# The effects of terror attacks on happiness: Evidence from Turkey

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**Abstract**

The economic effects of terror attacks have been extensively examined in the literature. Yet there is a paucity of empirical research investigating their effect on welfare. Existing studies suggest that, in addition to economic costs, terror also imposes social costs. Using both micro-level data at the individual level and macro-level data at the provincial level, this article examines the association of terror and happiness in Turkey. To address income endogeneity, the conditional mixed process estimation method is employed. The results indicate that while a bidirectional relationship between happiness and income level exists, terror negatively affects happiness. Additional factors such as perceived relative income, gender, employment status, and household size have significant effects on individual wellbeing as well. The findings suggest that measuring only the economic costs of terror fails to capture the full extent of the costs imposed on society.

Terror attacks in Europe and the Middle East have created global concern and distress among many nations. Even though acts of terror might be localized, fear of terror affects the lives of everyone anywhere, but especially so in large metropolitan areas. Economic, psychological, and social consequences exist for any country exposed to terror events. Even if not directly affected, spillover effects from neighboring countries and/or to trade partners can matter. Acts of terror may affect economies by a variety of channels such as increased transaction costs, decreased tourism revenues, decreased savings, a decrease in the number of firms and employment, and decreased foreign direct investment. Terror also adversely affects financial markets, although its impact on returns and volatility can be transitory. Counterterrorism may also have a negative effect on economic growth as it entails an increase in security and military expenditure. In addition to its economic effects, terror also carries intangible costs, including victims' pain and despair and the generally increased levels of anxiety and reduced life satisfaction and happiness.[1]

Turkey has been suffering from domestic and international terror attacks for almost fifty years, a large part of which, however, arises from attacks carried out by the Kurdistan Workers' Party (PKK) and is concentrated in the southeastern region of the country. With the intensification of terror in Turkey, claiming the lives of many people and damaging property, the Turkish people have been experiencing major interruptions of daily activities such as delayed commuting in metropolitan areas, closed schools, interrupted education, difficulties in access to health services, and inconsistent work hours. Additionally, there is a significant amount of stress and fear, similar to experiences reported for Israel. Moreover, fear of terror deters people from engaging in ordinary daily activities, such as shopping, so as to avoid crowded places and leading to a decrease in daily economic transactions.[2]

Prior research finds that terror hinders economic growth in Turkey. Yet the impact of terror on the wellbeing of Turkish citizens has not been previously investigated. This article examines this effect by using micro-data at the individual level and macro-data at the provincial level. The micro-data are drawn from the Turkish Statistical Institute's (TurkStat) Life Satisfaction Survey of 2013, where the sampling enables researchers to obtain individual level data. Provincial level data regarding macroeconomic correlates are obtained from TurkStat's regional statistics. Terror events data come from the Global Terrorism Database (GTD) at the University of Maryland. Conditional mixed-process (CMP) models are employed for the empirical analysis. The remainder of the articles is structured as follows: The next section reviews the literature on the effect of terror on individual wellbeing. This is followed by sections covering the data, the analytical framework and estimation method, and the empirical model and estimation results. The final section concludes.[3]

## Literature review

In the defense economics literature, terror is often defined as the premeditated use or threat to use violence by individuals or subnational groups against noncombatants to attain political and social objectives by intimidating a large audience beyond

that of immediate victims. Based on ideological, social, and/or political motives, acts of terror are carried out to spread fear so as to compel government officials and politicians to reach an accommodation with the terror perpetrating organization. In Turkey, a number of national and international organizations have been contributing to terror. Until recently, the PKK was the major such organization ,from the 1980s onward, aided by the Islamic Great Eastern Raiders/Front and the Turkish Workers' and Peasants' Liberation Army (TIKKO).[4]

Even though the roots of ethnicity-based terror have been attributed to regional inequalities prevalent in Turkey, unrest in the Middle East, especially in Iraq and Syria, has contributed to the escalation of ethnic-based terror in southeastern Turkey since the early 2000s. In an attempt to solve the conflict peacefully, Turkey's ruling Justice and Development Party initiated a peace process in 2009. Meetings between Turkish government representatives and PKK leaders were held in Oslo in 2012 (which later became known as the Oslo Process). Subsequently, a decline in the number of PKK-initiated terror events was observed between 2012 and 2013. Since then however, terror acts committed by the PKK, and met by Turkish security forces' military operations, have interrupted the Oslo Process.[5]

Research agrees that terror hampers Turkish economic growth. For example, applying nonlinear econometric methods to the 1987–2004 period, Araz-Takay, Arin, and Omay (2009) report a large, statistically significant impact, which is especially pronounced during expansionary periods. Ocal and Yildirim (2010) employ provincial level data and perform a regional effects analysis with a geographically weighted regression approach. They, too, report that terror negatively affects economic growth across Turkey. However, the adverse effects are more accentuated in the southeastern provinces, where most of the terror activity has been concentrated. Bilgel and Karahasan (2013) explore effects on real GDP in terror-stricken eastern and southeastern Turkey, 1975–2001, using the synthetic control method. They find an average real GDP gap of about 7 percent between the actual (with terror) and synthetic control (without terror) of eastern and southeastern Anatolia.

Turkey is a popular tourist destination, attracting more than 25 million foreigners in 2016 and, according to TurkStat data, generating total revenue of USD31.4 billion. The world's 6th-most visited country in 2015, Turkey's tourism sector is a source of foreign exchange reserves, creates employment, and leads to economic growth. However, in addition to a slew of international conflicts in the Middle Eastern region, acts of terror in Turkey adversely affect its tourism revenue. Accordingly, another strand of the literature specifically

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examines the effect of terror on tourism in Turkey. From studies beyond Turkey, it is known that terror events generally have long-lasting negative impacts—even after stability is reestablishment—and a study on Turkey similarly suggests that negative effects can be observed up to 10 months following an attack. Drakos and Kutan (2003) examine the issue for three countries in the Mediterranean region with a high incidence of terrorism: Turkey, Israel, and Greece. Their findings support the results stemming from single country studies in that acts of terror significantly hamper tourist arrivals. Moreover, terror events, in any country, not only affect the domestic economy but also have significant spillover effects on tourism markets of neighboring countries, thus leading to a region-wide loss in economic activity.[6]

Beyond tourism, the effects of terror on other sectors and the overall economy have been assessed by researchers who find that terror leads to increased production and transaction costs, decreased savings, and decreased foreign direct investment, all of which result in significant costs and which, in turn, causes reduced economic growth. However, the total social and political impact of terror is difficult to estimate. Terror and counterterrorism may have psychological consequences for individuals, impairing the daily life of citizens who are not only directly affected by terror but also of those who are indirectly affected. Post-traumatic stress disorder and depression are common among individuals who live in countries exposed to terror attacks. All of these consequences reduce social welfare. And yet, there is a relative lack of empirical research investigating the effect of terror on welfare.[7]

Frey, Luechinger, and Stutzer (2009) estimate the cost of terror on life satisfaction in regions of France, the British Isles, and Northern Ireland. They report statistically significant negative effects of terror and positive effects of income on life satisfaction. Similarly, Romanov, Zussman, and Zussman (2012) study the effect of terror on the happiness of Israelis between 2002 and 2004 (during the Intifada), revealing differences in happiness levels of Jewish and Arab Israelis:

While terror fatalities do not significantly affect happiness levels of Jewish Israelis, they do (negatively) affect its Arab citizens. Bryson and MacKerron (2018) find that terror events such as killings, bombings, shootings, incendiary attacks, and assaults adversely affect individuals' *momentary* happiness and anxiety. However, the magnitude of the negative effect depends on the type of the terror act as well as on individuals' time and place proximity to the event. Vorsina, *et al*. (2017) also investigate the social costs of terror. Employing cross-country data from 117 countries covering the time period 2006–2011, they explore the direct relation between individuals' life satisfaction and terror and the indirect effect of terror acts on life satisfaction through its impact on national income. They find that acts of terror directly causes lower life satisfaction and indirectly as well through the channel of reduced national income.

Prior research on the determinants of life satisfaction in Turkey examines the relation between subjective wellbeing and socio-demographic factors. Selim (2008) finds that health, income, and employment significantly affect happiness and life satisfaction, and Ekici and Koydemir (2014) reveal a relation between happiness and various aspects of social capital. Among comparative studies, Dumludag (2013) finds that increases in household consumption levels and income significantly improve life satisfaction. Caner (2014) suggests that in addition to absolute income, favorable income comparisons to others enhance levels of happiness in Turkey, but the effects vary with business cycles. Dumludag, Gokdemir, and Giray (2016) and Caner (2014) point out that the relative standing of income level is a predictor of individuals' life satisfaction. Moreover, household income, being a housewife, being retired, and living in rural areas are positive correlates of happiness. Yet none of the existing studies shed light on the link between terror and happiness in Turkey, which is what this study contributes to the literature.[8]

## The data

Consisting of interviews with 196,203 individuals aged 18 and older, and belonging to 125,720 households, the 2013 Life Satisfaction Survey (LSS) conducted by the Turkish Statistical Institute (TurkStat) was the first to reveal data at the province level. Individuals' answer to the question "Thinking about your life as a whole, how happy would you say you are?" constitutes the self-reported happiness variable. Answers were given on a scale of one to five (1 completely happy; 5 completely unhappy). To align with other studies, answers were inverted (1 completely unhappy; 5 completely happy). The monthly household income variable consists of 5 response categories, ranging from income of less than USD1,000 to USD2,950 or more. Additionally, respondents' perception of their own income were captured by asking the question "Imagine a 10-step ladder, on the bottom of which, on the first step, stand the poorest 10% people in Turkey, and on the highest step, the 10th, stand the richest 10% of people in Turkey. On which step of the ladder are you?" Data and sources are presented in Table A1 in the Appendix.

Descriptive statistics are presented in Table A2, where the happiness variable is grouped into three categories: Happy (completely happy + happy), neither happy nor unhappy, and unhappy (completely unhappy + unhappy). The mean happiness score is 3.56 with a standard deviation of 0.86. Some 60.3 percent of the sample report that they are happy; 10.9 percent report unhappiness. Higher proportions of females (62.1%) and married (62.5%) individuals report that they are happy, compared to males (58.0%) and unmarried (53.4%), respectively. The youngest and oldest groups in the sample exhibit higher proportions of happy individuals. University graduates have the highest proportion of happy individuals (62.5%) whereas the illiterate group has the highest proportion of unhappy people (15.8%). The unemployed are more likely to be unhappy as compared to the employed. It appears that money brings happiness since the percentage of happy people rises as the level of income increases.

Data relating to terror events are gathered from the Global Terrorism Database (GTD). Although the GTD data provides information on several items related to terror, it does not cover actions of states and the relationships between activities of separatist groups and reactions of states. Figure 2 presents the number of terror events by attack type. During the time period under consideration, 2000–2013, there were a total of 509 attacks, 54.6% of which were bombings and explosions, followed by armed assaults (21.6%). The number of attacks reached its peak in 2012. The total number of victims were 546 killings and 538 fatalities, that is, averaging slightly more than one dead and one injured person per event. The majority of targets were police and military facilities (35.2%), and 13.2% of targets were on private businesses. Another nearly 15% of targets were on private citizens and properties. Educational and governmental institutions were also among the targets with 6.3% and 13.2% of the attacks, respectively. Approximately 7% of total incidents were directed to transportation facilities.

A terror index is constructed by principal component analysis for the years 2010, 2011, 2012, and 2013. It includes four variables: the number of terror incidences, fatalities, injuries, and the presence of property damage in each province for the given year. The indices are then rescaled to lie between 1 (lowest level) and 10 (highest level). An average index is calculated as the arithmetic average of the indices across the

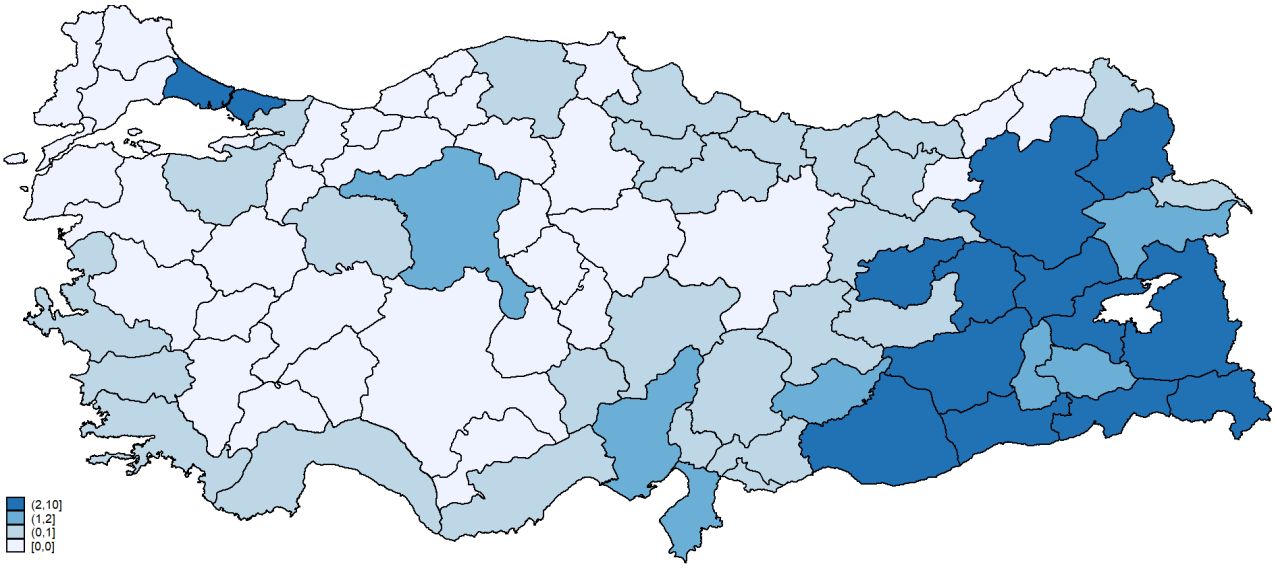


**Figure 1**: Spatial distribution of average terror index, 2010–2013. *Source*: GTD (2016).

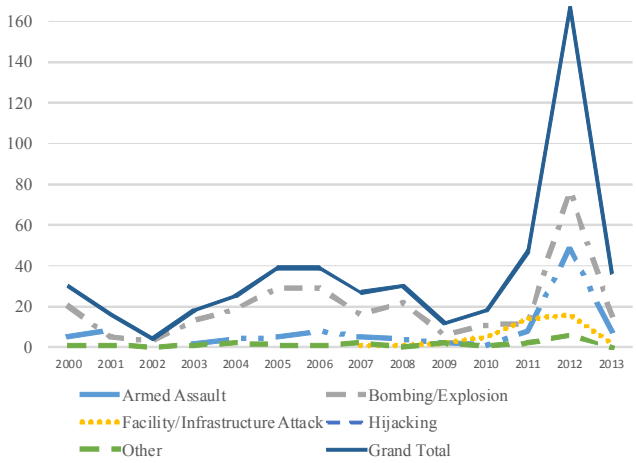


**Figure 2**: Number of terror incidents by type of attack. *Source*: GTD (2016).

corresponding years and subsequently used in the empirical models. A major characteristic of terror in Turkey is its geographical dimension (see Figure 1).[9] Attacks and fatalities are concentrated in Eastern and Southeastern Turkey and in the major cities.

## Analytical framework and estimation method

Depending on the field of specialization, different estimation methods are employed in the literature to investigate the determinants of happiness (Ferrer-i-Carbonell and Frijters, 2004; Kristoffersen, 2010). Generally, psychologists and sociologists prefer to employ Ordinary Least Squares (OLS) regressions, treating happiness by implicit assumption as a cardinal variable. This has been criticized by economists who argue that the subjectivity of happiness hinders an assessment of the realism of the cardinality assumption (Ferrer-i-Carbonell and Frijters, 2004; MacKerron, 2012). Economists, by relaxing the assumption of cardinality, thus generally employ standard ordered probit and logit models (van Praag, 2007), which treat ordinal data as a discrete expression of the continuous latent variable of arbitrary scale (Blanchflower and Oswald, 2004b). Yet results obtained from models that do and models that do not assume cardinality are usually extremely similar (MacKerron, 2012). Some studies employ both methods to demonstrate that their results are not biased by the particular analytical technique (Stevenson and Wolfers, 2009). For instance, models which impose cardinality provide results similar to ordered choice models such as logit and probit (Ferrier-i-Carbonell and Frijters, 2004; Blanchflower and Oswald, 2004b; MacKerron, 2012).

To account for ordinal comparability in rated happiness, our models are intended to be estimated primarily by ordered probit. However, to address the issue of endogeneity of income in the determination of happiness and interdependence leading to unobserved heterogeneities, we employ a conditional mixed process (CMP) model where the correlation between the error terms of happiness and income is estimated as an auxiliary parameter. The CMP estimator is an alternative, more suitable for multiple equations estimations involving different types of dependent and independent variables (Roodman, 2011), and enabling researchers to jointly estimate the system of reduced and structural equations.

We model simultaneously two equations where the model equations can have different dependent variables.

(1) $H_i = X_i\beta + \alpha T_i + \epsilon_{i1}$; $IG_i = X_i\lambda + \epsilon_{i2}$,

where $H$ denotes the ordinal happiness variable, ranging from 1 (completely unhappy) to 5 (completely happy), and $IG$ denotes income group, ranging from 1 (USD0–USD350) to 5 (USD2,950+). The error terms are assumed to be bivariate normally distributed with zero mean, unit variance, and correlation coefficient $\rho$. $X_i$=($X_{1i}$, $X_{2i}$, ..., $X_{ki}$) is a k×1 vector of covariates, $T$ is the average terror variable, and ($\beta_1$, $\beta_2$, ..., $\beta_k$) and ($\lambda_1$, $\lambda_2$, ..., $\lambda_k$) are parameter vectors to be estimated.

The correlation between the two equations' error terms would capture any interdependence of unobserved components in subjective life satisfaction and income. If the error terms of both equations are affected by similar components, they will not be independent, leading to inconsistent parameter estimates in univariate models. The Wald test, and/or Lagrange Multiplier test, provide evidence on the correlation between unobserved explanatory variables that affect both equations. A conditional maximum likelihood estimation approach, which imposes appropriate restrictions on the correlation structure between the errors of the two equations, can be employed to attain consistent and efficient estimates. Roodman's (2009, 2011) novel mixed-process model deals with the endogeneity problem and obtains efficient estimates. Roodman (2011) proposes a general tool implemented on Stata software and using the CMP algorithm to estimate a limited information maximum likelihood.

## Estimation results

As self-ratings of individual's overall happiness are measured by an ordered categorical variable, existing studies have generally employed single equation standard ordered response models to analyze its determinants. Since these studies consider various forms of subjective wellbeing and income level as independent achievements, or choices, they fail to account for any interdependency there might exist between these variables. But extensive evidence from by cross-sectional and panel survey data studies suggests that higher income is in fact associated with elevated levels of happiness and life satisfaction (Blanchflower and Oswald, 2004a; Diener, Diener, and Diener, 1995; Ferrer-i-Carbonell and Frijters, 2004; Frijters, Haisken-Denew, and Shields, 2004; Kahneman, *et al*., 2006; Stevenson and Wolfers, 2009). And yet, Easterlin's pioneering work shows that a rising individual *absolute* income level alone does not uniformly increase happiness. This Easterlin Paradox effect occurs because an individual`s income in comparison to others' income—the *relative* income level—may not have not changed (Easterlin, 1974; 1995; 2001). Subsequent empirical research agrees that absolute income enhances happiness but that its marginal impact on self-reported happiness decreases when individual income increases. In addition to this direct effect, income also affects happiness through social comparisons with certain reference groups (Clark, Frijters, and Shields, 2008; Dumludag, Gokdemir, and Giray, 2016; Wolbring, Keuschnigg, and Negele, 2013). Thus, only relative income is significant for life satisfaction (Mentzakis and Moro, 2009). These mixed findings pave the way for further research on the income-happiness relation.[10]

Random disturbances affecting subjective wellbeing such as happiness, life satisfaction, and income level may be correlated and, thus, interdependent. Neglecting unobserved heterogeneity will result in personality bias in empirical estimates.[11] Earlier studies reveal that happy people are more likely to have a number of positive psychological traits. Thus, they are more productive and successful in their professions leading to improved workplace outcomes and higher satisfaction levels with their jobs as compared to unhappy people (Boehm and Lyubomirsky, 2008; Judge and Ilies, 2004; Mignonac and Herrbach, 2005). Moreover, individual characteristics have an impact on both happiness and income determination. Individuals who are extravert and resilient are more likely to be happy and to earn more (Boehm and Lyubomirsky, 2008; Lyubomirsky, King, and Diener, 2005). Furthermore, some individuals may need to work in unfavorable conditions, long hours, and spend time away from their homes and loved ones, all of which negatively affect their happiness. In such cases, estimating standard ordered response models would inappropriately constrain the correlation between random disturbances to be equal to zero, implying that any randomness affecting happiness is unrelated to income level. This constraint can be relaxed, however, by jointly estimating equations in the form of a bivariate ordered response model, which contains an extra parameter to account for any correlation across equations similar to a seemingly unrelated regression model.

The empirical results of our conditional mixed process estimation for the two-equation system in equation (1) are presented in Table A3. While the dependent variables are self-rated happiness and income groups, the main explanatory variable is the average terror index of each province for the 2010–2013 period.[12] Additionally, a provincial level variable—to control for ethnicity (the percentage of the Kurdish population in each province)—is included in the empirical models. The remaining explanatory variables come from the Life Satisfaction Survey (LSS) and include gender, age, education level, household income, perceived relative income, marital status, health indicator, work status, and immigration

status. The CMP estimation results reveal that the correlation coefficient between disturbances of the two equations (atanhrho) is statistically significant. This indicates that single equation ordered probit estimates fail to capture the association of happiness and income level. The statistically significant positive value of the correlation coefficient (atanhrho) that we find instead suggests that there are some unobserved factors that positively impact happiness and income variables.

The estimation results for the happiness equation, presented in Table A3, indicate that terror has a statistically significant negative impact on happiness, and thus supports earlier evidence (Frey, Luechinger, and Stutzer, 2007; Vorsina, *et al*., 2017). The existing literature suggests that ethnic diversity is associated with life satisfaction (Barger, Donoho, and Wayment, 2009; Algan, Hemet, and Laitin, 2016). Since terror in Turkey is generally concentrated in its southeastern provinces where a high number of Kurds live, the explanatory variables also include an ethnicity variable which is the percentage of Kurdish population in each province as calculated by Mutlu (1996). The results reveal that having a high percentage of Kurdish population in a province hinders happiness. However, its negative impact vanishes when regional fixed effects are introduced into the model (Model II). The great majority of existing research reports a positive association between *absolute* income and happiness or subjective wellbeing, although its impact is smaller as when compared to variables such as marriage and unemployment (Ferrer-i-Carbonell, 2013). Yet, the evidence regarding the relation between happiness and *relative* income is mixed (Verme, 2018). A strand of the literature using panel data for developed countries reports a negative relation between self-reported happiness and income of a reference group (Helliwell, 2003; Stutzer, 2004; Vendrik and Woltjer, 2007). However, a positive association between perceived income and happiness is reported for a number of less developed countries (Dumludag, Gokdemir, and Giray, 2016; Knight, Song, and Gunatilaka, 2007; Knight, Shi, and Song, 2006; Stutzer, 2004). Results presented in Table A3 reveal that the level of perceived relative income has a positive impact on self-reported happiness in Turkey. Individuals are happier when their income is higher than the income of the reference group. This result is consistent with previous findings for Turkey reported by Dumludag, Gokdemir, and Giray (2016).

According to the findings presented in Table A3, the education variables are not statistically significant for happiness levels. Previous studies report mixed results for the relationship between education level and life satisfaction. While Dumludag (2013) and Kangal (2013) find a positive education effect, Selim (2008) reports that education is not a statistically significant determinant of happiness. Recently, Dumludag, Gokdemir, and Giray (2016) provide empirical evidence for a U-shaped relationship between education and happiness. The endogeneity of income could be one of the reasons for the mixed empirical findings with respect to the education variable. Even though education may have an impact on happiness, it is not a direct effect. Rather, education fosters happiness indirectly through its positive effects on income levels. Estimation results from the CMP model of the income equation, given in Table A3, suggest that higher levels of education lead to an increase in income which then enhances individuals' happiness. This could be due to the fact that enhancing human capital enables people to get better jobs with higher earnings.

With respect to socio-demographic variables, our results indicate that self-reported happiness follows a U-shape over age, which is consistent with the literature (Blanchflower and Oswald, 2008; Cheng, Powdthavee, and Oswald, 2015; van Landeghem, 2012; Stone, *et al*., 2010). For Turkey, the literature either reports a negative (Ekici and Koydemir, 2014; Selim, 2008) or a U-shaped (Caner, 2014; Dumludag, Gokdemir, and Giray, 2016) impact of age on happiness. Our study here indicates that happiness falls with age and reaches a minimum at age 51, which is very close to the age 55 marker reported in the literature and then rises again (Blanchflower and Oswald, 2004a; Frijters and Beatton, 2012). Gender differences in happiness exist and our estimation results imply that females are happier than males, also consistent with previous evidence (Caner, 2014; Cordero, Salinas-Jimenez, and Salinas-Jimenez, 2017; Ekici and Koydemir, 2014; Selim, 2008). Being married enhances the likelihood of being happy, again supporting earlier findings (Dumludag, Gokdemir, and Giray, 2016; Ekici and Koydemir, 2014; Mentzakis and Moro, 2009; Stutzer and Frey, 2006). Stack and Eshleman (1998) suggest three intermediating processes by which marriage or cohabitation may positively impact happiness: Marriage may enhance financial resources, stimulate better physical health, and/or yield greater emotional support. Stutzer and Frey (2006), however, claim that happier people are more likely to get married, and hence there is a bidirectional relationship between them.

Considering work status, being unemployed or disabled hinders happiness. However, retirees and homemakers are more likely to be happy when compared to employed individuals. Employment is generally considered to provide basic financial resources, social contacts, social status, and identity within society's institutions and networks (van der Meer, 2014; Warr, 1982). Thus, unemployment is expected to be negatively related to happiness, a proposition empirically

supported by longitudinal and by cross-sectional research (Ferrer-i-Carbonell and Frijters, 2004; Stam, *et al*., 2016; Winkelmann and Winkelmann, 1998).When unemployed, an individual loses both financial and social benefits. Winkelmann and Winkelmann (1998) argue that the nonpecuniary costs of unemployment are greater than the pecuniary costs resulting from loss of income. On the one hand, loss of financial resources during unemployment may inhibit people from planning their future and fulfilling various psychological needs, and it may even lead to poverty (Shields and Price, 2005). Loss of nonpecuniary benefits, on the other hand, may lead to social exclusion. Losing nonpecuniary benefits may help explain happiness levels of individuals who belong to another work or employment status, such as retirees, homemakers, disabled people, and students (Stam, *et al*., 2016).[13] An ability to compensate for a lack of nonpecuniary benefits determines the degree of wellbeing. Hence, homemakers are expected to follow employed people in terms of happiness as the family sphere may sufficiently compensate them for any lost work-related nonpecuniary benefits. Students also have a social environment and they can create identities and activities that compensate for any lost benefits (Calvo, Mair, and Sarkisian, 2015). Similarly, retirees may likewise benefit from a family environment, which makes up for any lost benefits of employment. In contrast, the unemployed and disabled may have some difficulties compensating for the lack of nonpecuniary benefits through other activities (Stam, *et al*., 2016; Strandh, *et al*., 2013). Our own results provided in Table A3 are in line with the existing literature, except for students. Being a student hinders happiness in Turkey.

Accumulated evidence indicates that the better an individual's physical and psychological health, the happier (s)he is on average.[14] Bloom and Canning (2000) argue for a two-way causality between health and income. Healthy people tend to be more productive and are more likely to invest in human capital, hence they are more educated. Additionally, since they are more likely to live longer they also tend to invest in physical capital. Accordingly, any improvement in health status elevates happiness. Moreover, chronic diseases and specific conditions such as heart attacks and strokes reduce life satisfaction (Dolan, Peasgood, and White, 2008). Our findings are in line with this literature that being unhealthy in the previous year reduces happiness (Dumludag, 2013; Peiro, 2006; Selim, 2008; Stam, *et al*., 2016).

Considering only economic motives for migration, one may assume that life in wealthier countries/provinces bring more happiness and prosperity. However, the bulk of the evidence in the literature generally suggests that migrants are less happy than natives in destination countries even though there has been a rise in their income levels (Baltatescu, 2007; Bartram, 2013; Knight and Gunatilaka, 2010; Koczan, 2016). Several factors may contribute to this finding such as underemployment, discrimination, extended separation from close family, and isolation (Bartram, 2013). Similar findings are reported in research on internal migration for China (Knight and Gunatilaka, 2010), Thailand (Jong, Chamratrithirong, and Tran, 2002), for Germany (Nakazato, Schimmack, and Oishi, 2011), and Britain (Nowok, *et al*., 2013). Our findings suggest that immigrants are *more likely* to be happy as compared to natives in Turkey, supporting the findings of Melzer (2011) and Switek (2016), even though there appears to be decline in their household income. Melzer (2011) finds that migrants, moving from East to West Germany, have improved their life satisfaction levels. Switek (2016), however, states that migration's impact on happiness depends on the reason for moving, and only individuals who migrated for better employment opportunities experience an increase in life satisfaction which lasts 6 to 10 years after their move. The latter two papers study fairly homogenous groups of migrants, and that could be the case for Turkey as well. Our finding that internal migration reduces income is in line with Tunali (2000) who reports that nearly 75 percent of migrants in Turkey realize net negative monetary returns over the period 1963–1973.

Regarding the remaining variables for the income level equations in models I and II, it appears that as the percentages of females, disabled, and students in the household increases, there is a decline in household income level. However, an increase in the percentage of income earners leads to a rise in household income level. Additionally, Model II in Table A3 controls for regional differences in social and economic conditions not accounted for by the other variables. There are 12 NUTS (the Nomenclature of Territorial Units for Statistics) Level-1 regions in Turkey. The reference region in the analysis is Istanbul. Although coefficients are not reported to conserve space, all regional dummy variables are negative and statistically significant indicating that compared to Istanbul all other regions have lower self-reported happiness levels. The coefficients of all control variables which are significant in Model I remain statistically significant and are quite similar is size. However, the size of the negative impact of terror on self-reported happiness is elevated when regional differences are taken into account.

## Conclusion

Terrorism can be classified as a subset of human-caused disasters (Colletta, 2004; Goldfrank, Panzer, and Butler, 2003) which in addition to causing material damage, can have a

particularly devastating impact on psychological functioning. Goldfrank, Panzer, and Butler (2003) state that terrorism may have a greater impact than other disasters on distress responses, behavioral change, and psychiatric illness due to the unique characteristics of terror events. Previous evidence suggests that terror has economic, psychological, and social consequences. While the economic costs have been well-documented, evidence for any welfare costs is limited. This study thus investigates the impact of terror on self-reported happiness for Turkey, which has been suffering from terror acts for almost fifty years. Acts of terror have been localized in the southeastern provinces and in major cities, and their frequency and severity has been increasing in recent years. In addition to claiming many lives and damaging property, terror spreads fear, uncertainty, anxiety, and anger, which collectively lead to changes in daily activities of people because of the unpredictability of such attacks. Understanding the extend of any welfare impacts of terror is important and may shape efforts to develop intervention strategies to lessen adverse psychological effects.

Employing a unique dataset which combines micro-data at the individual level and macro-data at the provincial level for Turkey, this article makes two major contributions to the literature. First, it analyzes the impact of terror on self-reported happiness in Turkey. Second, it contributes to the happiness literature by jointly estimating self-reported happiness and income group variables, taking the potential endogeneity of the latter into account. For this purpose, it employs a conditional mixed process (CMP) estimation method, where the correlation between the error terms of happiness and income models is estimated as an auxiliary parameter.

The empirical findings suggest that terror diminishes self-reported happiness, supporting earlier findings (Frey, Luechinger, and Stutzer, 2007; Romanov, Zussman, and Zussman, 2012; Vorsina, *et al*., 2017; Bryson and MacKerron, 2018). Furthermore, our results indicate that there is a U-shaped relationship between age and self-reported happiness, while marriage, being female, and being healthy enhance self-reported happiness levels. The estimation also suggests that education fosters happiness indirectly through its positive effects on income level. Regarding work status, unemployed or disabled people are less happy compared to employed respondents. While migration elevates happiness, this is achieved at the expense of a lower household income. Regarding the determinants of income level, it appears that as the percentage of females, disabled, and students in the household increases, there is a decline in household income level. However, an increase in the percentage of income earners in the household leads to a rise in income level. Finally, the results reveal that the correlation coefficient between disturbances of the income and happiness equations is statistically significant and positive. This implies that any increase in income level enhances self-reported happiness. In addition to absolute levels of household income, perceived relative income level is also positively related to self-reported happiness of Turkish individuals. Individuals who live in provinces which a higher percentage of Kurds report lower happiness. Moreover, the negative impact of terror on happiness is accentuated when regional variation is considered by including regional indicators.

In all, this study reveals that the cost of terror includes both tangible and intangible costs. The findings suggest that the welfare cost to society is underestimated if one considers only the traditional economic cost of terror.

## Notes

1. Transaction costs: Frey, Luechinger, and Stutzer, 2007. Decrease in tourism revenues: Blunk, Clark, and McGibany, 2006; Brian, 2003; Sloboda, 2003; Drakos and Kutan, 2003; Enders, Sandler, and Parise, 1992; Yechiam, *et al*., 2005. Decrease in savings: Fielding (2003). Decrease in the number of firms and employment: Greenbaum, Dugan, and Lafree, 2006. Decrease in foreign direct investment: Fielding, 2004. Financial markets: Chesney, Reshetar, and Karaman, 2011; Aslam, *et al*., 2018; Kollias, Papadamou, and Arvanitis, 2013). Transitory returns and volatility: Kollias, Papadamou, and Stagiannis, 2011. Counter-terrorism activities: Eckstein and Tsiddon, 2004. Intangible costs: Schuster, *et al*., 2001; Vorsina, *et al*., 2017.

2. Southeastern region: Ocal and Yildirim (2010); Yildirim and Ocal (2013). Israel: Shalev, *et al*. (2006).

3. Prior research: Araz-Takay, Arin, and Omay (2009); Ocal and Yildirim (2010). Life Satisfaction Survey: TurkStat (2013). Events data: Global Terrorism Database (2016).

4. Definition of terror: Enders and Sandler (1993, 2000). Until recently: Drakos and Kutan (2003).

5. Root causes: Feridun and Sezgin (2008); Yildirim and Ocal (2013). Peace process: Unal (2016).

6. 6$^{th}$-most visited: UNWTO (2018). Adverse effect on tourist revenue: Tosun, Timothy, and Ozturk (2003). Another strand: Drakos and Kutan (2003); Yaya (2009). Long-lasting: Enders and Sandler (1991); Enders, Sandler, and Parise (1992). 10 months later: Yaya (2009).

7. PTSD and depression common: Schuster, *et al*. (2001); Schiff (2006); Canetti-Nisim, *et al*. (2009). Social welfare reduction: Frey, Luechinger, and Stutzer (2007).

8. Determinants of life satisfaction in Turkey: Dumludag (2013); Dumludag, Gokdemir, and Giray (2016); Ekici and Koydemir (2014); Selim (2008).

9. For brief accounts of terror events in Turkey, see Ocal and Yildirim (2010); Yildirim and Ocal (2013).

10. See Frey and Stutzer (2002) for a detailed literature review on economics and happiness research.

11. See Powdthavee (2010) for a review.

12. Alternative specifications for the terror variable have been considered. We estimated models using the terror index for 2013 to examine the current effects. Models using of terror index only for 2013 provide similar results. The estimation results also remained robust when alternative definitions of the terror variable were used.

13. See Stam, *et al*. (2016) and Calvo, Mair, and Sarkisian (2015) for a detailed discussion on how work status and subjective wellbeing are associated.

14. See Frey and Stutzer (2002) for a review.

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**Table A1: Data, data sources, and variable definitions**

| *Variable* | *Definition* |
|---|---|
| | **Provincial level variables** |
| Terror index | Yearly terror indices (2010–2013) are constructed by principal component analysis and include four variables: Number of terror events, number of fatalities, number of injuries, and presence of property damage, by province by year. The empirical model uses the 4-year arithmetic average of the indices. |
| Number of events | Total number of terror events by province by year. |
| Number of fatalities | Total number of confirmed victims and attackers who died as a direct result of the event. |
| Number of injuries | Total number of confirmed nonfatal injuries to both perpetrators and victims. |
| Property damage | 1 = The event led to property damage. 0 = The event did not lead to property damage. |
| Ethnicity | Percentage of Kurdish population by province. |
| | **Individual level variables** |
| Happiness | Self-reported. Ranges from 1="completely happy" to 5="completely unhappy". |
| Female | 1=Female; 0=Male. |
| Age | Age of the individual. |
| Education | No schooling (reference group)<br>Primary education<br>High school<br>University and other higher education |
| Work status | Working or temporarily laid-off (Reference group=employed)<br>Unemployed<br>Retired<br>Permanently disabled<br>Keeping house<br>Student |
| Married | 1=Married; 0=Otherwise. |
| Immigrant | 1=Person migrated in the previous year; 0=Otherwise. |
| Health | 1=Serious health problem in the previous year; 0=Otherwise. |
| Perceived income | Income ladder with ranges from 1 (lowest) to 10 (highest). |
| | **Household level variables** |
| Income group | Group 1: < USD1,000<br>Group 2: USD1,001 – USD1,435<br>Group 3: USD1,436 – USD2,000<br>Group 4: USD2,001 – USD2,950<br>Group 5: > USD2,950 |
| Percentage of females in the household | |
| Percentage of disabled persons in the household | |
| Percentage of students in the household | |
| Percentage of income earners in the household | |

*Sources*: GTD (2016); TurkStat (2013).

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**Table A2: Frequency distributions for levels of happiness (in percent)**

| *Variable* | *Happy* | *Neither happy nor unhappy* | *Unhappy* |
|---|---|---|---|
| **Total** | 60.3 | 28.8 | 10.9 |
| Male | 58.0 | 30.4 | 11.6 |
| Female | 62.1 | 27.6 | 10.3 |
| **Age group** | | | |
| 18–24 | 55.1 | 26.8 | 8.1 |
| 25–34 | 60.3 | 30.9 | 8.8 |
| 35–44 | 55.1 | 33.8 | 11.1 |
| 45–54 | 54.5 | 33.2 | 12.4 |
| 55–64 | 58.2 | 28.9 | 13.0 |
| 65+ | 63.4 | 23.6 | 13.0 |
| **Education** | | | |
| < primary school | 59.8 | 24.4 | 15.8 |
| Primary school | 57.3 | 31.9 | 10.9 |
| Secondary school | 58.4 | 31.9 | 9.7 |
| High school or equivalent | 59.8 | 31.2 | 9.0 |
| University or higher | 62.5 | 29.5 | 8.0 |
| **Marital status** | | | |
| Married | 62.5 | 28.0 | 9.5 |
| Not married | 53.5 | 31.3 | 15.3 |
| **Working status** | | | |
| Working or temporary lay-off | 59.5 | 31.2 | 9.4 |
| Unemployed | 42.1 | 33.8 | 24.1 |
| Retired | 61.7 | 28.1 | 10.2 |
| Permanently disabled | 44.2 | 28.8 | 27.0 |
| Keeping house | 64.0 | 26.5 | 9.5 |
| Student | 51.0 | 33.2 | 15.7 |
| Unhealthy | 51.3 | 29.9 | 18.8 |
| **Income groups** | | | |
| < USD1,000 | 56.4 | 28.8 | 14.8 |
| USD1,001 – USD1,435 | 61.4 | 29.4 | 9.2 |
| USD1,436 – USD2,000 | 61.7 | 30.0 | 8.3 |
| USD2,001 – USD2,950 | 64.6 | 28.9 | 6.5 |
| > USD2, 950 | 69.7 | 25.3 | 5.0 |

*Source*: TurkStat (2013).

**Table A3: CMP estimation results**

| *Variable* | *Model I* | | *Model II* | |
|---|---|---|---|---|
| | *Happiness* | *Income level* | *Happiness* | *Income level* |
| Terror index | –0.00847*** | | –0.0093*** | |
| | (0.0028) | | (0.0045) | |
| Female | 0.0483*** | | 0.0481*** | |
| | (0.0102) | | (0.0103) | |
| Age | –0.0466*** | 0.0056*** | –0.0466*** | 0.0449*** |
| | (0.0011) | (0.0098) | (0.0011) | (0.00098) |
| Age squared | 0.00045*** | –0.00049*** | 0.00045*** | –0.00049*** |
| | (0.00001) | (0.0001) | (0.00001) | (0.00001) |
| Primary school | –0.0031 | 0.424*** | –0.0065 | 0.382*** |
| | (0.0083) | (0.0079) | (0.0084) | (0.0081) |
| High school | –0.0112 | 1.122*** | –0.014 | 1.082*** |
| | (0.0118) | (0.0095) | (0.0118) | (0.0096) |
| University/higher ed. | –0.00052 | 1.973*** | –0.0054 | 1.934*** |
| | (0.0198) | (0.0126) | (0.0198) | (0.0128) |
| Perceived relative income | 0.128*** | | 0.128*** | |
| | (0.0018) | | (0.0018) | |
| Married | 0.320*** | | 0.322*** | |
| | (0.0085) | | (0.0085) | |
| Unhealthy | –0.237*** | | –0.237*** | |
| | (0.0078) | | (0.0078) | |
| Unemployed | –0.336*** | | –0.337*** | |
| | (0.0154) | | (0.0015) | |
| Retired | 0.0401*** | | 0.0369*** | |
| | (0.0133) | | (0.0133) | |
| Student | –0.0809*** | | –0.0836*** | |
| | (0.0227) | | (0.0228) | |
| House keeping | 0.055*** | | 0.0545*** | |
| | (0.0122) | | (0.0122) | |
| Disabled | –0.229*** | | –0.226*** | |
| | (0.0209) | | (0.0209) | |
| Ethnicity | –0.00054*** | | 0.00022 | |
| | (0.00016) | | (0.00025) | |
| Immigrant | 0.0889*** | –0.0397*** | 0.0854*** | –0.033** |
| | (0.0206) | (0.0153) | (0.0206) | (0.0156) |
| % disabled in household | | –1.408** | | –1.380*** |
| | | (0.0397) | | (0.0398) |
| % students in household | | –0.173*** | | –0.174*** |
| | | (0.0281) | | (0.0281) |
| % income earners in household | | 1.365*** | | 1.316*** |
| | | (0.0125) | | (0.00127) |
| % females in household | | –0.744*** | | –0.766*** |
| | | (0.0152) | | (0.0153) |
| atanhrho | 0.0779*** | | 0.0753*** | |
| | (0.0036) | | (0.0036) | |
| Regional dummies | No | | Yes | |
| Wald chi-squared | $\chi2(17)=11,873.24$*** | | $\chi2(27)=12,303.59$*** | |
| Obs N | 196,203 | | 196,203 | |

*Notes*: Robust standard errors in parentheses; ***p<0.01; **p<0.05; *p<0.10.
*Sources*: TurkStat (2013); GTD (2016).