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The Dynamics and Determinants of Economic Crimes in Türkiye

Türkiye'de Ekonomik Suçların Dinamikleri ve Belirleyicileri

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Abstract

The economics of crime deals with two issues: (i) the economic cost of the crime, and (ii) the economic motivations behind the crime that is committed by individuals. In this context, crime is distinguished by whether it has an economic characteristic or not. Economic crimes can be defined as non-violent crimes committed to gain profit, benefit, or social status. Understanding the dynamics of crime is crucial for policy-making to minimize the economic and social costs to society. In the last decade, the total amount of crime has been increasing continuously in Türkiye. The economic crimes accounted for approximately 60 % of total crimes until 2012. In the later years, the rate of other crimes (particularly, assault, threat, and traffic crimes) in total crimes have surpassed economic crimes, nonetheless, the number of economic crimes has also been increasing gradually and peaked in 2018. Moreover, economic crimes show regional differences in Türkiye, and revealing these disparities may provide useful insights to policymakers. Therefore, the examination of the dynamics of economic crimes at the regional level and its relationship with economic variables in Türkiye seems to be timely and important. We collect a broad economic crime data of 26 sub-regions for the 2006-2020 period. We first analyze the regional differences in property and fraud by utilizing the mapping method. We also tried to reveal the link between income, unemployment, and education level with property and fraud with dynamic panel methodology and revealed that variables have different effects on different economic crimes.

Jel Codes: *E24, K42, C23*
Keywords: *Economic Crime, Income, Unemployment, Education*

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Öz

Suç ekonomisi iki konu ile ilgilenir: (i) suçun ekonomik maliyeti ve (ii) bireyler tarafından işlenen suçun arkasındaki iktisadi motivasyonlar. Bu bağlamda suç, ekonomik bir niteliğe sahip olup olmamasına göre ayrılmaktadır. Ekonomik suçlar kar, menfaat veya sosyal statü elde etmek amacıyla işlenen şiddet içermeyen suçlar olarak tanımlanabilir. Suç dinamiklerini anlamak, topluma olan ekonomik ve sosyal maliyetlerini en aza indirgemek için politika oluşturma açısından çok önemlidir. Son on yılda, Türkiye'de toplam suç miktarı sürekli olarak artmaktadır. 2012 yılına kadar toplam suçların yaklaşık %60'ını ekonomik suçlar oluşturuyordu. Daha sonraki yıllarda diğer suçların (özellikle yaralama, tehdit ve trafik suçları) toplam suçlar içindeki oranı ekonomik suçları geçmiş, bununla birlikte ekonomik suçların sayısı da giderek artarak 2018 yılında zirveye ulaşmıştır. Ayrıca, Türkiye'de ekonomik suçlar bölgesel farklılıklar göstermektedir ve bu farklılıkların ortaya konulması politika yapıcılara faydalı bilgiler sağlayabilmektedir. Bu nedenle Türkiye'de bölgesel düzeyde ekonomik suç dinamiklerinin ve ekonomik değişkenlerle ilişkisinin incelenmesinin yerinde ve önemli olduğu görülmektedir. 2006-2020 dönemi için 26 alt bölgeye ait ekonomik suç verileri geniş bir kapsamda toplanmıştır. İlk önce haritalama yöntemini kullanarak mülk ve dolandırıcılıktaki bölgesel farklılıkları analiz edilmiştir. Ayrıca dinamik panel metodolojisi ile gelir, işsizlik ve eğitim düzeyi ile mülk ve dolandırıcılık arasındaki bağlantıyı ortaya koymaya çalışılmış ve değişkenlerin farklı ekonomik suçlar üzerinde farklı etkileri olduğunu ortaya konmuştur.

Jel Kodları: *E24, K42, C23*
Anahtar Kelimeler: *Ekonomik Suç, Gelir, İşsizlik, Eğitim*

1. Introduction

Crime has taken place in almost all individuals and societies with its different elements throughout history and continues to do so. Therefore, crime-related studies can be seen in many fields such as economy, psychology, sociology, finance, politics, development, law, etc. Since crime is both an individual and a social phenomenon, it can only be eliminated when all members of society adopt the same values against crime[3]. However, such a standardization is neither possible nor desirable due to certain limitations. In the field of economics, Becker (1968) is the pioneering study that investigates criminal incentives and deterrent mechanisms with the cost-benefit approach. In its simplest, individuals tend to commit crimes when their expected value is higher than the expected punishment. Accordingly, the economics of crime literature expands with the socio-economic factors behind the individuals' and societies' motivations towards crime. The extensive empirical literature reveals that crime is mostly associated with income, unemployment, and education level.

According to seminal studies, unemployment may lead to crime largely because of criminals' poorer financial conditions (Becker, 1968). However, unemployment may decrease the median household income (Ehrlich, 1973; 1996) thus decreasing the expected gain from crime and discouraging criminals due to the lower income of potential victims. Melick (2003) defines the effects of unemployment that lead to committing crime in two ways (i) opportunity and (ii) motivation effects. When the motivation effect is valid, unemployment will cause to people commit crimes to find income sources. On the other hand, when unemployment is high, especially the private properties will be guarded strictly due to leisure time at home, then crime opportunities will be less. Moreover, the opportunity effect may occur due to income changes. In regions with high income, the expected benefit from crime will increase, which in turn increases crime rates. In that sense, the impacts of income and unemployment on crime may also be interrelated.

The other explanation for the relationship between unemployment and crime rates comes from the labor market opportunities approach. Since education level, income, and opportunities to enter the labor market of an individual are very closely related to each other, these three factors are considered together in the vast majority of studies but do not provide a consensus on the direction and the magnitude of the effects. The effect of education on crime varies according to the level of education or job opportunities, and the type of crime. For example, while many studies (e.g., Glaeser, 1996; Buonanno, 2003; Lochner, 2004; Khan et al., 2015) report the existence of a negative relationship between education level and crime rates, some studies (Groot & Brink, 2010; Hazra, 2020) show evidence that this relationship can be positive for some specific types of crime. The role of education is promoter for fighting crime due to creating legitimate job opportunities, increasing human capital, changing social networks, and the willingness to take risks against crime, especially for street crimes such as violent and property crimes (Hjalmarsson & Loncher, 2012).

The fact that the determinants of crime can show different effects according to its different types has led to the analysis of crime with sub-categories in the empirical literature. The significance and direction of especially violent and non-violent crimes demonstrate substantial

[3] See, for a more detailed discussion Amza (2002) and Achim et al. (2021).

differences. Since non-violent crimes are more closely related to the economic conditions of individuals and societies, it has pushed the relevant literature towards economic or financial crime definitions. Economic crimes may be defined as non-violent crimes that are committed with the aim of gaining profit, benefit, or social status. Although the term economic crimes include crimes that have economic reasons or economic consequences in the literature, the point of origin of economic crimes is white-collar crimes. According to Achim et al. (2020) white-collar crimes are suggested by Sutherland (1945) for the first time to cover crimes committed by upper-class employees to gain higher income or status by using their status. Fraud, breach of trust, and abuse of position are the most common examples of them. Since such crimes are closely related to income, the higher the income, the higher the expected profit from the crime and the higher the probability of committing it.

On the other hand, property crime, which is another type of economic crime, may be better explained by unemployment and education (See, e.g., Buonanno & Montolio, 2008; Baharom & Habibullah, 2009). For economic crimes, similar effects can be seen in the impact of education on crime. According to Lochner (2004), education can have the effect of boosting crimes, which are mostly called white-collar crimes such as fraud, forgery, and embezzlement. Because a high education level brings high status and income, the return of crimes committed by using authority or skill will be higher than wage. This, in turn, may cause the effect of opportunity to become dominant and increase white-collar crimes.

In the last decades, studies related to economic crimes provide a broader perspective that includes white collar crimes. While it is seen that property crimes come from lower income groups priorly, changing norms, social structure, and economic conditions change the idea that economic crimes are linked with specific groups of society. Gottschalk (2010) defines economic crimes[4] as using or capitalizing on properties illegally which belong to others. This definition includes corruption, fraud, theft, and manipulation. Economic crimes are considered mostly in the scope of property crimes in Türkiye. This controversial and problematic approach in the literature on law[5] is applied also by Turkish Statistical Institute (TURKSTAT) and economic literature. According to the approach of Akdeniz & Öcal (2011) economic crimes cover embezzlement, bribery forgery, fraud, using and selling drugs, and smuggling in the most general sense.

Due to the high economic cost results and the economic motivations behind them, studies on economic crimes have gained importance in the economics of crime research in recent years. Because, when we think in a broader context, the costs of economic crimes (or financial crimes) including organized crimes such as money laundering, smuggling, and financing of terrorism are increasing day by day. The cost of protecting against the risks posed by these

[4] The terms economic crimes and financial crimes are used interchangeably in the literature. Although there is no consensus on that which term includes which types of crime, the scope of financial crimes is broader. For this reason, we prefer to utilize "economic crime" in our study.

[5] For a detailed review of economic and financial crimes in the Turkish law system, please see Tuzcu Ersin et al. (2022). https://uk.practicallaw.thomsonreuters.com/w-020-4991?transitionType=Default&contextData=(sc.Default)&firstPage=true

crimes alone has been calculated as $274.1 billion in the world for 2022[6]. In the last decade, the total amount of crime has been increasing continuously also in Türkiye. The economic crimes accounted for approximately 60 % of total crimes until 2012. In the later years, the rate of other crimes (particularly, assault, threat, and traffic crimes) in total crimes have surpassed economic crimes, nonetheless, the number of economic crimes has also been increasing gradually and peaked in 2018. Moreover, economic crimes show regional differences in Türkiye, and revealing these disparities may provide useful insights to policymakers. Therefore, the examination of the dynamics of economic crimes at the regional level and its relationship with economic variables in Türkiye seems to be timely and important.

In these contexts, our aim is to investigate the dynamics and determinants of economic crime using the dataset of Turkish regions for the period 2006-2020. Our study differs from previous studies in three aspects. First, we effort to obtain all-inclusive subcategories of crime. In line with this purpose, we collect the data of nine economic crime types that are theft, robbery, swindling, forgery, embezzlement, bribery, smuggling, opposition to the bankruptcy & enforcement law, and opposition to cheque laws. Then, we divide economic crimes into two categories property and fraud crimes and examine their periodic and regional dynamics via the mapping method. Second, we employ the most sensitive interrelating variables which are shown as education, income, and unemployment in the literature. Third, we consider aggregation bias in economic crime by estimating two separate models for two types of crime and controlling for dynamic impacts by using the system-GMM panel estimation method. In this study, after the introduction part, studies from different country samples and a literature review section covering Türkiye are presented. Chapter 3 includes a mapping analysis of the historical dynamics of economic crimes in Türkiye. Next, the empirical framework and findings are presented. The study concludes with the final chapter.

2. Literature Review

The empirical studies provide strong supporting evidence that income, unemployment, and education level affect the crime rates in many countries, but the magnitude and direction of the effects are controversial. For example, Edmark (2005) for Swedish counties, Ayhan & Bursa (2019) for 28 European Countries, and Jawadi et al. (2021) for France and the United Kingdom, report that unemployment leads to an increase the crime rates. Also, some studies (e.g., Ayhan & Bursa, 2019; Malby et al., 2012) emphasize that these findings may stem from the worsening economic conditions of the 2008 global economic crisis. Gould et al. (2002) stress that although the theoretical expectation is positive for the relationship between unemployment, income, and crime rates; regional labor market opportunities and wages of low-skilled workers can change the direction or size of this relationship. Similar to Gould et al. (2002), Freeman (1999) and Imrahoroglu et al. (2001) show that crime rates are not only motivated by unemployment contrary to general expectation and argue that income or opportunities in the labor market are more significant for crime. Sugiharti et al. (2023) focus on the effect of poverty and income on crime rates in Indonesia. The findings support that

[6] Please see https://risk.lexisnexis.com/global/en/insights-resources/research/true-cost-of-financial-crime-compliance-study-global-report

income increases crime rates, similar to the reasons behind the increasing effect of unemployment.

On the other hand, the characteristics of the crime may also lead to such results. Edmark (2005) and Jawadi et al. (2021) focus on the prominence of economic and non-violent types of crime such as burglary and property crimes and show that the effect of variables differs according to different types of crimes. Imrohoroglu et al. (2001) and Altindag (2012) investigate specific to property crime in the United States and Europe, respectively. They report that there is a positive relationship which indicates that 1 % increase in the unemployment rate causes over the range of 0.5 % and 2 % increase in the property crime rates. Baharom & Habibullah (2009) examine the link between income, unemployment, and crime in 11 European countries. Both income and unemployment have positive effects on the total crime. However, unemployment has a negative effect on violent crime, while income has a negative effect on burglary.

There are also studies that find reducing effects of unemployment and income on crime rates. For example, Brosnan (2018) reports a positive relationship between relative income, unemployment, and crime in Ireland. However, an increase in income causes a crime reduction. This fact implies that higher income increases the expected income from legal actions, but as relative income reduces, this relation becomes reversed. Andresen (2012) concludes that property crime in Canada is affected by unemployment rates in different manners in the short and medium term. While widespread unemployment leads to lower crime rates thanks to an increase in people's home guarding in the short term, worsening economic conditions in the long run may cause increasing crime rates. Groot & Brink (2010) find that crimes such as shoplifting, and vandalism decrease as the actual years of education increase but increasing education years leads to tax fraud in the Netherland. They interpret these results that tax fraud tends to increase with higher levels of education because the knowledge and job skills of highly skilled workers may result in greater potential benefits from such crimes. Moreover, getting a higher income of high-skilled workers is more likely to enable tax fraud and evasion.

Wassie et al. (2023) distinguish the education variable to literacy and illiteracy and their analysis is based on the direct effects of illiteracy on low income. The results indicate that when literacy reduces crimes related to theft and robbery, illiteracy leads to an increase in theft and burglary. Andresen (2012) also provides evidence on the effects of post-secondary education on violent and non-violent crime in Canada. He finds that any education after high school (university or certificate programs) reduces crime rates in the short term but increases in the long term. This result proves that there is a significant relationship between education and expected income, and it is claimed that it is possible because higher education causes more income at the regional level in the long term.

The determinants of economic crime literature on Türkiye can be divided into two groups. While many studies attempt to specify socio-economic determinants of the crime rates in Türkiye, another group of studies focuses on economic crimes.[7] One of the early studies,

[7] On the other hand, a limited body of literature (Tunca, 2018; Durusu-Ciftci & Kargın-Akkoç, 2019) investigates the convergence of crime rates in Türkiye to show regional differences and similarities.

Cömertler & Kar (2007) use cross-sectional data that consists of crime rates of 81 provinces in 2000. This study employs socio-economic indicators such as income, unemployment, education, and some demographic factors in the analysis found that unemployment and per capita income increase the crime rates. Durusoy et al. (2008) report that only unemployment has a positive effect on property crime, but education has a negative effect on both property and violent crimes by using province-level data and similarly by employing the linear regression method. Eren & Özkılbaç (2020) report that there is a positive link between young unemployment and total crime rates for 81 provinces by using cointegration estimation techniques. Filiztekin (2013) uses crime data at NUTS-2 level for the period of 2004-2018. He concludes that higher unemployment leads to higher rates of violent and narcotic crimes, on the other hand, higher reel wages reduce the total crime rates.

The analysis by decomposing the types of crimes produces interesting results about the economic crimes. According to Halıcıoğlu (2012) which analyzes the relationship between violent and non-violent crimes and some economic factors by ARDL cointegration method for 1965-2009 period, the most powerful effects work for non-violent crimes. The study uses real income per capita, unemployment rate, divorce rate, urbanization rate, and real public security expenditure as explanatory variables and reports that income has statistically significant positive effects on all types of crimes. However, although unemployment has not significant effect on violent crimes, the effect of unemployment on non-violent crimes is more than double of effect on total crime.

Aksu & Akkuş (2010) predict determinants of property crimes for 1970 and 2007 by using ARDL cointegration method. The results imply that real GDP per capita, unemployment, and secondary education are determinants of property crime. The first reduces property crimes, but the other two of them cause an increase in property crimes. Er Yiğit (2019) provides supporting evidence on the positive effects of secondary education by panel fixed effects estimator, but she reports that real GDP increases property crimes also. The other study that focuses on the effects of education on crime is Tunca (2019). According to the results, property crimes positively relate to higher education level, but the relation is negative with school dropout.

In the last years, three studies (Gültekin & Oğuzhan, 2021; Odabaşı, 2021; Yıldız et al., 2022) report similar findings about the effects of unemployment. They provide evidence that unemployment leads to lower economic crime rates by using static and dynamic panel estimators, respectively. Besides this, they (except Odabaşı, 2021) find that higher income increases property crimes. Also, Yıldız et al. (2022) report a positive and significant coefficient for secondary education and emphasize that education policies may not an efficient way to fight crime. Moreover, Cinar & Tas (2022) stress that an increase of 1000 people in unemployment increases property crime nearly 3 times compared to crimes against life. They also find strong evidence by panel fixed effects and random effects estimation for the period between 2009-2019 for NUTS-2 regions in Türkiye on the detrimental effects of income and education on property crime rates. The most recent study about socio-economic determinants of property crimes in Türkiye is Kaya & Tabak (2023). This study employs system GMM estimation to put in place only unemployment as economic indicators in the explanatory variables list and focuses on migration of each region. It takes into consideration

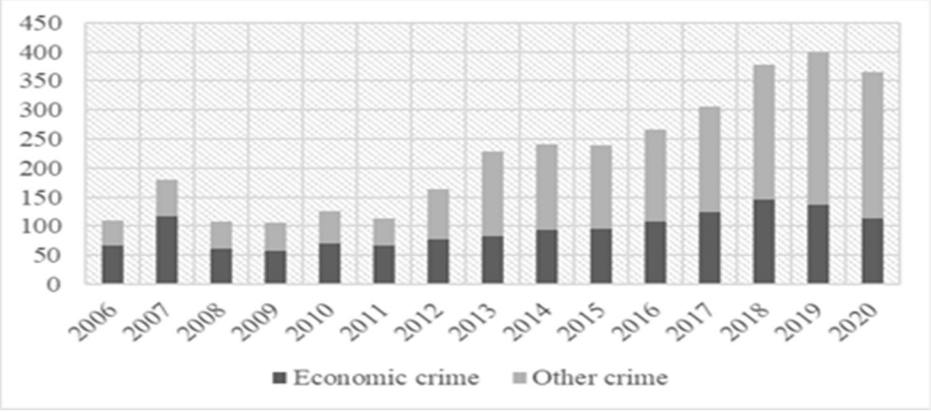
only theft and extortion as property crimes. Results show that an increase in unemployment increases in theft rather than extortion. A 1% increase in unemployment increases theft crime by 0.1%.

3. Some Stylized Facts of Economic Crime in Türkiye

In this study, we examine the development of economic crimes in Türkiye by using the number of criminals recorded by the judicial authorities published by the TURKSTAT. TURKSTAT reports annual data on convicts received into prison by 24 different crime types. Although the reported crime data is quite diverse, some types of crime that fall under the definition of economic crimes in the literature (for example, cybercrime and crimes related to counterfeit products) are not included in the TURKSTAT justice statistics. Following the literature, we identify nine crime types as economic crime among the total crime and divided them into two groups: Property crime (including theft and robbery) and fraud crime (including swindling, forgery, embezzlement, bribery, smuggling, opposition to the bankruptcy & enforcement law and opposition to cheque laws). The number of crimes and types of crimes differ regionally in Türkiye. To account for this heterogeneity, we analyze economic crime data of 26 sub-regions (NUTS-2 level) for the 2006-2020 period. Based on the empirical literature (e.g., Fajnzylber et al., 2002; Choe, 2008; Saridakis & Spengler, 2012), we calculated the number of crimes per 100.000 inhabitants in a region.

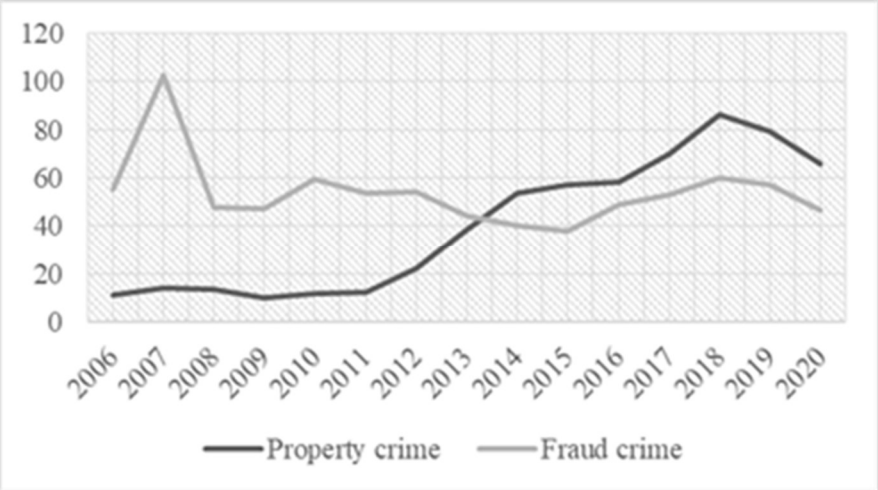
Before moving on to the regional data analysis, we present two graphs of the development of economic crime in Türkiye. Figure 1 shows the number of economic crimes and other crimes and provides us three important information. First, the total amount of crime has been increasing continuously in the last 10 years in Türkiye. Second, although a sharp increase in the rate of economic crime in 2007, its share in total crime has never been such high again in the following years. Economic crimes accounted for approximately 60 % of total crimes in Türkiye until 2012, this rate gradually decreased and fell to 30 % in 2020. Third, while the rate of other crimes (particularly, assault, threat, and traffic crimes) in total crimes has surpassed economic crimes since 2012, it is seen that the number of economic crimes has been increasing gradually and peaked in 2018.

Figure 1: Economic Crime and Other Crime (Per 100,000 Inhabitants)



When we go one step further and analyze the economic crime data in more detail, it is revealed that different types of economic crimes seem to follow different courses in Türkiye (see Figure 2). There has been a significant and upward trend in crimes against property, increasing from a low of 10 per 100,000 inhabitants in 2009 to a peak of 86 in 2018. The jump in fraud crime in 2007 is due to the increase in the number of crimes related to opposition to the bankruptcy & enforcement law, which increased by 125% compared to the previous year and reached 78,4 per 100,000 inhabitants. After 2007, it is seen that the crimes related to fraud are around 40-60 bands per 100,000 people. During the 2016-2020 period, Türkiye was confronted with two major occurrences: coup attempt in 2016 and Covid-19 pandemic in 2020. Due to the coup attempt, there has been a significant increase in crimes against property as well as total crimes. However, as a consequence of the closures for Covid-19 pandemic, the property crime started to have downward trend after 2020.

Figure 2: Property Crime and Fraud (Per 100,000 Inhabitants)



As can be seen in Figure 2, the appearance of economic crimes in Türkiye has changed within 5-year periods. Between the years of 2006-2010, fraud crimes are considerably higher than property crimes. From 2011 to 2015, property crimes started to increase rapidly, but fraud crimes followed a horizontal course. During the 2016-2020, although property crimes are higher, both types of crime act in sync. Moreover, the regional distribution of economic crime and the change in the degree of concentration over time may also provide important information. In this respect, mapping the developments in economic crime at the regional level may be a good guide for interpreting the data. Figures 3 and 4 illustrate the regional property crime and fraud crime per 100,000 inhabitants of Türkiye for the periods 2006-2010, 2011-2015, and 2016-2020. In these maps, economic crime is divided into four quantiles. The darker the colors, the higher the economic crime quantile, and thus the highest economic crime is illustrated in the darkest color which means that the economic crime per 100,000 inhabitants is above 76.

Figure 3 shows that property crimes were at the lowest level in all sub-regions of Türkiye for the 2006-2010 period. In the second period, property crimes have increased in the Western and Central Anatolian regions of Türkiye, especially in the İzmir and Antalya sub-regions. In the third period, property crime moved to the next crime quartile in all sub-regions, except

Malatya and Şanlıurfa regions. In the 2016-2020 period, İzmir, Aydın, Antalya, and Adana regions were in the highest crime quartile. In light of this information, it can be said that property crimes were relatively less in the Black Sea, and Eastern and Southeastern Anatolia regions throughout the entire period, and the increase in the number of crimes was also limited in these regions. In addition, it is quite remarkable that the amount of crime has gradually increased and reached the highest level, specifically in the Aegean and Mediterranean regions. It can be said that the significant increase in these regions may be due to a seasonal tourist density and tourism activity since both are tourism regions.

Figure 4 maps the crimes related to fraud were at the highest level in many of the sub-regions in Türkiye. In the first period, fraud crime was at a much higher level in the western parts of the country, especially in the Marmara, Aegean, and Mediterranean regions. In the 2011-2015 period, while the amount of fraud crime decreased in 23 out of the 26 regions, 12 of them (Tekirdağ, İstanbul, Kocaeli, Bursa, Manisa, İzmir, Ankara, Konya, Zonguldak, Trabzon, Malatya, and Gaziantep) dropped to a lower crime quartile. However, in the third period, the amount of fraud crime increased in 12 out of the 26 regions compared to the previous period and 5 of them (İstanbul, Kayseri, Van, Ağrı, and Mardin) raised to a higher crime quartile. On the other hand, the amount of crime in the other 5 sub-regions (Tekirdağ, Balıkesir, Bursa, Kırıkkale, and Kastamonu) decreased to a lower crime quartile.

Figure 3: Dynamics of The Property Crime in Türkiye (Per 100,000 Inhabitants), 2006-2010

:0-25; :26-50; :51-75; :>76

2011-2015

:0-25; :26-50; :51-75; :>76

2016-2020

:0-25; :26-50; :51-75; :>76

Figure 4: Dynamics of The Fraud Crime in Türkiye (Per 100,000 Inhabitants), 2006-2010

:0-25; :26-50; :51-75; :>76

2011-2015

:0-25; :26-50; :51-75; :>76

2016-2020

:0-25; :26-50; :51-75; :>76

In sum, the regional density of fraud crimes is more heterogeneous compared to the regional density of property crimes. In addition, it is not possible to state that fraud crimes generally follow a decreasing or increasing trend in the second and third periods. While property crimes follow an increasing trend throughout the country, fraud crimes have an increasing, decreasing, or constant trend in some sub-regions. However, it is clear from the maps that both types of crime are more common in the western and central regions of Türkiye compared to other regions.

It is seen that the share of economic crimes in total crimes shows different dynamics over the years. Moreover, when we consider economic crimes separately as property and fraud, the opposite movement between the years 2006-2014 is striking. During these years, while property crime has increased continuously, fraud crime has also decreased continuously and in 2014 these two crime types have caught up with each other. After this year, they started to synchronize. However, fraud crime is still below property crime. For these reasons, we make separate estimates were made for total, property, and fraud crimes in the next section. As a matter of fact, as mentioned in the introduction and literature section, theoretical expectations indicate that economic indicators may have different effects on these two types of crime.

4. Empirical Framework

In the economics of crime literature, economic crimes are mostly related with three variables: income, unemployment, and education level. However, there is no common consensus on the relationship between these variables and economic crimes. Therefore, an accurate and comparative interpretation of a simple picture of the relationship between the variables may also provide important implications for policymakers. In Türkiye, it is quietly clear that the sub-categories of economic crimes had different trends in Türkiye. For that reason, two important questions arise: (i) What is the relationship between economic crimes and the related variables in Türkiye? and (ii) Do these relations differ for property crime and fraud-related

crimes? To answer these questions, we estimate the following simple dynamic panel data model:

$$Crime_{i,t} = \beta_0 + \beta_1 Crime_{i,t-1} + \beta_2 Income_{i,t} + \beta_3 Unemployment_{i,t} + \beta_4 Education_{i,t} + \varepsilon_{i,t} \quad (1)$$

where the subscripts i and t represent region and time, respectively, and ε_(i,t) is the error term. Crime is the number of total, property, or fraud crimes per 100.000 inhabitants in a region. Income is measured by real per capita GDP (constant 2009, US$), and unemployment is measured by the unemployment rate (15 years old and over). Lastly, education is proxied by high school and vocational school at high school level graduate/total. Although the crime data is available at the provincial level (NUTS-3 level) for Türkiye, unemployment data are reported at the sub-regional level and for a limited time frame. Therefore, we use the largest panel data available, for both crime and potentially crime-related data. All the variables in the models are in natural logarithm forms, so each estimated coefficient should be interpreted as the percentage change in crime that is caused by the percentage change in explanatory variables.

Similar to most previous studies on crime and its determinants, we work with panel data that partially overcome some estimation problems of this empirical analysis. First, combining information from both the cross-section dimension and the time period, panel data methods have greater statistical power, less collinearity among variables, more degrees of freedom, and greater control of individual heterogeneity than time series methods (Baltagi, 2008). Second, previous literature (e.g., Fajnzylber et al., 2002; Neumayer, 2005; Altındag, 2012) emphasizes the high possibility of endogeneity between some of the economic and social explanatory variables and crime. For instance, they argue that if crime usually occurs in poor areas, it may further deteriorate the income differences. Likewise, high crime rates may lead to a decrease in investments in the region and thus result in lower economic growth and higher unemployment. Third, there is a significant relationship between past and current crime rates and OLS provides inconsistent estimates when a lagged dependent variable is included in the model. To control for the endogeneity problem and account for dynamic effects, we follow previous empirical studies on crime (e.g., Choe, 2008; Buonanno & Montolio, 2008), which use regional-level panel data, and we prefer to estimate our empirical model by using generalized method of moments (GMM) methodological framework to take into account the impacts of our lagged dependent variables. Arellano & Bond (1991) propose to take the first differences of the variables to eliminate the fixed effects and use of lags of dependent and explanatory variables as instruments. However, the lagged independent variables may be weak instruments and if the explanatory variables are persistent over time the first difference GMM estimator can produce biased estimates (Arellano & Bover, 1995; Blundell & Bond, 1998). To solve these problems, Arellano & Bover (1995) and Blundell & Bond (1998) suggest the system-GMM estimator which combines the level regression and first differenced regressions in a system. To check the consistency of the system-GMM estimator one should provide two diagnostics. The first condition is that there is no second-order autocorrelation (AR2) in residuals while the second condition is to test the no correlation between the instrumental variables and error terms by using Sargan/Hansen overidentifying restrictions tests.

Table 1 reports the estimation results for two types of crime, and total crimes which also comprise other crimes in Türkiye.[8] The null of no second-order serial correlation cannot be rejected in all the models. Also, the results of the Hansen test of overidentifying restrictions indicate that the null of instrument validity also cannot be rejected for three models. In the System-GMM framework, time dummies could be used in order to control for the time-specific effects and to prevent cross-individual correlation (Roodman, 2006). Since our data analysis on crime indicated that we should consider time effects, time dummies are used in all three models.

The regressions for all crime types indicate that the lagged crime has positive and significant coefficients. This result confirms the previous studies (e.g., Glaeser et al., 1996; Fajnzylber et al., 2002; Brosnan, 2018) that reveal the effect of hysteria on criminal behavior for Türkiye as well. In the analysis we made with the mapping method in the previous section, it was seen that the crime rates (especially property crime) in Türkiye were higher in certain regions and the increase also continued in these regions. When compared with the coefficients of other explanatory variables, it is apparent that the lagged dependent variable had a quite large effect on crime.

As mentioned earlier, theoretically, greater income is associated with higher crime. The main intuition behind this approach is that richer areas attract more criminal activities since there exist greater benefits, especially for property-related crimes. Our findings acknowledge this approach and indicate that an increase in income leads to an increase only property crimes, which is also in line with earlier findings for Türkiye (e.g., Er Yiğit, 2019; Gültekin & Oğuzhan, 2021). These results suggest that regions with a higher GDP per capita suffer more from property-related criminal activities. In Türkiye, crimes against property are mostly seen in the western and southern regions. The regions where Türkiye has a relatively higher per capita income are the Marmara, Aegean, and Mediterranean regions. On the other side, fraud crimes show a more heterogeneous structure regionally compared to property crimes. Therefore, empirical findings confirm our expectations.

[8] We carried out panel unit root test of Levin, Lin & Chu (2002) and find that our dependent variables (lntotcrime, lnproperty and lnfraud) are stationary.

Tablo 1: Dynamic Panel Model Estimation Results

	Total crime	Property crime	Fraud crime
$lncrime_{-1}$	**0.925*** **	**0.945*** **	**0.862*** **
	(0.022)	(0.014)	(0.023)
lnincome	0.067	**0.095** **	0.128
	(0.045)	(0.037)	(0.080)
lnunemp	**0.069*** **	**0.095*** **	**0.083*** **
	(0.024)	(0.023)	(0.048)
lnhighschool	**-0.193***	-0.168	**-0.702*** **
	(0.101)	(0.137)	(0.192)
lnuniversity	**0.163*** **	0.049	**0.565*** **
	(0.060)	(0.084)	(0.179)
Hansen test	5.11	7.64	9.66
	[1.000]	[1.000]	[1.000]
AR(1)	-3.65	-3.14	-2.46
	[0.000]	[0.002]	[0.014]
AR(2)	-1.56	1.14	-0.41
	[0.118]	[0.252]	[0.681]
Observations	390	390	390
Time dummies	Yes	Yes	Yes

The numbers in parentheses are robust standard errors. ***, **, and * denote significance at the 0.1, 1, and 5% levels, respectively. The numbers in the parentheses are robust standard errors and the numbers in the brackets are p-values of the related statistics.

The coefficient of unemployment is positive and statistically significant for all crime types. Findings show that the increase in the unemployment rate increases the economic crimes more than the total crimes. This is an expected result especially for property crimes because property crimes such as theft and robbery are mostly committed by those who do not already have a job. The theory claims that being unemployed motivates people to earn money illegally, but it is not necessarily valid for all crime types other than property crimes. This finding is also in line with Glaeser et al. (1996) and Cinar & Tas (2022) who find that the impact of unemployment has the largest effect on crimes. Moreover, according to Cinar & Tas (2022) this effect is the highest, especially for the crime against property in Türkiye. In fraud crimes, e.g., forgery, bribery, and smuggling, the findings indicate that the opportunity cost of committing a crime for the unemployed in Türkiye is lower than for workers. The positive sign of income is also consistent with Yıldız et al. (2022).

The effect of education on crime reveals interesting results for different types of crime. While total crime and fraud crime are negatively associated with high school graduation, they are positively associated with university graduation. The striking result here is that the coefficient of high school graduation is larger than the coefficient of university graduation. This finding for Türkiye confirms the earlier studies of Lochner & Moretti (2004) and Tunca (2019) which report that the effect of high school graduation is larger than the effect of an additional year of school. Fraud crime is further committed in the regions where the level of education is relatively high. This confirms the fact that fraud crimes such as swindling, and opposition of bankruptcy are committed mostly in big cities of Türkiye where individuals with a high school education live.

While crimes such as theft and robbery are costly due to their shameful nature for highly educated individuals, on the other hand, higher education also increases the probability of committing crimes since it also represents high income. The findings may have caused the impact of education to be neutralized due to the balancing of these two opposite effects. Noneconomic factors after high school graduation such as changing lifestyles, residential location, etc. Also, these reduce the amount of property-related crime opportunities. This result is in line with Fajnzylber et al. (2002) which find that education does not have any significant impact on property crimes.

5. Conclusion

Demographic and economic conditions of countries may determine people's reactions to legal and illegal activities. The economic crime literature suggests that crime motivation and opportunity costs of crime that reveal the effects of economic factors on crime rates are affected by especially unemployment, income, and education level. In this context, we aim to examine the dynamics and determinants of economic crime using the dataset of Turkish regions for the period 2006-2020. Our analysis differs from the earlier studies in Türkiye for three reasons: (1) We utilize the all-inclusive subcategories of economic crime, and we categorized them into two as fraud and property crime. (2) Before the empirical analysis, we examined their dynamics in the relevant period regionally and revealed the changing situation over time with the mapping method. (3) Lastly, we employ the most sensitive interrelating variables which are shown as education, income, and unemployment in the literature. We take into account aggregation bias in economic crime by estimating two separate models for property and fraud crime and controlling for dynamic impacts in econometric analyses.

The main results of the study are in line with striking results of studies about Türkiye and other countries showing that the unemployment rate is a significant factor for both total, property, and fraud crimes. This fact may mean that income losses caused by unemployment lead people to seek income from illegal activities. Moreover, two issues about unemployment should be considered. Firstly, having a job creates an income, however at the same time increases mental and physical health, socializing, and happiness consequently. Furthermore, inflation rates in Türkiye reached double digits since 2017, while it varies greatly in the period of the sample. The misery index which is a total of the unemployment rate and inflation rate reflects the economic well-being of the median of the society. Growing unemployment and increasing inflation negatively affect the happiness, expectations, and welfare of the citizens. For this reason, tough economic and social periods in an economy also increase further the possibility that people tend to illegal activities. Our findings on high school education indicate that it would be an efficient way that creating job opportunities by supporting high school education policies to fight against crime. However, the positive relationship between university degrees and fraud should be taken into consideration carefully by policymakers. This result is in line with relevant literature but shows that educated people tend to commit white-collar crimes. For this reason, social norms and punishments should be designed to deter crimes that are directly related to income, and status such as bribery, fraud, and smuggling. Unfortunately, increasing crime rates with education level shows that net gain from illegal activities is much more than legal gains such as wages.

In the last years, the place of crime has largely shifted to virtual platforms all over the world. As a consequence, economic crimes are expanding with cybercrimes. For example, fraud is committed over information and communication technologies such as phones and the Internet. The positive effect of education on this type of crime may be stronger. There is no extensive data on cybercrimes yet. However, socio-economic determinants of cybercrimes have the potential to be one of the further research areas.

References

Achim Monica, V. & Borlea Sorin, N. (2020). Economic and Political Determinants of Economic and Financial Crime. *Economic and Financial Crime: Corruption, Shadow Economy, and Money Laundering* (73-176).

Achim Monica, V., Văidean Viorela, L., Borlea Sorin, N. & Decebal, R. F. (2021). The Impact of the Development of Society on Economic and Financial Crime: Case Study for European Union Member States. *Risks, 9*(5), 97.

Akdeniz, S. & Öcal, F. M. (2011). Ekonomik Suçlar ve Kriz. İ. Şiriner, F. Morady, J. Mika, M. Aydın, Ş. A. Koç, H. Kapucu & E. Doğan (Ed.), *Political Economy, Crisis and Development (Politik İktisat, Kriz ve Kalkınma)* (135-152).

Aksu, H. & Akkuş, Y. (2010). Türkiye'de Mala Karşı Suçların Sosyoekonomik Belirleyicileri Üzerine Bir Deneme: Sınır Testi Yaklaşımı (1970-2007). *Sosyoekonomi, 11*(11).

Altindag, D. T. (2012). Crime and Unemployment: Evidence from Europe. *International Review of Law and Economics, 32*(1), 145-157.

Amza, T. (2002). *Criminologie, Tratat de Teorie şi Politica Criminologica (Criminology, Treatise on Criminological Theory and Policy)*. Bucharest: Lumina Lex Publishing House.

Andresen, M. A. (2012). Unemployment and Crime: A Neighborhood Level Panel Data Approach. *Social Science Research, 41*(6), 1615-1628.

Arellano, M. & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, 58*(2), 277-297.

Arellano, M. & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics, 68*(1), 29-51.

Ayhan, F. & Bursa, N. (2019). Unemployment and Crime Nexus in European Union Countries: A Panel Data Analysis. *Yönetim Bilimleri Dergisi, 17*(34), 465-484.

Baharom, A. H. & Habibullah, M. S. (2009). Crime and Income Inequality: The Case of Malaysia. *Journal of Politics and Law., 2*, 55.

Baltagi, B. H. (2008). Forecasting with Panel Data. *Journal of Forecasting, 27*(2), 153-173.

Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy, 76*(2), 169-217.

Blundell, R. & Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models*. Journal of Econometrics, 87*(1), 115-143.

Brosnan, S. (2018). The Socioeconomic Determinants of Crime in Ireland from 2003-2012. *The Economic and Social Review, 49*(2, Summer), 127-143.

Buonanno, P. (2003). The Socioeconomic Determinants of Crime. A Review of the Literature. *Working Paper Dipartimento Di Economia Politica, Università Di Milano Bicocca*, 63.

Buonanno, P. & Montolio, D. (2008). Identifying the Socio-Economic and Demographic Determinants of Crime Across Spanish Provinces. *International Review of Law and Economics, 28*(2), 89-97.

Choe, J. (2008). Income Inequality and Crime in the United States. *Economics Letters, 101*(1), 31-33.

Cinar, M. & Tas, C. (2022). Türkiye'de Bölgesel İşsizlik ve Suç Türleri İlişkisi: Panel Veri Yaklaşımı. *Business & Economics Research Journal, 13*(2).

Cömertler, N. & Kar, M. (2007). Türkiye'de Suç Oranının Sosyo-Ekonomik Belirleyicileri: Yatay Kesit Analizi. *Ankara Üniversitesi SBF Dergisi, 62*(02), 37-57.

Durusoy, S., Köse, S. & Karadeniz, O. (2008). Başlıca Sosyo-Ekonomik Sorunlar Suçun Belirleyicisi Olabilir mi? Türkiye'de İller Arası Bir Analiz. *Elektronik Sosyal Bilimler Dergisi*, (Elektronik).

Durusu-Çiftçi, D. & Kargın Akkoç, G. (2019). Convergence of Crime in Turkey: Time Series Analysis with Accounting Structural Breaks. *Finans Politik ve Ekonomik Yorumlar Dergisi*.

Edmark, K. (2005). Unemployment and Crime: Is There a Connection*?. Scandinavian Journal of Economics, 107*(2), 353-373.

Ehrlich, I. (1973). Participation in Illegitimate Activities: A Theoretical and Empirical Investigation. *Journal of Political Economy, 81*(3), 521-565.

Ehrlich, I. (1996). Crime, Punishment, and the Market for Offenses. *Journal of Economic Perspectives, 10*(1), 43-67.

Er Yigit, E. (2019). *Socio-Economic Determinants of Property Crime in Turkey*. Doctoral Dissertation, Marmara University, Turkey.

Eren, M. & Özkılbaç, S. (2020). Türkiye'de Genç İşsizliği ile Suç Düzeyi Arasındaki İlişki: Düzey 1 Bölgeleri Üzerine Bir Uygulama. *Global Journal of Economics and Business Studies, 9*(17), 13-20.

Fajnzylber, P., Lederman, D. & Loayza, N. (2002). What Causes Violent Crime?. *European Economic Review, 46*(7), 1323-1357.

Filiztekin, A. (2013). Türkiye'de Suç ve Emek Piyasası İlişkisi. Literatür Yayınları, İstanbul

Freeman, R. B. (1999). The Economics of Crime. *Handbook of Labor Economics, 3*, 3529-3571.

Glaeser, E. L., Sacerdote, B. & Scheinkman, J. A. (1996). Crime and Social Interactions. *The Quarterly Journal of Economics, 111*(2), 507-548.

Gottschalk, P. (2010). Categories of Financial Crime. *Journal of Financial Crime, 17*(4), 441-458.

Gould, E. D., Weinberg, B. A. & Mustard, D. B. (2002). Crime Rates and Local Labor Market Opportunities in the United States: 1979-1997. *Review of Economics and Statistics, 84*(1), 45-61.

Groot, W. & Van Den Brink, H. M. (2010). The Effects of Education on Crime. *Applied Economics, 42*(3), 279-289.

Gültekin, H. & Oğuzhan, A. (2021). Socioeconomic Factors' Effect on Crime: Spatial Panel Data Analysis of Level-2 Regions. *Uluslararası İktisadi ve İdari İncelemeler Dergisi,* (31), 293-310.

Halicioglu, F. (2012). Temporal Causality and the Dynamics of Crime in Turkey. *International Journal of Social Economics, 39*(9), 704-720.

Hazra, D. (2020). What Does (And Does Not) Affect Crime in India?. *International Journal of Social Economics, 47*(4), 503-521.

Hjalmarsson, R. & Lochner, L. (2012). The Impact of Education on Crime: International Evidence. *Cesifo DICE Report, 10*(2), 49-55.

Imrohoroglu, A., Merlo, A. & Rupert, P. (2006). Understanding the Determinants of Crime. *Journal of Economics and Finance, 30*(2), 270-284.

Jawadi, F., Mallick, S. K., Cheffou, A. I. & Augustine, A. (2021). Does Higher Unemployment Lead to Greater Criminality? Revisiting the Debate Over the Business Cycle. *Journal of Economic Behavior & Organization, 182*, 448-471.

Kaya, A. & Tabak, O. (2023). The Effects of Socio-Economic Factors on Property Crimes against Wealth: System GMM Analysis in Turkey's Level-2 Regions. *İzmir İktisat Dergisi, 38*(1), 35-53.

Khan, N., Ahmed, J., Nawaz, M. & Zaman, K. (2015). The Socio-Economic Determinants of Crime in Pakistan: New Evidence on an Old Debate. *Arab Economic and Business Journal, 10*(2), 73-81.

Levin, A., Lin, C. F. & Chu, C. S. J. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics, 108*(1), 1-24.

Lochner, L. (2004). Education, Work, and Crime: A Human Capital Approach. *International Economic Review, 45*(3), 811-843.

Lochner, L. & Moretti, E. (2004). The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports. *American Economic Review, 94*(1), 155-189.

Malby, St., Davis, P., Wever, W., Broek, E., Rizzi, R. & Pysden, C. (2012). *Monitoring the Impact of Economic Crisis on Crime*. United Nations Office on Drugs and Crime.

Melick, M. D. (2003). The Relationship Between Crime and Unemployment. *The Park Place Economist, 11*(1), 30-36.

Neumayer, E. (2005). Inequality and Violent Crime: Evidence from Data on Robbery and Violent Theft. *Journal of Peace Research, 42*(1), 101-112.

Odabaşı, S. (2022). Socio-Economic Determinants of Crime in Turkey: A Panel Data Analysis. *İzmir İktisat Dergisi, 37*(3), 586-606.

Roodman, D. (2006). How to Do Xtabond2: An Introduction to Difference and System GMM in Stata. *Center for Global Development Working Paper*, No.103.

Saridakis, G. & Spengler, H. (2012). Crime, Deterrence and Unemployment in Greece: A Panel Data Approach. *The Social Science Journal, 49*(2), 167-174.

Sugiharti, L., Purwono, R., Esquivias, M. A. & Rohmawati, H. (2023). The Nexus Between Crime Rates, Poverty, and Income Inequality: A Case Study of Indonesia. *Economies, 11*(2), 62.

Sutherland, E. H. (1945). Is "White Collar Crime" Crime?. *American Sociological Review, 10*(2), 132-139.

Tunca, H. (2018). Do Crimes Against Property Converge?. *Aydın İktisat Fakültesi Dergisi, 3*(2), 18-29.

Tunca, H. (2019). Socio-Economic Determinants of Crime: A Panel Data Analysis. *İnsan ve Toplum Bilimleri Araştırmaları Dergisi, 8*(4), 2767-2784.

Tuzcu Ersin, B., Şirin, E. & Necipoğlu, C. (2022). Financial Crime in Turkey: Overview. https://uk.practicallaw.thomsonreuters.com/w-0204991?transitiontype=default&contextdata=(sc.default)&firstpage=true

Wassie, N., Melese, B. & Eyasu, N. (2023). Socioeconomic Determinants of Property Crime Offending in Ethiopia: Convicted Offenders in Focus. *Journal of Financial Crime, 30*(2), 494-511.

Yıldız, Ü., Kabakçı Günay, E., Günsoy, G. & Günsoy, B. (2022). Socioeconomic Determinants of Economic Crimes in Turkey: Dynamic Panel Data Analysis. *Journal of Management and Economics Research, 20*(3), 253-275.

Çıkar Beyanı: Yazarlar arasında çıkar çatışması yoktur.

Etik Beyanı: Bu çalışmanın tüm hazırlanma süreçlerinde etik kurallara uyulduğunu yazarlar beyan eder. Aksi bir durumun tespiti halinde Fiscaoeconomia Dergisinin hiçbir sorumluluğu olmayıp, tüm sorumluluk çalışmanın yazarlarına aittir.

Yazar Katkısı: Yazarların katkısı aşağıdaki gibidir;

1. yazarın katkı oranı: %50. 2. yazarın katkı oranı: %50.

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Ethical Approval: The authors declare that ethical rules are followed in all preparation processes of this study. In the case of a contrary situation, Fiscaoeconomia has no responsibility, and all responsibility belongs to the study's authors.

Author Contributions: Author contributions are below;

1st author's contribution rate: %50, 2nd author's contribution rate: %50.

Appendix

Table A1: NUTS-2 Level Sub-Regions of Türkiye

TRA1	Erzurum, Erzincan, Bayburt	Northeast Anatolia
TRA2	Ağrı, Kars, Iğdır, Ardahan	
TRB1	Malatya, Elazığ, Bingöl, Tunceli	Centraleast Anatolia
TRB2	Van, Muş, Bitlis, Hakkâri	
TRC1	Gaziantep, Adıyaman, Kilis	Southeast Anatolia
TRC2	Şanlıurfa, Diyarbakır	
TRC3	Mardin, Batman, Şırnak, Siirt	
TR10	İstanbul	İstanbul
TR21	Tekirdağ, Edirne, Kırklareli	West Marmara
TR22	Balıkesir, Çanakkale	
TR31	İzmir	İzmir
TR32	Aydın, Denizli, Muğla	Aegean
TR33	Manisa, Afyon, Kütahya, Uşak	
TR41	Bursa, Eskişehir, Bilecik	East Marmara
TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova	
TR51	Ankara	West Anatolia
TR52	Konya, Karaman	
TR61	Antalya, Isparta, Burdur	Mediterranean
TR62	Adana, Mersin	
TR63	Hatay, Kahramanmaraş, Osmaniye	
TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir	Central Anatolia
TR72	Kayseri, Sivas, Yozgat	
TR81	Zonguldak, Karabük, Bartın	West Blacksea
TR82	Kastamonu, Çankırı, Sinop	
TR83	Samsun, Tokat, Çorum, Amasya	
TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane	East Blacksea