REGIONAL AGGLOMERATION AND DISPARITIES IN RELATION TO EARTHQUAKE RISKS IN TURKIYE

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Abstract

This study investigates the role of regional development policies and regional disparities in relation to the vulnerability of settlements under earthquake risks. The concentration of economic investments and hence population in a region is called value agglomeration (VA). VA process in Türkiye has been accelerated after the 1980s as an outcome of liberalization and open trade policy and resulted in extremely uneven development in the country.

Research findings showed that the majority of most developed districts are located in the riskiest zone, while least developed ones are located in less risky zones. Between 2008 and 2022, Türkiye's total population increased by 13.8 million people, and 8.6 million (63%) of this resided in the 1st-degree seismic belt. When the period between 1986-2022 is examined, 73% of the most developed districts and 55% of the priority regions for development are located in the 1st-degree seismic belt.

Results reveal that VA is correlated with seismic risks, which implies a need for reversing regional development strategies in Türkiye. To achieve a resilient settlement pattern, the government may achieve risk mitigation by adopting effective regional planning policies, government incentives, and investment promotion.

Keywords: regional disparities, seismic risks, Türkiye.

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1. Introduction

In the last three decades, Türkiye has suffered 7 violent quakes (1998 Ceyhan, 1999 Düzce, 2020 Elazığ, 2020 Seferihisar, 2023 Samandağ), as well as 3 devastating quakes (1999 Gölcük, 2023 Pazarcık, 2023 Elbistan). Cities were damaged by earthquakes as a result of poor design and subpar construction, which resulted in hundreds of thousands of fatalities and injuries. Additionally, in 1999 while only making up 23% of Türkiye's total population, the earthquake-affected area contributed almost 34% of the nation's GDP

The estimated impact of the earthquake in 1999 on the economy is about 17 billion dollars, according to TUSIAD, 15-19 billion dollars, according to the DPT, and 12-17 billion dollars, according to the World Bank. In this context, according to the assessment of TÜSİAD, the earthquake caused the loss of 9 percent of the GDP in 1999, 8 to 10 percent according to the DPT, and 6.3 to 9 percent according to the World Bank.

Earthquakes can be regarded as disasters when they damage human life and the economy. Regional agglomeration, the concentration of economic activities and population, increases the vulnerability to damages. This study investigates the role of regional development policies and regional disparities in relation to the vulnerability of settlements under earthquake risks. The concentration of economic investments and hence population in a region is called value agglomeration (VA). VA process in Türkiye

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has been accelerated after the 1980s as an outcome of liberalization and open trade policy and resulted in extremely uneven development in the country. Industry, tourism, trade-commercial activities, universities, and employment have been concentrated around major metropolitan cities located in the western part of Türkiye due to access to foreign markets and transport corridors, whereas those settlements are located in the riskiest seismic belts.

In Türkiye, most of the settlements are located in risky locations. This is a historical legacy. Many of the settlements have developed in high-hazard geography with the motive of benefiting from natural resources such as fertile lands, water availability, transition points, and positional advantages (Genç, 2007:38). The idea that the only measure that can be taken against earthquake hazard in Türkiye is reinforcement at the building level makes the assumption that there is no risk other than the single building risk in the urban environment, leaves social responsibility to the market and excludes the option of comprehensive planning (Genç, 2007:41). The social, political, and economic features of the society in which the disaster happened are as essential as the natural event itself in converting natural events into disasters (Özgen, 2007:350)

The main reasons for the natural events to turn into disasters in Türkiye are as follows; The majority of the country is a first-degree earthquake zone, most of the big cities are located on or very close to fault lines, and therefore a large amount of building stock and people are settled in areas that are unsafe against earthquakes (Geray, 1977; Keleş, 2002; Özgen, 2007:352)

The number of people who lost their lives due to natural disasters in the last 70 years in Türkiye is 100,000; the number of damaged houses is 600.000, and the number of houses affected by the earthquake in various ways is around 500.000. On average, every year, 1000 people die in earthquakes, 2100 people are injured, and 7000 buildings are damaged (Keleş, 2002; Erdik, 1999; Kiper, 2001; Genç, 2007). The current system is built on post-disaster intervention rather than risk reduction by developing effective mitigation measures before the disaster (Özgen, 2007).

Although regional plans have been made in our country since the 1960s to reduce regional development differences and ensure a balanced distribution of income and population among regions (cities), these plans have not shown the expected success (Dinler, 2001). While this is the case in terms of regional plans, it is seen that city plans also cannot achieve the purpose of directing the development of cities, and cities develop haphazardly, unplanned, without considering local characteristics and dangers (Tekeli, 1991; Keleş, 2000; Özgen, 2007:355).

2. Literature

2.1. Effects of Disasters on National and Global Economy (Costs)

Scholars and practitioners in Türkiye emphasize building quality, ground strength, and urban-scale development strategies. However, a limited number of studies deal with the problem of agglomeration of economic activities and settlements around earthquake-prone zones (seismic belts).

Man-made hazards, also known as "un-natural" disasters (Hewitt, 1997), are dangers that humans create for themselves as a result of the risks they take and that they try to reduce through hazard management (Blaikie et al., 1994; Burton et al., 1993). People now fully understand that natural disasters can have an impact on the national and global economies in addition to human causalities. For example, The Great East Japan Earthquake and Tsunami of 2011 severely disrupted the supply of Japanese-made vehicle parts to auto assembly plants all over the world, which had repercussions on the global economy through the supply chains of industry (Ando and Kimura 2012).

Similarly, The Chao Phraya River Flood in Thailand in 2011 served as a reminder once more of the dangers of business closure and the further effects on the local, regional, and global economies through their supply chains (Komori et al. 2012). The flooding of the Chao Phraya River in Thailand in 2011 resulted in significant damage that lasted for a considerable amount of time and affected a large area,

extending from the nation's capital of Bangkok to the north. Flooding had serious effects on the industrial sector, causing significant losses. J. P. Morgan (2011) estimates that the incident reduced worldwide industrial production by about 2.5%. Since October 2011, flooding has wreaked havoc on the seven industrial estates close to the province of Ayutthaya, where several Japanese companies have operations. The destruction of Ayutthaya Province had a significant effect on the world's supply lines for the electronics and automobile sectors, among others (Baba et al., 2013).

Analysts in the insurance sector estimate that a repeat of the Great Kanto Earthquake (1923) would result in economic losses between US$1.8 to US$2.5 trillion (Babst, 1996, cited in Fluchter, 2003). Nearly $100 billion in direct losses were brought on by Hurricane Katrina in New Orleans in 2005. More than 200,000 people died as a result of the earthquake in Port-au-Prince in January 2010 (Lall and Deichmann, 2012). Over 1.6 million people have died as a result of documented disasters since 1990, and yearly economic losses are pegged at between USD260 and USD310 billion (UNDRR, 2015a). According to estimates, direct losses from all catastrophes from 1998 to 2017 totaled $2.9 trillion, an amount that is 2.3 times the total losses from 1978 to 1997 ($1.3 trillion) (UNDRR 2019a). Disasters can be extremely damaging. For instance, Hurricane Katrina in the US killed over 1,800 people and resulted in losses of $160 billion (in 2017 dollars) in 2005; whereas Hurricane Harvey directly claimed the lives of 68 people, left 13 million people without power, and caused $125 billion in damages in 2017 (Blake and Zelinsky, 2018). Such severe disasters can disrupt or even wipe out local economies, especially in developing nations. For instance, the earthquakes that struck Nicaragua in 1972, Guatemala in 1976, El Salvador in 1986, and Haiti in 2010 resulted in direct economic losses of around 98%, 82%, 40%, and 120% of the nominal GDP of each nation in the year of the disaster, respectively (UNDRR, 2019b). The Kobe earthquake of 1995, which struck the Kobe/Osaka metropolitan area, killed 6000 people and caused more than $100 billion in direct economic losses (Hochrainer & Mechler, 2011).

The Tangshan earthquake in China in 1976 was one of the twentieth century's largest urban disasters. The death toll has been estimated to be between 246,000 and 500,000 (Wenzel, Bendimerad, and Sinha, 2007). Metro Manila and Jakarta are among the eight out of the ten largest cities in the world with moderate to high earthquake hazards (ADB, 2008). Additionally, because Asian megacities frequently serve as entry points for the global economy and have significant concentrations of skilled labour, natural disasters there could have a devastating impact on the economies of entire regions (ADB, 2008; van Dijk, 2007).

2.2. Location of Industrial Agglomeration

Industrial agglomeration typically occurs along riverine or coastal zones because these areas are convenient for physical distribution. The development of industrial clusters in cities is also correlated with the rate of urbanization, for example, through the concentration of labour as a component of production (METI 2010). For example, as a result of these industrial clusters' increasing supply chains inside ASEAN (Association of Southeast Asian Nations), the industrial agglomeration in and around several recently emerging cities is accelerating.

History has shown that many towns have grown up around points of natural attractiveness or accessibility, such as a river crossing, a coastline, or fertile volcanic soils. Floods, cyclones, and volcanic eruptions are hazardous events that are frequently linked to certain geographic contexts as those (Lall and Deichmann,2012).

2.3. Concentration of Industry and Cities

Economic factors, including economies of scale and production specialization, led to urban concentration. They lead to the formation of agglomeration economies, which support urban expansion until congestion costs take over. Moving out of harm's way is typically not a practical risk reduction approach due to the allure of cities (Lall and Deichmann,2012). For instance, overcoming Japan's unipolar concentration on Tokyo is a problem that is intimately related to earthquake risk (Fluchter, 2003).

What is true of the population is even more true of the economic resources and productivity. Cities are growth-producing engines, and businesses seek to locate there because they have easy access to customers, complementary inputs, and labor markets. Productivity rises to levels unattainable in rural areas as a result of rising returns and specialization. Therefore, each urban entity produces a significantly greater amount of output and contains a larger stock of financial resources, governmental facilities, and private property. The output per capita in urban regions is typically much higher than in rural areas. Therefore, cities will have a much higher relative economic exposure to natural disasters than rural areas. These exposure patterns have significant effects on risk profiles for urban hazards. (Lall and Deichmann,2012).

The concentration of people and assets in a relatively consolidated area is what makes cities distinctive. According to a conservative estimate of economic concentration or density, only 1.5% of the world's surface area (almost entirely urban areas) produces 50% of the world's GDP (World Bank 2008).

2.4. Cities and Risks

The number of cities with 300,000 populations reached 1,860 in 2018, rising from 305 cities in 1950 and 976 in 1990 (United Nations, 2018). It is considered that 70 to 80 percent of the gross domestic product (GDP) in many nations is created in metropolitan regions (Weiss, 2001; Dobbs, Manyika, and Roxburgh, 2011). Urban centers are more subject to the risk of being severely affected by natural hazards than rural settings because of the growing population concentration in urban areas, the high density of assets, and the socio-economic and spatial vulnerabilities that characterize many cities (Gencer, 2013). There is evidence that a significant portion of the impact of natural catastrophes is driven by rapid urbanization and population increase (UNISDR, 2012). The likelihood of deaths and economic losses as a result of climatic or geodynamic disasters increases with the density of the population in at-risk locations (Gu, 2019).

Mega-Cities

Previous studies have demonstrated that megacities face significant risks from natural disasters and that they are vulnerable to a variety of natural disasters, including wildfires and geological, meteorological, and climatic occurrences (Gencer, 2013; UN-Habitat, 2011). It is indicated that compared to other types of cities, megacities were more likely to experience at least one of the six types of natural disasters at a high degree of exposure. It also appears that compared to other city sizes, megacities were more vulnerable to disaster-related fatalities and economic losses. It turns out that, except Moscow, all megacities (or 97 percent) were highly vulnerable in terms of economic vulnerability. Tokyo (37.5 million, Japan), Delhi (28.5 million, India), Shanghai (25.6 million, China), Sao Paulo (21.7 million, Brazil), and Mexico City (21.6 million, Mexico) were the five megacities with the highest populations in 2018. They all had a high level of exposure to at least one significant form of natural hazard. These five cities were particularly vulnerable to disaster-related fatalities and financial losses (Gu, 2019).

Cities of the Less Developed Regions

It is generally known that cities in less-developed regions are more exposed to and vulnerable to natural disasters than cities in more-developed regions (Alcantar-Ayala, 2002). In less-developed regions compared to more-developed regions, a higher percentage of cities were found in highly disaster-prone areas. The probability of fatality from disasters was likewise higher in less-developed areas. In other words, compared to developing nations and more-developed regions, the least-developed nations have the highest mortality risk (Gu, 2019).

Economic vulnerability due to disasters differed somewhat by the development group. Compared to more than 90% of cities in other less-developed regions and 89% of cities in more-developed regions, only 75% of cities in the least-developed countries were extremely vulnerable to disaster-related economic losses. This may have occurred as a result of the economic worth of assets being lower in cities in least-developed nations than in other cities (Dilley et al., 2005).

Change Between 1950-2018

Regardless of the categories of risk (cyclones, floods, droughts, earthquakes, landslides, and volcanic eruptions), the number of cities in the less developed regions with 300,000 or more residents in 2018 increased by around ten times from 1950 to 2018, as opposed to merely a two- or three-fold growth in the more developed regions. In 1950, fewer cities in the less developed regions fit into each exposure and vulnerability category than there were in the more developed regions. The number of cities with high exposure and vulnerability to natural catastrophes was, however, 3.0 to 4.5 times higher than that in the more developed regions in 2018 (Gu, 2019).

2.5. Responses of Agglomerations to Risks

Agglomeration economies alter how businesses and families react to the risk of natural disasters. Most risks have comparatively small chances of happening. Therefore, even though the effects of a hazard event would be severe, cities in hazard zones continue to be desirable. Popular earthquake epicenters like San Francisco, Istanbul, or Tehran have not experienced a population decrease. Many cities have inherent advantages or built-up infrastructure that ensure their continuous allure even when the frequency of events is high. The stakes of living close to economic density will be great enough if cities achieve economies of scale and agglomeration so that people won't be put off by the danger of hazards. The primary responses to risk will be mitigation (such as modifying buildings) and risk transfer (such as insurance) rather than leaving (Lall and Deichmann,2012). The behavioral economics literature also demonstrates that probabilities are frequently overestimated, particularly for uncommon events like large-scale earthquakes. People practice "selective fatalism," opting to minimize the importance or likelihood of circumstances they believe they have little or no control over (Lall and Deichmann,2012).

Even in the most hazard-prone cities, disaster risk is unlikely to slow population expansion since businesses and people want to locate in major cities because of their amenities and for economic advantages (World Bank, 2008).

2.6. Difficulty of Dispersal of Industrial Agglomeration

Under Shintaro Ishihara's leadership as Governor of the Tokyo Metropolitan Government, the city is actively opposing plans to move capital services from Tokyo to a new capital (a decision that was made in 1992 but has not yet been implemented). Due to certain structural issues, including the Japanese political system, centralism, the involved power structures, and the importance of the infamous "Iron Triangle" (politics, bureaucracy, and the business sector) in the construction industry, it is likely impossible even in the long run (Fluchter, 2002 cited in Fluchter, 2003).

2.7. Amount of Population Living in Risky Areas

According to estimates, the number of people living in metropolitan areas exposed to a considerable risk of a severe earthquake will rise from 370 million in 2000 to 870 million in 2050 (Lall and Deichmann,2012). In the last 20 years, natural disasters have claimed the lives of 1.3 million people, injured 4.4 billion people, and left millions of people homeless, displaced, or in need of emergency assistance (Gu, 2019). More than half of these fatalities were caused by earthquakes and subsequent tsunamis (CRED and UNISDR, 2015a).

2.8. Post-Earthquake Developments

According to economists, the locations and relative sizes of cities are frequently determined by locational fundamentals and agglomeration economies. Although theories based on locational fundamentals would predict that even significant short-term shocks would leave the distribution of city sizes unchanged (Davis and Weinstein, 2002), agglomeration economies have the potential to cause multiple equilibrium states that suggest path dependence in city sizes (Bleakley and Lin, 2012; Bleakley and Lin, 2015; Krugman, 1991).

The presence of migrant networks is one potential mechanism of path dependence. In the past, migrants' choice to settle in a particular area was largely influenced by existing networks of family and friends (chain migration). These social networks helped newcomers move more affordably by giving them useful information about available jobs, housing options, local regulations, and customs (Moretti, 1999; Wegge, 1998). Even though the reasons that had influenced the geographical choice of early settlers have become obsolete, the value of being close to others who share one's cultural background might make clear longevity in relative city sizes (Ager et al., 2020).

After the earthquake, the population size in more afflicted cities decreased significantly more than in less affected ones. It is possible that the earthquake interrupted chain migration by having a bigger impact on net migration rates in locations with larger pre-existing migrant networks, which helps to explain why the shock was so prolonged (Ager et al., 2020). People left the damaged areas as a reaction to the shock, according to empirical studies on the economic effects of natural disasters in the United States during the first half of the 20th century (Boustan et al., 2012; Hornbeck and Naidu, 2014; Hornbeck, 2012). The impact of natural catastrophes on migration rates and other economic consequences at the county level between 1920 and 2010 is examined in recent work by Boustan et al. (2017). The authors demonstrate that counties affected by major disasters saw dropping land prices, higher rates of out-migration, and higher rates of poverty.

2.9. Central and Local Governments

Central government institutions provide the legal framework, coordination, and resources that are scarce at the local level, such as technical expertise and financing for large-scale investments (ex-ante policies). Other tasks, especially for preparedness, will require strong local leadership and participation (ex-post policies) (Lall and Deichmann,2012).

2.10 Ex-post Policies

Ex-ante (prevention, preparedness, and risk finance) and ex-post (relief and reconstruction) actions are all included in the broad category of disaster management. However, approximately 95% of the money is still spent on ex-post treatments (Mechler, 2004). A thorough risk management strategy must also address the underlying causes of vulnerability, which are frequently influenced by political and financial restraints (Hochrainer and Mechler, 2011). The fundamental goal of the new policy should be to shift focus from the post-disaster period to the pre-disaster era, to reduce risks with actions to be taken ahead of time, and, therefore, to reduce long-term harm in the aftermath of the disaster (Genç, 2007:32).

2.11. Urban Planning and Risk

Damages can be prevented early on by integrating hazard risk reduction into routine urban planning and management. Hazard risk is shaped by the city government's land use planning decisions. The primary goal of risk reduction is to stop the development of hazard-prone territory (Lall and Deichmann, 2012).

3. Method

Unlike other studies conducted at the provincial (NUTS-3) and regional (NUTS-2) levels in Türkiye, aiming at a geographically sensitive analysis this study was conducted at the district level. The map showing the seismic belts and fault lines of Türkiye was obtained from the Institute of Mineral Research and Exploration (MTA) fault line and seismic zones database. Then seismic zone map was overlapped with district boundaries to obtain the seismic belt class of each district.

The variables used in the analysis were associated with the seismic belt values of the districts. The analysis was based on the risk equation (Risk=Magnitude*Value*Vulnerability), and the "value" variable in the equation is a combination of human life and economic value.

The study examines the independent variable "value" by first examining population and population change as labour indicators. Second, bank deposits and bank loans are considered capital indicators. third, electricity consumption, industrial land use size, and gross domestic product are reviewed as production infrastructure. Finally, the level of development as a composite of the above variables.

Table-1. Seismic Classes of Districts in Türkiye

#	Province	District	Seismic Zone	Pop.	Industrial Area	Dev. Index	Bank Deposits	Bank Credits	Electricity Consumption	GDP	Development Priority
1	Adana	Aladağ									
2	Adana	Ceyhan									
..											
970	Zonguldak	Merkez									

4. Findings: Value Assessment in Seismic Belts

Two major fault lines (East Anatolian Fault Line and North Anatolian Fault Line) intersect at the eastern regions of Türkiye making those regions vulnerable to earthquake risks. In addition, hundreds of minor fault lines at the western regions of the country generate medium-scale quakes.

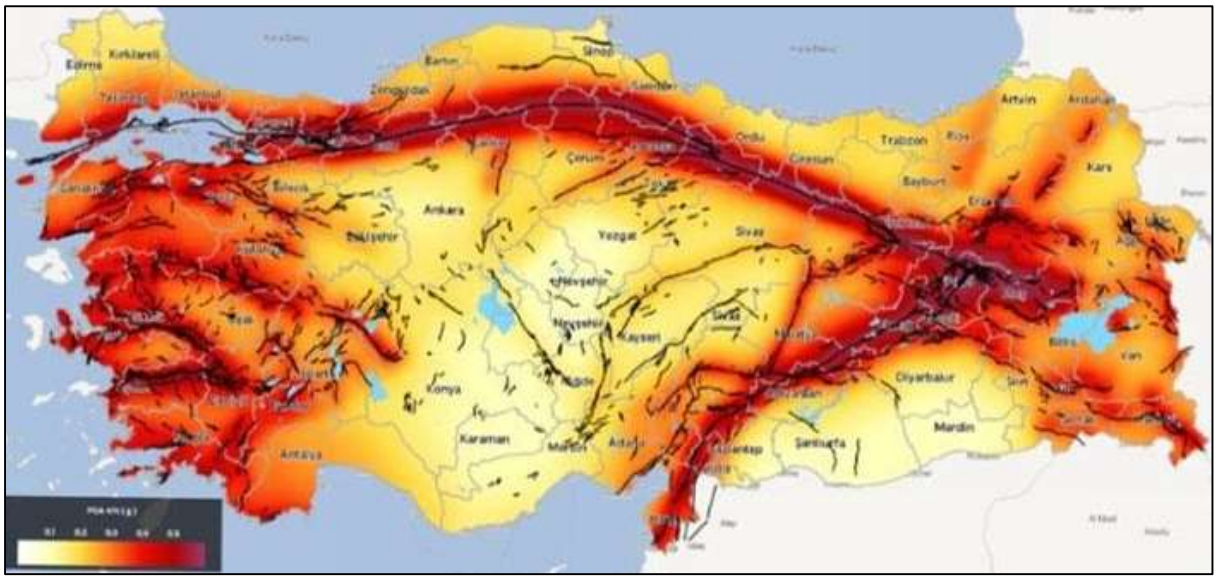

Figure-1. Seismic Zones and Fault Lines in Türkiye
Source: Retrieved from https://www.mta.gov.tr/ (accessed at 07/4/2023)

There are 81 provinces, the main administrative unit in Türkiye. A district is a sub-provincial unit in the administrative system, and the total number in 2023 was 970.

Figure-2. District Boundaries of Türkiye
Source: https://www.atlasbig.com/images/turkiyenin-tum-ilceleri-haritasi.png

4.1. Labour Indicators

Between 1985 and 2022, Türkiye's population increased by 34.6 million people. 68% of this increase (23.6 million) occurred in the 1st-degree seismic belt. In the 37 years between 1985 and 2022, the population living in the 1st-degree seismic belt constituted 65% of the total population of Türkiye, and the weight of the population living in this belt did not change in the said period.

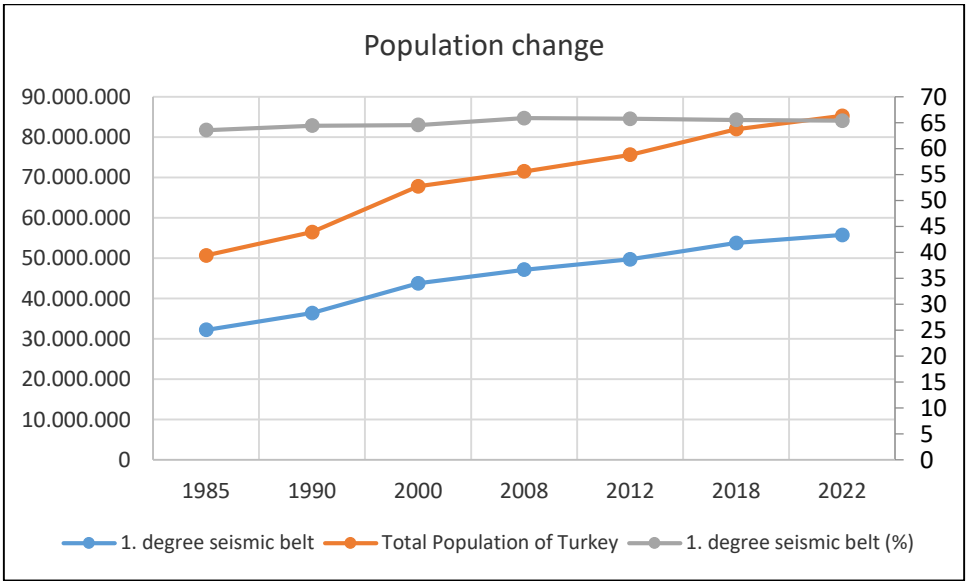

Figure-3. Population change in the 1st-degree seismic belt

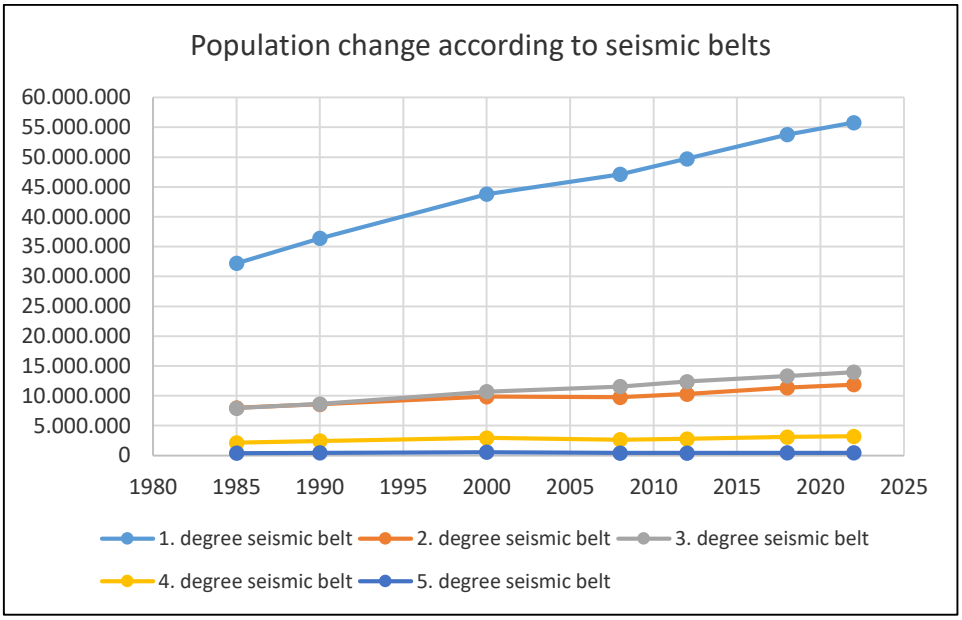

Figure-4. Population by Seismic Zones

4.2. Capital Indicators

An analysis of the 22 years between 2000 and 2022 shows that, on average, 70% of both credits and deposits are concentrated in the 1st-degree seismic belt.

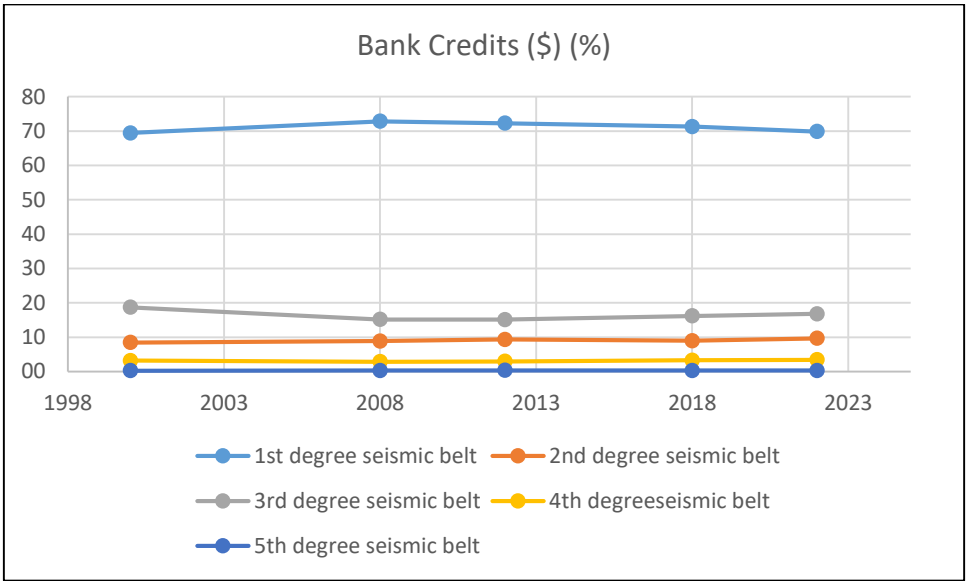

Figure-5. Bank Credits, Shares of Seismic Zones

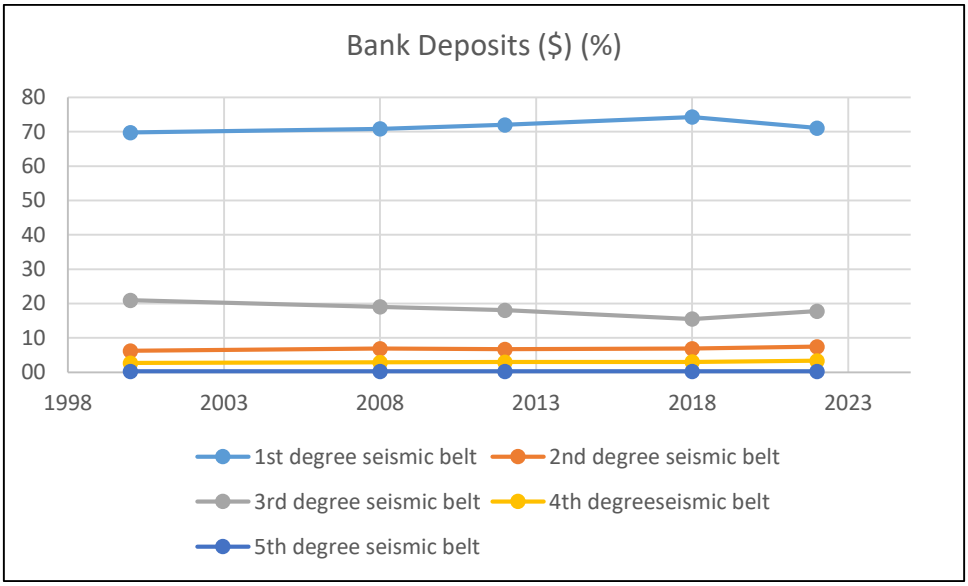

Figure-6. Bank Deposits, Shares of Seismic Zones

4.3. Production Indicators

Between 2008 and 2022, Türkiye's electricity consumption increased by 127.3 million kWh. 79.5 million kWh of this increase was realized in the 1st-degree seismic belt. Although its share in total electric energy consumption decreased from 71.1% to 67.3% in the said period, the electric energy used in the 1st-degree seismic belt continues to constitute two-thirds of Türkiye's total.

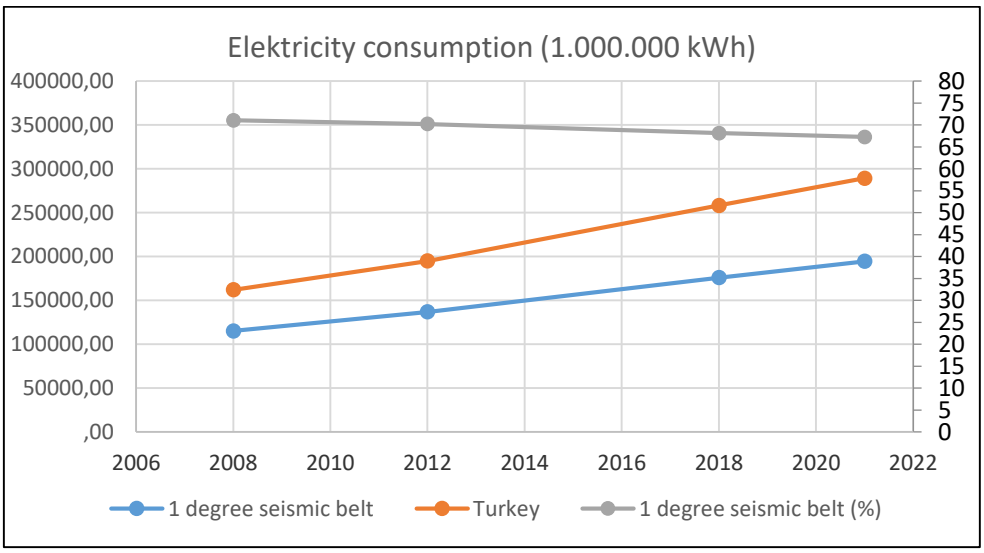

Figure-7. Electricity consumption in the 1st-degree seismic belt.

Between 1990 and 2018, the total industrial area in Türkiye increased by 163.4 million sq. meters, 107.5 million sq. meters (66%) of this increase occurred in the 1st-degree seismic belt. In the same period, the share of industrial areas in the 1st-degree seismic belt in the total increased by 6.2%.

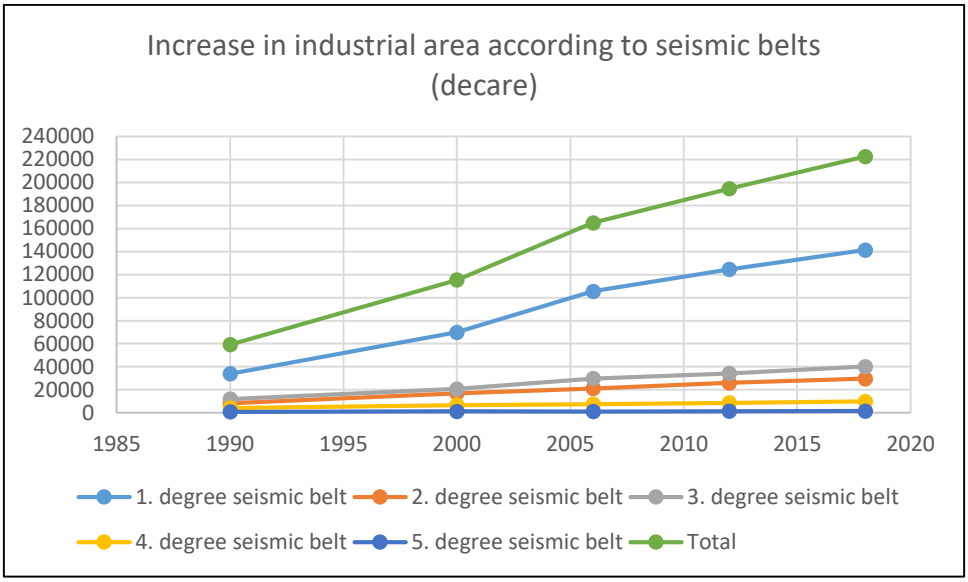

Figure-8. Industrialization in Seismic Zones

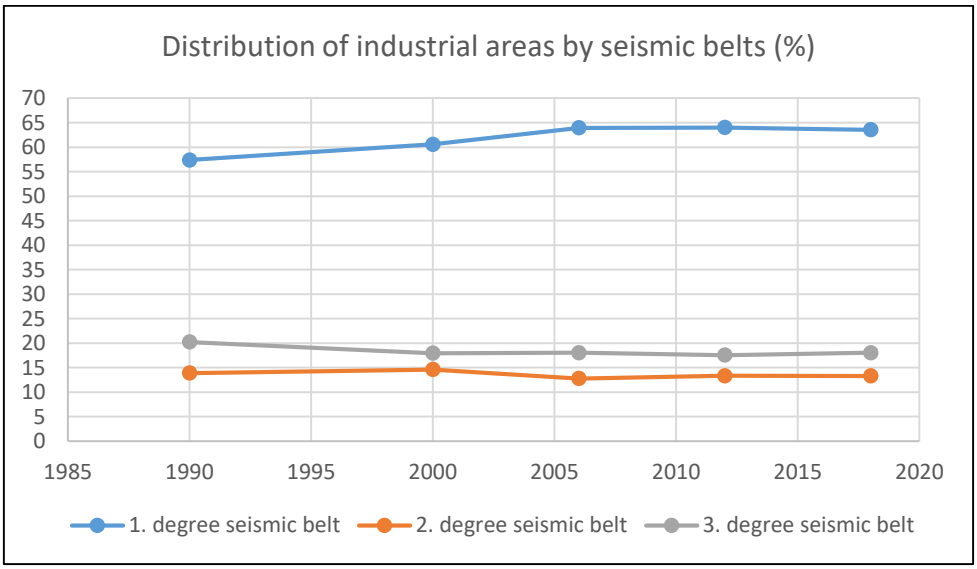

Figure-9. Industrial Areas, Shares of Seismic Zones

Although the value of GDP generated in Türkiye and in the 1st-degree seismic belt fluctuated in the 2008-2021 period, the share of GDP generated in the 1st-degree seismic belt in total GDP remained stable at around 70%.

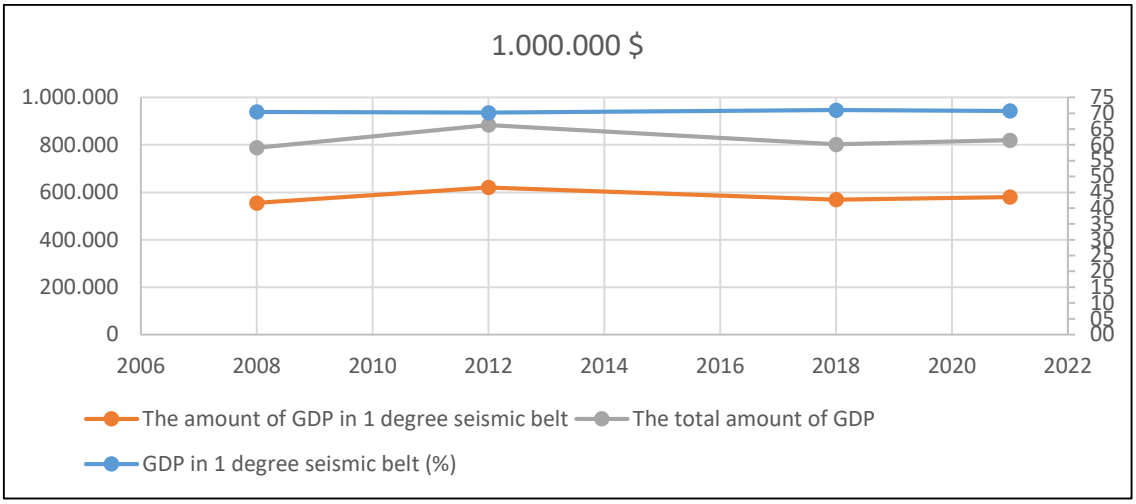

Figure-10. GDP in the 1st-degree seismic belt.

4.4. Prosperity Indicator

According to the social and economic development index studies conducted by the Ministry of Industry in 1986, 1996, 2004, 2017, and 2022, more than 70% of the most developed districts are located in the 1st-degree seismic belt.

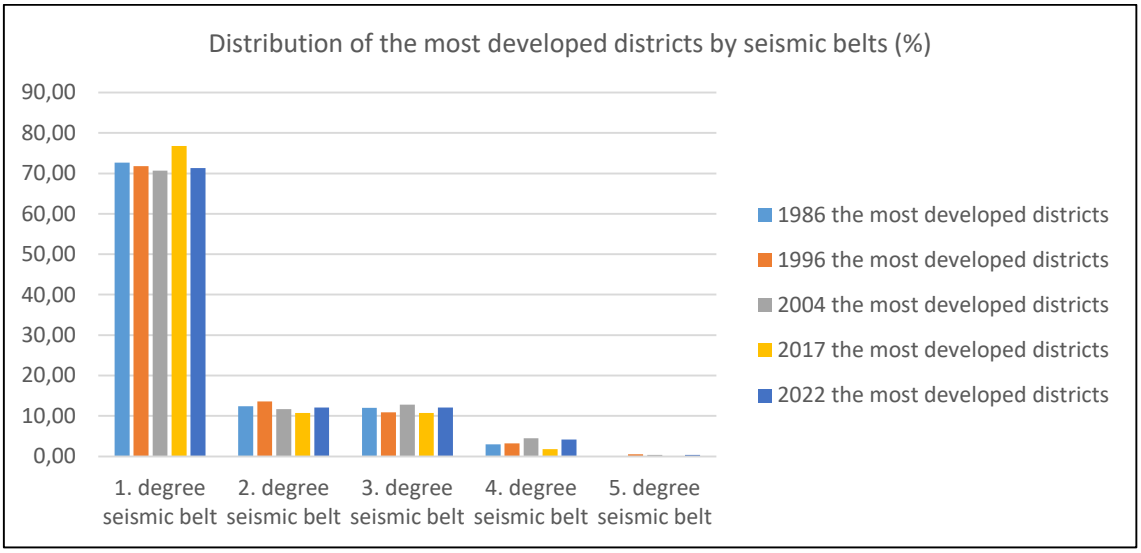

Figure-11. Classification of the Most Developed Districts by Seismic Belts

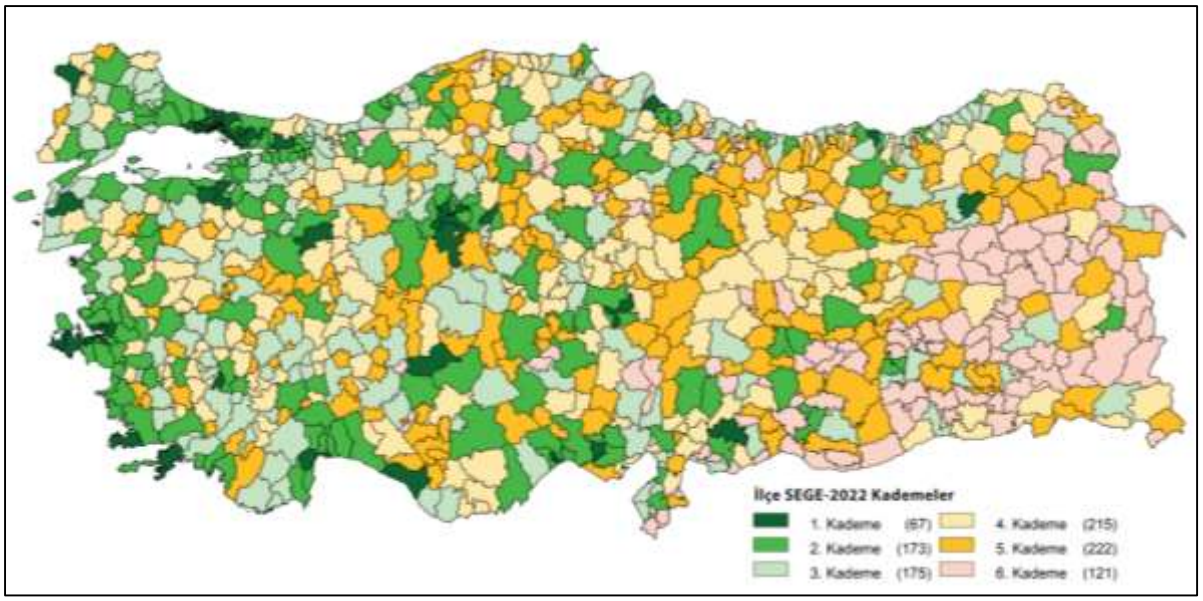

Figure-12. Classes of Districts, based on the Development index (1: most developed, 6: least developed) Source: Retrieved from https://www.sanayi.gov.tr/assets/pdf/birimler/2022-ilce-sege.pdf (accessed at 07/04/2023)

One of the most prominent policy instruments implemented in Türkiye that aim to reduce interregional development disparities is the identification and support of priority regions for development. However, it is observed that approximately 55% of priority regions for development are located in the 1st-degree seismic belt.

Table 1: Priority Areas of Development (Districts) by Seismic Zones

		Priority Areas for Development (PAD)		
		PAD	non PAD	Total
Degree of seismic belt	1	259	351	610
	%	54.6	70.8	62.9
	2	105	52	157
	%	22.2	10.5	16.2
	3	68	61	129
	%	14.3	12.3	13.3
	4	37	24	61
	%	7.8	4.8	6.3
	5	5	8	13
	%	1.1	1.6	1.3
	Total	474	496	970
	%	100.0	100.0	100.0

Conclusions

Earthquakes and the loss of life and property caused by earthquakes are one of the most important agenda items in Türkiye. After the 1999 Gölcük (7.8) and Düzce (7.5) earthquakes and the 2011 Van (7.2) earthquake, the recent 2023 Kahramanmaraş earthquakes (7.5; 7.8) were a painful reminder of this reality. However, retrospective analysis shows that this fact is not well understood.

The approach to earthquake risks in Türkiye is reduced to some limited and ineffective measures. First, earthquake risk has always been handled at the building scale, and the vulnerability of structures has been tried to be reduced by resorting to engineering solutions.

Second, although urban redevelopment practices in Türkiye aim to make the built environment under earthquake-risk earthquake-resistant, what is happening, especially in Istanbul, is that areas with high

potential for generating urban rent are being redeveloped on the grounds of earthquake risk, while a large part of the building stock that is actually at risk is being left untouched.

The third point, which is the subject of this article, is that despite all these disasters, the value agglomerations (VA) in the 1st-degree seismic belt and the consequent increase in the level of risk continue to increase.

Another related point is that the reality of earthquakes is not taken into account as an input in development policies. Instead of using engineering solutions to lessen the vulnerabilities specified in the formula (risk = magnitude/density x value x vulnerability), policies intended to reduce earthquake risks in Türkiye should concentrate on relocation policies in the direction of value reduction. Otherwise, regional policies invalidate the advantages of building-scale improvements.

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