → ***Poverty*** | 198.363 | 0.000*** | −1.317** | −4.149***; 5.095***; −2.263*** |
| ***IMR* and log *ABG*** | → ***Poverty*** | 2,469.979 | 0.000*** | *IMR*: 0.664*** | *IMR*: 0.157*; 0.507***; |
| | | | | log *ABG*: −1.794*** | log *ABG*: −0,546, −0,248*** |

Note: ***, * denote statistical significance at the 1%, and 10% levels, respectively.
Source: Author's own calculations

The first model examines the causal relationship between *IMR* and poverty rates. At the 1% significance level, the null hypothesis is rejected, indicating that infant mortality is the Granger cause of *Poverty*. The summary coefficient of the model is positive. The optimal

lag of the variable determined by the BIC is three. The second lag also showed significance at the 1% level when lagged values were examined. The results show that an increase in infant mortality is associated with an increase in poverty rates.

The second model tests the hypothesis that *ABG* is the cause of *Poverty* and the null hypothesis is rejected at the 1% level of significance, indicating that there is sufficient evidence to conclude that *ABG* is a Granger cause of *Poverty*. The lagged values of *ABG* provide information to estimate poverty rates. The coefficient of the model is negative and significant at the 5% level. According to the BIC, the optimal specification for the lags is three. The first and third lags of the *ABG* variable are negative and the second lag is positive, with all three being significant at the 1% level. The negative coefficient of the model implies that an increase in the *ABG* is associated with a decrease in the poverty rate.

The joint causal relationship between the *IMR* and the *ABG* variables is analysed in the third model. The HPJ Wald test rejects the null hypothesis significantly at the 1% level, suggesting a joint Granger causal relationship between the two variables. The *IMR* and the *ABG* have positive and negative values respectively. Therefore, a positive correlation between higher infant mortality and increased *Poverty* is observed while higher *ABG* is linked to a reduction in *Poverty*. The BIC confirms the statistical significance of the variables at the 1% level, identifying an optimal lag length of two. The first lag of the *IMR* is significant at the 10% level, while the second lag is significant at the 1% level with negative coefficients. The second lag of the *ABG*, however, has a positive coefficient significant at the 1% level. Overall, the third model has consistent outcomes with those of the first two.

These findings reveal a statistically significant relationship between institutional quality and poverty across the regions in Turkey. Lower poverty rates are found in regions with more robust institutional frameworks, highlighting that strong institutions play a crucial role in poverty reduction by improving governance and providing a more equitable allocation of resources. Besides, a strong heterogeneity in the impact of institutional quality on poverty reduction is observed, given that urban centres with more developed institutions exhibit a larger reduction in poverty compared to rural areas. This disparity emphasizes the necessity of targeted policies to strengthen institutional capacity, particularly in rural regions.

## 4.1 Robustness test

To test the reliability of the findings, the causal relationship between the number of convicts and the poverty rates in specific regions was examined. The objective of this analysis was to capture the quality of institutions on a broader scale, particularly with regard to the

judiciary. The quality and effectiveness of the judiciary, along with access to education and healthcare, are significant indicators of institutional quality. The administration of justice must prioritize the efficiency and economic delivery of justice for all, as it plays a crucial role in the maintenance of internal peace, with the judiciary being particularly important. The internal peace of a country is maintained through the full protection of citizens' legal rights, *i.e.*, a mechanism must be in place in the case of violation of law. To provide justice by establishing institutions to manage its affairs, particularly the judiciary, is a state's main responsibility.

The efficiency of the judicial system depends on the accessibility of judicial services, the predictability of judicial decisions and the inter-organizational improvement of the legal sector (Jin and Amaral-Garcia, 2019; Mughal, 2012). Studies consistently point out a negative correlation between educational attainment and criminal activity. Improved education provides several societal benefits such as better employment prospects and a drop in most crimes through the cultivation of values and strengthening cognitive and social skills that encourage law-abiding behaviour and social harmony. The influence of education on crime prevention extends beyond the immediate impact on labour market opportunities, covering a broader societal impact (Machin *et al*., 2010; Buonanno and Leonida, 2009). Conversely, inadequate access to quality education, adequate nutrition and basic healthcare contributes significantly to poor community health and increased crime. Individuals residing in impoverished regions, particularly those lacking access to essential resources, are more prone to engage in criminal activities as a means of survival or due to a lack of viable alternatives. In these regions, the burden of providing physical, mental and social health resources often shifts to the criminal justice system, which becomes increasingly intertwined with the public health system. Consequently, the criminal justice system, which is typically focused on law enforcement, also becomes a *de facto* provider of social services. This underscores the critical need for integrated policies that address both education and health to effectively reduce crime (Smith, 2014).

In order to assess the validity of the aforementioned significant findings, the test proposed by Juodis *et al*. (2021) was also used to determine whether there is a causal relationship between the number of convicts residing in the relevant region and the poverty rate. It was found that the number of convicts in the relevant region has a unit root. The logarithm of the variable was calculated and subjected to further analysis. As demonstrated in Table 8, the findings of this analysis suggest that the log *convict* variable is stationary.

**Table 8: IPS unit root test**

| Variables | *W-t*-bar | *p*-value |
|---|---|---|
| ***convict*** | 0.878 | 0.801 |
| **log *convict*** | –1.539 | 0.0618 |

Source: Author's own calculations

The Pesaran CD test was subsequently employed to assess the presence of cross-sectional dependence. The findings indicated a substantial degree of cross-sectional dependence between the poverty rate and log *convict*, as illustrated in Table 9.

**Table 9: CD test**

| Variables | CD test value | *p*-value |
|---|---|---|
| ***Poverty* – log *convict*** | 4.94 | 0.000 |

Source: Author's own calculations

Thereafter, the analysis was complemented by a causality analysis, which is presented in Table 10.

**Table 10: Causality test**

| | HPJ Wald test | *p*-value | Coefficient | Lags of coefficients |
|---|---|---|---|---|
| **log *convict* → *Poverty*** | 25.834 | 0.000*** | –1.685* | –3.824**; 7.980***; –7.552*** |

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Author's own calculations

The findings indicate that the number of convicts exerts a Granger causal influence on the poverty rate. In the integrated model, the coefficient of log *convict* is found to be negative, indicating that an increase in the number of convicts in a region leads to a reduction in the poverty rate at the 10% level. According to the BIC, the optimal number of lags is three, and all lags are statistically significant. The first lag exhibits a negative effect at the 5% significance level, while the second and third lags are significant at the 1% level. However, the second lag demonstrates an increasing effect on the poverty rate, while the third lag exhibits

a decreasing effect. Given the overall effects of all lags, the number of convicts has a negative effect.

The findings suggest that the *IMR* and the *ABG* have a major influence on regional poverty rates in Turkey. Higher levels of the *IMR* reflect the inadequacy of the healthcare system and ineffective healthcare policies, which adversely affect disadvantaged populations by inducing a decrease in labour productivity and an increase in dependency ratios. On the contrary, regions with a lower *IMR* have more robust institutional frameworks and enhanced economic stability. In addition, higher *ABG* levels increase regional income and reduce poverty rates by increasing employability, social mobility and earning potential.

Health and education jointly play a crucial role in the dynamics of poverty. While poor health outcomes are likely to limit educational opportunities, high education levels often improve health outcomes. This proves that integrated policy approaches which simultaneously address health and education are essential in alleviating poverty.

## 5. Conclusion

Institutions play a crucial role in shaping economic outcomes. Yet, due to income inequalities and inefficiency of institutions, persistent regional inequalities are observed in Turkey. This study empirically shows that institutional quality, proxied by *IMR* and *ABG*, significantly influences regional poverty levels. The findings indicate that poverty rates are positively linked to the *IMR* whereas a higher *ABG* is associated with a reduction in poverty. These results suggest that institutional capacities in healthcare and education must be strengthened to reduce regional inequalities.

Focusing on the short-term dynamics of regional poverty and institutional factors, this research paper provides a novel analytical framework. Contrary to the previous research, which has mainly examined the long-term changes in income inequality and institutional evolution, this study explored the influence of institutional structures on poverty rates, filling an important gap in the literature. The panel causality analysis clearly shows the influence of institutional quality on regional economic inequalities, suggesting practical policy implications for reducing disparities in institutional performance in Turkey.

The half-panel jackknife estimator, an innovative panel causality test developed by Juodis *et al*. (2021), was utilized to achieve robust and reliable information on the short-term dynamics of poverty. This approach differs from conventional econometric methods by effectively addressing a common specificity of regional analyses, cross-sectional dependence, thus improving the reliability of the findings and providing the flexibility of advanced econometric techniques.

This research innovatively used health and education indicators, in particular the *IMR* and the *ABG*, as indicators of institutional quality. Unlike traditional studies focusing on economic measures such as GDP or investment rates, human-centred dimensions of institutional structures were emphasized in this paper. The *IMR*, reflecting the accessibility and efficiency of healthcare, is directly linked to regional poverty, while the *ABG* refers to the influence of education in strengthening populations and alleviating poverty by increasing economic resilience. Examination of these variables provides a comprehensive understanding of how institutional factors shape regional inequalities and a more accurate framework for policymaking aimed at poverty reduction.

Providing robust evidence on the short-term relationships between institutional quality and poverty, this study paves the way for future research in several ways. Firstly, future studies on the long-term influence of institutional factors on poverty are needed for a better understanding of the relationship between institutional structures and poverty rates. Approaches such as panel cointegration or structural equation models can provide deeper insights into the persistence and path dependence of institutional dynamics, confirming and extending the findings of the present study. Secondly, while the *IMR* and *ABG* effectively capture the people-centred dimensions of institutional quality, future research could assess additional indicators such as quality of governance, legal frameworks or access to public services to provide a more comprehensive view of institutional impacts on poverty. Examining these dimensions would allow testing the robustness of the findings in different institutional contexts.

The findings of the study reveal the heterogeneity of Turkey's regions and the need for region-specific policies. The marked differences in institutional quality and economic conditions in different regions suggest that a uniform institutional solution will be insufficient. Policymakers need to adopt specific and targeted approaches to address the unique challenges faced by each region.

Beyond education and health services, this study also examined the role of crime to better understand its relationship with poverty. The findings reveal that crime rates are closely linked to education and economic opportunities. As a result, efforts to reduce crime rates through vocational training and job creation can indirectly contribute to poverty reduction by promoting social stability and economic inclusion.

Taken together, these evidence-based recommendations, supported by both methodological and theoretical contributions, provide policymakers with a comprehensive roadmap to tackle the root causes of poverty in different regions of Turkey. The study also provides direction for future research, emphasizing the importance of continuing to examine institutional dynamics in promoting equitable and sustainable development.

While this analysis focused on Turkey's regional disparities, its methodological framework is also amenable to cross-country comparisons; it is particularly applicable to emerging economies facing similar structural challenges. Such comparative studies will help us better understand how institutional reforms affect poverty reduction in different socio-economic contexts and provide valuable guidance to policymakers.

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