THE IMPACT OF 2023 KAHRAMANMARAŞ EARTHQUAKES ON EARTHQUAKE INSURANCE POLICY SALES

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DECLARATION OF ORIGINALITY

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ABSTRACT

The Impact of 2023 Kahramanmaraş Earthquakes

on Earthquake Insurance Policy Sales

On February 6, 2023, Türkiye was hit by two devastating earthquakes in Kahramanmaraş with magnitude 7.7 and 7.6 that occurred at short intervals on the same day. Despite several researches have been made revealing the relation between the earthquake and demand and willingness to purchase an earthquake insurance policy, the impact of the earthquakes on the earthquake insurance policy sales remains inadequate. Moreover, the literature mostly focuses on homeowners' purchases of earthquake insurance policies and does not pay as much attention to the buying behavior of businesses. To address these gaps in the literature, this paper examines the total earthquake insurance policy sales for homeowners and businesses for the periods of 3-month, 6-month and 12-month before and after the 2023 Kahramanmaraş earthquakes and investigates the impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales. The results indicate that the earthquakes have a significant impact on the earthquake insurance sales to homeowners. The positive impact of the Kahramanmaraş earthquakes is found for the 3-month and 12-month time interval comparisons based on a firm-based secondary data. On the other hand, the results indicate that the impact of the Kahramanmaraş earthquakes on earthquake insurance policy sales for businesses is not statistically significant. Our research provides valuable insights to literature as well as the insurance firms by ensuring the right crisis management in the face of such a natural hazard.

ÖZET

2023 Kahramanmaraş Depremlerinin Deprem Sigorta Poliçesi Satışına Etkisi

6 Şubat 2023 tarihinde Türkiye, Kahramanmaraş'ta aynı gün kısa aralıklarla meydana gelen 7.7 ve 7.6 büyüklüğündeki iki yıkıcı depremle sarsıldı. Deprem ile deprem sigortası poliçesi satın alma talebi ve isteği arasındaki ilişkiyi ortaya koyan çeşitli araştırmalar yapılmış olmasına rağmen, depremlerin deprem sigortası poliçe satışları üzerindeki etkisi konusunda araştırmalar yetersiz kalmaktadır. Ayrıca, literatür çoğunlukla ev sahiplerinin deprem sigortası poliçesi alımlarına odaklanmakta ve işletmelerin satın alma davranışlarına, ev sahiplerininki kadar ilgi göstermemektedir. Literatürdeki boşlukları gidermek için bu çalışma, 2023 Kahramanmaraş depremlerinden 3 ay, 6 ay ve 12 ay öncesi ve sonrası için, ev sahipleri ve işyerleri için toplam deprem sigortası poliçe satışlarını incelemekte ve Kahramanmaraş depremlerinin deprem sigortası poliçe satışları üzerindeki etkisini araştırmaktadır. Sonuçlar, depremlerin konut sahiplerine yapılan deprem sigortası satışları üzerinde önemli bir etkisi olduğunu göstermektedir. Kahramanmaraş depremlerinin olumlu etkisi, firma bazlı ikincil verilere dayalı olarak ise 3 aylık ve 12 aylık zaman aralığı karşılaştırmalarında ortaya çıkmaktadır. Kahramanmaraş depremlerinin işyerleri için deprem poliçesi satışlarına etkisi ise istatistiksel olarak saptanamamıştır. Araştırmamız, hem literatüre hem de firmalara böyle bir doğal tehlike karşısında doğru süreç yönetiminin sağlanması konusunda önemli bilgiler sunmaktadır.

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CHAPTER 1

INTRODUCTION

An earthquake is identified as seismic waves propagating outward from the epicenter as a result of a sudden release of strain energy in the Earth's crust (British Geological Survey, 2024). Geology explains the earthquake occurrence process as waves of shaking following the fracture of the crust when the stress in the crust surpasses the rock's strength occurring along lines of weakness on pre-existing or newly formed fault lines. Earthquakes have the potential to cause destruction to several spheres: to individuals, families, social organizations and the economy. In the aftermath of a devastating earthquake, cities mostly face with problems in utilities such as supply of electricity, water and gas which amplify the economic and social problems and retard the recovery process in the affected region. In addition, overpopulation is another factor that contributes to the disruptive consequences of an earthquake (Rikitake, 1968). Undoubtedly, the most tragic outcome of earthquakes is the significant loss of human lives (Coburn & Spence, 2002). In addition to actual damages and losses caused by an earthquake, it is evident that an earthquake carries a potential to create a psychological horror in people even though they're fully aware of it and its consequences (Rikitake, 1968).

Dealing with any type of risk can be complex due to its nature and conditions surrounding the risk. Since the uncertainty is high for an earthquake and it is not possible to certainly predict the timing of risk and its consequences due to inadequate analyzing techniques that are used by seismologists (Comerio, 2004), scientific uncertainty along with necessity to satisfy several interests create a need for tools or procedures in order to be protected from the earthquake risks. Mitigating earthquake

risks often requires a comprehensive approach that includes several precautions such as the identification of earthquake faults, assessment of soil conditions, implementation of land use regulations, establishment of building and infrastructure construction standards, and public education about safety (Comerio, 2004). On the other hand, economic losses faced by the residents after the earthquake can be mitigated through purchasing an earthquake insurance policy. Thus, earthquake insurance policy stands out as an economic protection mechanism that covers the financial losses that might arise as a result of a low frequency and high impact event, an earthquake.

Literature mainly focuses on the customer side and presents vast amount of research about the factors affecting the purchase and willingness to purchase an earthquake insurance policy. The main relations that are investigated in that area can be categorized under three groups, namely, the relation of the purchase of earthquake insurance policy with risk perception, socio-economic factors and the price of the insurance policy (Palm & Hodgson, 1992; Kunreuther, 1978). When it comes to the impact of earthquakes on the purchase of earthquake insurance policy, the issue is examined mostly through the perspective of risk perception. Since the insurance market experiences a lower amount of insurance policy production relating earthquake when compared to the levels based on mathematical calculations assuming people are rational beings (Şimşek & Karaca, 2022), an economic understanding, namely behavioral economics, which assumes that people deviate from rational actions in their economic decision-making process (Kahneman & Tversky, 1979), is used in explaining risk perception relations with earthquake and earthquake insurance purchase. More specifically, according to this understanding, people exhibit non-rational decision makings and economic behaviors due to some

psychological elements and deviations preventing being rational (Mullainathan & Thaler, 2000; Simon, 1957; Shogren & Taylor, 2008; Bergstrom, 1989; Smith, 1998). Even though the economic models and theories claim the positive impact of an earthquake on the earthquake insurance policy purchase theoretically (Kahneman & Tversky, 1979; Yang, Tan, & Peng, 2020), there are also conflicting results which suggest the opposite due to malfunctioning in the insurance market, thereby due to conditions in the insurance system itself (Yang et al., 2020).

When the earthquake-risk perception and earthquake insurance purchase relation is assessed from the risk perception definitions, the elements of probability of an event to occur, consequences of that event (Sjöberg, 1994; Palm 1999) and also worry (Xu, Liu, Wang, Tang, & Liu, 2018) which all asserted to impact risk perception and thereby the willingness to purchase an earthquake insurance in a positive way are observed. The suggested positive relation between risk perception and willingness to purchase an earthquake insurance is also supported by empirical studies (Tian & Yao, 2015).

Thus, the literature provides the theoretical and empirical findings indicating the positive relationship between risk perception which is affected by an earthquake and earthquake insurance purchase. However, contradictory results may arise if problems in developing a demanded product or service occur in the insurance market (Yang et al., 2020).

The existing literature investigates the relations between an earthquake, risk perception and earthquake insurance purchase mostly based on yearly data and does not provide a monthly analysis of investigated notion while also considering the time factor, rarity and remembering issues affecting the risk perception and consequently the earthquake insurance purchase (Schmidt & Zank, 2008; Kahneman & Tversky,

1979; Papon, 2008). Moreover, the existing literature mostly focus on the demand and customer side (purchase of an earthquake insurance policy) and does not provide much insights about the insurance firms' point of view when faced with a devastating earthquake. However, it is important to understand the insurance firms' and insurance market conditions in order to present meaningful insights about the earthquake insurance policy production and sales. The main reason is that in the condition of a devastating earthquake, firms face with an unanticipated fixed cost (Born & Viscusi, 2006) and might have a tendency to alter their insurance policy selling decisions (insurability) based on their economic constraints and profit expectations if the insurance system allows them to do so (Kleindorfer & Kunreuther, 1999). At that point, it is important to consider the specific type of earthquake insurance policy since compulsory earthquake insurance, generated by public-private partnerships like Turkish Catastrophe Insurance Pool (TCIP), is different from a fire and natural disaster policy that includes earthquake coverage as an addition. Consequently, types of the earthquake insurance policy and thus conditions change the sales of earthquake insurance when the issue is assessed from the insurance firms' point of view. The literature mostly focuses on earthquake insurance policy sales to homeowners which is usually compulsory and does not give much attention to earthquake insurance policy sales to businesses which is noncompulsory most of the time or compares international insurance systems (Yamori & Kobayashi, 2002) instead of focusing on a single country, examining how earthquakes affect sales of insurance policies for both homeowners and businesses.

To fill those gaps, we address the earthquake insurance policy sales issue by considering both demand (purchase of an earthquake insurance policy by customers) and supply (earthquake insurance sales of insurance firms to customers) sides and its

influencing factors after the devastating 2023 Kahramanmaraş earthquakes. Moreover, the current research provides a short-term analysis of earthquake insurance policy sales to both homeowners and businesses (different policy types) while considering the time factor affecting the risk perception. More specifically, current research investigates the impact of 2023 Kahramanmaraş earthquakes on the earthquake insurance policy sales to both homeowners and businesses on different time intervals (3-month, 6-month, 12-month). According to our research and knowledge, this is the first study in the literature to investigate the impact of the 2023 Kahramanmaraş earthquakes on earthquake insurance policy sales. Moreover, this study investigates this effect on two different types of insurance policies sold to two different customer targets, both homeowners (compulsory earthquake insurance policy) and businesses (fire and natural disaster insurance policy - non-compulsory). This study provides a short-term sales analysis that also considers factors affecting the supply (insurance companies) and demand side (homeowners and businesses).

The main objective of this study is to analyze the impact of the 2023 Kahramanmaraş earthquakes on earthquake insurance policy sales by considering the sales behavior of insurance companies and the forces that may affect the purchasing behavior of homeowners and businesses. In addition, it aims to contribute to the literature with recommendations for the establishment of an effective insurance system that enables the accumulation of the necessary amount of monetary pool in the event of a devastating natural disaster such as the 2023 Kahramanmaraş earthquakes.

CHAPTER 2

LITERATURE REVIEW

2.1 Earthquake insurance

Earthquake insurance is generally described as coverage for catastrophic losses with low-probability but high-severity. In practice, a homeowner purchases a compulsory earthquake insurance (also known as TCIP insurance) to provide protection against earthquake while businesses purchase fire and natural disaster policy which is not compulsory in Türkiye. TCIP insurance (DASK insurance in Turkish) is mandatory in a way that individuals are not financially penalized for not owning a TCIP insurance but prevented from utilizing specific public services such as natural gas, water and electricity and also face with barriers in the processes of property registration and credit transactions.

Even though earthquakes are classified as low-probability events, they do occur quite frequently (Murdoch, Singh, & Thayer, 1993). The significance of earthquake insurance extends to consumers, the insurance industry, industry regulators and government agencies because of the potential devastating loss that might occur as a result of an earthquake. The insurance industry might face significant challenges and financial instability in the condition of the occurrence of such a major earthquake which potentially hinder the claims payment ability of insurance companies (Cummins, Doherty, & Lo, 2002).

If insurance consumers base their expectations on recent seismic events, it is likely that only a small amount of property owners will have earthquake insurance even if it is offered at a reasonable price and accessible; and offered for the areas with a higher likelihood of earthquakes (Athavale & Avila, 2011). In addition, if a

significant number of homeowners opt not participate in insurance activity, the costs related with disaster relief and recovery will be substantial.

Earthquakes are not counted as ideal insurable occurrences for insurance companies (Soberon, 1995, p.144) as they both lack predictable and statistically independent element of an optimal insurable events. In other words, the occurrence of earthquake losses is infrequent which makes difficult to accurately estimate the likelihood of their happening and also the severity of the earthquake loss. Additionally, another challenge about earthquake insurance for insurance companies is the fact of earthquake probability having a widespread affect, meaning affecting a large number of policyholders simultaneously. Moreover, insurance companies may face reluctance in providing earthquake insurance if they are required by rating agencies to maintain higher reserves or capital to mitigate the risk of catastrophic losses; or insurance companies' incapability of adequately pricing the coverage and compensate shareholders for this peril may discourage them from offering earthquake insurance policies (Athavale & Avila, 2011). The key factor for insurance industry's reluctance is believed to be based upon intertemporal problem of catastrophe coverage which is explained as regular stream of yearly premiums punctuated/interrupted by irregular loss payments (Jaffee & Russell, 1997).

Jaffee and Russell (1997) challenge the belief that catastrophic coverage cannot be insured as ideal and profitable way by suggesting (1) pre-disaster mitigation efforts which lower both expected and real losses caused by catastrophe and (2) mediums such as reinsurance, access to lines of credit, catastrophe derivative contracts and catastrophe bonds which contribute to intertemporal diversification, ultimately reducing the risk factor in insurance premiums. Hence, in turn, those

practices lead to the establishment of an effective market for catastrophic insurance coverage.

An alternative solution to pricing and servicing catastrophic insurance claims could involve the increased role of government agencies. A National Earthquake Insurance Program, similar to the existing National Flood Insurance Program, is suggested as a potential solution to address market deficiencies (Gudmundsen, 1986). The advantage of such a government-administered program is not being limited by financial constraints as faced by insurance industry. In addition to analyzing earthquake programs, Kunreuther (2001) also investigated the role of government agencies in risk management strategies which encompass a combination of insurance and capital market instruments with regulation and enforcement. Recently, the insurance industry's ability to handle catastrophic losses is investigated and the role of public sector in mitigating the impact of such losses on capital and assisting the insurance industry is defended (Kunreuther & Michel-Kerjan, 2007). The California Earthquake Authority (CEA), which is established in 1996, is an example of a risk pool specially designed to address market deficiencies. The changes after involvement of CEA into the insurance market are investigated and the positive relationship between news supporting the establishment of CEA and insurance company stock prices is revealed (Marlett & Pacini, 1999). Hence, the capital market recognizes the positive effects of public-private partnership in sharing the risks associated with catastrophic losses.

The insurance system set up in Türkiye to address natural disasters and their resulting damages is relatively new. More specifically, only 41 insurance companies which most of them considered as having inadequate capital resources and unskilled risk management abilities were providing property and fire coverage which includes

earthquake coverage as a supplementary coverage before 1999 Marmara earthquake in Türkiye (Gurenko, Lester, Mahul, & Gonulal, 2006). Thus, although earthquake insurance has been implemented in Türkiye for over half a century in that way, the transition to mandatory earthquake insurance system was made with the "Decree Law No. 587" after the Marmara earthquake on August 17, 1999, and the Bolu-Düzce earthquake on November 12, 1999 (Şimşek & Karaca, 2022). Turkish Catastrophe Insurance Pool (TCIP) which manages this system was founded in 2000 as a response to the significant losses and financial strain experienced by the government in compensating the damages caused by the 1999 Marmara earthquakes. The Turkish government has been confronted with a fiscal and social challenge due to the fact that a significant portion of the population resides in regions prone to earthquakes. This persistent threat of large-scale natural disasters prompted the establishment of the Turkish Catastrophe Insurance Pool (TCIP). In addition to financial vulnerability, the primary reason for the establishment of TCIP (denoted as DASK in Turkish) stemmed from the significantly low rate of household participation in catastrophe insurance penetration. The operation of TCIP is inspired by the California Earthquake Authority (CEA) and the New Zealand Earthquake Commission (EQC), but localized through adapting Türkiye-specific realities and circumstances (Gurenko et al., 2006). TCIP operates as a government-owned insurance organization that offers coverage against catastrophic risks for homeowners in the country. The TCIP, which reflects a public-private partnership (PPP), does not employ any public workers. The private insurance industry is responsible for all of its operational activities including sales, reinsurance, and claim management. The government's involvement is restricted to offering additional financial support in case the TCIP's ability to pay of claims is exceeded. This

program has four main goals: firstly, to offer earthquake insurance coverage for all urban dwellings at rates that are both affordable and actuarially sound; secondly, to minimize the government's financial vulnerability to natural disasters; thirdly, to establish reserves that can be utilized in the long-term to cover losses caused by future earthquakes; and finally, to promote risk reduction and mitigation practices in the construction of residential buildings (Gurenko et al., 2006). To sum, TCIP is responsible for the acquisition, implementation, and management of Compulsory Earthquake Insurance since its establishment. The roles and contributions of other main players that constitute the organization of compulsory earthquake insurance system in Türkiye, namely, 1) government, 2) domestic insurance companies, 3) international reinsurers and 4) the World Bank are defined by the TCIP (Gurenko et al., 2006). TCIP is governed by a board which makes critical decisions that shape and impact the operational strategies of the TCIP. Other than the board, the government engages pool managers of the TCIP who directly control and analyze information systems, carry out reinsurance operations and deal with claims. The government, more specifically the General Directorate of Insurance (GDI) of the Turkish Treasury is responsible for conducting TCIP's framework, organizing campaigns to inform the public and increase public awareness about the earthquake risks, determines the insurance coverage terms and premium rates based on long-term financial goals while also ensuring to reach a targeted market penetration level. In addition, GDI oversights the TCIP's operations and controls the implementation of compulsory earthquake insurance system. Domestic insurance companies are responsible for the distribution of the compulsory earthquake insurance policies. Those companies issue TCIP policies as a standalone product which has TCIP logo on it according to the agreement made with TCIP and transfer 100% of the risk to TCIP. As a result, TCIP

does not employ public workers, instead uses domestic insurance companies as selling points which gain commissions based on premiums paid. International reinsurance companies and market are essential to carry out a successful risk transfer process. At that point, the technical assistance of the World Bank to the TCIP in conducting reinsurance relations with the international companies at the setup time is worth mentioning. Moreover, the World Bank stands out as an important organization aiding countries in terms of financial needs. The World Bank primarily uses Emergency Recovery Loans (ERL) to help countries affected by natural disasters. ERLs were created in the late 1960s and were expanded in August 1995 to include also post-conflict reconstruction. Relating 2023 Kahramanmaraş Earthquakes, on February 9th, the World Bank announced a starting aid package of $1.78 billion to assist in efforts of aid and improvement (World Bank, 2023).

When SWOT analysis of Turkish insurance sector is assessed, the compulsory earthquake insurance is positioned having strengths, opportunities and threats (Kamilçelebi, 2011). Firstly, since the compulsory earthquake insurance that is produced under TCIP enables to provide a coverage against a catastrophic event such as an earthquake is considered as a strength of the Turkish insurance system. Secondly, due to the fact that Türkiye is located in a highly active seismic belt, it naturally creates a significant market opportunity for insurance companies relating compulsory earthquake insurance policy (Kamilçelebi, 2011; Kotan, 2020); and also a foreign investment opportunity in case of such a catastrophic crisis. However, even though the compulsory earthquake insurance is compulsory in a way through creating several social blocks, there is a low number of earthquake policy adoption in Türkiye compared to the developed countries that have a well-developed insurance system. One of the main reasons of low earthquake insurance adoption is stated as

inadequate educational programs in schools which cause insufficient level of the awareness of getting an earthquake insurance (Özüdoğru & Çetin, 2017). A survey study which investigates the participants' perception regarding compulsory earthquake insurance supports this reasoning by revealing that only 17.4% of the participants are aware of the specific coverages provided by the earthquake insurance policy in Karabük province in Türkiye (Özel & Öztaş, 2022). To sum, the low earthquake insurance adoption threatens national economic development and wealth protection while also threatening the continuity of tax revenues that contribute to the economic wealth. It is worth mentioning that the study relating to the perception of compulsory earthquake insurance in the examined province reveals that 33.8% of the participants obtained insurance due to necessity, 24.4% did so for reasons out of legal compliance, and the remaining 41.8% were uninsured which highlights the low voluntary insurance adoption and low insurance coverage knowledge in Türkiye (Özel & Öztaş, 2022).

Despite the low probability of an earthquake, its occurrence might significantly impact the financial stability of insurance companies. As an example, the study investigating the aftermath of Loma Prieta earthquake (1989) reveals the unexpected positive impacts of the occurrence on the value of insurance firms (Shelor et al., 1992). The analysis reveals three factors contributing to this outcome: (1) a significant amount of uninsured earthquake loss due to high insurance rates and a lack of awareness about the risk which, in turn, discouraging many properties' owners having coverage; (2) reinsurance which spreads the risk and loss among multiple insurers; and lastly (3) investors' anticipation of a future increase in demand for earthquake insurance which would offset the negative impact of current losses.

Earthquake insurance works as a two sided mechanism which is explained as a function of mitigating individuals' financial cost caused by property damage while enabling insurance companies to effectively handle risks relating earthquake peril by accurately evaluating the risk during the underwriting process which includes benefiting from seismological data, construction knowledge and attendance to market assistance programs, pooling arrangements and transfer of the risk through reinsurance and capital markets (Athavale & Avila, 2011). Moreover, a comprehensive approach to pre-event seismic risk management is proposed which include actions such as implementing seismic provisions in new construction design codes, retrofitting in existing infrastructure, ensuring an effective emergency preparation along with to mitigate financial risk associated with earthquakes in the society (Goda & Hong, 2008).

The evidences regarding the pricing of earthquake insurance to the consumer is contradictory. High premium offerings and deductibles are often considered as reasons of noninsurance such as in the finding of full noninsurance rate in the study of damaged residential mortgage properties in 1971 San Fernando earthquake (Anderson & Weinrobe, 1986). However, it is stated that accurately priced earthquake insurance can be obtained through private market or certain restrictions (Gudmundsen, 1986). On the other hand, Palm (1995) asserts that earthquake insurance is not obligatory and is comparatively costly in California. Thus, it is clearly seen that earthquake pricing findings conflict with each other.

Despite our inability to prevent natural disasters, the financial impact of devastating consequences on homeowners and society can be reduced through the purchase of insurance. However, consumers are generally reluctant to insure themselves against low probability-high loss catastrophic events and frequently

behave in a manner that contradicts the principles of expected utility theory (Hogarth & Kunreuther, 1985; Urbany, Schmit, & Butler, 1989). Individuals' biases and cognitive shortcuts, namely, heuristics, which are often formed by recent experiences and memories play a significant role in affecting the decisions regarding earthquake insurance regardless of the actual risk they face. Hence, it is asserted that the demand for earthquake insurance is not associated with actual geophysical risk of earthquake but rather with perceived risk (Palm, 1995). Later, perceived consequences of the occurrence are added into subsequent finding and the combination of the two is proposed as a factor relating the demand of the earthquake insurance of an individual (Palm, 1999). Some discouraging factors in terms of getting insurance coverage, such as search costs generated in information collection process, ambiguity/uncertainty in premiums, uncertainty in the issue of likelihood of occurrence and magnitude of losses are demonstrated (Kunreuther & Pauly, 2004). Moreover, those discouraging factors are found still effective even if the insurance is offered at attractive prices. In addition, recent events and losses can influence the demand for catastrophe insurance (Browne & Hoyt, 2000). However, as the memory of the hardships and devastation caused by a previous disaster fade in the process of time, individuals become less motivated to be prepared for natural disasters (Brummond, 1994).

Studies about after earthquake period reveal that economic consequences such as financial losses will cause a reduction in the value of assets and personal savings in the condition of the lack of insurance coverage. This, as a result, impacts household lifestyles and consumption behavior patterns in the aftermath of the event (Sawada & Shimizutani, 2008). This impact does not only affect households but also businesses. In fact, businesses face with disruptions and economic losses in the

aftermath along with the direct physical damage (Tierney, 1997). Thus, it is crucial to emphasize the potential broader impact of earthquake losses on businesses.

2.2 Earthquakes in Türkiye & 2023 Kahramanmaraş earthquakes

Three types of faults are identified which can induce an earthquake as normal, thrust (reverse) and strike-slip ("Earthquakes," n.d.). Thrust faults are characterized by a crack in the Earth's crust that causes older rocks being pushed above the younger ones and are found in the east in Türkiye (Tan, Tapırdamaz, & Yörük, 2008). On the other hand, normal fault systems which are characterized by downward movement of hanging wall from the footwall dominate in western region and central Anatolia due to the north-south extensional regime in the Aegean (Tan et al., 2008). Active strike-slip faults which are vertical faults where blocks move horizontally, like the North Anatolian Fault System (NAFS) and the East Anatolian Fault System (EAFS), cause major earthquakes in Türkiye. Additionally, these faults help to move the Anatolian micro-plate westward (Tan et al., 2008).

Türkiye is stated as the 5th country in the list of total fatality amount due to significant seismic activity during twentieth century with 111 fatal earthquakes in 20th century causing 99.391 total fatalities (Gurenko et al., 2006). Similarly, approximately 90.000 people have stated as lost their lives in 76 earthquakes occurred since 1900 in Türkiye which nearly affected 7 million people and caused a heavy loss of nearly 25 billion USD.

For Marmara region, 33 earthquakes which have min 6 and bigger magnitude are stated as occurred between the years of 1509-1999, until the establishment of TCIP while 19 of them belongs to the group sharing min. 6.8 magnitude and higher (Ambraseys & Jackson, 2000).

Türkiye is situated on the boundaries of three tectonic plates: Eurasian, African, and Arabian. This makes it prone to earthquakes as there are active faults like the North Anatolian Fault (NAF), East Anatolian Fault (EAF), and West Anatolian Fault (WAF). In the past four decades, Türkiye has experienced several devastating earthquakes, such as the 1992 Erzincan earthquake, the 1998 Adana-Ceyhan earthquake, and the 1999 Kocaeli earthquake. These earthquakes have resulted in a considerable loss of life and damage to buildings.

On February 6, 2023, a magnitude 7.7 earthquake struck the Kahramanmaraş region in south-eastern Türkiye. Nine hours later, another earthquake with a magnitude of 7.6 occurred. These shallow earthquakes, at a depth of around 10 km, caused severe shaking across a wide area spanning Türkiye and Syria. 2023 Kahramanmaraş Earthquakes occurred along the East Anatolian Fault (EAF) which is located in the eastern Mediterranean that separates the Arabian and Anatolian tectonic plates over a distance of nearly 600 km (McKenzie, 1976). The North Anatolian Fault (NAF) working in conjunction with the EAF enables the Anatolian plate that covers the most of mainland of Türkiye to move westward at a rate of approximately 20 mm per year (Hussain, Kalaycıoğlu, Milliner, & Çakır, 2023). The continuous movement of Anatolian plate to west stems from the collision between the Arabian and Eurasian plates in the eastern Türkiye which consequently creates recurrent earthquakes along the North and East Anatolian Faults to facilitate this long-term movement of Anatolian plate. While the NAF experienced significant earthquakes between 1939 and 1999, the EAF remained relatively silent after a magnitude 6.8 earthquake in Bingöl in 1971. Moreover, the fault segment that subject to the mainshock of Kahramanmaraş Earthquakes (magnitude 7.7) had not been ruptured since 1513 (Duman & Emre, 2013). Thus, it is safe to state that this

fault portion has been accumulating strain due to the plate motion at a rate of approximately 10 mm per year based on the past 5 centuries data, resulting in a storage about 5 meters of potential fault slip. Since the mainshock of Kahramanmaraş earthquakes caused a displacement of 4-6 meters, it is accurate to state that measurements after the earthquakes closely align with the anticipated amount (Hussain et al., 2023). Similarly, the aftershock with a magnitude 7.6 occurred on a separate fault zone on the EAF which encompasses relatively north faults if compared with the mainshock and caused a displacement at the surface as well. The displacement at the Earth's surface caused by both faults reached up to 8 m due to 2023 Kahramanmaraş earthquakes, resulting in the disruption of infrastructure such as buildings, roads and railways (Hussain et al., 2023). In addition, historical structures such as minarets and mosques such as Adıyaman Ulu Mosque were severely damaged by the earthquakes in the earthquake zone (Kocaman, 2023). Nevertheless, the cost of the earthquakes is expected to reach around 70 billion dollars, a significant portion of this cost is covered by the public (Şen, 2023) showing potential economic impact of Kahramanmaraş earthquakes. In addition to material destruction and financial losses, the Kahramanmaraş earthquakes also led to loss of many lives. The casualties have surpassed 44,218 individuals as of February 24, 2023 (“Kahramanmaraş’ta Meydana Gelen Depremler Hk Basın Bülteni-35,” 2023); already making this the deadliest disaster in modern Turkish history, surpassing the 1939 Erzincan earthquake which claimed the lives of nearly 33,000 individuals (Hussain et al., 2023).

2.3 Earthquake insurance policy purchase (demand side)

A wide range of literature is accessible which explores the variables affecting earthquake insurance purchase. To classify, three main factors are studied considered to be decisive in earthquake insurance purchase: risk perception, socio-economic factors and the price of the insurance (premium) (Palm & Hodgson, 1992; Kunreuther, 1978).

The insurance sector might be described as a high-risk and high-uncertainty industry when compared to other sectors. Literature grounds relating hypotheses and empirical studies to behavioral economics principles as against to normative, neo-classical economics to a large extent and reasons this as follows:

Mainstream economic theories such as expected utility theory which mathematically calculates the utility of an action under uncertainty and advises making the decision that has maximum expected utility, does not consider the psychological factors in decision making process. Hence, even though such economic theories make the decision-making process simpler, they ignore the influence of psychology on economic events which needs to be involved into the analysis of human behavior according to the behavioral economics.

Behavioral economics argue that individuals exhibit certain behavioral biases that prevent them from being rational as opposed to neoclassical economics which assumes agents, firms and households as rational actors. In other words, people do not always act in a rational way. Mullainathan and Thaler (2000) have identified three main categories that explain deviations in rational human behavior: bounded rationality, bounded willpower and bounded self-interest. Bounded rationality implies individuals' limited capabilities to process all necessary information for making rational decisions (Simon, 1957). Bounded willpower implies that

individuals may struggle with controlling their actions such as not saving enough, acting impulsively, delaying tasks, and more (Shogren & Taylor, 2008). In addition, bounded self-interest reflects that people not only look out for their own interests, but also care about the well-being of others (Bergstrom, 1989). Adam Smith also highlights this contradictory nature in human behavior by explaining that individuals can also act selflessly (Smith, 1998). Moreover, it has been demonstrated that policies ignoring the irrationality of and inconsistent choices made by individuals can lead to inefficient outcomes (Shogren & Taylor, 2008). In other words, behavioral economics theory attributes the lower number of disaster insurance policy production to behavioral biases and deviations within this context (Şimşek & Karaca, 2022). Thus, in the light of the foundations of behavioral economics, individuals might need to be supported by some psychological "impulses" in order to be leaded to more rational choices (Şimşek & Karaca, 2022).

Risk perception is one of the main topics that is investigated under behavioral economics principles. The researches relating the link between risk perception and the willingness to purchase a natural hazard insurance is mostly rooted to the Prospect Theory (PT) which was proposed by Kahneman and Tversky (1979) as a theory of behavioral economics. The theory was initially proposed as an alternative for the known rational and mathematical Expected Utility Theory (Wang & Hazen, 2016). As a general understanding, the theory explains how people make decisions in uncertain situations and highlights behaviors that contradict with the expected utility theory (Starmer, 2000). According to this theory, individuals place different values on gains and losses. An important finding of PT is that losses can have a significant impact on how people perceive emotionally and feel about events, causing them to avoid from potential losses. Moreover, this aversion to risk can lead to an inaccurate

perception of events with low probabilities. In particular, individuals might overestimate and give too much weight to the impacts of rare events (Schmidt & Zank, 2008). However, this result does not seem to apply for rare events with low probabilities due to the fact that people may completely ignore these low probabilities when the probabilities of rare events decrease to a certain extent (Kahneman & Tversky, 1979). The experimental analysis of consumer behavior towards insurance purchase reveals the influence of prospect theory, particularly for explaining low earthquake insurance demand. In addition, it is suggested the lack of interest towards adopting an earthquake insurance may stem from people's difficulty in remembering past disasters which leads ignorance of future risks (Papon, 2008).

Another motivation for property owners to take precautions and purchase insurance in order to mitigate natural hazards is their previous experiences (Kunreuther 1978; Laska, 1986). The main reason is, individuals who have previously experienced hazardous occurrences possess a higher level of understanding and awareness regarding them (Kates, 1971). One can refer to past experiences when anticipating familiar and repetitive behaviors (Macey & Brown, 1983). Additionally, the link between attitudes, self-protective behaviors and risk reducing practices with experiences (Weinstein, 1989) might be explained from the aspects of (1) impact of personal experiences in shaping individuals' future victimization through direct involvement of memory in making of judgments regarding probabilities (Kahneman & Tversky, 1979); (2) evaluation and gaining insights about the extent of damage and current availability of the mediating measures; (3) experience enhances the solidity of information. In other words, information becomes more reliable with experience (Nisbett & Ross, 1980); (4) experience diminishes the ambiguity regarding the occurrence (Fazio & Zanna,

1978); (5) experiences are means that show people that they are not impervious to harm or failure in life (Janoff-Bulman, 1985). Hence, past experience is asserted as a significant and indirect factor affecting insurance adoption through increasing or decreasing the perception and awareness mechanism to the risk. An additional insight concerning the relation between purchasing a hazard insurance and experience of hazardous situation, is highlighted by the perspective of another finding of the Prospect Theory (PT) which is called reference point. Reference point, which is also defined as adaptation level, is described as the status quo, neutral point or one's current assets (Kahneman & Tversky, 1979). People' responses to a stimulus may differ due the interpretation of the relation of stimuli with reference points that directly impact preferences. Thus, a shift in reference point also leads to a change in the ranking of preferences for potential outcomes. In other words, potential outcomes are shaped or measured based on a reference point. At that point, reference point may play a crucial rule when it comes to hazard insurance purchase (Yang et al., 2020) due to the fact that the shift in the reference point of individuals may lead them to perceive insurance as a gain after the hazard while it is mostly regarded as a loss in non-hazardous scenarios. Thus, the hazard experience is claimed to positively impact the willingness to purchase hazard insurance (Yang et al., 2020). Even though, this relation seems logical under PT, the findings revealed the opposite and this finding is associated with the malfunctioning in hazard insurance system such as undeveloped insurance products or services that prevent people to treat insurance a gain even after experiencing a hazard (Yang et al., 2020).

Sjöberg (1994) identifies "risk perception" as involving two independent components, namely, probability of an event to occur and consequences of that event; and asserts consequences of the event as a component is more important to the

other and the main driving parameter that affects the demand for mitigating measures such as attitude to home insurance and buying decisions eventually. On the contrary, Palm (1999) argues that the combination of those two perceived factors empirically affect the purchase of earthquake insurance, only one does not accurately explain the relation with earthquake insurance adoption. Later, possibility of an event to occur and worry are regarded as determinants of risk perception; and risk perception is asserted as a significant factor that is positively related with willingness to purchase earthquake insurance (Xu et al., 2018). The significant and positive relation between risk perception and willingness to purchase earthquake insurance is also supported by a study researching parameters that impact willingness to purchase earthquake insurance rural China (Tian & Yao, 2015). The impact of the factors of ambiguity tolerance (AT) and message source on risk perception and consequently on earthquake insurance purchase is researched as well. People with high AT are stated to perceive more risk and more inclined to buy earthquake insurance when the message is transmitted through publicity (news media) in comparison of WOM (peers) while people with low AT have almost same risk perception levels and intention to purchase an earthquake insurance regardless of the message source (Zhu, Xie, & Xie, 2012). Furthermore, government propagandas regarding earthquake prevention is found to be raising the likelihood of people buying earthquake insurance policies (Tian & Yao, 2015). Consequently, risk perception is agreed to represent personal understanding and estimation of natural hazard occurrence and not solely dependent to the scientific facts and calculations with regard to potential hazard (Kunreuther, 1978). More recently, according to Barnett and Breakwell (2001), engaging in risk prevention is more likely among individuals who have experienced disasters more frequently, faced greater final losses, and perceived a

higher degree of loss. However, Tian and Yao (2015) empirically found that there is no significant correlation between frequency of disaster experience and willingness to purchase earthquake insurance but one positive and significant relationship exists between experience of earthquake evacuation and willingness to be insured.

Montz (1982) who studies the effect of location on adoption of hazard mitigation measures reveals that vulnerability to the hazard in comparison of location is the most prominent and statistically correlated factor that motivate people to take protective measures. In this context, distance is stated as an important element that is not directly influencing the adoption of mitigation measures but may be related according to the closeness to the natural occurance (e.g, stream). Similarly, location is counted as an indirect factor that raises the awareness of the threat and the impact of distance on awareness of geophysical risk is also revealed in the case of volcanoes (Greene, Perry, & Lindell, 1981) and landslides (Geipel, 1982). Palm and Hodgson (1992) who empirically investigate the factors affecting homeowners' earthquake insurance adoption in four different cities of the U.S.A reveal that earthquake insurance purchase is not correlated with geophysical risk. Thus, simply informing individuals about the risk such as news to motivate residents to take proactive measures like acquiring earthquake insurance for self-protection is insufficient to motivate them to take preventive actions. Information provision only becomes influential in this empirical equation if it leads to a change in attitude and eventually to perception of the risk (Palm & Hodgson, 1992). The perception of the risk is associated with insurance purchase within this context.

Furthermore, the finding that insurance purchase is empirically specified as being independent of socioeconomic factors (Palm & Hodgson, 1992) as well. In that sense, the theoretical relation of elderly being more risk averse (Schiff, 1977) due to

their accumulated knowledge regarding mitigating regards, leading this aged group to have a higher level of tendency to insurance adoption is found unrelated (Palm & Hodgson, 1992). In addition, based on an empirical finding of people who possess relatively high home equity and are more expected to protect their financial equity (Anderson & Weinrobe, 1981); and eventually might be more inclined to purchase insurance is found insignificant (Palm & Hodgson, 1992). Empirical findings of Palm and Hodgson (1992) also aligns with many previous studies on how people respond to natural disasters (Drabek, 1986). Earlier literature widely asserts that purchase of earthquake cover is not related with income level (Kunreuther, 1978) nor socioeconomic characteristics and age as well (Palm & Hodgson, 1992). Instead, perceived risk is found to be the most prominent factor to influence earthquake insurance purchase (Palm & Hodgson, 1992).

More recent literature presents inconsistent findings with respect to previous studies about the relation between income and insurance adoption. In terms of catastrophe insurance, Browne and Hoyt (2000) examines flood insurance buying decisions through financial data of purchases collected from the United States' National Flood Insurance Program (NFIP) between the years of 1983-1993; and confirms that income and price significantly impact an individual's buying decision of flood insurance empirically. More specifically, the study reveals a positive correlation between income and demand for the flood insurance purchase. In addition, the study demonstrates a high correlation between the number of flood insurance purchases at the state and the extent of flood losses experienced in the state during the previous year which is consistent with the awareness and insurance purchase relation mentioned earlier. Grace, Klein and Kleindorfer (2004) adds to the literature by supporting this positive relationship through their empirical findings

about the positive but relatively inelastic relation of income and demand for catastrophe coverage for flood insurance in New York (0.25) and Florida (0.32). Athavale and Avila (2011) propose that there is a positive and significant relationship between demand for earthquake insurance purchase and income statistically but it is also relatively inelastic (0.77) compared to findings of Browne and Hoyt (2000) (1.400 to 1.506 range). Similarly, if the relation is assessed from the households' livelihood capital perspective which was framed by Department for International Development (DFID) under five types, namely, human capital, natural capital, financial capital, physical capital and social capital; natural and physical capital are found to be positively related with the willingness to purchase earthquake insurance (Xu et al., 2018).

Premium amount or cost of the insurance purchase is asserted as negatively related with insurance adoption in most of the academic studies (Meltsner, 1978; Buffinton, 1961). Above all, premium is asserted as the main determinant of earthquake insurance purchase when compared with risk perception (Pothon, Gueguen, Buisine, & Bard, 2019). Underlying reason of one can be fully aware of the earthquake risk but cannot afford the premium of earthquake insurance (Kovacevic & Pflug, 2011); is then supported with the Pothon et al.'s study (2019) which claims no one would prefer to stay uninsured in the condition of a certain lower earthquake insurance price (USD 160 or lower for California). On the other hand, risk perception is asserted to lead that kind of an 100% earthquake adoption level at the current premium/ price only when people are believed that a destructive earthquake can occur at any time, in other words, it is imminent (Pothon et al., 2019). Similar to mentioned studies relating price and earthquake insurance purchase, the reason of Japanese people not purchasing an earthquake insurance is concluded as

being too expensive and only through replacing current community rating with a fair premium, the earthquake insurance adoption rate is asserted to increase by about 3.7 % and mostly in less risky areas (Naoi, Seko, & Sumita, 2009). To be more precise about the price effect, high deductibles and underestimation of total reconstruction cost have been stated as main responsible elements for this disreputation of price & earthquake purchase relationship (Pothon et al., 2019). Since policy holders receive lower compensation due to predetermined deductibles which are calculated based on total reconstruction cost stated by policy holder, and those declared costs are also found to have a potency to be inadequate to compensate actual repair costs (Marquis, Kim, Elwood, & Chang, 2015); people feel reluctant but more importantly unsecured for purchasing an earthquake insurance.

Besides that, Grace et al. (2004) empirically reveal that catastrophe insurance demand is more price elastic compared to noncatastrophe insurance demand for New York and Florida. This finding is also supported with the finding that homeowners purchase more catastrophe insurance when it is subsidized through regulatory implications such as price constraints (Grace et al., 2004).

In addition, the relationship between personal characteristics and household characteristics with willingness to purchase earthquake insurance is asserted to be insignificant (Xu et al., 2018). On the other hand, according to Tian and Yao (2015), homeowners who do not have reinforced buildings, have low earthquake resistant houses, and own multiple properties were more likely to buy earthquake insurance.

2.4 Earthquake insurance policy sales (supply side)

The firms also face with a decision of natural hazard policy writing / sale as well as people who face with a purchase decision. Insurers are also concerned with

ambiguity and uncertainty relating natural hazards which impact two main points: 1) whether they are intended to offer coverage and sell insurance policy and 2) what premiums to charge against specific risks (Kleindorfer & Kunreuther, 1999).

In the case of earthquakes, insurers often have a portfolio of policies focused on a specific region. This means that the insurer will either experience a period of feast (when no hurricanes occur) or famine (when a hurricane strikes the area where numerous policies have been sold). Thus, the insurer's primary concern lies not only in the uncertainty surrounding the probability of loss, but also in the potential magnitude of claims in the event of a single disaster (Kleindorfer & Kunreuther, 1999). In that manner, probable-maximum-loss (PML) is identified as a having a significant role in determining the number of policies to write and sell as a protection mechanism against potential catastrophic events. Also, it should be mentioned that insurers, especially in hazard-prone areas are inclined to lower their PMLs because it has a direct influence on evaluating an insurer's policy writing capacity ("Catastrophes," 1996).

As a response to the questions of insurability of earthquake risks by firms, Stone (1973) highlighted the two main constraints that firms face in maximizing their expected profits: ensuring the survival and stability of their operations. Hence, the firm is intended to insure an earthquake risk if probability of insolvency and probability of exceeding predetermined maximum LR (loss and expense ratio) is less than a certain level. In addition, those probability functions also depend on premium (only one price exists if structures are assumed the same) and number of the maximum policies to be written. More specifically, company's current surplus in dollars or current currency is also a parameter of survival constraint while total expenses beside total losses appear as a parameter of stability constraint.

Another important aspect relating insurer's willingness and decision to insure and sell earthquake insurance policy is that assessing the issue from the profitability perspective. In the conditions of fixed costs associated with product development are low enough to ensure a positive expected profit, the firm consider insurability. At that point, the relations of premium with maximum number of policies to be written plays a significant role. More specifically, an increase in premium increases the maximum number of policies that can be written but decreases the demand for coverage (Kleindorfer & Kunreuther, 1999). As a result, the firm chooses not to offer earthquake insurance policy it finds that it cannot attract enough interest at different price levels to guarantee profitability, considering the limitations imposed by survival and stability constraints on the number of policies it can offer.

According to a study which examines impact of catastrophes on the homeowners' insurance coverage written in the U.S on firm-basis between the years of 1984-2004 reveal that catastrophes hit the insurance firms hard as it does to individuals (Born & Viscusi, 2006). It appears as an unanticipated fixed costs to firms. Actually, the uncertainty and ambiguity surrounding an earthquake, hence its nature, creates the problem for insurance firms. It is because if the risks would be fully anticipated, then the firms would adjust the premiums previously (before it appears as a sudden huge fixed cost), and firms will continue to operate in a profitable way as before. Thus, after being hit by a catastrophe and faced with a devastating loss, firms either opt to raise insurance rates or to exit the state as another option (Born & Viscusi, 2006). In the first option, firms raise their insurance rates to increase premiums in an aim to cover up their loss incurred as result of the catastrophe. That's why the loss rates (loss ratio is described as loss/premiums earned) are observed as showing an increasing pattern as a response to the

catastrophe and decreasing pattern after following non-catastrophe years. Actually, this process is the result of a readjustment of risk assessment and insurance rates done by insurance firms. In addition, Born and Viscusi (2006) conclude that catastrophic risks lead to a reduction in the overall premiums earned in the state due to a decrease in the amount of insurance policy purchased by the individuals. Two main causes are presented in this study as sources of impact: (1) the increase in the price of insurance (premiums), (2) reduction in the number of firms writing the insurance policy, meaning that especially small firms that are reluctant to withstand against such a huge financial shock, exit the state as a result.

On the other hand, an academic study which investigates Japanese insurers and compare the Japanese insurance firms' stock prices before and after 1995 Hanshin-Awaji earthquake with the U.S based academic studies, finds interesting results (Yamori & Kobayashi, 2002). The U.S based insurance firms seem to "gain from loss" hypothesis which reveals the increase in the U.S market valuation, more specifically stock prices, after natural disasters (Shelor et al., 1992). This is due to the belief among investors that the expected surge in demand for insurance coverage overweighs the negative impact of capital outflow resulting from claims payments made by insurance companies (Yamori & Kobayashi 2002). However, in contrary to the case in the U.S, Japanese insurance firms experience negative stock price reactions after the 1995 Hanshin-Awaji earthquake even though prevalence ratio (the number of earthquake insurance policy/total number of households) increases after the earthquake. That contraposition is stated as a further research needed topic in the study. However, the most remarkable difference of the Japanese insurance system that differs itself from the U.S market stands out as Japanese government's attitude

towards setting price of earthquake insurance at the no loss and no profit level and its strictly regulation of price.

Due to the fact that the actual insurance policy production for earthquake insurance was decreased after the natural hazards in the U.S because of an increase in premium (Born & Viscusi, 2006), the possibility of the U.S firms to generate an increase in the insurance rates and the beliefs towards the increase in demand might contribute handling the claims payments and empower positive market valuations. At that point, the importance of the regulation of pricing systems and role of governments stand out in insurance markets.

Relating to the impact of an earthquake on sales of earthquake insurance, California Earthquake Authority (CEA) shared a report declaring the increase in the sales of earthquake insurance policies after the La Habra earthquake that occurred in Southern California in March 29, 2014 with magnitude 5.1 (Ousley, 2014). CEA is established by California Legislature as a non-profit, publicly managed and privately funded organization in order to provide residential earthquake insurance to the homeowners. In that manner, organization of CEA resembles TCIP in Türkiye. According to that report published by the CEA on May 30, 2014, sales of CEA earthquake insurance policies increased by almost the same magnitude following the March 29, 2014, the 5.1 magnitude La Habra earthquake as was observed following the 9.0 magnitude Tohoku earthquake in Japan on March 11, 2011 (Ousley, 2014). In the report, it is also stated that La Habra earthquake only caused minor economic damage and loss but not loss of life. Moreover, earthquakes are identified as "reminders" for residential earthquake damage risk by CEA and related with increase in earthquake insurance policy in that manner. With respect to the long-term effect of an earthquake, the report states that after the Northridge earthquake of 1994, with a

magnitude of 6.7 which was the most recent seismic event that resulted in substantial residential destruction in California until La Habra earthquake, there has been a significant decline in the number of residents who possess earthquake insurance since then.

An empirical study which investigates the impact of earthquakes through online data searches and also compares the sales of residential earthquake insurance in the U.S.A between the years of 2002-2020 reveals that the highest annual increase of earthquake insurance sales (approximately 270,000 both for CEA and non-CEA insurance) among these years occurred in 2018 in the aftermath of the two strong Mexican origin earthquakes (Mexican Earthquakes) occurred with magnitude 8.2 on 8 September 2017 and 7.1 on 19 September 2017 (Gizzi & Potenza, 2022). In fact, the increase in earthquake insurance sales in 2017 which surpasses the previous year by over 100,000 policies has been the largest annual increase between 2002 and 2017 for both CEA and non-CEA earthquake insurance contracts. Subsequently, in 2018, there was a significant increase of approximately 270,000 policies compared to 2017, representing the highest yearly increase of sales in the observed time period in the research, from 2002 to 2020. For the period between the years of 2002-2016, sales of total (CEA+non CEA) earthquake insurance reaches highest value in 2011 when 9.0 magnitude Tohoku earthquake occured in Japan on March 11, 2011 and followed by the 5.1 magnitude La Habra earthquake occurred in March 29, 2014 which is in accordance with the CEA report published by Ousley (2014). Thus, there is an apparent pattern relating earthquakes and sales of earthquake insurance and impact of earthquake on sales of earthquake insurance.

Similarly, the mentioned “reminder” effect has been declared by sales director of a known Istanbul-based insurance company, namely Quick, for the

following 5.8 magnitude Istanbul earthquake in Türkiye on 26 September 2019 (Yesilyurt, 2019). It has been stated that compulsory earthquake insurance sales increased 100% on daily basis based on the 2 days data after the earthquake for Quick insurance company. Moreover, it is stated in the declaration that this situation is prevalent in the whole country as well. According to the declaration, earthquakes are stated to cause periodic and short term increases in earthquake insurance policy demand. Similarly, a news report that is prepared based on TCIP data stated that 5.8 magnitude Istanbul earthquake scared homeowners and 15,708 houses were insured in Istanbul against earthquake while this number reaches 16,386 nationwide in 2 days after the earthquake (Öztürk, 2019).

CHAPTER 3

HYPOTHESES AND METHODOLOGY

3.1 Hypotheses

3.1.1 Impact of Kahramanmaraş Earthquakes on the earthquake insurance policy sales to homeowners

We base our hypotheses regarding earthquake insurance policy sales mostly on behavioral economics principles when we evaluate the impact of the earthquakes on demand side. Behavioral economics simply assumes that people consider and are influenced from psychological factors in their economic decision-making processes. Since normative and neo-classical economics principles fall short of explaining actual economic decisions made (Shogren & Taylor, 2008) and more specifically, since reluctance of people and their buying behavior to acquire an earthquake insurance policy which provides a protection against a low probability-high loss event contradicts with Expected Utility theory within the earthquake insurance context (Hogarth & Kunreuther, 1985) and people purchase lower amount of earthquake insurance policy that was predicted in EU theory which demonstrates misleading results (Şimşek & Karaca, 2022), we proceed with conducting our hypotheses based on behavioral economics principles and models.

In accordance with behavioral economics, we base our hypotheses relating risk perception notion to Prospect Theory (PT). Due to the fact that “loss” has a significant impact on how people perceive probabilities, especially cause inaccurate perception for low-probability events and lead people to demonstrate risk averse behaviors (Kahneman & Tversky, 1979); we expect that Kahramanmaraş earthquakes will have a significant and positive impact on the demand of earthquake insurance

right after the occurrence. This impact is also supported from the reference point perspective under PT which explains the change in risk perception going from loss to gain towards earthquake insurance after an earthquake (Yang et al., 2020). In that manner, Kahramanmaraş earthquakes might be considered as mediums which cause shifts and change in people' risk perception towards issue that leads increase in earthquake insurance demand as a risk aversion mechanism.

Moreover, when the definitions and mechanisms of risk perception are assessed, we encounter with the notions of consequences of the event, probability of the event to occur (Sjöberg, 1994; Palm, 1999) and worry as well (Xu et al., 2018). Since Kahramanmaraş earthquakes have devastating consequences, we expect this event to lead an increase in risk perception and eventually in earthquake insurance demand and purchase.

However, according to PT, even though people have a tendency to overestimate the impacts of a rare event at first (Schmidt & Zank, 2008), they will categorize such devastating earthquakes as rare events with low probabilities in the long term and will tend to ignore those events (Kahneman & Tversky, 1979). In addition, ignorance to purchase an earthquake insurance is associated with remembering condition of the event (Papon, 2008). Thus, mentioned positive impact is expected to decrease in the long term.

Since we analyze the number of policies written by firms, thereby the earthquake insurance policy sales data, we also considered the factors impacting the supply side beside demand side. Thus, the firm point of view is also involved in the analysis in order to present a comprehensive analysis.

Two main parameters which are insurance rates which directly affects the profitability of the insurance firms and deductible rates which indirectly affects the

profitability of the firms through its inverse relationship between insurance rates; are checked after the Kahramanmaraş earthquakes in Türkiye from the reports that is published by Insurance and Private Pension Regulation and Supervision Authority (IPRSA) periodically. IPRSA which has administrative and financial autonomy, reports to the Ministry of Treasury and Finance. Insurance rates are predetermined by IPRSA according to riskiness of the earthquake region of the dwelling and deductibles usually stay constant at 20% level for businesses and %2 for homeowners, meaning that insurance firms are not responsible from the 20% of the costs occurred for business and %2 for homeowners. For the period we observed for this analysis, neither of these two values experienced a change. The most current change in interest rates entered into force in January 2024. In fact, the stability of insurance rates threatens the profitability of the insurance firms which might create a reluctancy to offer earthquake insurance policy. However, insurance firms do not have a choice whether to offer a compulsory earthquake insurance policy which is controlled by TCIP through a public-private partnership. Thus, we conclude that the increased demand to purchase an earthquake insurance policy will be met with sales as in the case in Japan (Yamori & Kobayashi, 2002) because there is no change in price and insurance firms are obliged to offer and sell earthquake insurance policy when there is a demand.

In this paper, we aim to analyze the short-term impacts of Kahramanmaraş earthquakes on earthquake insurance policy sales. The data is analyzed according to certain periods based on quarters in order to understand the significant impact and size of the Kahramanmaraş earthquakes.

Since we deal with short term data for this paper, we expect a significant and positive impact of the earthquakes on earthquake insurance policy sales (compulsory

earthquake insurance) for homeowners for all time intervals but with a decreasing effect according to the mentioned theoretical and empirical studies mentioned. Thus, our hypotheses for earthquake insurance policy sales to homeowners are:

H1a) Kahramanmaraş Earthquakes have a positive impact on the earthquake insurance policy sales to homeowners for the first quarter.

H1b) Kahramanmaraş Earthquakes have a positive impact on the earthquake insurance policy sales to homeowners for the half term.

H1c) Kahramanmaraş Earthquakes have a positive impact on the earthquake insurance policy sales to homeowners for the calendar year.

H1d) The positive impact is highest for the first quarter.

3.1.2 Impact of Kahramanmaraş Earthquakes on the earthquake insurance policy sales to businesses

Since businesses face with business interruptions (BI) and large-scale problems related with external resources such as utility and transportation problems due to earthquakes (Tierney, 1997); we also aimed to analyze earthquake insurance policy sales for businesses beside homeowners in order to include commercial concerns relating the earthquakes that might affect earthquake insurance policy sales. Again, we expect the same significant and positive impact of Kahramanmaraş Earthquakes on earthquake insurance demand for businesses for the same time intervals as described above for homeowners.

However, when the supply side is evaluated from the firm point of view, we propose different hypotheses for earthquake insurance policy sales for businesses than homeowners.

In the aftermath of the Kahramanmaraş Earthquakes, insurance firms face with an unanticipated and huge loss which appear as sudden fixed cost (Born & Viscusi, 2006). This fixed cost that stem from the earthquakes threatens the profitability of the firms through adding extra costs to survival and stability constraints which directly influence the number of the earthquake insurance policy that can be offered (Kleindorfer & Kunreuther, 1999).

Since there is no change in insurance rates (price) and deductible rate, there will be an increased demand towards earthquake insurance policy with an increased risk perception as mentioned in homeowner's section. However, for businesses, we anticipate that the increased demand will not be met with increased supply, thereby with the increase in earthquake insurance policy sales. The main underlying reason is that insurance firms are not obliged to offer an earthquake insurance policy this time. Since their profitability is threatened by a sudden and huge fixed cost caused by the Kahramanmaraş Earthquakes, it is highly probable that positive expected profit will not be ensured which cause insurance firms to be reluctant to offer insurance policy to customers (Kleindorfer & Kunreuther, 1999).

Another reason grounding this anticipation is that the insurance firms might wait to offer earthquake insurance policy until the insurance rates are changed by the government through IPRSA announcements. Since the announcements made by IPRSA relating insurance rates and deductible rates are published frequently (approximately once in 4 months), it is highly probable that this will create an expectation and the insurance firms would expect an increase in insurance rates and be reluctant to write earthquake insurance policy until the insurance rates are changed and the premiums and revenues become profitable in a way that overweighs the claims payments caused by Kahramanmaraş Earthquakes.

In addition, since no change has been made in insurance rate and deductibles by government in the observed period, we conclude that insurance firms will pursue their reluctant manner in earthquake insurance sales and will not be inclined to sell insurance policy.

Due to the fact that, the insurance firms have a choice of not to offer an earthquake insurance policy this time, we conclude that the increased demand towards earthquake insurance policy purchase will not be met by increased sales by firms until the (insurance rates) price and deductible change have been made. Thus, we conclude that Kahramanmaraş Earthquakes will have a negative impact on the earthquake insurance sales for all observed periods in the analysis which experience no change in price and deductible.

Thus, our hypotheses for earthquake insurance policy sales to businesses are shaped as:

H2a) Kahramanmaraş Earthquakes have a negative impact on the earthquake insurance policy sales to businesses for the first quarter.

H2b) Kahramanmaraş Earthquakes have a negative impact on the earthquake insurance policy sales to businesses for the half term.

H2c) Kahramanmaraş Earthquakes have a negative impact on the earthquake insurance policy sales to businesses for the calendar year.

3.2 Research methodology

Based on the theoretical and empirical studies from the literature, this paper attempts to: (1) assess the impact of Kahramanmaraş Earthquakes on earthquake insurance policy sales to homeowners and (2) assess the impact of Kahramanmaraş Earthquakes on earthquake insurance policy sales to businesses.

To test our hypotheses, we have used secondary data from Insurance Association of Türkiye and analyzed the sales of earthquake insurance by insurance firms to homeowners and businesses for different time intervals, namely, 3 months-6months-12 months before and after the Kahramanmaraş Earthquakes. The statistical tables provided by Insurance Association of Türkiye shows the breakdown of total insurance sales data on insurance firm basis. In addition, the statistical tables are provided cumulative basis and quarterly by Insurance Association of Türkiye. Thus, we have 4 different earthquake insurance sales table for an academic (X) year on insurance firm basis: March X, June X, September X and December X. In order to obtain 3-month total sales of earthquake insurance for homeowners before the Kahramanmaraş earthquakes, as an example, we subtracted the total sales that is declared in September 2022 from December 2022. These tables do not contain missing values but missing values occur when insurance firms are aimed to be analyzed for all specified time periods. In other words, an insurance firm may not exist in all time intervals that are examined. In order to eliminate the increasing effect due to sample size, we kept the insurance firms that exist in all before and after periods of Kahramanmaraş Earthquakes for the specific category (homeowners and businesses).

In order to test our hypotheses relating impacts of Kahramanmaraş Earthquakes earthquake insurance policy sales to homeowners, we analyzed compulsory earthquake insurance category in the table provided by Insurance Association of Türkiye, which is also known as TCIP (Turkish Catastrophe Insurance Pool) insurance and DASK insurance in Turkish, on insurance firm basis. This type of insurance is stated as “compulsory”. However, it is actually compulsory for certain circumstances. More specifically, it is needed in order to benefit from a government

home loan or provide utility services (electricity, water and gas) for a new house. Other than specific circumstances, TCIP insurance is not compulsory for homeowners. At that point, it is worth mentioning that the ones who don't own a compulsory earthquake insurance, cannot benefit from the economic loss coverage provided by government in the aftermath of an earthquake. After filtering our data and removing missing values, we have identified 30 insurance companies that are common in all time intervals under research (see Appendix A, Table 15). In order to demonstrate the scope of our analysis, we've also made a comparison of our 3-month total compulsory earthquake insurance sales data before Kahramanmaraş Earthquakes with TCIP data which corresponds to all compulsory earthquake insurance sales data nationwide. In that manner, it is appropriate to state that our data (2,647,973) covers and represents approximately 86.85% of the total compulsory earthquake insurance sales (3,048,842) in Türkiye for the last quarter of 2022.

In order to test our hypotheses relating impact of Kahramanmaraş Earthquakes earthquake insurance policy sales to businesses, we analyzed fire and natural disaster insurance category that exists in statistical table provided by Insurance Association of Türkiye. The main reason is that compulsory earthquake insurance is only issued for residences. Moreover, the only way to insure a business against earthquake is to purchase a fire and natural disaster policy. Thus, it is safe to state that fire and natural disaster insurance is the appropriate category to analyze the impacts of Kahramanmaraş Earthquakes on earthquake insurance policy sales to businesses. After filtering our data and removing missing values, we have identified 27 insurance company that are common in all time intervals under research for hypotheses for businesses (see Appendix A, Table 16).

Throughout the analysis, we specified the period that includes Kahramanmaraş Earthquakes as post-earthquake period as situated in academic studies that investigate pre-post effect of an impactful occurrence (Alsamhi et al., 2022). Wilcoxon Signed Ranks Test is used to analyze the non-normal distribution data and hypotheses.

CHAPTER 4

ANALYSIS AND RESULTS

4.1 Preliminary analysis

4.1.1 Impact of 2023 Kahramanmaraş earthquakes on the earthquake insurance policy sales to homeowners

In this study, we have collected total earthquake insurance sales of 30 insurance companies (N=30) in Türkiye before and after the Kahramanmaraş earthquakes at different time intervals (3 months, 6 months, 12 months) for the hypothesis relating homeowners.

First of all, we want to emphasize that sample size is equal to 30 in all observed periods, meaning that selected insurance companies are common in all time periods chosen (see Appendix A, Table 17). Thus, there is no missing values in our sample.

For the mean comparison of the 3-month time period before (88.265,75) and after (95.463,13) the Kahramanmaraş earthquakes, an increase in mean values is detected (see Appendix A, Table 17). The sum of total sales of 3 months (2.647.973) before the earthquake is also increased after (2.863.894) the occurrence period. For 3-month period, standard deviation is calculated as 150.139,52 for pre-earthquake period and 162.171,83 for the post-earthquake period.

Relating with 6-month time period, the mean of total sales is calculated as 171.596,80 (approximately 171.597 in terms of insurance policy number) with a S.D 300.428,95 for the pre-earthquake period and 168.400,59 (approximately 168.401 in terms of insurance policy number) with a S.D 298.092,64 for the post-earthquake period chosen (see Appendix A, Table 17). The sum of total sales is calculated as

5.147.904 for before and 5.052.018 for after the earthquakes. In that period, sum, mean and std. deviation values are all observed to be decreased after the Kahramanmaraş earthquakes.

For the 12-month time period before and after the Kahramanmaraş earthquakes, mean values are increased from 318.815,51 (approximately 318.816 earthquake insurance) with a S.D of 563.463,25 to 333.778,82 (app. 333.779 earthquake insurance sold) with a S.D of 580.449,29 after the earthquake chosen (see Appendix A, Table 17). The sum of the total earthquake insurance policies sold are also increased from 9.564.465 to 10.013.365 after the earthquake period.

Thus, according to the descriptives table, a similar pattern is seen in 3-month and 12-month periods whereas 6-month periods demonstrate a different trend.

4.1.2 Impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales to businesses

In this study, we have collected total earthquake insurance sales of 27 insurance companies (N=27) in Türkiye before and after the Kahramanmaraş earthquakes at different time intervals (3-months, 6-months, 12-months) for the hypothesis relating businesses (see Appendix A, Table 18).

It is worth mentioning that our sample size is equal to 27 in all observed periods, meaning that selected insurance companies are common in all observed periods. Hence, there are no missing values in our sample.

When descriptive statistics are examined (see Appendix A, Table 18), an increase in the mean values of total sales of 3-month periods is identified which is stated as 57.099,89 (approximately 57.100 earthquake insurance sales in terms of number) with a S.D of 103.596,272 for pre-earthquake period and 62.799,48

(approximately 62.799 earthquake insurance sales in terms of policy number) with a S.D of 122.625,037 for the post-earthquake period. In addition, the sum of the earthquake insurance sales is increased after the earthquake when the 3-months are compared before and after (an increase from 1.541.697 to 1.695.586).

Relating with 6-month periods before and after the Kahramanmaraş earthquakes, the mean of total sales is decreased from 118.499,96 (approximately 118.500 earthquake insurance) with a S.D of 241.929,606 (pre-earthquake period) to 111.667,80 (approximately 111.668 earthquake insurance sales in policy numbers) with a S.D of 230.997,960 (post-earthquake period). In addition, the sum of total sales experiences a decrease when 6 months before (3.199.499) and after (3.015.031) the Kahramanmaraş earthquakes are compared (see Appendix A, Table 18).

When descriptive statistics are compared for 12-month before and after the Kahramanmaraş earthquakes, the mean values are calculated as decreasing from 223.993,61 (approximately 223.994 for pre-earthquake period) with a S.D of 475.761,738 to 206.699,03 (approximately 206.699 total sales for post-earthquake period) with a S.D of 384.152,737. Moreover, the sum of total earthquake insurance sales is decreased from 6.047.828 (pre-earthquake period) to 5.580.874 (post-earthquake period) (see Appendix A, Table 18).

Thus, descriptive statistics values are increased for the 3-month period after the Kahramanmaraş earthquakes while decreased for 6-month and 12-month period when before and after total earthquake insurance sales are compared.

In order to provide information about the distribution of the data, skewness and kurtosis values of descriptives relating homeowners (see Appendix A, Table 19) and businesses are checked (see Appendix A, Table 20). Since the Skewness values are greater than 0 for all time intervals, we conclude that total sales values are

clustered to the left at the low values. In addition, positive Kurtosis values demonstrate that the distribution is rather peaked. As a result, since the skewness and kurtosis values are different than 0, we conclude that the distribution is not perfectly normal for all time periods observed.

In order to gain more insight about the distribution of our data and decide on the appropriate statistical test for hypothesis testing, tests of normality are conducted.

4.2 Assessing normality of data

4.2.1 Impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales to homeowners

In order to identify the appropriate test to be used for the hypotheses, normality tests have conducted which actually supports the Skewness and Kurtosis interpretations that are found.

Since, Kolmogorov-Smirnov significance values are all calculated as .000 which are less than .05, we conclude that the assumption of normality is violated (see Appendix A, Table 21). As a result, it is seen that our data is not normally distributed.

4.2.2 Impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales to businesses

The Kolmogorov-Smirnov test is used to test normality of the data. The results indicate that sig. values for all time periods are .000 (less than 0.05) suggesting the rejection of assumption of normality at the 0.05 significance level (see Appendix A, Table 22).

As a result, based on the Skewness and Kurtosis values and Kolmogorov-Smirnov test of normality significance values, we can conclude that our data that will be used to test hypotheses relating both homeowners and businesses do not follow a normal distribution.

4.3 Testing the hypotheses

Based on the Skewness, Kurtosis values and Kolmogorov-Smirnov test of normality significance values, we conclude that the data that we will use to test all hypotheses is not normally distributed. Therefore, we will be using the non-parametric alternative to test paired samples which is Wilcoxon Signed Rank Test instead of paired samples t-test to test our hypotheses as suggested in Pallant's (2007) SPSS Guideline.

As a reminder, we divided our hypotheses into two main parts which (1) investigates the impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales to homeowners (H1a, H1b,H1c,H1d), and (2) impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales to businesses (H2a,H2b,H2c).

For H1a, we compared the 3-month before and after Kahramanmaraş earthquakes total sales data of insurance firms (N=30) (see Appendix B, Figure 1).

Wilcoxon signed ranks test result indicate an asymptotic significance value of 0.004 with a Z value of -2.890. The two-tailed asymptotic significance level less than 0.05 (p-value = 0.004) indicating that the difference between 3- month total sales data before and after Kahramanmaraş earthquakes is statistically significant. Therefore, we conclude that before and after total earthquake insurance policy sales values are significantly different.

When the Wilcoxon Signed Rank Test – Rank table is examined, it is clearly seen that positive ranks which indicates an increase in the sales after Kahramanmaraş earthquakes is prevalent in the data. More specifically, this case holds true for 21 firms out of 30 insurance firms. When the mean ranks are compared, it is observed that the 3-month total earthquake insurance sales after Kahramanmaraş earthquakes (17.76) is significantly higher than the 3-month total earthquake insurance sales before Kahramanmaraş earthquakes (10.22) which demonstrates that the difference is in favor of an increase in the total sales after the earthquakes (positive ranks). Hence, H1a is supported based on the results which confirm that the sales of earthquake insurance is increased after the Kahramanmaraş earthquakes when 3-month data before and after the earthquakes are analyzed.

Table 1. Wilcoxon Signed Rank Test for Earthquake Insurance Policy Sales to Homeowners (3-months)

Ranks				
		N	Mean Rank	Sum of Ranks
tsalespost3 - tsalespre3	Negative Ranks	9[a]	10.22	92.00
	Positive Ranks	21[b]	17.76	373.00
	Ties	0[c]		
	Total	30		
a. tsalespost3 < tsalespre3				
b. tsalespost3 > tsalespre3				
c. tsalespost3 = tsalespre3				

Table 2. Wilcoxon Test Statistics for H1a (3-months)

Test Statistics[a]	
	tsalespost3 - tsalespre3
Z	-2.890[b]
Asymp. Sig. (2-tailed)	0.004
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

For H1b, we compared the 6-month before and after Kahramanmaraş earthquakes total sales data of insurance firms (N=30) (see Appendix B, Figure 2).

Wilcoxon signed ranks test result has a Z value of -0.895 and a two-tailed asymptotic significance level more than 0.05 (p-value = 0.371). The asymp. significance value greater than 0.05 indicating that the difference between 6- month total sales data before and after Kahramanmaraş earthquakes is not statistically significant. Therefore, we conclude that before and after total earthquake insurance policy sales values are not significantly different for 6-month periods. Also, when we examined the Wilcoxon Signed Ranks Test- Ranks table, it is observed that positive and negative ranks which indicate increase and decrease of sales after Kahramanmaraş earthquakes, are really close to each other (18 firms experienced a decrease in total sales after the earthquakes while 12 of them experienced an increase); and more importantly, when the mean ranks are compared, a significant difference can not be observed (15.33-15.75) as p value (0.371> 0.05) of the test indicates. Hence, our H1b is not supported based on the results which indicate that there is no significant difference between the total sales of earthquake insurance policies before and after Kahramanmaraş earthquakes for the 6-month periods.

Table 3. Wilcoxon Signed Rank Test for Earthquake Insurance Policy Sales to Homeowners (6-months)

Ranks				
		N	Mean Rank	Sum of Ranks
tsalespost6 - tsalespre6	Negative Ranks	18[a]	15.33	276.00
	Positive Ranks	12[b]	15.75	189.00
	Ties	0[c]		
	Total	30		
a. tsalespost6 < tsalespre6				
b. tsalespost6 > tsalespre6				
c. tsalespost6 = tsalespre6				

Table 4. Wilcoxon Test Statistics for H1b (6-months)

Test Statistics[a]	
	tsalespost6 - tsalespre6
Z	-.895[b]
Asymp. Sig. (2-tailed)	0.371
a. Wilcoxon Signed Ranks Test	
b. Based on positive ranks.	

In order to test H1c, we compared the total sales of earthquake insurance policy of 12-months before and after Kahramanmaraş earthquakes (N=30) (see Appendix B, Figure 3).

The test statics of Wilcoxon signed rank test indicates a two-tailed asymptotic significance level of 0.030 with a Z value of -2.170. Since the significance level is less than 0.05 (p-value < .05) meaning that there is a statistically significant

difference in total sales of earthquake insurance policy 12-months before and after Kahramanmaraş earthquakes. When the mean ranks are compared, positive ranks which indicate an increase in total sales after the earthquakes showing a higher value (17.79) compared to negative ranks which indicate a decrease in total sales after the earthquakes (11.55), thereby the results show that the difference is in favor of positive ranks which indicate an increase in total sales after the earthquakes. Hence, H1c is supported based on the results which indicate a positive impact of Kahramanmaraş earthquakes on earthquake insurance policy sales.

Table 5. Wilcoxon Signed Rank Test for Earthquake Insurance Policy Sales to Homeowners (12-months)

Ranks				
		N	Mean Rank	Sum of Ranks
tsalespost12 - tsalespre12	Negative Ranks	11[a]	11.55	127.00
	Positive Ranks	19[b]	17.79	338.00
	Ties	0[c]		
	Total	30		
a. tsalespost12 < tsalespre12				
b. tsalespost12 > tsalespre12				
c. tsalespost12 = tsalespre12				

Table 6. Wilcoxon Test Statistics for H1c (12-months)

Test Statistics[a]	
	tsalespost12 - tsalespre12
Z	-2.170[b]
Asymp. Sig. (2-tailed)	0.030
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

For H1d, we compared the effect sizes of Kahramanmaraş earthquakes on earthquake insurance policy sales for 3-month and 12-month periods. Since the results do not indicate a significance difference between the 6-month total earthquake insurance policy sales before and after Kahramanmaraş earthquakes, the effect size is not calculated for 6-month periods. For the calculation of the effect size, we used the Cohen's (1988) formula of $r = Z/\sqrt{N}$ as suggested in Pallant's SPSS Guideline (2007).

Table 7. Wilcoxon Effect Size Estimation for H1d

	Z	N	r = Effect Size ($Z/\sqrt{N}$)
pre3-post3	2.890	60	0.373
pre12-post12	2.170	60	0.280
*N: number of observations over two time points, N=60			

Z values are taken from the Wilcoxon test statistics table as 2.890 for 3-month period and 2.170 for 12-month period. According to the results, r=0.373 which is between the values of $0.3 < 0.373 < 0.5$ indicating a medium size effect

while r= 0.280 which is between the values of 0.2 < 0.280< 0.3 indicating a small size effect. Hence, the effect size is medium for the 3-month periods and small for 12-month periods. As a result, H1d which proposes that the effect will be highest in the first quarter is supported when the results are compared for 3-month and 12-month periods.

For the second part of our analysis, we test the hypotheses relating the impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales to businesses (H2a, H2b, H2c).

In order to test H2a, we compared the total earthquake insurance policy sales of insurance firms (N=27) to businesses for the 3 months before and 3 months after Kahramanmaraş earthquakes (see Appendix B, Figure 4).

The test statistics indicate a two-tailed asymptotic significance level is of 0.156 with a Z value of -1.417. Since the asymp. sig. level of 0.156 is higher than 0.05 (p-value > 0.05), the statistics indicate that there is no statistically significant difference in the total earthquake insurance sales to businesses before and after the Kahramanmaraş earthquakes for the 3 months periods. Hence, we cannot mention an impact of Kahramanmaraş earthquakes on the total earthquake insurance sales for these periods. Thus, H2a is not supported.

Table 8. Wilcoxon Signed Rank Test for Earthquake Insurance Policy Sales to Businesses (3-months)

Ranks				
		N	Mean Rank	Sum of Ranks
tsalespost3 - tsalespre3	Negative Ranks	9[a]	14.44	130.00
	Positive Ranks	18[b]	13.78	248.00
	Ties	0[c]		
	Total	27		
a. tsalespost3 < tsalespre3				
b. tsalespost3 > tsalespre3				
c. tsalespost3 = tsalespre3				

Table 9. Wilcoxon Test Statistics for H2a

Test Statistics[a]	
	tsalespost3 - tsalespre3
Z	-1.417[b]
Asymp. Sig. (2-tailed)	0.156
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

However, it is worth mentioning that the total sales increased for 3-months after the earthquakes for 18 firms and decreased for 9 firms. In addition, total sales have increased from 1.541.697 (before the earthquakes) to 1.695.586 (after the earthquakes) for observed 3-month periods when all firms are included (see Appendix A, Table 18).

To test H2b, we compared the insurance firms' (N=27) total earthquake insurance policy sales data for 6 months before and 6 months after the Kahramanmaraş earthquakes (see Appendix B, Figure 5).

Our test results show a two-tailed significance level of 0.648 which is greater than 0.05 (p-value > 0.05) with a Z value of -0.456. Therefore, according to the significance level, it is concluded that there is no significant difference in the total sales of earthquake insurance policies 6 months before and 6 months after the earthquakes. Thus, H2b is not supported.

Table 10. Wilcoxon Signed Rank Test for Earthquake Insurance Policy Sales to Businesses (6-months)

Ranks				
		N	Mean Rank	Sum of Ranks
tsalespost6 - tsalespre6	Negative Ranks	13[a]	16.00	208.00
	Positive Ranks	14[b]	12.14	170.00
	Ties	0[c]		
	Total	27		
a. tsalespost6 < tsalespre6				
b. tsalespost6 > tsalespre6				
c. tsalespost6 = tsalespre6				

Table 11. Wilcoxon Test Statistics for H2b

Test Statistics[a]	
	tsalespost6 - tsalespre6
Z	-.456[b]
Asymp. Sig. (2-tailed)	0.648
a. Wilcoxon Signed Ranks Test	
b. Based on positive ranks.	

However, it should be mentioned that total sales of earthquake insurance policy sales increased for 14 firms and decreased for 13 firms 6 months after the earthquakes period. In addition, total sales of earthquake insurance policy decreased from 3.199.499 (before the earthquakes) to 3.015.031 (after the earthquakes) for 6-month periods when all firms are included (see Appendix A, Table 18).

In order to test H2c, we compared the total earthquake insurance policy sales of firms (N=27) for 12 months before and 12 months after the Kahramanmaraş earthquakes (see Appendix B, Figure 6).

The test statistics indicate a significance level of 0.614 which is greater than 0.05 (p-value > 0.05) with a Z value -0.505. Thus, we conclude that there is no significant difference in terms of total earthquake insurance policy sales for 12 months before and after periods according to the significance level. In other words, Kahramanmaraş earthquakes have no impact on the total earthquake insurance policy sales when 12 months before and after periods are compared. Thus, H2c is not supported.

Table 12. Wilcoxon Signed Rank Test for Earthquake Insurance Policy Sales to Businesses (12-months)

Ranks				
		N	Mean Rank	Sum of Ranks
tsalespost12 - tsalespre12	Negative Ranks	16[a]	13.13	210.00
	Positive Ranks	11[b]	15.27	168.00
	Ties	0[c]		
	Total	27		
a. tsalespost12 < tsalespre12				
b. tsalespost12 > tsalespre12				
c. tsalespost12 = tsalespre12				

Table 13. Wilcoxon Test Statistics for H2c

Test Statistics[a]	
	tsalespost12 - tsalespre12
Z	-.505[b]
Asymp. Sig. (2-tailed)	0.614
a. Wilcoxon Signed Ranks Test	
b. Based on positive ranks.	

In addition to test statistics, it is worth mentioning that 11 firms have stated an increase while 16 firms stated a decrease in the total earthquake insurance policy sales for the period of 12 months after the Kahramanmaraş earthquakes when it is compared to 12 months before the earthquakes period. Furthermore, the total sales have seen a decrease from 6.047.828 (total of 12 months before the earthquakes) to

5.580.874 (total of 12 months after the earthquakes) when all insurance firms are included in the evaluation (see Appendix A, Table 18).

Table 14. Status of the Hypotheses

Hypotheses	Status
H1a	Supported
H1b	Not Supported
H1c	Supported
H1d	Supported
H2a	Not Supported
H2b	Not Supported
H2c	Not Supported

CHAPTER 5

CONCLUSION AND DISCUSSION

5.1 Discussion

Kahramanmaraş earthquakes resulted in a devastating loss of life, injury and caused extensive damage to various cities in southern Türkiye including Gaziantep, Antakya and Adana as well as some cities in Syria. The devastating consequences of these earthquakes reminded residents how the country is actually exposed to earthquake risks due to geographical position and non-earthquake-proof buildings. The reminder effect also caused a sudden but significant increase in compulsory earthquake insurance demand as reported in news reports according to 2 days after the earthquake data (Öztürk, 2019). While some insurance sector professionals and managers have realized the sudden impact of a major earthquake (Ousley, 2014), there is still ambiguity about how long the effect lasts. In order to address this research gap, this study examines the impact of Kahramanmaraş earthquakes on the earthquake insurance policy sales on insurance firms basis through comparing the values before and after the earthquakes in three different periods: 3-month, 6-month and 12-month. Moreover, our study covers the impact of the Kahramanmaraş earthquakes on both compulsory earthquake insurance policy (TCIP) which is sold to homeowners, and the fire and natural disaster policy which is sold to businesses in order to present a comprehensive study. By analyzing our research results, we present valuable insights and operational recommendations to insurance firms and TCIP to minimize the negative effects of earthquakes and to help the insurance sector maintain the pool functioning which ensures social welfare.

The first part of our study (H1a, H1b, H1c and H1d) demonstrates that Kahramanmaraş earthquakes have a positive impact on the earthquake insurance policy sales when 3-month and 12-month before and after periods are compared. However, there is no significant difference in the earthquake insurance sales between 6-month before and 6-month after the earthquakes. This result suggests that the change in the residents' risk perception towards earthquakes after the Kahramanmaraş earthquakes increased the demand for obtaining an earthquake insurance. Since there is no malfunctioning occurred and detected in the TCIP's operations and since there is no change in insurance rates (price) and deductible rate emerged during that period; increased demand to purchase an earthquake insurance policy was met with increased supply (sales). Also, it should be mentioned that reluctance to offer an insurance policy by insurance firms cannot be a decisive factor because TCIP policies are compulsory and must be offered when there is a demand. However, when the 6-months are compared, the difference between the periods disappear. Hence, we conclude that the total insurance policy sales for the period of April-May-June 2023 has decreased when compared with before the earthquakes periods (July-August-September & October-November-December 2022 periods) and / or 3-months after the earthquakes period (January February- March 2023) which in total neutralizes the first 3 month increase effect of Kahramanmaraş earthquakes and creates no difference when 6-months before and after are compared in terms of total policy sold to homeowners. Since the malfunctioning of the insurance system, price and deductible rate changes, reluctance to offer an insurance policy by insurance firms are out of topic for this case, we conclude that there is no operational problem in the supply side of the issue. Thus, we anticipate that the decrease in the sales is stemmed from the decrease in demand to obtain an earthquake insurance policy. A

possible reason for this might be homeowner's loss of trust to DASK due to the TV campaigns that were arranged to raise funds with the help of Turkish celebrities. Those campaigns which were also named as "charity nights" might have created the belief that there are no enough funds to cover financial losses of Kahramanmaraş earthquakes. In that manner, homeowners might have thought that their losses wouldn't be covered if they face with a similar case. Thus, the demand of homeowners to purchase an earthquake insurance policy might have been decreased after the first shock of the earthquake which also might have caused a decrease in the sales of earthquake insurance policy after 3 months when 6-month periods are assessed. In addition, people may start to forget the impacts of the Kahramanmaraş earthquakes after 3 months, hence this may also support the decrease in the earthquake insurance demand (when compared to 3-month period after the earthquakes) by homeowners. Since, the results show no significant difference between the 6-month periods but a significant difference between the 12-month periods, we conclude that the sales of earthquake insurance policies to homeowners increased between 6-12 months compared to the previous year because the impact of the earthquakes have been neutralized in the 6th month according to the results. We assume that insurance industry conditions (price and deductible rates) and the operations in terms of product developments stay the same for the observed periods as mentioned above for all TCIP insurance hypotheses. That's why, we again ground the increase in the earthquake insurance sales to the increase in demand to purchase an earthquake insurance policy. A possible reason for this result might be the increased and frequent information distribution through both conventional and social media about the risks and potential consequences of earthquakes in Türkiye, especially by seismologists and increased propagandas to refresh the risk awareness

and to prevent forgetting the riskiness of earthquakes in Türkiye. As a result, it has been observed that the neutralized effect has turned into a positive effect after the 6-month period. In addition, the results show that the effect size is medium in 3-month, small in 12-month periods. Thus, the results suggest that the strength of the effect is the highest right after the earthquake, but the effect is weakened with the time factor which is parallel to our anticipation regarding the change in risk perception based on Prospect Theory- Reference Points (Yang et al., 2020) and ignoring a rare and low-probability event after a certain time (Kahneman & Tversky, 1979) with a tendency to forget the impacts of the disaster as time passes (Papon, 2008).

In the second part of our analysis (H2a, H2b and H2c), we aimed to reveal the impact of Kahramanmaraş earthquakes on earthquake insurance policy sales to businesses for the same periods we analyzed for homeowners. The test results indicate that there is no significant difference in total earthquake insurance sales to businesses before and after the Kahramanmaraş earthquakes in all periods observed (3-month, 6-month and 12-month). Even though there is no significant difference between the periods, the sum of sales of earthquake insurance policies has increased after the Kahramanmaraş earthquakes for 3-month period; and decreased for 6-month and 12-month periods. This contradictory result might be explained as follows: the insurance firms may not be aware of the size of the economic loss right after the earthquake hence it takes time to evaluate it. And for that period (3-month after the earthquakes), they might continue to produce and sell earthquake insurance policies to businesses. However, when the claim payments have started to become prominent after 3 months and when the firms faced with a huge and anticipated fixed costs, they might become reluctant to write and sell insurance policy because the current insurance rates might prevent insurance firms to reach their profit expectations. Thus,

they might slow down their insurance writing processes with current conditions, want to bear no more risk especially for risky regions or they might share the risk with other insurance firms through co-insurance which also slows down the insurance writing process. Also, insurance companies may have been reluctant to provide coverage after realizing the financial consequences of Kahramanmaraş earthquakes (3 months) because they might anticipate that a large portion or all of their capitals and reserves would be spent on compensation payments based on the course of the process. This anticipation and implementation might lead insurance companies to create more reserves through reinsurance activities where insurance companies also insure their risks through reinsurance firms which consequently slows down the insurance selling process. In addition, since firms are aware of the fact that IPRSA publishes reports on quarterly basis, they might slow down or decrease their sales activities until a price (insurance rate) change, thereby until conditions become much more profitable for them. At that point, some insurance firms, especially big insurance firms, might trust their reserves and reinsurance activities and adjust their sales activities to meet increased demand, some insurance firms, especially smaller firms might be reluctant to offer and hence might decrease the sales amount compared to before earthquake period. Thus, we conclude that the insurance firm types and economic conditions might play a significant role in whether to proceed selling an earthquake insurance policy or not. And, this might be the main reason causing the indifference in earthquake insurance sales before and after the earthquake's periods. We assume that there is an increased demand from the businesses point of view as we anticipated for homeowners because there is no change in any economic parameters. Hence, for businesses we conclude that the

insignificance of difference and the changes in total sales stem from the supply side (from the insurance firms).

As clearly seen from the results, it is of great importance that the insurance policy is compulsory. When the policy is compulsory and restricted by government, the insurance firms cannot think any other choice but offer the earthquake insurance policy to homeowners at predetermined, affordable prices; the policy sales increase. However, when the policy is not compulsory, insurance firms might be reluctant to offer a policy until the price conditions are turned into a profitable way by the government and might decrease their policy sales or might practice co-insurance according to their will.

At that point, it should be highlighted that the practices of TCIP which corresponds to the compulsory earthquake insurance (compulsory to buy for homeowners, to sell for firms), actually prevents the irrational behaviors of human nature that are influenced by psychological factors as mentioned under the assumptions of behavioral economics. With psychological impulses, insurance being compulsory in this case, irrational behavior (not purchasing and selling an earthquake insurance) is prevented and the sales increased as a result.

In addition, if we compare the impact of 2023 Kahramanmaraş earthquakes on earthquake insurance policy sales with the studies from Japan and the U.S, it is apparent that earthquake insurance policies that are sold to homeowners and businesses show different sales patterns. Since the number of compulsory earthquake insurance policies that are sold to homeowners has significantly increased after the earthquakes for 3-month and 12-month periods and since the price tariff is strictly regulated and kept at reasonably priced by the government to extend insurance adoption; the sales pattern and surrounding conditions of compulsory earthquake

insurance system (TCIP) resembles to Japan and its insurance system. It is mainly because Japanese insurance system also operates under a similar “no loss, no profit” condition for insurance companies and also experiences an increase in the earthquake insurance policies after the earthquakes (Yamori & Kobayashi, 2002). On the other hand, the impact of the 2023 Kahramanmaraş earthquakes on fire and natural disaster policies which include earthquake coverage (not compulsory) and are sold to businesses presents insignificant findings. Again, we believe that the insignificant impact that are found in all observed periods for businesses might mostly stem from the financial conditions of the insurance companies that are observed. However, apart from the rank comparison, the descriptives demonstrate a decrease in the insurance policy sales in 6-month and 12-month comparison which resembles to the situation that occurs in the U.S. Due to the fact that there has been no change in the insurance rate in the observed periods, we cannot expect the impact of it but as similar to the reducing number of firms writing insurance coverage in the U.S (Born & Viscusi, 2006), we conclude that the reluctance of insurance companies to underwrite an insurance policy due to the unprofitable economic conditions that threaten the companies’ financial constraints, might have created a similar impact on the insurance policy sales which decrease the insurance policy sales in total.

5.2 Limitations and future research

The impact of the devastating Kahramanmaraş earthquakes on the earthquake insurance sales is a topic that requires a long-term analysis in order to gain a comprehensive understanding about the changes in risk perceptions which also involve forgetting and ignoring effect after the earthquake. In this study, we have analyzed the impacts of Kahramanmaraş earthquakes maximum one year before and

after periods. Hence, extending this period to 2 years and more will provide a more comprehensive study regarding the long-term impacts of the earthquakes.
In this study, we have used a cumulative sales data that is prepared quarterly, which have limited us to test detailed monthly effects. A month-based analysis may provide powerful insights about the reasons of changes in the total sales before and after periods.

In addition, our observation period did not experience a change in interest rates and deductible rates. However, new regulations were published by government under the name of Insurance and Private Pension Regulation and Supervision Agency (IPRSA) and came into force on January 1, 2024. Hence, one of the most important contributions would be the analysis of total earthquake insurance sales after the Kahramanmaraş earthquakes involving the new price effect.

An analysis which includes the same type of insurance firms in terms of size, economic conditions etc. might provide more significant results especially in terms of the difference in earthquake insurance policy sales to businesses after the earthquake. Thus, this contribution also stands out as a topic for further research.

Moreover, an international comparison of Turkish insurance firm's stock price with Japanese firms which are highly restricted by government, managed through no loss no profit principle and experienced a stock price decrease after the earthquakes; and with American firms which experienced a stock price increase in contrary to Japanese firms (Yamori & Kobayashi, 2002); can be added to the study. The results might provide powerful insights to managers about how to manage the earthquake process while considering the stakeholders' perspective.

5.3 Managerial implications

Since the compulsory earthquake insurance sales demonstrated an increasing pattern in before and after 3-month and 12-month periods, the results actually reveal the successful results of behavioral economics practices. It is because this “mandatory” principle and the public-private partnership governed by TCIP prevented insurance companies from pursuing their own self-interest and postponement tendency. Moreover, this compulsory principle ensured the increase in the total earthquake insurance sales and total funds collected which provides kind of a security to social welfare.

In that manner, fire and natural disaster policies which are sold to businesses might be involved to TCIP and might be conducted with a similar mandatory aspect as applied in TCIP insurance policy which is carried out by non-financial penalties when one does not have a TCIP insurance but face with economic and social blocks. Thus, the reluctance of insurance firms to write an earthquake insurance policy in the case of threatened profitability expectations would be prevented.

Another alternative approach would be conducting multi-year policies which would prevent the reluctance of firms from the beginning. However, these implementations would bear too much risk on the insurance firms because they would have been obliged to meet each and every insurance policy demand by the businesses. Therefore, at that point, it is important to provide and ease the extra reinsurance capacity holding processes of insurance firms to decrease the risk they own.

In order to prevent decreases in the demand side, TCIP and insurance firms might inform the public frequently about the actions they carried after the earthquakes period through conventional and online media platforms. This action

would decrease the effects of such news declaring that one couldn't get the claims payment determined from TCIP after the Kahramanmaraş earthquakes. Informative TV programs, writings and actions on social media about the riskiness and consequences of the potential earthquakes in Türkiye especially seismologists and declaration of having a fire and natural disaster / compulsory earthquake insurance especially by trusted celebrities and opinion leaders would prompt the sales of earthquake insurance policy. Thus, TCIP and the sales team of the insurance firms might allocate some financial resources to informative and promotional activities relating the earthquake insurance.

APPENDIX A

TABLES

Table 15. Descriptive Statistics of the Insurance Companies for Hypotheses relating Homeowners

company ID	number of employees	years of operation	country of origin	market share (total)	yearly revenue (in terms of total premium production / TL)
2	761	63	Türkiye	5.62%	27,298,748,170
3	1,674	134	Germany	9.60%	46,637,616,105
4	1,750	99	Türkiye	9.10%	44,228,418,367
7	243	36	England	1.46%	7,105,799,901
11	75	35	Germany	1.25%	6,057,793,654
13	690	35	Holland	2.34%	11,384,397,733
15	1,578	67	Türkiye	12.25%	59,518,179,027
16	770	121	Germany	5.19%	25,239,312,351
17	192	29	Türkiye	1.75%	8,501,088,233
18	192	180	Germany	0.36%	1,742,035,744
19	548	91	Spain	2.30%	11,159,759,327
20	483	15	Kuwait	2.37%	11,517,253,524
21	70	42	UAE	0.16%	792,662,618
22	360	66	Türkiye	2.64%	12,815,129,659
23	74	69	Türkiye	0.26%	1,253,271,714
24	790	137	Japan	3.60%	17,477,426,649
25	320	11	Türkiye	1.94%	9,432,850,058
26	162	13	Türkiye	0.40%	1,930,618,992
27	263	62	U.S.A	0.98%	4,754,470,459
28	129	33	Türkiye & Japan	0.56%	2,703,455,145
30	339	152	Switzerland	1.09%	5,278,463,932
31	62	8	Türkiye	1.08%	5,259,183,390
32	117	9	Türkiye	4.18%	20,298,954,634
33	118	9	Türkiye	0.17%	845,972,736
35	123	5	Türkiye	0.37%	1,792,623,466
37	45	4	Türkiye	0.19%	918,605,724
38	38	3	Türkiye	0.02%	87,703,404
39	155	3	Türkiye	1.28%	6,213,502,715
40	97	4	England	0.40%	1,931,438,585
41	224	4	Türkiye	0.54%	2,633,579,810

Source: Insurance Association of Türkiye

Table 16. Descriptive Statistics of the Insurance Companies for Hypotheses relating Businesses

company ID	number of employees	years of operation	country of origin	market share (total)	yearly revenue (in terms of total premium production / TL)
1	56	232	France	0.36%	1,726,372,280
2	761	63	Türkiye	5.62%	27,298,748,170
3	1,674	134	Germany	9.60%	46,637,616,105
4	1,750	99	Türkiye	9.10%	44,228,418,367
13	690	35	Holland	2.34%	11,384,397,733
15	1,578	67	Türkiye	12.25%	59,518,179,027
16	770	121	Germany	5.19%	25,239,312,351
17	192	29	Türkiye	1.75%	8,501,088,233
19	548	91	Spain	2.30%	11,159,759,327
20	483	15	Kuwait	2.37%	11,517,253,524
21	70	42	UAE	0.16%	792,662,618
22	360	66	Türkiye	2.64%	12,815,129,659
23	74	69	Türkiye	0.26%	1,253,271,714
24	790	137	Japan	3.60%	17,477,426,649
25	320	11	Türkiye	1.94%	9,432,850,058
26	162	13	Türkiye	0.40%	1,930,618,992
27	263	62	U.S.A	0.98%	4,754,470,459
28	129	33	Türkiye & Japan	0.56%	2,703,455,145
30	339	152	Switzerland	1.09%	5,278,463,932
31	62	8	Türkiye	1.08%	5,259,183,390
32	117	9	Türkiye	4.18%	20,298,954,634
33	118	9	Türkiye	0.17%	845,972,736
35	123	5	Türkiye	0.37%	1,792,623,466
37	45	4	Türkiye	0.19%	918,605,724
38	38	3	Türkiye	0.02%	87,703,404
40	97	4	England	0.40%	1,931,438,585
41	224	4	Türkiye	0.54%	2,633,579,810

Source: Insurance Association of Türkiye

Table 17. Descriptive Statistics for Earthquake Insurance Policy Sales to Homeowners

Descriptive Statistics						
	N	Minimum	Maximum	Sum	Mean	Std. Deviation
tsalespre3	30	0	730485	2647973	88265.75	150139.515
tsalespost3	30	7	792350	2863894	95463.13	162171.825
tsalespre6	30	4	1494491	5147904	171596.80	300428.951
tsalespost6	30	10	1496297	5052018	168400.59	298092.638
tsalespre12	30	5	2801657	9564465	318815.51	563463.254
tsalespost12	30	18	2911409	10013365	333778.82	580449.286
Valid N (listwise)	30					

Table 18. Descriptive Statistics for Earthquake Insurance Policy Sales to Businesses

Descriptive Statistics						
	N	Minimum	Maximum	Sum	Mean	Std. Deviation
tsalespre3	27	4	507128	1541697	57099.89	103596.272
tsalespost3	27	10	630309	1695586	62799.48	122625.037
tsalespre6	27	19	1214587	3199499	118499.96	241929.606
tsalespost6	27	21	1190622	3015031	111667.80	230997.960
tsalespre12	27	60	2457431	6047828	223993.61	475761.738
tsalespost12	27	33	1926309	5580874	206699.03	384152.737
Valid N (listwise)	27					

Table 19. Skewness and Kurtosis Values for Earthquake Insurance Policy Sales to Homeowners

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
tsalespre3	30	3.096	0.427	11.408	0.833
tsalespost3	30	3.116	0.427	11.619	0.833
tsalespre6	30	3.306	0.427	13.027	0.833
tsalespost6	30	3.397	0.427	13.721	0.833
tsalespre12	30	3.316	0.427	13.074	0.833
tsalespost12	30	3.373	0.427	13.534	0.833
Valid N (listwise)	30				

Table 20. Skewness and Kurtosis Values for Earthquakes Insurance Policy Sales to Businesses

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
tsalespre3	27	3.491	0.448	14.174	0.872
tsalespost3	27	4.103	0.448	18.919	0.872
tsalespre6	27	3.92	0.448	17.236	0.872
tsalespost6	27	4.219	0.448	19.744	0.872
tsalespre12	27	4.278	0.448	20.205	0.872
tsalespost12	27	3.767	0.448	16.264	0.872
Valid N (listwise)	27				

Table 21. Kolmogorov-Smirnov Test for Earthquake Insurance Policy Sales to Homeowners

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
tsalespre3	0.278	30	0.000	0.612	30	0.000
tsalespost3	0.278	30	0.000	0.610	30	0.000
tsalespre6	0.284	30	0.000	0.592	30	0.000
tsalespost6	0.286	30	0.000	0.580	30	0.000
tsalespre12	0.286	30	0.000	0.589	30	0.000
tsalespost12	0.283	30	0.000	0.588	30	0.000
a. Lilliefors Significance Correction						

Table 22. Kolmogorov-Smirnov Test for Earthquake Insurance Policy Sales to Businesses

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
tsalespre3	0.291	27	0.000	0.569	27	0.000
tsalespost3	0.304	27	0.000	0.496	27	0.000
tsalespre6	0.312	27	0.000	0.503	27	0.000
tsalespost6	0.314	27	0.000	0.474	27	0.000
tsalespre12	0.319	27	0.000	0.466	27	0.000
tsalespost12	0.299	27	0.000	0.538	27	0.000
a. Lilliefors Significance Correction						

APPENDIX B

FIGURES

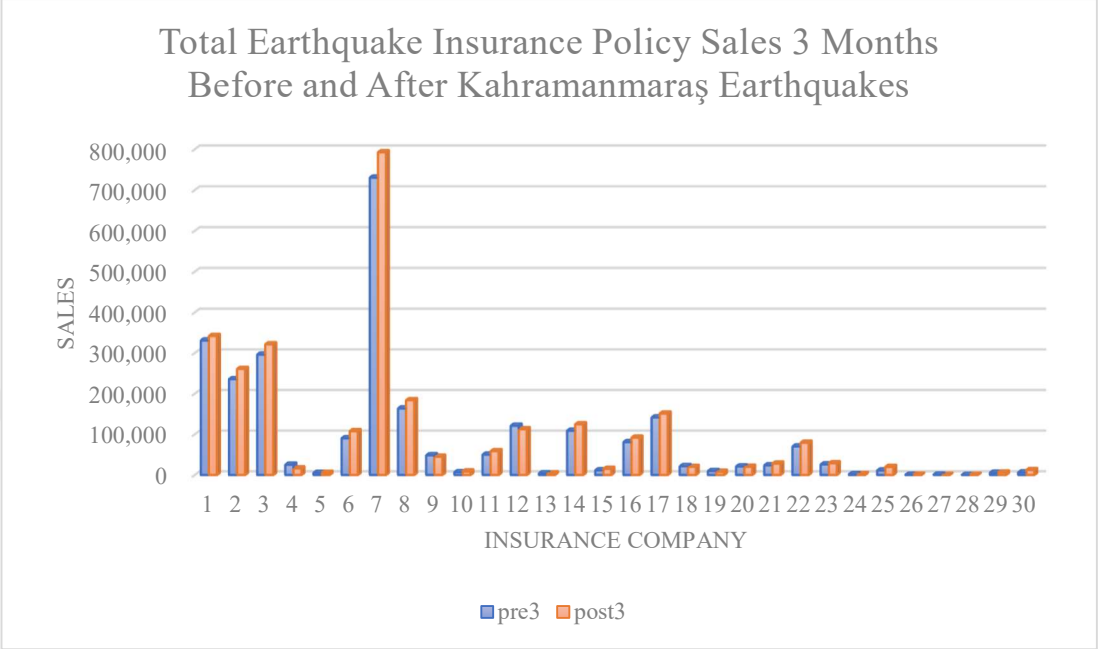

Figure 1. Total earthquake insurance policy sales to homeowners 3 months before and after Kahramanmaraş earthquakes

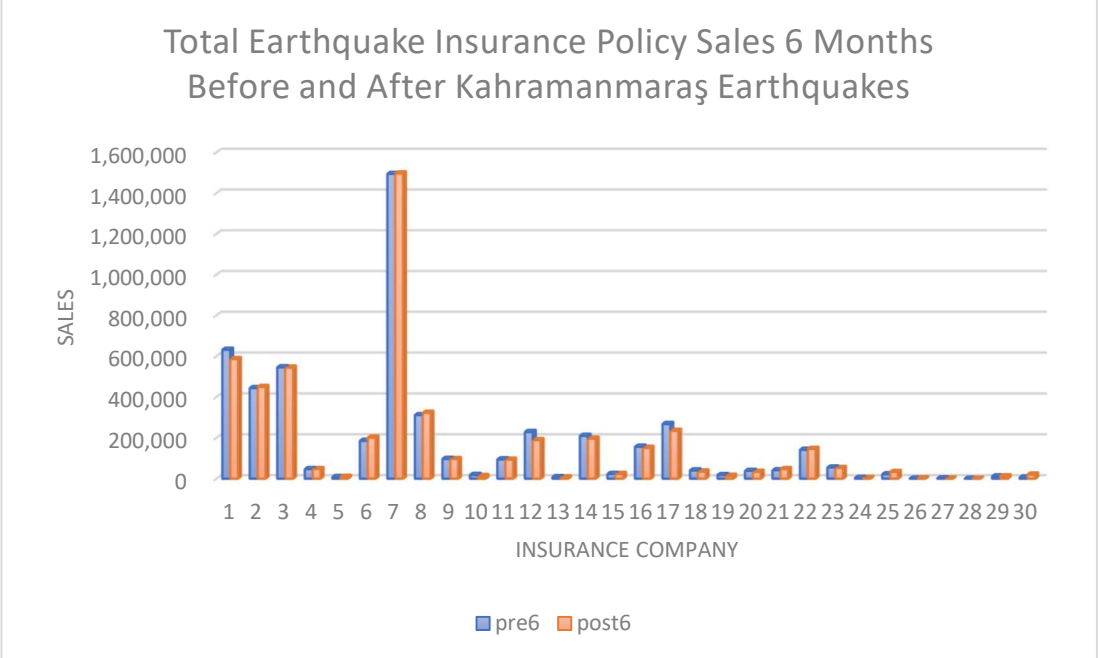

Figure 2. Total earthquake insurance policy sales to homeowners 6 months before and after Kahramanmaraş earthquakes

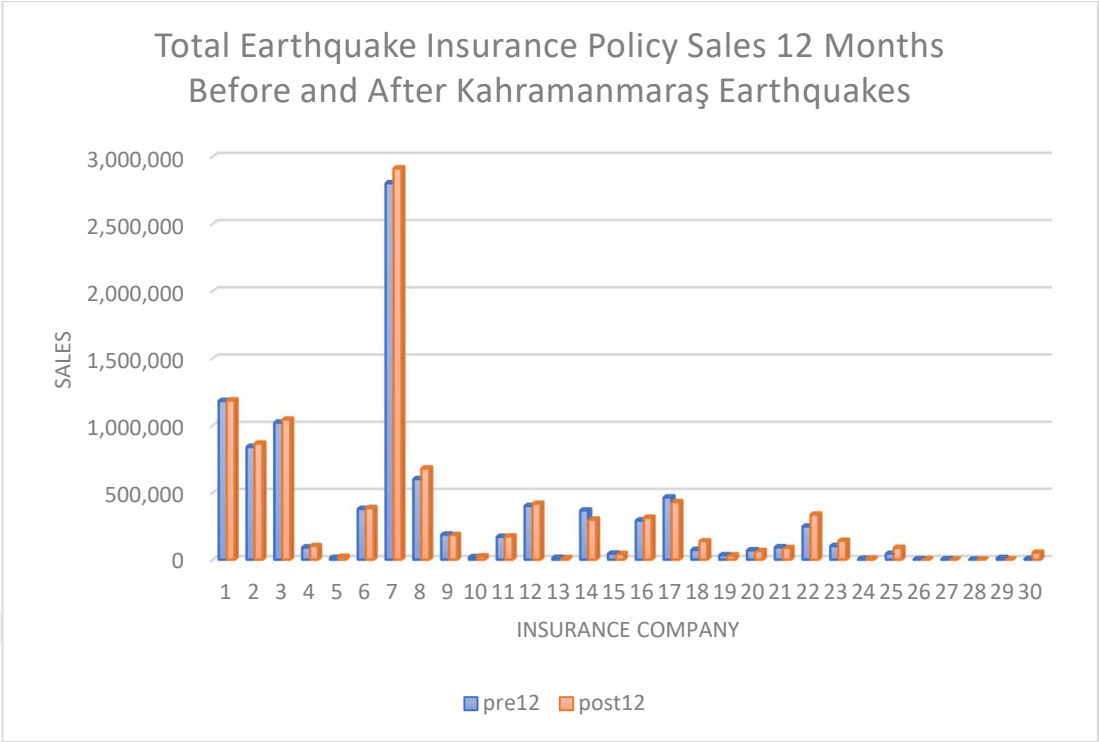

Figure 3. Total earthquake insurance policy sales to homeowners 12 months before and after the Kahramanmaraş earthquakes

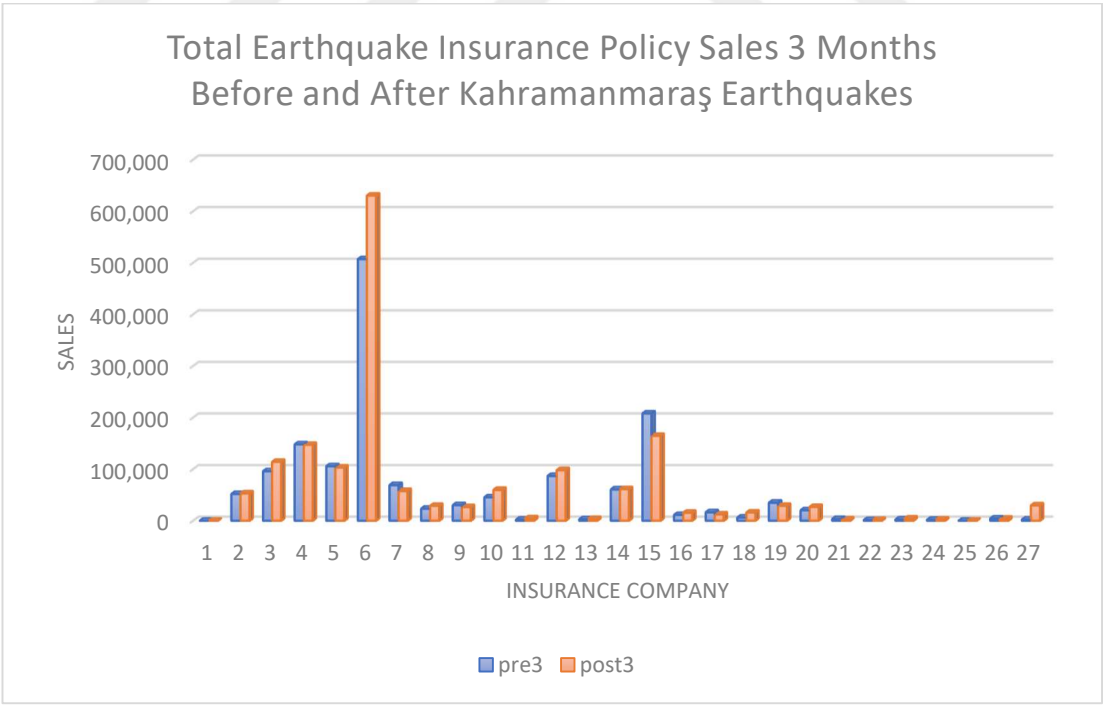

Figure 4. Total earthquake insurance policy sales to businesses 3 months before and after Kahramanmaraş earthquakes

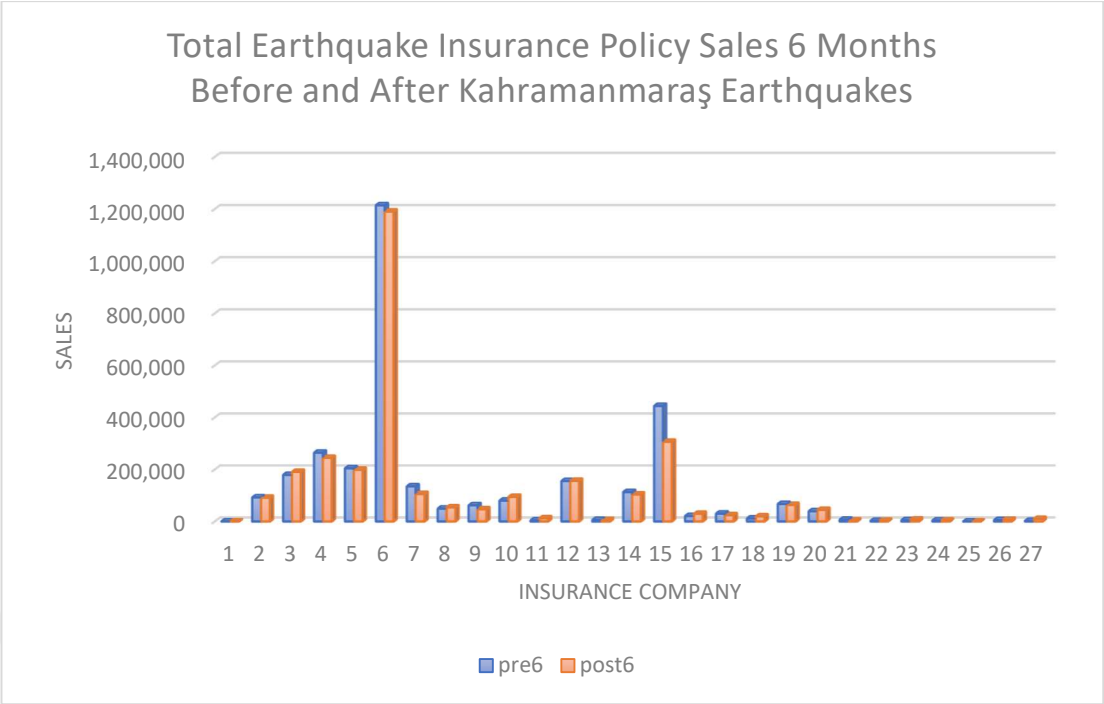

Figure 5. Total earthquake insurance policy sales to businesses 6 months before and after Kahramanmaraş earthquakes

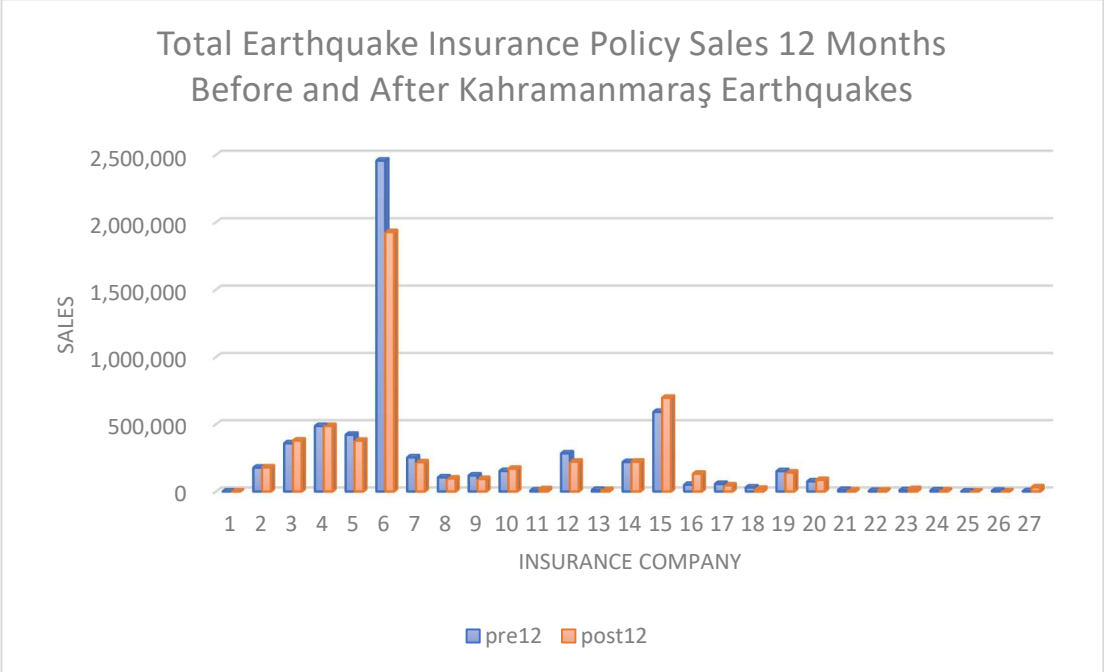

Figure 6. Total earthquake insurance policy sales to businesses 12 months before and after Kahramanmaraş earthquakes

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