Rockets: The Housing Market Effects of a Credible Terrorist Threat*

Yael Elster
Hebrew University

Asaf Zussman†
Hebrew University

Noam Zussman
Bank of Israel

November 1, 2015

Abstract

This paper explores the economic costs of conflict using a unique experiment. We analyze the effects of Hezbollah's massive surprise rocket attack against northern Israel during the 2006 Second Lebanon War and the continued threat posed by the organization's expanding rocket arsenal on the housing market, the labor market and patterns of migration flows and sorting. Relying on hedonic and repeat sales approaches and using a difference-in-differences identification strategy for 2000-2012, we show that the attack led to a 6-7 percent decline in house prices and rents in the most severely hit localities relative to other localities in northern Israel. These effects persisted until 2012, suggesting that the

*We thank the editor, Daniele Paserman, three anonymous referees, John Cotter and audiences at the Bank of Israel, Bar Ilan University, Ben Gurion University, ETH Zurich, Hebrew University, I-CORE, IDC Herzliya, Israel Democracy Institute, the Israeli Economic Association Meeting, the Israeli Real Estate and Urban Economics Symposium, and Tel Aviv University for valuable comments. We are grateful to Adi Ben-Nun from the GIS lab at the Hebrew University and to Yafit Alfandari, Mark Feldman and Doron Sayag from the Israeli Central Bureau of Statistics for their help with the data, to Neelie Ben-Tovim for research assistance and to the I-Core Program of the Planning and Budgeting Committee at the Israel Science Foundation (grant no. 1821/12) for financial support. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Bank of Israel.

†Corresponding author. E-mail: asaf.zussman@mail.huji.ac.il.

public continued to view the rocket threat as credible. In contrast, we find practically no effect on labor market conditions, migration flows and sorting. The results are consistent with a standard spatial equilibrium model.

JEL classification codes: F52, R21, R23, R31.
Keywords: Housing Market, Spatial Equilibrium, Terrorism, Israel.

1 Introduction

During the 2006 Second Lebanon War, Hezbollah, a Lebanese terrorist organization, carried out a massive attack on northern Israel, firing almost 4,000 rockets on dozens of civilian and military targets. This was by far the most intensive and longest rocket attack against Israel until then. The Hezbollah attack came as a surprise, as the years following the 2000 withdrawal of Israeli troops from southern Lebanon were characterized by almost complete calm. Since the 2006 war Hezbollah has continued to build and improve its rocket arsenal and repeatedly threatened that it will carry out additional attacks on Israel. It is estimated that today Hezbollah has more than 100,000 rockets, an order of magnitude more than it had before the war.

Israel was not standing idly by as the Hezbollah threat developed. It has invested substantial resources in developing offensive and defensive measures aimed at eliminating the rocket threat emanating from Hezbollah as well as from other terrorist organizations (mainly operating in the Gaza strip), Arab countries and Iran.

In this paper we examine the economic effects of the war and the continued rocket threat posed by Hezbollah. In the context of a standard spatial equilibrium model, the threat of rocket attacks can be viewed as a disamenity; an increase in the perceived threat would lead to a decline in house prices and rents and could also affect labor market conditions and migration patterns.

To carry out the investigation we merge confidential data on the location of rocket hits during the Second Lebanon War with comprehensive and detailed housing market, labor market and population data for northern Israel in 2000-2012. Identification of causal effects relies on the surprising nature of the attack and on the spatial variation in rocket hits. Our difference-in-differences approach compares pre- and post-war outcomes between the most severely hit localities and others in northern Israel.[1] It is important to bear in mind that the rocket threat should have a general equilibrium effect: when

[1] An alternative approach could have been to compare outcomes between localities in northern Israel and localities in other parts of the country. However, analysis reveals that before the war, price dynamics were completely different in the two regions.

a particular locality or region becomes riskier, others become relatively safe. This is especially true in a small country like Israel. Thus our analyses capture a relative rather than an absolute treatment effect.

Using hedonic and repeat sales approaches, we find that house prices in the most severely hit localities started to decline relative to the other localities in the north immediately after the war. The cumulative decline in house prices reached a peak of about 7% in the first quarter of 2008, i.e. about a year and a half after the war, and remained at this approximate level until the end of 2012. Rent dynamics were similar: the cumulative relative decline in rents was about 5% by the first quarter of 2008 and roughly 7% from 2010 through 2012. Additional analysis suggests that the price declines were driven by a drop in demand rather than by an increase in supply. In contrast to the results for the housing market, we find that the war had practically no effect on labor force participation, unemployment, and wages as well as on migration flows and sorting (based on willingness to pay to avoid the risk associated with the rocket threat).

We interpret the results in terms of a standard spatial equilibrium model presented by Gyourko, Kahn, and Tracy (1999), which follows the tradition of Rosen (1979) and Roback (1982). The model has utility maximizing individuals and profit maximizing firms; rents and wages are determined in equilibrium given amenities. Assuming free mobility and perfect competition, utility is equal across locations and profits are zero. A comparative statics analysis predicts that a decline in amenities in a particular location would be followed by a decrease in equilibrium rents. In contrast, the effect on equilibrium wages and on migration flows is indeterminate.

We argue that before the war the Israeli public was not aware of the severity and the credibility of the rocket threat posed by Hezbollah. The war revealed the organization's significant capabilities and willingness to attack. It also revealed that some areas in northern Israel face greater risk than others (e.g. because they host major military bases and key infrastructure facilities). The elevated risk perceptions made the affected areas less attractive and generated a decline in relative demand for housing in the most severely hit localities.

The fact that there was no effect on the labor market and on migration flows is consistent with the spatial model discussed above and implies that housing market prices fully absorbed the disamenity shock associated with the Second Lebanon war.

The persistence of the effects until 2012 implies that since the war the Israeli public continued to view the rocket threat as credible and was skeptical about the government's ability to eliminate it. This is consistent with several facts. First, in the post-war period Hezbollah has dramatically increased and improved its rocket arsenal and continued to threaten Israel. Second, since 2006 Israel was subjected to several major rocket attacks from the Gaza Strip, demonstrating Israel's limited ability to prevent such attacks. Third, the relevant defensive anti-rocket systems developed by Israel were still in their infancy during the period analyzed here.[2]

Our paper builds on and contributes to two lines of research in the literature. The first analyzes the capitalization of amenities and disamenities into house prices. The second examines the effects of conflict on asset markets.

A vast literature investigates the impact of various amenities and disamenities on house prices. These include, for example, neighborhood school quality (Black, 1999; Figlio and Lucas, 2004), access to transportation (Baum-Snow and Kahn, 2000; Gibbons and Machin, 2005), environmental quality (Greenstone and Gallagher, 2008; Currie et al., 2015), foreclosures (Campbell, Giglio, and Pathak ,2011), crime (Linden and Rockoff, 2008; Ajzenman, Galiani, and Seira, 2014), and racial and ethnic tensions (Collins and Margo, 2007; Gautier, Siegmann, and Van Vuuren, 2009).

In general, it is difficult to compare the results of the studies mentioned above to ours since each study relies on a different methodology and on a different type of shock. The study most comparable to ours is Gautier, Siegmann, and Van Vuuren (2009), who examine the effect of Theo van Gogh's murder by an Islamic terrorist in Amsterdam in 2004 on listed house prices in the city. The paper uses a difference-in-differences hedonic approach to

[2]The first successful interception of rocket fire (from the Gaza Strip) by the *Iron Dome* system took place at the very end of the period under investigation (see below for details).

show that prices decreased by three percent within ten months of the event in neighborhoods where more than a quarter of the population belongs to an ethnic minority from a Muslim country relative to other neighborhoods in the city.

Numerous studies have documented that various forms of conflict affect prices of financial assets. Examples include the impact of war (Willard, Guinnane and Rosen, 1996; Guidolin and La Ferrara 2007) and of terrorism (Abadie and Gardeazabal, 2003). Within the last category, several papers have focused on the Israeli-Palestinian conflict (Eldor and Melnick, 2004 and 2010; Zussman and Zussman, 2006; Zussman, Zussman and Nielsen, 2008; Berrebi and Klor, 2010).[3]

At the intersection of these two lines of research, a number of studies examine how terrorism affects the housing market.[4] Abadie and Dermisi (2008) show that following the 9/11 terrorist attacks office vacancy rates increased at the three main landmark buildings in downtown Chicago relative to nearby buildings. Besley and Mueller (2012) examine the effect of political violence on house price indices in Northern Ireland by exploiting variation across regions and over time in violence intensity. The study shows that violence depressed house prices and, conversely, that the prospects of peace led to house price appreciation.

In the Israeli context, two studies estimated the effect of Palestinian bombing and shooting terrorist attacks during the Second Intifada of the early 2000s on the Jerusalem housing market. Exploiting variation across neighborhoods in the intensity of violence, Hazam and Felsenstein (2007) show that terrorism had a stronger negative effect on rents than on purchase prices. Arbel et al. (2010) focus on the Gilo neighborhood in southern Jerusalem, which suffered from sporadic gunfire from a neighboring Palestinian locality, Beit Jala (near

[3]The reaction of asset markets to terrorism may be viewed as excessive given the low-probability nature of the threat. Becker and Rubinstein (2011) present a model that helps to account for over-reaction to acts of terrorism and test it using Israeli data.

[4]A related literature explores the long-term effects of conflict on urban and regional development. Examples include Davis and Weinstein (2002), Berkman, Garretsen, and Schramm (2004), and Miguel and Roland (2011). In the Israeli context, see Glaeser and Shapiro (2002).

Bethlehem). Results indicate that the shooting depressed house prices in Gilo, and especially in "frontline" streets facing Beit Jala.

Nevo (Ben-Or) and Shechter (1999) compare list prices for properties in three cities in northern Israel which were differentially exposed to rocket fire from Lebanon in the 1990s (discussed below). In late 1997-early 1998 the authors collected data from newspaper ads and follow-up phone calls on 200 properties. The paper shows that list prices were about 7% lower in the most exposed city than in the least exposed one. Given the cross-sectional nature of their analysis, however, the results cannot be interpreted as causal.

In contrast to most of the papers mentioned above, our paper casts a wider net by exploring how a disamenity shock effects not only the housing market but also labor market outcomes as well as patterns of migration and sorting. Moreover, several features of the study facilitate credible identification of causal effects – the exogenous nature of the shock and its magnitude, the spatial variation in treatment intensity, and the quality of the data. By offering these advantages, we believe that our study makes a significant contribution to the literature.

The rest of the paper is organized as follows. Section 2 provides a background on the rocket threat and the Second Lebanon War. In Section 3 we describe the data sources. The effects of the rocket threat on the housing market are presented in Section 4; the effects on the labor market, migration flows and sorting are presented in Section 5. Section 6 discusses the results and concludes.

2 The Rocket Threat

The rocket threat facing Israel has a long history.[5] For the last half century Israel's enemies, both countries and terrorist organizations, have acquired and used rockets as a means to counter Israeli military superiority. To aid the discussion below, Figure 1 shows a map of Israel.

[5] We use the terms "rocket" and "missile" interchangeably. While missiles have a guidance system, rockets do not. In both cases we refer solely to surface-to-surface projectiles.

In the early 1960s, Egypt developed rocket technology with the aid of German scientists, a project that was derailed by Israeli intelligence. During the 1973 Yom Kippur War, Soviet forces stationed in Egypt fired Scud missiles at frontline Israeli forces and the Syrian army fired Frog missiles at a major air force base in northern Israel.

During the 1991 Gulf War, Iraq fired 39 Scud missiles at Israeli cities, marking the first major missile attack by an Arab country against Israeli civilian population. While the attack caused only two fatalities and minor property damage, it created widespread anxiety and led to population exodus from the Tel Aviv metropolitan area (which suffered a large share of the hits).

Since the Gulf War the rocket threat posed by Arab countries (and Iran) has increased in terms of the number of rockets and their range, accuracy and payload. Moreover, the threat was magnified by the concern that Israel's enemies would arm their missiles with non-conventional (chemical, biological, and nuclear) warheads.

All along, terrorist organizations contributed to the growing rocket threat facing Israel. From the late 1960s and until the early 1980s, the Palestinian Liberation Organization sporadically launched rockets from southern Lebanon into northern Israel. This eventually led to an Israeli invasion of Lebanon in 1982 (the First Lebanon War). Israeli forces stayed in the country for the next 18 years, in part because decision makers were concerned that withdrawal would lead to the renewal of rocket fire. One of the consequences of the Israeli invasion was the establishment of Hezbollah (discussed below).

Since the turn of the millennium, an additional terrorist rocket threat emerged along Israel's southern border. Following the outbreak of the Second Intifada (uprising) in late 2000, Palestinian terrorist organizations started to fire primitive self-made rockets from the Israeli-occupied Gaza Strip. This threat increased after the Israeli pullout from the Gaza Strip in 2005 and led Israel to initiate three large-scale military operations: "Cast Lead" (December 2008 – January 2009), "Pillar of Defense" (November 2012) and "Protective Edge" (July-August 2014). During all three operations, the Palestinians were able to fire a large number of rockets (with increasing range and payload)

despite the efforts of the Israeli military.[6]

2.1 The Hezbollah Rocket Threat

Hezbollah was founded by Shia clerics in the early 1980s with the primary aim of resisting Israel's occupation of southern Lebanon. Over the years the organization gained in popularity and is today one of the strongest political and military forces operating in Lebanon. In the 1980s and 1990s it carried out guerrilla operations against Israeli troops stationed in Lebanon and their Lebanese allies. The organization first fired rockets against border localities in northern Israel in 1992, in response to the Israeli assassination of its leader. Hezbollah carried out several additional relatively minor rocket attacks on border localities in the following years. These attacks ceased after Israel pulled out of Lebanon in 2000. Over the years Hezbollah, aided by its sponsors, Iran and Syria, acquired a large and sophisticated rocket arsenal. On the eve of the Second Lebanon War in 2006 Hezbollah had roughly 14,000 rockets.

2.1.1 The Second Lebanon War and its Aftermath

The Second Lebanon War started in July 12, 2006 with a Hezbollah cross-border kidnapping operation against an Israeli military patrol. Israel immediately responded with great force to the provocation. During the war, which ended with a cease-fire agreement in August 14, 2006, large scale Israeli forces operated in Lebanon in an attempt to destroy Hezbollah's rocket arsenal, command and control infrastructure, and military posts. Despite this effort, throughout the war and even on its last days, Hezbollah managed to continue firing rockets. All in all, the organization fired almost 4,000 rockets against civilian and military targets in northern Israel, up to 75km from the Israel-Lebanon border. We discuss and analyze the pattern of rocket hits in detail below. The war resulted in 165 Israeli fatalities (44 of them civilians) and more than 1,000 Lebanese fatalities. The severity of Hezbollah's rocket

[6] In recent years a new, and until now relatively minor, threat emerged in the south: Islamist organizations operating on the Egyptian side of the Israel-Egypt border fired rockets into the southern Israeli city of Eilat (see Figure 1).

attack led to a population exodus from localities in northern Israel during the war.

Since the war Hezbollah has not carried out additional rocket attacks against Israel. However, with the help of Syria and Iran it has continued to build and improve its rocket arsenal. It is estimated that today Hezbollah possesses more than 100,000 rockets, making the organization's arsenal one of Israel's major national security threats.[7]

The Second Lebanon War was a turning point in public concern about the threat of rocket attacks. Using *Google Trends*, Figure 2 demonstrates that before the war the public showed little interest in built-in shelters (see next section); the war changed this state of affairs. Interest in the shelters increased substantially in the year following the war and then stabilized, well before the escalation in the south which led to operation "Cast Lead".

2.2 Israeli Response to the Rocket Threat

To counter the rocket threat, Israel has developed a set of defensive and offensive measures. On the defensive side, underground shelters – originally intended to protect the population from aerial bombardment and artillery fire – were built since the 1950s. Following the 1991 Gulf War Iraqi Scud attack, the state mandated that all new apartments will have built-in shelters (rooms made out of fortified concrete). It is estimated that today less than 50% of apartments have built-in shelters.[8]

A second set of defensive measures consists of anti-rocket and anti-missile surface-to-air missile systems. The *Iron Dome* system is the most relevant system as far as the Hezbollah rocket threat is concerned. It is designed to operate against short-range rockets fired from distances of up to 70km. This system became operational in 2011. It was used for the first time during operation "Pillar of Defense" in November 2012. At that time, Israel had

[7] Source: a public speech given by Israel's head of military intelligence in January 2014 at The Institute for National Security Studies (Tel Aviv University).

[8] Built-in shelters offer two advantages relative to underground shelters. First, the population can get into them almost immediately. Second, they are more convenient to stay in for an extended period.

five *Iron Dome* batteries; the number has increased to nine since then. Each battery covers an area of only 150 square km. They are deployed in different parts of the country based on changing military needs.

Israel has also developed offensive measures to counter the rocket threat. These include building intelligence and military (especially air force) capabilities to detect and destroy rockets and launchers. In recent years Israel has invested heavily in efforts to disrupt rocket shipments to terrorist organizations. For example, according to media reports it assassinated in Beirut, Damascus, and Dubai individuals who were in charge of rocket acquisition, development, and operation; it conducted air strikes in Syria and Sudan destroying long range missile systems bound for Hezbollah and Palestinian terrorist organizations operating in the Gaza Strip; the Israeli navy intercepted ships in the Mediterranean Sea and in the Red Sea which carried rockets to these organizations.

3 Data

The paper merges data on rocket hits during the Second Lebanon War with housing market and labor market data as well as information relevant for the analysis of migration flows and sorting.

3.1 Rocket Hits

We obtained confidential data on the universe of rocket hits during the Second Lebanon War from the Home Front Command of the Israeli Defense Forces (IDF). For each hit we have information on locality and date. During the war Hezbollah fired 3,854 rockets.[9] All rockets fell within a distance of 75km from the Israel-Lebanon border; from now on we refer to this area in northern Israel as the "rocket range" (Figure 1). Figure 3 highlights the five localities that suffered from the largest number of hits: Qiryat Shemona (401), Nahariyya

[9] This number includes mortar fire. Our data source does not differentiate between mortars and rockets.

(299), Ma'alot-Tarshiha (226), Zefat (193) and Haifa (128). Together these *Top5* localities account for almost a third of the total number of hits and stand out relative to the more than five hundred other localities within rocket range (Figure 4).

Several factors likely account for the concentration of rocket hits in the *Top5* localities. Qiryat Shemona, Nahariyya and Ma'alot-Tarshiha are relatively populous border localities. Zefat hosts the IDF's Northern Command and is also close to the Israeli Air Force's northern control and command center. Haifa is northern Israel's major city, where several strategic facilities – such as an oil refinery, a large civilian port and a key naval base – are located; during the war Hezbollah's leader, Hassan Nassrallah, specifically mentioned that Haifa is a prime target for the organization's rocket fire.[10]

We next examine more rigorously potential determinants of the spatial variation in the number of hits. Table 1 shows that the number of hits per locality within rocket range is negatively correlated with distance from the Lebanon border and with the locality being Arab[11]; the number is positively correlated with the locality having a large population and hosting a major military base. These patterns illustrate that rockets were not fired at random and therefore may suggest that the public could expect that past targets would become future targets. An additional perspective on the spatial variation in the number of hits is provided in Figure A1 in the Appendix, which illustrates that the natural areas encompassing the *Top5* localities suffered the largest number of hits.[12]

All the analyses we conduct from this point on excludes Arab localities. We do so for two main reasons. First, housing and labor markets in Israel are

[10] For example, on July 16, 2006 Nassrallah said that he is proud that the organization was able to attack the city of Haifa and military command centers in northern Israel. Source: Hezbollah's TV station via *BBC Worldwide Monitoring*.

[11] During the war Nassrallah apologized for the death of several Arab Israelis from Hezbollah's rocket fire.

[12] Natural areas are small geographical regions defined by the Israeli Central Bureau of Statistics (there are 27 different natural areas within rocket range). We note that a similar pattern emerges when we examine the variation in the *per capita* number of hits by natural area.

to a large extent ethnically segregated. Second, the number of housing market transactions in the Arab sector is extremely low (less than one percent of the total in the period analyzed). This may suggest that many transactions in this sector are not mediated through the market and that the reported transactions may not be representative.

3.2 Housing Market

3.2.1 Purchase Transactions

We use administrative data on the universe of household purchases of residential properties. The data were obtained from the Israel Tax Authority (Ministry of Finance) via the Bank of Israel. These data are used by the Israeli Central Bureau of Statistics (CBS) to construct the official Prices of Dwellings Index; transactions that do not meet criteria set by the CBS to construct the index were dropped.[13] For each transacted property we have date, location, price, number of rooms, size (in square meters) and building year.[14] Our analysis focuses on the years 2000-2012; we thus have periods of similar length before and after the 2006 war. In total, 140 thousand transactions within rocket range are available for the hedonic analysis; when using a repeat sales analysis, we rely on a subset of these transactions.[15]

[13] The most important criteria are the following: (1) the number of rooms is between 1.5 and 5.0 (the share of properties outside this range is negligible); (2) the size to rooms ratio is within a certain range; (3) the price to size ratio in a given locality is within a certain range.

[14] Several property characteristics may be associated with an elevated risk of being hit by Hezbollah's rockets. These include north-facing windows and location in the top floors of high-rises. Unfortunately, we do not have reliable information on these characteristics. The dataset also does not contain information on seller and buyer characteristics (other than scrambled identification numbers).

[15] The identification of repeat sales uses a sophisticated algorithm which mainly relies on seller and buyer identification numbers, address, and physical characteristics of the property (e.g. number of rooms).

3.2.2 Rents

Our data on rents come from the CBS Rent Surveys for 2000-2012. The Rent Survey is carried out throughout the year among a representative sample of households which rent from individual property owners.[16] The dataset has a panel structure: the same property may appear multiple times. For each observation we have a unique property identification number, several property characteristics, location, survey date, and monthly rent. The Rent Surveys are used by the CBS in constructing the housing component of the Consumer Price Index. In total, around 24 thousand rent observations are available for the localities within rocket range for 2000-2012.

3.2.3 Construction Starts

We obtained information on the quarterly number of all private construction starts (in housing units terms) per locality-statistical area (sub-neighborhood) from the CBS, which collects it from construction companies and planning committees.

3.3 Labor Market, Migration and Sorting

We use several sources of data to analyze the effects of the war on labor market outcomes as well as on patterns of migration and sorting.

3.3.1 Labor Force and Income Surveys

We use the detailed, restricted-use, versions of the 2000-2011 Labor Force Surveys and Income Surveys conducted by the CBS.[17] Both surveys collect many socio-demographic characteristics of participants (including locality of residence) and cover large representative samples of the Israeli working-age population. The Labor Force Survey has a panel structure: each individual

[16] We note that the commercial rental market is extremely thin and that there is no rent control in the private market.

[17] The survey methodology changed considerably in 2012, making comparison with the earlier surveys difficult.

is interviewed in two consecutive quarters, not interviewed in the next two quarters, and interviewed again in the following two quarters. The Income Survey is based on the last interview of each individual in the Labor Force Survey.

3.3.2 Tax Authority Panel Data on Wage Earners

We rely on an anonymized, restricted-use, administrative dataset on wage earners. The data were constructed by the Israel Tax Authority for the Bank of Israel and are based on employers' mandatory tax filings on behalf of individuals. In the year 2000, the Authority randomly sampled ten percent of all wage earners and followed them since then, augmenting the sample every year to match the increase in the number of wage earners in the population. We use data for 2000-2012. For each individual and year we have several socio-demographic characteristics (including locality of residence) and information about employment status and income.

3.3.3 List of Localities

Lists of localities are produced annually by the CBS, using data from the Israeli Population Registry, and contain (among other things) population size in each locality and its ethnic makeup.

Summary statistics are provided in Table A1 in the Appendix.

4 Effect of the Rocket Threat on the Housing Market

4.1 House Prices

We use a difference-in-differences strategy to identify the effect of the rocket threat on house prices. Our approach builds on the spatial variation in the number of hits during the Second Lebanon war. As we have shown above,

variation in the number of hits per locality is explained by several key variables, such as the locality's distance from the Lebanon border, its population size, and the existence of major military bases within its confines. This suggests that, based on past experience, the public could roughly estimate which localities are more likely to be targeted by Hezbollah in a future confrontation.

Our difference-in-differences identification strategy therefore compares price dynamics before and after the war between "high-dosage" and "low-dosage" localities within rocket range, where the dosage category is determined by the number of rocket hits per locality. In particular, we estimate the following hedonic equation:

$$\ln(p_{ilt}) = \alpha + \boldsymbol{\beta}'\mathbf{x}_i + \delta_l + \theta_t + \gamma Treatment_l * \theta_t + \varepsilon_{ilt}, \tag{1}$$

where p is the price of property i in locality-statistical area l sold on date t; $\mathbf{x}$ is a vector of property characteristics: number of rooms (in groups: 1.5-2, 2.5-3, 3.5-4, 4.5-5), log area (in square meters) and log age; δ is a locality-statistical area fixed-effect; θ is a year fixed-effect; and ε_{ilt} is a well-behaved error term clustered at the locality-statistical area level.[18] In our baseline specification $Treatment$ is an indicator that receives the value of one for properties in the five localities that saw the largest number of hits during the war ($Top5$) and the value of zero for properties in all other localities within rocket range. We divide the year 2006 into two sub-periods: "2006-1" (January 1 to July 11) and "2006-2" (August 15 to December 31).[19] Our interest is in the coefficient γ, which might be interpreted as capturing the average willingness to avoid the disamenities associated with living under the shadow of the rocket threat.[20]

[18] The dependent variable and the hedonic covariates are identical to those used by the CBS when constructing the "Prices of Dwellings" Index.

[19] Throughout this section, we omit from the analysis transactions that took place during the war (July 12 to August 14, 2006) and define transactions in the first eleven days of July as belonging to the second quarter of 2006.

[20] A possible concern about this interpretation is that, as in all empirical work on amenities and property values, we can observe prices only for houses that sell. If the war changed the composition of buyers and sellers (e.g. in terms of risk tolerance) or of houses actually sold (in terms of unobserved property characteristics), this interpretation may not be correct. However, it is not clear ex-ante whether such composition effects would lead us to overestimate or underestimate the average willingness to pay to avoid the disamenities

As a preliminary step, we estimate a baseline model that excludes from equation (1) the interaction terms between *Treatment* and the year fixed-effects. Results (column 1 of Table 2) show that property characteristics have the expected signs and are highly statistically significant: prices rise with the number of rooms and area and decline with age. The explanatory power of the regression is high, about 0.8.

In column 2 we present results from estimating the full version of equation (1), where the first part of 2006 ("2006-1") is the basis for comparison (i.e. we exclude this period from the set of year fixed-effects and its interaction with the treatment variable). The results indicate that before the war there was no difference in the behavior of prices between properties in the *Top5* localities and properties in other localities within rocket range. In contrast, already in the months immediately following the war ("2006-2"), relative prices in the *Top5* localities started to decline. By 2008 the cumulative price decline (relative to the first part of 2006) reached a peak of 6.7%. In the next four years the cumulative price decline fluctuated around 6%.

A graphical illustration of these price dynamics is provided in Figure 5. We re-estimate equation (1), replacing the year fixed-effects with year-quarter fixed-effects, and plot the value of the estimated interaction coefficients between the year-quarter fixed-effects and the treatment indicator (together with 95% confidence intervals).[21] The figure shows a sharp and monotonic relative price decline in the *Top5* localities following the war, reaching a peak of about 7% already by the first quarter of 2008, i.e. about a year and a half after the war.[22] From then until the last quarter of 2012, the cumulative relative price decline fluctuates between 5% and 7% with no apparent trend.

While the drop in relative house prices in the *Top5* localities following the war was quick, one may still wonder why it was not immediate. We offer

associated with the rocket threat. See Linden and Rockoff (2008) and Ajzenman, Galiani, and Seira (2014) for discussion of these issues. We return to the issue of sorting based on willingness to pay in section 5.3.

[21] The second quarter of 2006 is used as the basis for comparison.

[22] The coefficient for the third quarter of 2006 should be discounted as it is based on a very small number of observations.

several possible explanations for this result. First, and most importantly, in the period immediately following the war there was uncertainty about Hezbollah's future rocket threat and Israel's ability to eliminate it.[23] Second, delayed price adjustment may have been driven by nominal loss aversion, as in Genesove and Mayer (2001). Third, difficulties in changing place of residence could have worked to delay adjustment; such difficulties may reflect attachment to the workplace and family and community ties (which are highly important in the Israeli context).

In column 3 of Table 2 we again rely on the spatial variation in the intensity of hits to explore the effect of the rocket threat, but instead of dividing localities in the north into high-dosage and low-dosage we simply use the number of hits per locality as a (continuous) dosage treatment variable. Using this approach yields a similar pattern to the one obtained using the dichotomous approach. As can be seen in the table and in Figure 6, by 2008 the adjustment was practically complete: the cumulative relative price decline fluctuated at around 3% per 100 rocket hits from that year through 2012.[24]

In columns 4 and 5 we conduct a repeat sales analysis. Specifically, we estimate the following equation:

$$\ln(p_{it}) = \alpha + \delta_i + \theta_t + \gamma Treatment_i * \theta_t + \varepsilon_{it}, \tag{2}$$

where p is the price of property i on date t; δ is a property fixed-effect; θ is a year fixed-effect; $Treatment$ is an indicator for affected areas; and ε_{it} is a well-behaved error term clustered at the locality-statistical area level. Remarkably, despite the sharp drop in the number of observations, the results are very similar to those presented in columns 2-3.

We next conduct several robustness checks for the baseline comparison of

[23] The war ended with a United Nations Security Council resolution which was approved by all sides. Among other things, the resolution called for the deployment of the Lebanese army and United Nations peace keeping troops in southern Lebanon and the disarmament of armed groups in the country (implying Hezbollah). It took months before it became apparent that Hezbollah would not be disarmed but rather increase in strength.

[24] We obtain qualitatively identical results when normalizing the number of hits per locality by either locality population or area.

price dynamics in the *Top5* localities relative to other localities within rocket range. The first check addresses the concern that some of the localities outside the *Top5* suffered a non-trivial number of hits during the war (Figure 4). In Panel A of Table 3 we therefore omit from the analysis in sequence the "Top 6-10", "Top 6-20" and "Top 6-40" localities in terms of the number of hits. Excluding these intermediate cases does not have much of an effect on the results.

The second check addresses the concern that the *Top5* localities are all relatively populous, a characteristic that might influence price dynamics. In Panel B of Table 3 we therefore exclude from the control group in turn localities with a population of less than 2,000, 10,000 and 20,000 residents. Again, there is little influence on the results.

Finally, a possible concern is that Haifa, being by far the most populous city in the north – and thus the market with the largest number of transactions – may be the sole driver of house price behavior in the *Top5* localities. In Panel C of Table 3 we thus separately compare price dynamics in (a) Haifa and (b) the four other *Top5* localities with price dynamics in all the non-*Top5* localities within rocket range. The results demonstrate that price dynamics were similar in Haifa and in the other *Top5* localities.[25]

4.2 Rents

We next analyze the effect of the rocket threat on rents by estimating the following equation:

$$\ln(r_{it}) = \alpha + \delta_i + \theta_t + \gamma Treatment_i * \theta_t + \varepsilon_{it}, \tag{3}$$

where r is the monthly rent of property i at month t; δ is a property fixed-effect; θ is a year (or year-quarter) fixed-effect; $Treatment$ is an indicator for affected areas; and ε_{it} is a well-behaved error term clustered at the locality-

[25] The baseline results are robust to several other changes, including adding to the analysis transactions in Arab localities and augmenting equation (1) with a locality-specific polynomial time trend.

statistical area level. We remove from the analysis observations from July and August of 2006 (the war period) and define January-June as "2006-1" and September-December as "2006-2". As before, "2006-1" serves as the basis for comparison. We again use two approaches. In the first we compare rent dynamics between high-dosage localities (*Top5*) and low-dosage localities. In the second we use the number of hits as our treatment variable. Results are presented in Table 4.

We find that before the war rent dynamics were similar in the *Top5* localities and in other localities within rocket range (column 1 and Figure 7). Rents started to decline already by 2007. The cumulative decline reached a level of about 5% by 2009 and fluctuated at a level of around 6%-7% in 2010-2012. A similar pattern emerges when using the number of hits per locality as the treatment variable, with the cumulative rent decline being similar to that estimated in the house price analysis – about 3% per 100 rocket hits (column 2).

4.3 Housing supply

So far our analysis has established that the Second Lebanon War and the rocket threat exerted a strong and persistent negative effect on house prices and rents in "treated" localities in northern Israel. This outcome could reflect shifts in both housing demand and housing supply. On the supply side, we note that the war had practically no effect on the housing stock in the north since very few buildings were severely damaged.[26] However, the war could have affected the supply of new housing units.

We explore this issue with data on the universe of private construction starts by locality and quarter. Results are presented in Appendix Table A2. While quite noisy, they suggest that the war had a negative effect on construction starts in the localities that saw the largest number of hits relative to others within rocket range. This by itself should have led to a relative rise

[26] For example, data from the Israeli Tax Authority, which is responsible for compensating house owners for war-related damages, indicate that only 149 such payments exceeded NIS 200,000 (about half of the construction costs for a typical apartment).

in house prices in the treated localities. The fact that relative prices actually declined in those areas indicates that there must have been a drop in relative housing demand. Moreover, since the government fully compensates house owners for war-related damages, the decline in demand is likely not driven by the concern of financial loss due to property damage but rather reflects additional considerations, e.g. the fear of injury or death.

5 Effect of the Rocket Threat on the Labor Market, Migration and Sorting

The standard spatial equilibrium model presented by Gyourko, Kahn, and Tracy (1999) predicts that a negative shock to amenities would lead to a price decline in the housing market, which we have documented, but has no clear predictions with respect to labor market and migration outcomes. In this section we examine these effects.

5.1 Labor market

We use a difference-in-differences approach to study the rocket threat's effect on labor market outcomes. The analysis is restricted to individuals of prime working age (25-54) and is conducted separately for men and women. The following equation leverages the panel structure of the Labor Force Surveys data:

$$outcome_{ilt} = \alpha + \pi_i + \boldsymbol{\beta}'\mathbf{x}_i + \delta_l + Y_t + Q_t + \gamma Treatment_l * Y_t + \varepsilon_{ilt}, \quad (4)$$

where *outcome* is an indicator either for participation in the labor force or for unemployment status of individual i in locality l at time t; π is an individual fixed-effect; $\mathbf{x}$ is a vector of individual characteristics that may vary over time (age, family status, number of children and education); δ is a locality fixed-

effect; Y is a year fixed-effect[27]; Q is a quarter fixed-effect; $Treatment$ is an indicator for the *Top5* localities; ε_{ilt} is a well-behaved error term clustered at the locality level.

We use Income Surveys to estimate the effect of the rocket threat on the monthly gross wage of salaried employees. These surveys do not have a panel structure. Thus, when estimating this effect, we drop from equation (4) the individual fixed-effect and add two time-invariant individual characteristics (new immigrant status and ethnicity) to the vector $\mathbf{x}$.

Results, presented in Table 5, indicate that the Second Lebanon War and the continued threat posed by Hezbollah's rockets had practically no effect on labor force participation, unemployment and wages. Similar results are obtained when using the treatment intensity approach (Appendix Table A3).

We next turn to the Tax Authority panel data on wage earners. This dataset does not differentiate between the unemployed and those who do not participate in the labor force. We therefore estimate equation (4) for employment and wage.[28] We again do not find much of an effect of the rocket threat on labor market outcomes (Table 6). The only exception is that the employment rate of women seems to have declined in the *Top5* localities relative to others in the post-war period. However, when we replicate this analysis using the treatment intensity approach, this effect disappears while the others continue to be insignificant (Appendix Table A4).

In summary, our analysis finds no evidence that the Second Lebanon War and the continued rocket threat emanating from Hezbollah had any labor market effects on treated localities relative to others in northern Israel. These results are consistent with the fact that the war was a relatively short confrontation which led to a small number of civilian casualties and limited direct economic damage (according to the Bank of Israel's *2006 Annual Report*, the

[27] We omit from the analysis the year 2006 since the number of observations in the first two quarters (2006-1) and in the fourth quarter (2006-2) for each gender × treatment category is quite low (the problem is especially severe in the Income Survey which we use in later analysis). The year 2005 is therefore the base for comparison.

[28] The estimated equation excludes the quarter indicators (since the data is annual) and education (which is not available).

war reduced Israeli GDP by only 0.5 percent in 2006).[29] In such a context, one would not expect to see broad economic repercussions.

5.2 Migration

We use two approaches to study the effect of the war on net migration flows. The first is an indirect approach which leverages CBS data on the population in each locality during 2000-2012.[30] Specifically, we estimate the following equation for localities within rocket range:

$$\ln(pop_{lt}) = \alpha + \delta_l + \theta_t + \gamma Treatment_l * \theta_t + \varepsilon_{lt}, \tag{5}$$

where *pop* is the population in locality l at the beginning of year t; δ is a locality fixed-effect; θ is a year fixed-effect; $Treatment$ is an indicator for the *Top5* localities; ε_{lt} is a well-behaved error term clustered at the locality level. The equation is estimated using 2006 population weights.

Column 1 of Table 7 suggest that the *Top5* localities experienced a population decline relative to other localities within rocket range throughout the period analyzed. The war does not seem to have had much of an effect on the rate of decline. This pattern could reflect a general trend of migration from urban to rural localities (rural localities are found only in the control group). Indeed, when we exclude from the analysis localities with a population of less than 2,000, 10,000 and 20,000 this pattern disappears (columns 2-4).[31]

The second and more direct approach of analyzing migration flows relies on the panel structure of the Tax Authority data on wage earners, which includes locality of residence in each year. Our analysis examines net migration between the *Top5* localities and other localities within rocket range. We do not find much evidence that the war and the continued rocket threat affected migration

[29] We note that in addition to covering war-related property damages, the Israeli government compensates firms and individuals for economic losses caused directly by the war (e.g. decline in revenue for firms and lost wages for employees).

[30] Population size is affected not only by net migration flows but also by birth and death rates. Our indirect approach abstracts from these considerations.

[31] Similar results are obtained when using the treatment intensity approach and also when estimating the equation without population weights (results not reported).

patterns (Appendix Table A5).

5.3 Sorting

Even if there is no change in net migration flows, it is still possible that the composition of migrants did change following the war. Such a change may reflect sorting based on willingness to pay to avoid the risk associated with the rocket threat. We cannot directly examine changes in the risk aversion of migrants since large-scale representative surveys in Israel do not ask the type of questions that are commonly used to elicit such preferences (e.g. hypothetical questions on lotteries). Instead, we apply a two-step procedure to indirectly identify sorting based on risk aversion. In the first step, we use the Tax Authority panel data to estimate whether the war affected the socio-demographic characteristics of migrants. In the second step we can combine the regression results with estimates of the socio-demographic correlates of risk-aversion (from previous literature).

We start by analyzing the effect of the war on the wages of migrants by estimating the following equation for individuals who migrated either from a *Top5* locality to a non-*Top5* locality within rocket range or in the other direction:

$$\ln(wage_{it}) = \alpha + \beta OutMigrant_i + \theta_t + \gamma OutMigrant_i * \theta_t + \varepsilon_{it}, \qquad (6)$$

where *wage* is the gross monthly wage of person i in year t; $OutMigrant$ is an indicator that receives the value of 1 if the individual resided in a *Top5* locality in year $t-1$ and in a non-*Top5* locality in year t (the indicator receives the value of 0 if the individual migrated in the other direction); θ is a year fixed-effect; ε_{it} is a well-behaved error term. This equation allows us to estimate whether the wages of out-migrants changed relative to wages of in-migrants following the war.

We find that the war did not affect the composition of migrants in terms of wages (Table 8, column 1). Analogous analyses for other migrant charac-

teristics – age, marital status, number of children, and new immigrant status – indicate that the war had no effect on these characteristics either (columns 2-5). Thus we find no evidence that the war led to the sorting of migrants.

The possibility remains that before the war residents of the *Top5* localities differed in their risk aversion from residents of other localities within rocket range. We use the Labor Force Survey, the Income Survey and the panel dataset of wage earners to explore this issue. The analysis indicates that in the pre-war period residents of the *Top5* localities were relatively young, less likely to be married, had fewer children, and had higher levels of education and income (Appendix Table A6). According to a recent influential paper (Dohmen et al., 2011), all these characteristics are associated with a greater willingness to take risks. Only one of the observed pre-war differences in socio-demographic characteristics points in the other direction (lower labor force participation rates). This analysis seems to suggest that our estimate of the effect of the rocket threat on house prices (and rents) may be downward biased.

6 Conclusion

This paper explores the economic costs of conflict using a unique experiment. We examine the effect of the massive rocket attack by Hezbollah on northern Israel during the 2006 Second Lebanon War and the continued threat emanating from the organization's growing rocket arsenal on housing market and labor market outcomes as well as on migration flows and sorting. Our examination relies on the surprising nature of the attack, on the spatial variation in rocket hits, and on detailed housing market and labor market data for the years 2000-2012. Using a difference-in-differences approach we compare the behavior of various outcomes between the most severely hit localities and other localities in northern Israel.

We rely on a standard spatial equilibrium model presented by Gyourko, Kahn, and Tracy (1999) to interpret the results. In the context of such a model, the rocket threat can be viewed as a disamenity. The model predicts

that a disamenity shock will lead to a decline in housing market prices but has indeterminate predictions with respect to labor market outcomes and migration patterns.

We find that following the Second Lebanon War, house prices and rents declined in the most severely hit localities relative to others in the north, reaching a trough of about 6%-7%. This effect persisted until the end of the period under investigation. Our analysis suggests that these housing market outcomes reflect a drop in demand rather than an increase in supply. On the other hand, we find practically no evidence that the war had an effect on labor market outcomes or on migration patterns, which is line with the fact that the war caused limited direct economic damage. The results therefore suggest that housing market prices fully absorbed the disamenity shock.

We next elaborate on the disamenity associated with living under the shadow of the rocket threat. The Second Lebanon War erupted after several years of calm along the Israel-Lebanon border. The war demonstrated that Hezbollah is able and willing to launch thousands of rockets deep into Israel. Moreover, rockets were not fired randomly but rather targeted specific localities due to their strategic importance and other considerations. This made some localities in the north riskier than others.

Crucially, in the years following the war Hezbollah improved its arsenal in terms of the number of rockets and their range, accuracy, and payload. Hezbollah was also able to develop methods to better conceal and protect rockets and launchers, making it more difficult for the Israeli military to destroy them. This, together with the constraints on the use of force put on Israel by the international community, might work to prolong future confrontations.

On the defensive side, the anti-rocket systems developed by Israel were still in their infancy during the period studied here. Especially relevant here is the "Iron Dome" system, which was first successfully used to intercept rockets (from the Gaza Strip) during operation "Pillar of Defense" in November 2012.

In sum, our results suggest that despite the major investments made by Israel to eliminate the Hezbollah rocket threat, throughout the post-war period and until at least 2012 the Israeli public continued to view it as credible.

7 References

Abadie, Alberto, and Javier Gardeazabal. 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93(1): 113-132.

Abadie, Alberto, and Sofia Dermisi. 2008. "Is Terrorism Eroding Agglomeration Economies in Central Business Districts? Lessons from the Office Real Estate Market in Downtown Chicago." *Journal of Urban Economics*, 64(2): 451-463.

Arbel, Yuval, Danny Ben-Shahar, Stuart Gabriel, and Yossef Tobol. 2010. "The Local Cost of Terror: Effects of the Second Palestinian Intifada on Jerusalem House Prices." *Regional Science and Urban Economics*, 40(6): 415-426.

Ajzenman, Nicolas, Sebastian Galiani, and Enrique Seira. 2014. "On the Distributive Costs of Drug-Related Homicides." NBER Working Paper 20067.

Baum-Snow, Nathaniel, and Matthew E. Kahn. 2000. "The Effects of New Public Projects to Expand Urban Rail Transit." *Journal of Public Economics,* 77(2): 241-263.

Becker, Gary S., and Yona Rubinstein. 2011. "Fear and the Response to Terrorism: An Economic Analysis." Centre for Economic Performance Discussion Paper 1079.

Berkman, Steven, Harry Garretsen, and Marc Schramm. 2004. "The Strategic Bombing of German Cities during World War II and its Impact on City Growth." *Journal of Economic Geography*, 4(2): 201-218.

Besley, Timothy, and Hannes Mueller. 2012. "Estimating the Peace Dividend: The Impact of Violence on House Prices in Northern Ireland." *American Economic Review*, 102(2): 810-833.

Berrebi, Claude, and Esteban F. Klor. 2010. "The Impact of Terrorism on the Defence Industry." *Economica*, 77(307): 518-543.

Black, Sandra E. 1999. "Do Better Schools Matter? Parental Valuation of Elementary Education." *Quarterly Journal of Economics*, 114(2): 577-599.

Campbell, John Y., Stefano Giglio, and Parag Pathak. 2011. "Forced Sales and House Prices." *American Economic Review*, 101(5): 2108-2131.

Collins, William J., and Robert A. Margo. 2007. "The Economic Aftermath of the 1960s Riots in American Cities: Evidence from Property Values." *Journal of Economic History*, 67(4): 849-883.

Currie, Janet, Lucas Davis, Michael Greenstone, and Reed Walker. 2015. "Environmental Health Risks and Housing Values: Evidence from 1,600 Toxic Plant Openings and Closings." *American Economic Review*, 105(2): 678-709.

Davis, Donald R., and David E. Weinstein. 2002. "Bones, Bombs, and Break Points: The Geography of Economic Activity." *American Economic Review*, 92(5): 1269-1289.

Dohmen, Thomas, Armin Falk, David B. Huffman, Uwe Sunde, Jurgen Schupp, and Gert G. Wagner. 2011. "Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences." *Journal of the European Economic Association*, 9(3): 522-550.

Eldor, Rafi, and Rafi Melnick. 2004. "Financial Markets and Terrorism." *European Journal of Political Economy*, 20(2): 367-386.

Eldor, Rafi, and Rafi Melnick. 2010. "Small Investment and Large Returns: Terrorism, Media and the Economy." *European Economic Review*, 54(8): 963-973.

Figlio, David N., and Maurice E. Lucas. 2004. "What's in a Grade? School Report Cards and the Housing Market." *American Economic Review*, 94(3): 591-604.

Gautier, Pieter A., Arjen Siegmann, and Aico Van Vuuren. 2009. "Terrorism and Attitudes towards Minorities: The Effect of the Theo Van Gogh Murder on House Prices in Amsterdam." *Journal of Urban Economics*, 65(2): 113-126.

Genesove, David, and Christohper Mayer. 2001. "Loss Aversion and Seller Behavior: Evidence from the Housing Market." *Quarterly Journal of Economics*, 116(4): 1233–1260.

Gibbons, Stephen, and Stephen Machin. 2005. "Valuing Rail Access Using Transport Innovations." *Journal of Urban Economics*, 57(1): 148-169.

Glaeser, Edward L., and Jesse M. Shapiro. 2002. "Cities and Warfare: The Impact of Terrorism on Urban Form." *Journal of Urban Economics*, 51(2): 205-224.

Greenstone, Michael, and Justin Gallagher. 2008. "Does Hazardous Waste Matter? Evidence from the Housing Market and the Superfund Program." *The Quarterly Journal of Economics,* 123(3): 951-1003.

Guidolin, Massimo, and Eliana La Ferrara. 2007. "Diamonds are Forever, Wars are Not: Is Conflict Bad for Private Firms?" *American Economic Review*, 97(5): 1978–1993.

Gyourko, Joseph, Matthew Kahn, and Joseph Tracy. 1999. "Quality of Life and Environmental Comparisons." In *Handbook of Regional and Urban Economics, Volume 3.* Paul Cheshire and Edwin S. Mills, eds., Amsterdam: Elsevier, 1413-1424.

Hazam, Shlomie, and Daniel Felsenstein. 2007. "Terror, Fear and Behavior in the Jerusalem Housing Market." *Urban Studies*, 44(13): 2529-2546.

Linden, Leigh, and Jonah E. Rockoff. 2008. "Estimates of the Impact of Crime Risk on Property Values from Megan's Laws." *American Economic Review*, 98(3): 1103-1127.

Miguel, Edward, and Gerard Roland. 2011. "The Long-run Impact of Bombing Vietnam." *Journal of Development Economics*, 96(1): 1-15.

Nevo (Ben-Or), Dorit, and Mordechai Shechter. 1999. "An Economic Analysis of 'Anxiety Costs' Associated with Rocket Attacks on the Town of Kiryat Shmonah in Upper Galilee." *Economic Quarterly (Israel)*, 46(3): 472-491. [in Hebrew].

Roback, Jennifer. 1982. "Wages, Rents, and the Quality of Life." *Journal of Political Economy*, 90(6): 1257-1278.

Rosen, Sherwin. 1979. "Wage-Based Indexes of Urban Quality of Life." in *Current Issues in Urban Economics.* Peter M. Mieszkowski and Mahlon R. Straszheim, eds., Baltimore, MD: Johns Hopkins University Press, 74-104.

Willard, Kristen L., Timothy W. Guinnane, and Harvey S. Rosen.

1996. "Turning Points in the Civil War: Views from the Greenback Market." *American Economic Review*, 86(4): 1001–1018.

Zussman, Asaf, and Noam Zussman. 2006. "Assassinations: Evaluating the Effectiveness of an Israeli Counterterrorism Policy Using Stock Market Data." *Journal of Economic Perspectives*, 20(2): 193-206.

Zussman, Asaf, Zussman, Noam Zussman, and Morten Nielsen. 2008. "Asset Market Perspectives on the Israeli-Palestinian Conflict." *Economica*, 75(1): 84-115.

Table 1
Hezbollah Targeting During the Second Lebanon War

Dependent variable: number of rocket hits per locality				
	(1)	(2)	(3)	(4)
Distance from the Lebanon border	-0.38***	-0.42***	-0.45***	-0.42***
	(0.07)	(0.08)	(0.08)	(0.08)
Population		5.79***	8.63***	7.32***
		(1.88)	(2.60)	(2.58)
Arab locality			-21.22***	-18.01***
			(6.50)	(6.43)
Major military base				99.18***
				(36.48)
Observations	536	501	501	501
R-squared	0.08	0.17	0.23	0.29

Sources. Data on localities are from the Israeli Central Bureau of Statistics: *List of Localities 2006*. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. "Distance from the Lebanon border" is the aerial distance of the locality from the Israel-Lebanon border in km. Locality population is in logs. "Arab locality" is an indicator for localities with a majority of Arab population as defined by the Israeli Central Bureau of Statistics. "Major military base" is an indicator for localities where a major army, air-force or navy base is situated.

The drop in the number of observations between column (1) and column (2) is due to the fact that some localities do not have a permanent population (e.g. colleges).

Estimated by OLS. Robust standard errors in parentheses.

*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 2
Effect of the Rocket Threat on House Prices

Dependent variable: log price					
	Hedonic Approach			Repeat Sales Approach	
	Baseline	*Top5* vs. other localities within rocket range	Number of hits per locality	*Top5* vs. other localities within rocket range	Number of hits per locality
	(1)	(2)	(3)	(4)	(5)
2.5-3.0 Rooms	0.051***	0.050***	0.050***		
	(0.008)	(0.008)	(0.008)		
3.5-4.0 Rooms	0.147***	0.146***	0.146***		
	(0.010)	(0.011)	(0.011)		
4.5-5.0 Rooms	0.233***	0.232***	0.233***		
	(0.012)	(0.012)	(0.012)		
Log (area)	0.743***	0.744***	0.744***		
	(0.015)	(0.015)	(0.015)		
Log (age)	-0.020***	-0.020***	-0.019***		
	(0.001)	(0.001)	(0.001)		
2000 x Treatment		-0.000	-0.007	-0.070**	-0.026
		(0.019)	(0.011)	(0.033)	(0.017)
2001 x Treatment		0.001	0.004	-0.059**	-0.015
		(0.018)	(0.010)	(0.029)	(0.015)
2002 x Treatment		0.004	0.007	-0.009	0.006
		(0.016)	(0.009)	(0.029)	(0.015)
2003 x Treatment		0.007	0.007	-0.027	-0.005
		(0.015)	(0.008)	(0.025)	(0.014)
2004 x Treatment		0.013	0.011	-0.006	0.007
		(0.012)	(0.007)	(0.026)	(0.013)
2005 x Treatment		0.005	0.003	-0.009	-0.004
		(0.011)	(0.006)	(0.026)	(0.014)
2006-2 x Treatment		-0.008	-0.006	-0.002	0.003
		(0.013)	(0.007)	(0.033)	(0.018)
2007 x Treatment		-0.033***	-0.010	-0.028	-0.018
		(0.012)	(0.007)	(0.027)	(0.015)
2008 x Treatment		-0.067***	-0.029***	-0.072**	-0.040**
		(0.014)	(0.009)	(0.029)	(0.017)
2009 x Treatment		-0.051***	-0.034***	-0.044	-0.038**
		(0.016)	(0.009)	(0.031)	(0.017)
2010 x Treatment		-0.055***	-0.033***	-0.059*	-0.051***
		(0.017)	(0.010)	(0.034)	(0.019)

2011 x Treatment		-0.066***	-0.032***	-0.056*	-0.045**
		(0.016)	(0.009)	(0.034)	(0.019)
2012 x Treatment		-0.066***	-0.028***	-0.069**	-0.044***
		(0.015)	(0.008)	(0.030)	(0.016)
Locality-SA FEs	Yes	Yes	Yes	No	No
Year FEs	Yes	Yes	Yes	Yes	Yes
Property FEs	No	No	No	Yes	Yes
Observations	140,147	140,147	140,147	38,265	38,265
R-squared	0.811	0.811	0.811	0.927	0.928

Sources. Data on purchase transactions are from The Israel Tax Authority (via the Bank of Israel): *Karmen* Database. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. In columns (2) and (4) "treatment" is an indicator for the five most severely hit localities. In columns (3) and (5) "treatment" is the number of hits per locality (divided by 100).

The excluded category in terms of the number of rooms is 1.5-2.0. Area is in square meters. Age is in years. The period from January 1, 2006 to July 11, 2006 is the basis for comparison. "2006-2" is the period from August 15, 2006 to December 31, 2006. Locality-SA is a combination of locality and statistical area (sub-neighborhood).

Estimated by OLS. Standard errors, clustered by locality-statistical area, in parentheses.

*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 3
Effect of the Rocket Threat on House Prices: Robustness Checks

Panel A: Excluding Localities with an Intermediate Number of Hits

Dependent variable: log price				
		Excluding localities in top		
	Baseline	6-10	6-20	6-40
	(1)	(2)	(3)	(4)
2000 x *Top5*	-0.000	0.009	0.028	0.039*
	(0.019)	(0.020)	(0.020)	(0.020)
2001 x *Top5*	0.001	0.009	0.028	0.039**
	(0.018)	(0.018)	(0.019)	(0.019)
2002 x *Top5*	0.004	0.012	0.027	0.036**
	(0.016)	(0.016)	(0.017)	(0.017)
2003 x *Top5*	0.007	0.013	0.025	0.035**
	(0.015)	(0.015)	(0.016)	(0.016)
2004 x *Top5*	0.013	0.017	0.023*	0.028**
	(0.012)	(0.012)	(0.013)	(0.014)
2005 x *Top5*	0.005	0.005	0.004	0.008
	(0.011)	(0.012)	(0.012)	(0.012)
2006-2 x *Top5*	-0.008	-0.006	-0.006	-0.003
	(0.013)	(0.013)	(0.014)	(0.014)
2007 x *Top5*	-0.033***	-0.031**	-0.035***	-0.035***
	(0.012)	(0.012)	(0.013)	(0.013)
2008 x *Top5*	-0.067***	-0.063***	-0.077***	-0.081***
	(0.014)	(0.015)	(0.015)	(0.016)
2009 x *Top5*	-0.051***	-0.047***	-0.063***	-0.073***
	(0.016)	(0.016)	(0.017)	(0.018)
2010 x *Top5*	-0.055***	-0.049***	-0.065***	-0.072***
	(0.017)	(0.017)	(0.019)	(0.019)
2011 x *Top5*	-0.066***	-0.058***	-0.065***	-0.067***
	(0.016)	(0.016)	(0.017)	(0.017)
2012 x *Top5*	-0.066***	-0.055***	-0.057***	-0.056***
	(0.015)	(0.015)	(0.016)	(0.017)
Property characteristics	Yes	Yes	Yes	Yes
Locality-SA FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	140,147	132,459	120,974	116,263
R-squared	0.811	0.813	0.813	0.814

Panel B: Excluding Small Localities

Dependent variable: log price				
		Excluding localities with population of less than		
	Baseline	2,000	10,000	20,000
	(1)	(2)	(3)	(4)
2000 x *Top5*	-0.000	-0.004	-0.009	-0.031
	(0.019)	(0.019)	(0.020)	(0.020)
2001 x *Top5*	0.001	-0.002	-0.007	-0.030*
	(0.018)	(0.018)	(0.018)	(0.018)
2002 x *Top5*	0.004	0.000	-0.006	-0.030*
	(0.016)	(0.016)	(0.016)	(0.016)
2003 x *Top5*	0.007	0.002	-0.003	-0.019
	(0.015)	(0.015)	(0.014)	(0.015)
2004 x *Top5*	0.013	0.007	0.004	-0.011
	(0.012)	(0.012)	(0.012)	(0.013)
2005 x *Top5*	0.005	0.003	0.001	-0.005
	(0.011)	(0.011)	(0.011)	(0.012)
2006-2 x *Top5*	-0.008	-0.008	-0.008	-0.014
	(0.013)	(0.013)	(0.013)	(0.014)
2007 x *Top5*	-0.033***	-0.032***	-0.033***	-0.028**
	(0.012)	(0.012)	(0.012)	(0.012)
2008 x *Top5*	-0.067***	-0.066***	-0.066***	-0.062***
	(0.014)	(0.014)	(0.015)	(0.015)
2009 x *Top5*	-0.051***	-0.053***	-0.054***	-0.051***
	(0.016)	(0.016)	(0.016)	(0.017)
2010 x *Top5*	-0.055***	-0.058***	-0.062***	-0.061***
	(0.017)	(0.017)	(0.017)	(0.018)
2011 x *Top5*	-0.066***	-0.071***	-0.077***	-0.079***
	(0.016)	(0.016)	(0.016)	(0.016)
2012 x *Top5*	-0.066***	-0.072***	-0.078***	-0.084***
	(0.015)	(0.015)	(0.015)	(0.016)
Property characteristics	Yes	Yes	Yes	Yes
Locality-SA FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	140,147	137,196	133,296	123,098
R-squared	0.811	0.808	0.812	0.810

Panel C: Separating Haifa from the other *Top5* Localities

Dependent variable: log price			
	Baseline	Haifa vs. non-*Top5*	Other *Top5* vs. non-Top5
	(1)	(2)	(3)
2000 x *Top5*	-0.000	0.029	-0.070***
	(0.019)	(0.020)	(0.024)
2001 x *Top5*	0.001	0.012	-0.026
	(0.018)	(0.019)	(0.026)
2002 x *Top5*	0.004	0.010	-0.013
	(0.016)	(0.017)	(0.020)
2003 x *Top5*	0.007	0.011	-0.006
	(0.015)	(0.016)	(0.020)
2004 x *Top5*	0.013	0.016	0.003
	(0.012)	(0.013)	(0.016)
2005 x *Top5*	0.005	0.003	0.013
	(0.011)	(0.012)	(0.017)
2006-2 x *Top5*	-0.008	-0.004	-0.019
	(0.013)	(0.015)	(0.017)
2007 x *Top5*	-0.033***	-0.043***	-0.008
	(0.012)	(0.013)	(0.016)
2008 x *Top5*	-0.067***	-0.070***	-0.058**
	(0.014)	(0.015)	(0.023)
2009 x *Top5*	-0.051***	-0.037**	-0.096***
	(0.016)	(0.016)	(0.025)
2010 x *Top5*	-0.055***	-0.051***	-0.070**
	(0.017)	(0.017)	(0.027)
2011 x *Top5*	-0.066***	-0.065***	-0.072***
	(0.016)	(0.016)	(0.027)
2012 x *Top5*	-0.066***	-0.065***	-0.071***
	(0.015)	(0.016)	(0.025)
Property characteristics	Yes	Yes	Yes
Locality-SA FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
Observations	140,147	125,417	102,181
R-squared	0.811	0.813	0.803

Sources. Data on purchase transactions are from The Israel Tax Authority (via the Bank of Israel): *Karmen* Database. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. "*Top5*" is an indicator for the five most severely hit localities. The period from January 1, 2006 to July 11, 2006 is the basis for comparison. "2006-2" is the period from August 15, 2006 to December 31, 2006. "Property characteristics" include number of rooms (in groups),

log area, and log age. Locality-SA is a combination of locality and statistical area (sub-neighborhood).
In all panels, column (1) reproduces the baseline results from column (2) of Table 2.
Panel A: columns (2)-(4) exclude the top 6-10, top 6-20, and top 6-40 localities in terms of the number of hits.
Panel B: columns (2)-(4) exclude localities with a population of less than 2,000, 10,000 and 20,000.
Panel C: column (2) compares Haifa to non-*Top5* localities while column (3) compares the *Top5* localities other than Haifa to non-*Top5* localities.

Estimated by OLS. Standard errors, clustered by locality-statistical area, in parentheses.
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 4
Effect of the Rocket Threat on Rents

Dependent variable: log rent		
	Top5 vs. other localities within rocket range	Number of hits per locality
	(1)	(2)
2000 x Treatment	0.004	0.008
	(0.019)	(0.013)
2001 x Treatment	0.011	0.003
	(0.017)	(0.009)
2002 x Treatment	0.004	-0.001
	(0.016)	(0.009)
2003 x Treatment	0.002	0.001
	(0.015)	(0.008)
2004 x Treatment	0.002	-0.000
	(0.012)	(0.007)
2005 x Treatment	0.006	-0.000
	(0.010)	(0.006)
2006-2 x Treatment	0.008	-0.003
	(0.012)	(0.007)
2007 x Treatment	-0.011	-0.007
	(0.010)	(0.006)
2008 x Treatment	-0.037***	-0.015*
	(0.014)	(0.009)
2009 x Treatment	-0.052***	-0.023**
	(0.016)	(0.010)
2010 x Treatment	-0.067***	-0.031***
	(0.018)	(0.011)
2011 x Treatment	-0.075***	-0.036***
	(0.019)	(0.012)
2012 x Treatment	-0.070***	-0.033***
	(0.019)	(0.012)
Year FEs	Yes	Yes
Property FEs	Yes	Yes
Observations	23,658	23,658
R-squared	0.950	0.950

Sources. Data on rents are from the Israeli Central Bureau of Statistics – Rent Survey. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.
Notes. In column (1) "treatment" is an indicator for the five most severely hit localities. In column (2) "treatment" is the number of hits per locality (divided by 100).

The period from January 1, 2006 to July 11, 2006 is the basis for comparison. "2006-2" is the period September-December 2006. "Property FEs" are based on a unique identification number for each surveyed apartment.
Estimated by OLS. Standard errors, clustered by locality-statistical area, in parentheses.
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 5
Effect of the Rocket Threat on Labor Market Outcomes
(Labor Force and Income Surveys)

	Men			Women		
Dependent variable	Labor Force Participation	Unemployment	Log Wage	Labor Force Participation	Unemployment	Log Wage
	(1)	(2)	(3)	(4)	(5)	(6)
2000 x Top5	0.030	0.023	-0.034	-0.019	0.053	-0.080**
	(0.032)	(0.061)	(0.043)	(0.028)	(0.034)	(0.039)
2001 x Top5	0.021	-0.001	-0.004	-0.048*	0.050	0.016
	(0.031)	(0.052)	(0.052)	(0.027)	(0.033)	(0.037)
2002 x Top5	0.027	-0.011	-0.014	-0.048**	0.018	-0.029
	(0.029)	(0.043)	(0.053)	(0.022)	(0.026)	(0.044)
2003 x Top5	0.023	0.002	0.005	-0.047*	0.016	0.011
	(0.021)	(0.028)	(0.057)	(0.025)	(0.027)	(0.029)
2004 x Top5	0.014	-0.008	-0.080**	-0.002	-0.003	-0.011
	(0.016)	(0.017)	(0.035)	(0.021)	(0.014)	(0.031)
2007 x Top5	0.029	-0.030	-0.019	0.013	-0.019	-0.024
	(0.041)	(0.029)	(0.029)	(0.053)	(0.030)	(0.049)
2008 x Top5	0.024	0.003	-0.043	-0.005	0.002	0.032
	(0.038)	(0.028)	(0.041)	(0.051)	(0.033)	(0.046)
2009 x Top5	0.013	0.012	-0.023	-0.005	0.010	-0.031
	(0.036)	(0.035)	(0.048)	(0.055)	(0.037)	(0.044)
2010 x Top5	-0.006	0.014	-0.042	-0.017	0.003	-0.033
	(0.045)	(0.045)	(0.037)	(0.060)	(0.038)	(0.048)
2011 x Top5	0.005	0.004	-0.007	0.025	-0.015	-0.084
	(0.045)	(0.044)	(0.057)	(0.064)	(0.040)	(0.073)
Individual FEs	Yes	Yes	No	Yes	Yes	No
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Year and quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	41,954	36,559	11,925	47,509	38,543	12,951
R-squared	0.820	0.730	0.329	0.796	0.756	0.232

Sources. Data on labor force participation and unemployment are from the restricted-use versions of the Israeli Central Bureau of Statistics' *Labor Force Surveys 2000-2011*. Data on (gross) wages are from the restricted-use versions of the Israeli Central Bureau of Statistics' *Income Surveys 2000-2011*. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.
Notes. "*Top5*" is an indicator for the five most severely hit localities. The analysis excludes the year 2006; the base year for comparison is 2005. We restrict the sample to individuals of prime working age (25-54). Wage analysis is for salaried employees only.
In columns (1)-(2) and (4)-(5) individual characteristics include indicators for age group, family status and education group as well as the number of children; in columns (3) and (6) we add to this vector two time-invariant characteristics: new immigrant status and ethnicity.
Estimated by OLS. Standard errors, clustered by locality, in parentheses.
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 6
Effect of the Rocket Threat on Labor Market Outcomes
(Panel of Wage Earners)

Dependent variable	Men		Women	
	Employment	Log wage	Employment	Log wage
	(1)	(2)	(3)	(4)
2000 x *Top5*	-0.004	-0.033*	-0.001	0.003
	(0.018)	(0.018)	(0.013)	(0.017)
2001 x *Top5*	0.012	-0.005	0.005	-0.003
	(0.012)	(0.018)	(0.010)	(0.014)
2002 x *Top5*	0.015**	0.006	0.001	-0.002
	(0.007)	(0.020)	(0.011)	(0.013)
2003 x *Top5*	-0.002	0.004	-0.003	-0.026**
	(0.007)	(0.015)	(0.008)	(0.013)
2004 x *Top5*	-0.002	-0.024*	-0.001	-0.005
	(0.007)	(0.013)	(0.004)	(0.012)
2007 x *Top5*	0.001	0.009	-0.012**	-0.016
	(0.007)	(0.016)	(0.006)	(0.014)
2008 x *Top5*	-0.004	0.021	-0.014*	0.003
	(0.009)	(0.020)	(0.007)	(0.012)
2009 x *Top5*	-0.007	-0.003	-0.015**	-0.008
	(0.006)	(0.032)	(0.007)	(0.014)
2010 x *Top5*	-0.002	-0.004	-0.010	-0.008
	(0.007)	(0.022)	(0.007)	(0.011)
2011 x *Top5*	-0.006	-0.002	-0.005	-0.005
	(0.008)	(0.020)	(0.008)	(0.012)
2012 x *Top5*	-0.008	0.016	0.004	-0.001
	(0.007)	(0.023)	(0.008)	(0.012)
Individual FEs	Yes	Yes	Yes	Yes
Individual characteristics	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	130,427	98,722	126,367	100,949
R-squared	0.563	0.738	0.543	0.696

Sources. Data on employment and wages are from a panel of wage earners constructed by The Israel Tax Authority for the Bank of Israel. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. "*Top5*" is an indicator for the five most severely hit localities. The analysis excludes the year 2006; the base year for comparison is 2005. We restrict the sample to individuals of prime working age (25-54). Individual characteristics include indicators for age group and family status as well as the number of children.

Estimated by OLS. Standard errors, clustered by locality, in parentheses.

*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 7
Population Dynamics

Dependent variable: log locality population				
		Excluding localities with 2006 population of less than		
	Baseline	2,000	10,000	20,000
	(1)	(2)	(3)	(4)
2000 x *Top5*	0.034	0.028	0.016	0.003
	(0.031)	(0.032)	(0.033)	(0.033)
2001 x *Top5*	0.027	0.020	0.011	0.000
	(0.026)	(0.027)	(0.027)	(0.027)
2002 x *Top5*	0.025	0.020	0.013	0.004
	(0.019)	(0.019)	(0.020)	(0.020)
2003 x *Top5*	0.016	0.012	0.008	0.002
	(0.012)	(0.012)	(0.013)	(0.013)
2004 x *Top5*	0.007	0.004	0.002	-0.001
	(0.007)	(0.007)	(0.008)	(0.008)
2007 x *Top5*	-0.018*	-0.012	-0.009	-0.004
	(0.009)	(0.010)	(0.010)	(0.010)
2008 x *Top5*	-0.028**	-0.018	-0.013	-0.006
	(0.013)	(0.014)	(0.014)	(0.014)
2009 x *Top5*	-0.038**	-0.024	-0.018	-0.008
	(0.016)	(0.016)	(0.017)	(0.017)
2010 x *Top5*	-0.044***	-0.029*	-0.026	-0.013
	(0.017)	(0.018)	(0.018)	(0.019)
2011 x *Top5*	-0.048***	-0.031	-0.026	-0.013
	(0.019)	(0.020)	(0.021)	(0.021)
2012 x *Top5*	-0.051**	-0.027	-0.021	-0.007
	(0.023)	(0.024)	(0.025)	(0.025)
Locality FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	4,824	480	300	216
R-squared	0.999	0.999	0.998	0.999

Sources. Population data are from the Israeli Central Bureau of Statistics: *List of Localities 2000-2012*. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.
Notes. "*Top5*" is an indicator for the five most severely hit localities. The analysis excludes the year 2006; the base year for comparison is 2005.
Estimated by OLS (using 2006 locality population as weight). Standard errors, clustered by locality, in parentheses.
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table 8
Sorting of Migrants

Dependent variable:	Log wage (1)	Age (2)	Married (3)	Number of children (4)	New immigrant (5)
2001 x OutMigrant	0.010	1.067	-0.072*	0.042	0.047
	(0.113)	(0.965)	(0.042)	(0.037)	(0.037)
2002 x OutMigrant	-0.054	0.795	-0.024	0.018	0.076**
	(0.119)	(0.910)	(0.041)	(0.036)	(0.036)
2003 x OutMigrant	-0.032	0.132	-0.001	0.035	-0.035
	(0.119)	(0.941)	(0.040)	(0.037)	(0.036)
2004 x OutMigrant	0.006	-0.661	0.004	0.095***	-0.035
	(0.116)	(0.951)	(0.041)	(0.036)	(0.036)
2007 x OutMigrant	0.036	0.916	-0.013	0.051	0.022
	(0.112)	(0.988)	(0.039)	(0.033)	(0.034)
2008 x OutMigrant	-0.072	0.656	-0.021	0.012	0.045
	(0.112)	(0.934)	(0.039)	(0.031)	(0.034)
2009 x OutMigrant	-0.070	-0.566	0.014	0.046	0.030
	(0.111)	(0.966)	(0.038)	(0.031)	(0.034)
2010 x OutMigrant	-0.090	-0.318	-0.012	0.060*	0.011
	(0.108)	(0.918)	(0.037)	(0.031)	(0.032)
2011 x OutMigrant	0.025	2.048**	0.016	0.035	0.045
	(0.112)	(0.965)	(0.038)	(0.031)	(0.033)
2012 x OutMigrant	-0.003	1.287	0.030	-0.029*	0.067**
	(0.103)	(0.964)	(0.038)	(0.016)	(0.033)
Observations	11,208	11,560	11,551	11,560	11,560
R-squared	0.013	0.010	0.014	0.060	0.003

Sources. Data on individual characteristics are from a panel of wage earners constructed by The Israel Tax Authority for the Bank of Israel. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. The analysis excludes the year 2006; the base year for comparison is 2005. The sample is restricted to individuals who migrated from the *Top5* localities to other localities within rocket range or in the other direction. "OutMigrant" is an indicator that receives the value of 1 for migrants leaving the *Top5* localities and 0 for those entering the *Top5* localities.

Estimated by OLS. Standard errors in parentheses.

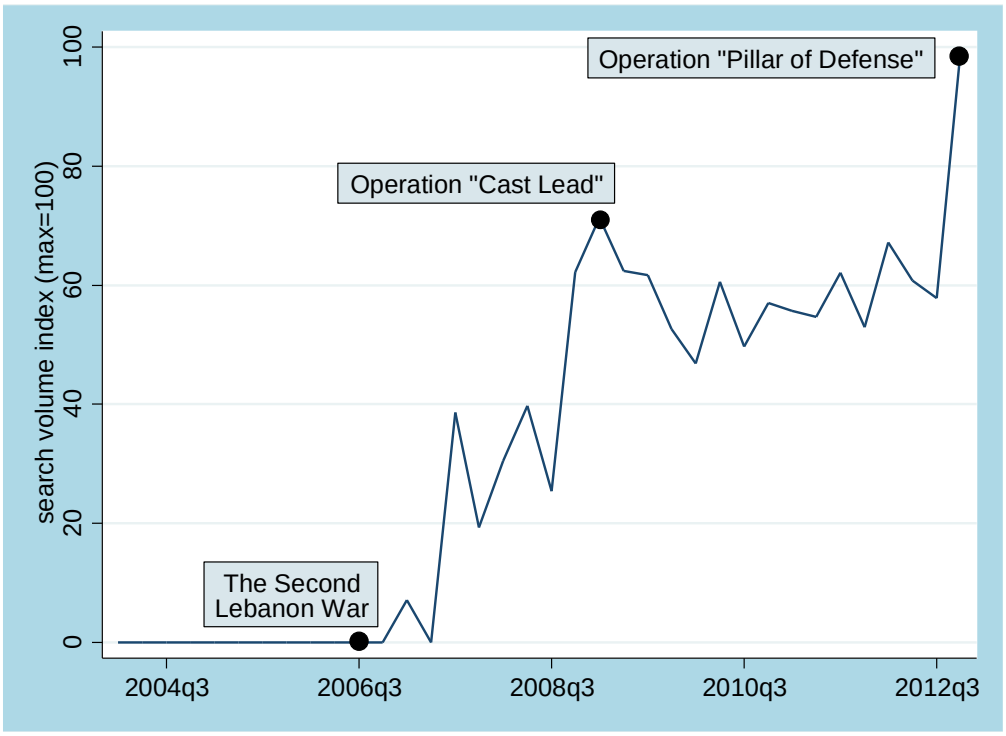
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Figure 1
Map of Israel



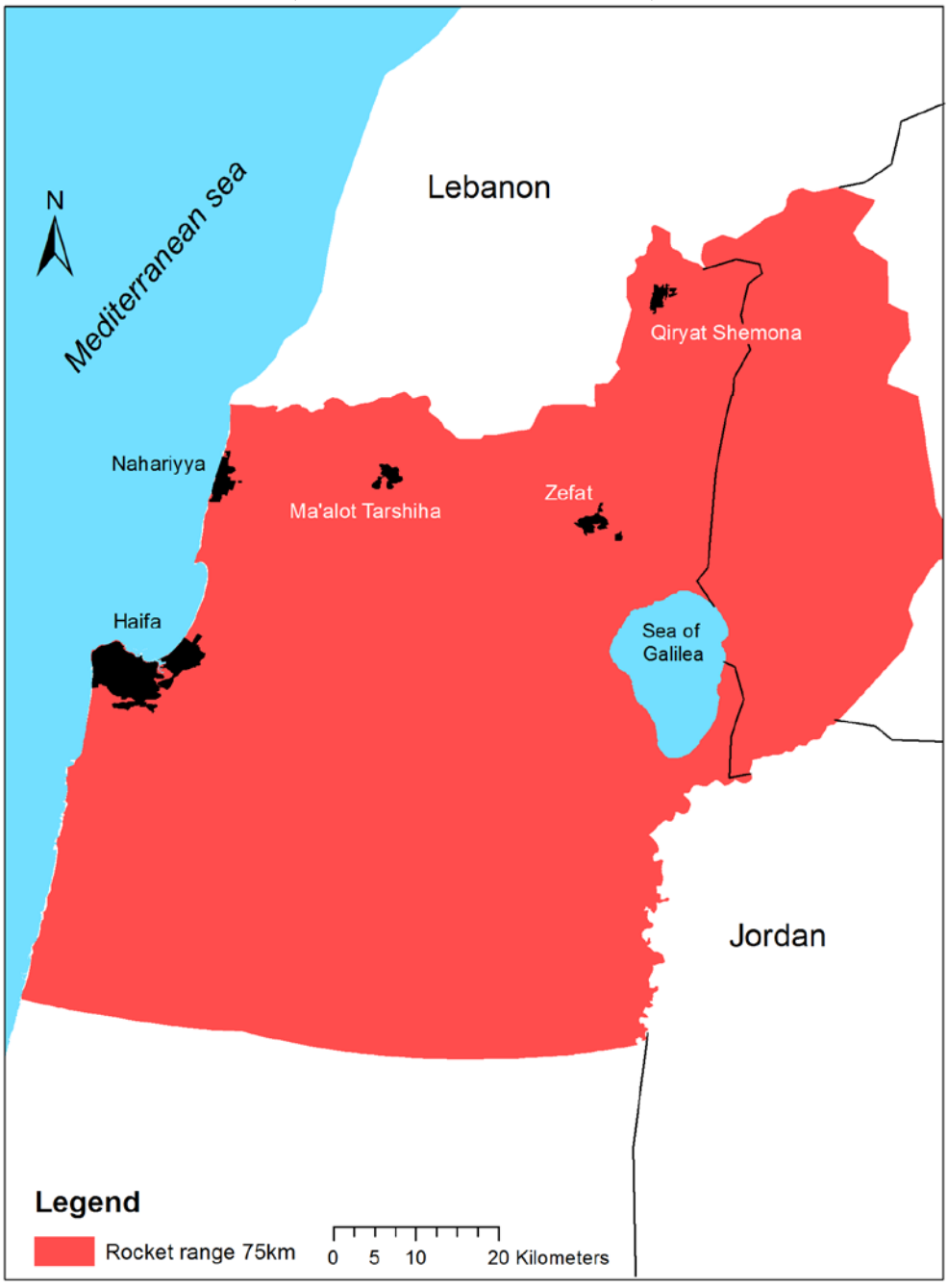
Sources. Home Front Command of the Israeli Defense Forces; GIS Lab, Department of Geography, The Hebrew University of Jerusalem.

Figure 2
The Rocket Threat: A Google Trends Perspective
(searches for "built-in-shelter", 2004-2012)



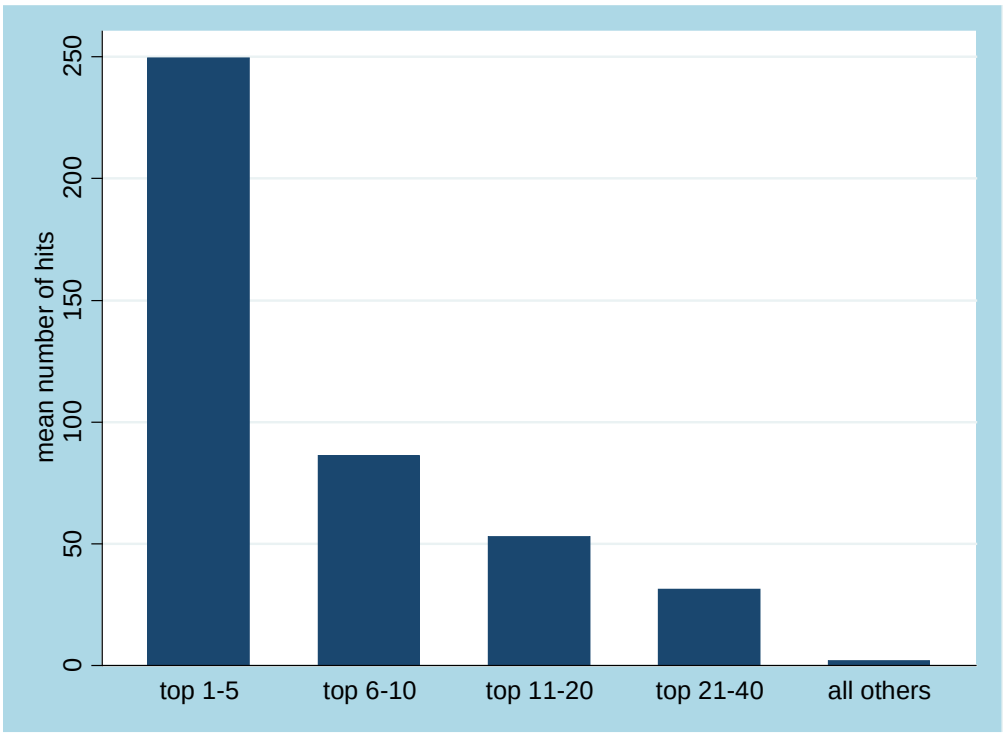
Notes. The figure covers the period from January 1, 2004 until December 31, 2012.

Figure 3
Rocket Range in Northern Israel
(75km from the Lebanon border)



Sources. Home Front Command of the Israeli Defense Forces; GIS Lab, Department of Geography, The Hebrew University of Jerusalem.

Figure 4
Number of Rocket Hits per Locality
(536 localities within rocket range)



Sources. Home Front Command of the Israeli Defense Forces.

Figure 5
Effect of the Rocket Threat on House Prices:
***Top5* vs. other Localities**

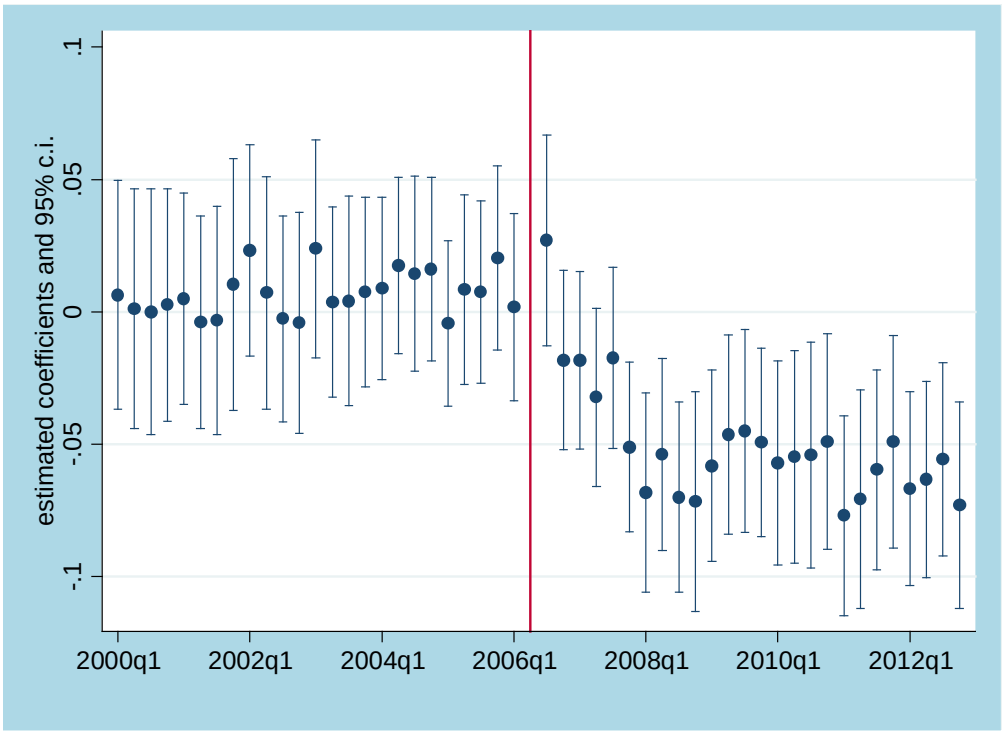


Figure 6
Effect of the Rocket Threat on House Prices:
Using the Number of Hits per Locality (/100) as Treatment

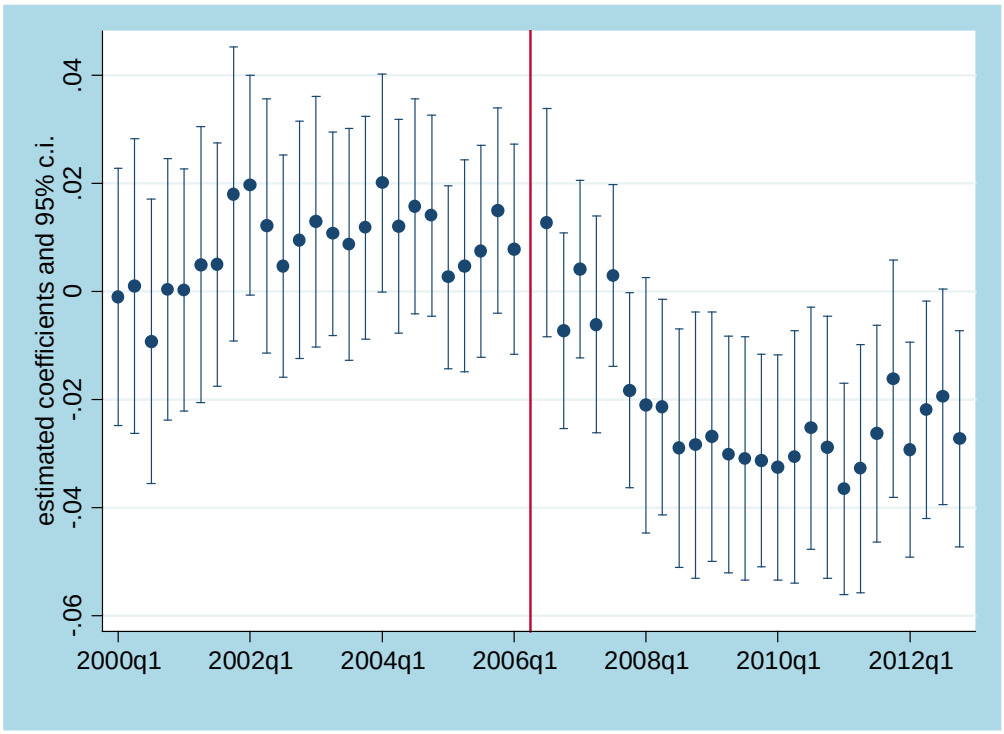
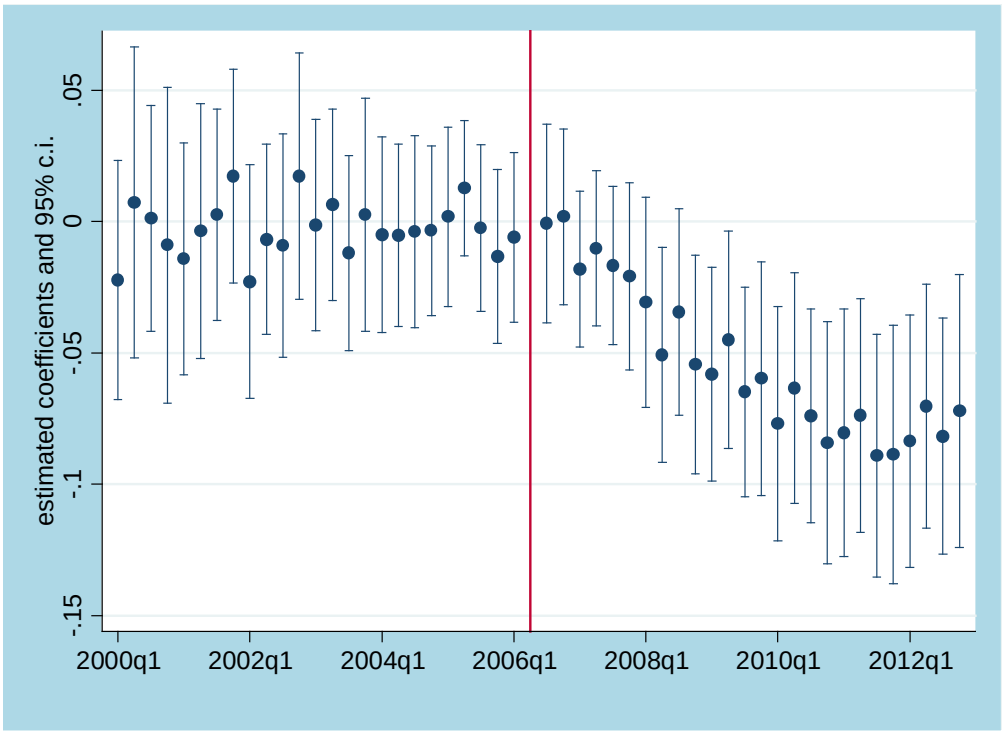


Figure 7
Effect of the Rocket Threat on Rents:
***Top5* vs. other Localities**



Appendix

Table A1
Summary Statistics

Dataset	Variable	Mean	S.D.	N
House purchase transactions	Price (NIS thousands)	571.9	319.2	140,147
	Rooms	3.6	0.9	140,147
	Area (square meters)	83.7	26.6	140,147
	Age (years)	24.0	20.9	140,147
	Repeat sales	2.4	0.8	38,265
	Gap between repeat sales (years)	3.7	2.9	21,011
Rent survey	Monthly rent (NIS)	1,872	680	23,658
Private construction starts	Quarterly starts per locality (unit)	33.4	49.8	918
Labor force survey	Unemployment rate (%)	8.4	27.7	75,102
	Labor force participation rate (%)	83.9	36.7	89,463
Income survey	Monthly gross wage (NIS)	7,663	6,374	24,876
Sample of wage earners	Employment rate (%)	77.3	41.9	256,794
	Monthly gross wage (NIS)	8,833	9,709	199,671

Sources. House purchase transactions and sample of wage earners – The Israel Tax Authority (via the Bank of Israel). All other data are from the Israeli Central Bureau of Statistics. Period covered is 2000-2012, except for the labor force and income surveys which are for the period 2000-2011. Construction starts data are restricted to cities (population of 20,000 or more).

Notes. The figures in the table refer to non-Arab localities within rocket range in northern Israel. The average exchange rate between the NIS and the $US in 2000-2012 was 4.14.

Table A2
Effect of the Rocket Threat on Construction Starts

Dependent variable: number of private construction starts (in logs)		
	Top5 vs. other localities within rocket range	Number of hits per locality
	(1)	(2)
2000 x Treatment	0.011	-0.028
	(0.339)	(0.121)
2001 x Treatment	-0.075	-0.071
	(0.366)	(0.136)
2002 x Treatment	0.256	0.165
	(0.413)	(0.172)
2003 x Treatment	-0.400	-0.064
	(0.366)	(0.128)
2004 x Treatment	0.173	0.113
	(0.325)	(0.112)
2005 x Treatment	-0.588*	-0.203*
	(0.330)	(0.099)
2006-2 x Treatment	-0.313	-0.202
	(0.530)	(0.179)
2007 x Treatment	-0.497	-0.113
	(0.391)	(0.162)
2008 x Treatment	-0.816*	-0.269*
	(0.417)	(0.149)
2009 x Treatment	-0.896	-0.297*
	(0.548)	(0.166)
2010 x Treatment	-0.205	-0.008
	(0.454)	(0.175)
2011 x Treatment	0.001	0.108
	(0.494)	(0.191)
2012 x Treatment	-0.886	-0.290
	(0.515)	(0.206)
Locality FEs	Yes	Yes
Year FEs	Yes	Yes
Observations	918	918
R-squared	0.516	0.516

Sources. Data on construction starts are from the Israeli Central Bureau of Statistics. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. The dependent variable is the log of (per locality quarterly number of private construction starts in terms of housing units *plus* one); we add one because in some cases the original number of starts is zero. In column (1) "treatment" is an indicator for the five most severely hit localities. In

column (2) “treatment” is the number of hits per locality (divided by 100). To reduce volatility we limit the analysis to cities (population of 20,000 or more). The analysis excludes the third quarter of 2006; “2006-2” is the last quarter of 2006; the basis for comparison is the first two quarters of 2006. Estimated by OLS. Standard errors, clustered by locality, in parentheses.
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table A3

Effect of the Rocket Threat on Labor Market Outcomes – Using the Treatment Intensity Approach

(Labor Force and Income Surveys)

	Men			Women		
Dependent variable	Labor Force Participation	Unemployment	Log Wage	Labor Force Participation	Unemployment	Log Wage
	(1)	(2)	(3)	(4)	(5)	(6)
2000 x Hits	0.016	0.041	-0.002	-0.017	0.022	-0.029
	(0.013)	(0.025)	(0.023)	(0.014)	(0.020)	(0.020)
2001 x Hits	0.015	0.022	-0.015	-0.031**	0.015	0.003
	(0.013)	(0.025)	(0.024)	(0.012)	(0.020)	(0.025)
2002 x Hits	0.012	0.016	-0.023	-0.025*	0.004	0.005
	(0.013)	(0.023)	(0.017)	(0.013)	(0.014)	(0.030)
2003 x Hits	0.012	0.013	-0.009	-0.028*	-0.000	0.000
	(0.012)	(0.015)	(0.021)	(0.016)	(0.013)	(0.017)
2004 x Hits	0.008	0.001	-0.013	-0.002	-0.002	0.006
	(0.008)	(0.009)	(0.038)	(0.015)	(0.007)	(0.023)
2007 x Hits	0.020	-0.022	-0.004	-0.028	-0.006	0.015
	(0.034)	(0.018)	(0.032)	(0.037)	(0.013)	(0.027)
2008 x Hits	0.013	-0.012	-0.008	-0.036	-0.004	0.035
	(0.030)	(0.016)	(0.023)	(0.037)	(0.015)	(0.029)
2009 x Hits	0.011	-0.001	-0.014	-0.039	-0.005	-0.010
	(0.028)	(0.015)	(0.020)	(0.042)	(0.015)	(0.028)
2010 x Hits	-0.006	0.004	0.007	-0.046	-0.011	-0.010
	(0.032)	(0.019)	(0.016)	(0.047)	(0.017)	(0.037)
2011 x Hits	-0.006	-0.002	-0.007	-0.031	-0.009	0.000
	(0.032)	(0.019)	(0.020)	(0.052)	(0.017)	(0.046)
Individual FEs	Yes	Yes	No	Yes	Yes	No
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Locality FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year and quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	41,954	36,559	11,925	47,509	38,543	12,951
R-squared	0.820	0.731	0.308	0.796	0.755	0.231

Sources. Data on labor force participation and unemployment are from the restricted-use versions of the Israeli Central Bureau of Statistics' *Labor Force Surveys 2000-2011*. Data on (gross) wages are from the restricted-use versions of the Israeli Central Bureau of Statistics' *Income Surveys 2000-2011*. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. "Hits" is the number of hits per locality (divided by 100). The analysis excludes the year 2006; the base year for comparison is 2005. We restrict the sample to individuals of prime working age (25-54). Wage analysis is for salaried employees only.

In columns (1)-(2) and (4)-(5) individual characteristics include indicators for age group, family status and education group as well as the number of children; in columns (3) and (6) we add to this vector two time-invariant characteristics: new immigrant status and ethnicity.
Estimated by OLS. Standard errors, clustered by locality, in parentheses.
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table A4

Effect of the Rocket Threat on Labor Market Outcomes – Using the Treatment Intensity Approach

(Panel of Wage Earners)

Dependent variable	Men		Women	
	Employment	Log wage	Employment	Log wage
	(1)	(2)	(3)	(4)
2000 x Hits	-0.013*	-0.007	-0.007	0.001
	(0.008)	(0.011)	(0.006)	(0.011)
2001 x Hits	-0.003	0.006	-0.003	0.001
	(0.005)	(0.011)	(0.004)	(0.006)
2002 x Hits	0.003	0.006	-0.004	-0.003
	(0.005)	(0.013)	(0.004)	(0.007)
2003 x Hits	-0.001	0.007	-0.002	-0.015**
	(0.005)	(0.009)	(0.005)	(0.006)
2004 x Hits	-0.001	-0.002	-0.002	-0.002
	(0.003)	(0.008)	(0.002)	(0.007)
2007 x Hits	0.000	0.006	-0.004	-0.003
	(0.004)	(0.012)	(0.003)	(0.008)
2008 x Hits	0.001	0.002	-0.006*	-0.001
	(0.004)	(0.010)	(0.004)	(0.006)
2009 x Hits	-0.006**	-0.010	-0.006	-0.007
	(0.003)	(0.019)	(0.005)	(0.006)
2010 x Hits	-0.004	-0.009	-0.003	-0.008
	(0.004)	(0.010)	(0.004)	(0.007)
2011 x Hits	-0.002	-0.006	-0.005	-0.004
	(0.004)	(0.010)	(0.004)	(0.006)
2012 x Hits	-0.004	-0.005	-0.002	-0.000
	(0.004)	(0.011)	(0.004)	(0.006)
Individual FEs	Yes	Yes	Yes	Yes
Individual characteristics	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	130,427	98,722	126,367	100,949
R-squared	0.563	0.738	0.543	0.696

Sources. Data on employment and wages are from a panel of wage earners constructed by The Israel Tax Authority for the Bank of Israel. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. "Hits" is the number of hits per locality (divided by 100). The analysis excludes the year 2006; the base year for comparison is 2005. We restrict the sample to individuals of prime working age (25-54). Individual characteristics include indicators for age group and family status as well as the number of children.

Estimated by OLS. Standard errors, clustered by locality, in parentheses.

*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table A5
Migration Dynamics

Dependent variable: net migration from Top5 to non-Top5 localities				
		Excluding localities with 2006 population of less than		
	Baseline	2,000	10,000	20,000
	(1)	(2)	(3)	(4)
2001	0.011	0.029	0.030	0.021
	(0.021)	(0.022)	(0.022)	(0.023)
2002	0.014	0.036*	0.036*	0.024
	(0.021)	(0.021)	(0.022)	(0.023)
2003	0.004	0.017	0.031	0.015
	(0.020)	(0.021)	(0.022)	(0.022)
2004	-0.002	-0.006	0.003	-0.010
	(0.020)	(0.022)	(0.022)	(0.022)
2007	0.005	0.015	0.022	0.014
	(0.020)	(0.021)	(0.021)	(0.022)
2008	0.024	0.032	0.042**	0.046**
	(0.019)	(0.021)	(0.021)	(0.021)
2009	0.011	0.020	0.020	0.031
	(0.019)	(0.020)	(0.021)	(0.021)
2010	0.012	0.017	0.017	0.024
	(0.019)	(0.020)	(0.020)	(0.021)
2011	0.025	0.024	0.030	0.038*
	(0.019)	(0.020)	(0.021)	(0.021)
2012	0.020	0.020	0.027	0.026
	(0.019)	(0.020)	(0.021)	(0.021)
Observations	11,560	10,365	9,806	9,060
R-squared	0.000	0.001	0.001	0.001

Sources. Data are from a panel of wage earners constructed by The Israel Tax Authority for the Bank of Israel. Data on rocket hits are from the Home Front Command of the Israeli Defense Forces.

Notes. The analysis excludes the year 2006; the base year for comparison is 2005. The year 2000 is excluded from the analysis since in order to define migrants we need information on individual's place of residence in the previous year (and our dataset starts in 2000).

Estimated by OLS. Robust standard errors in parentheses.

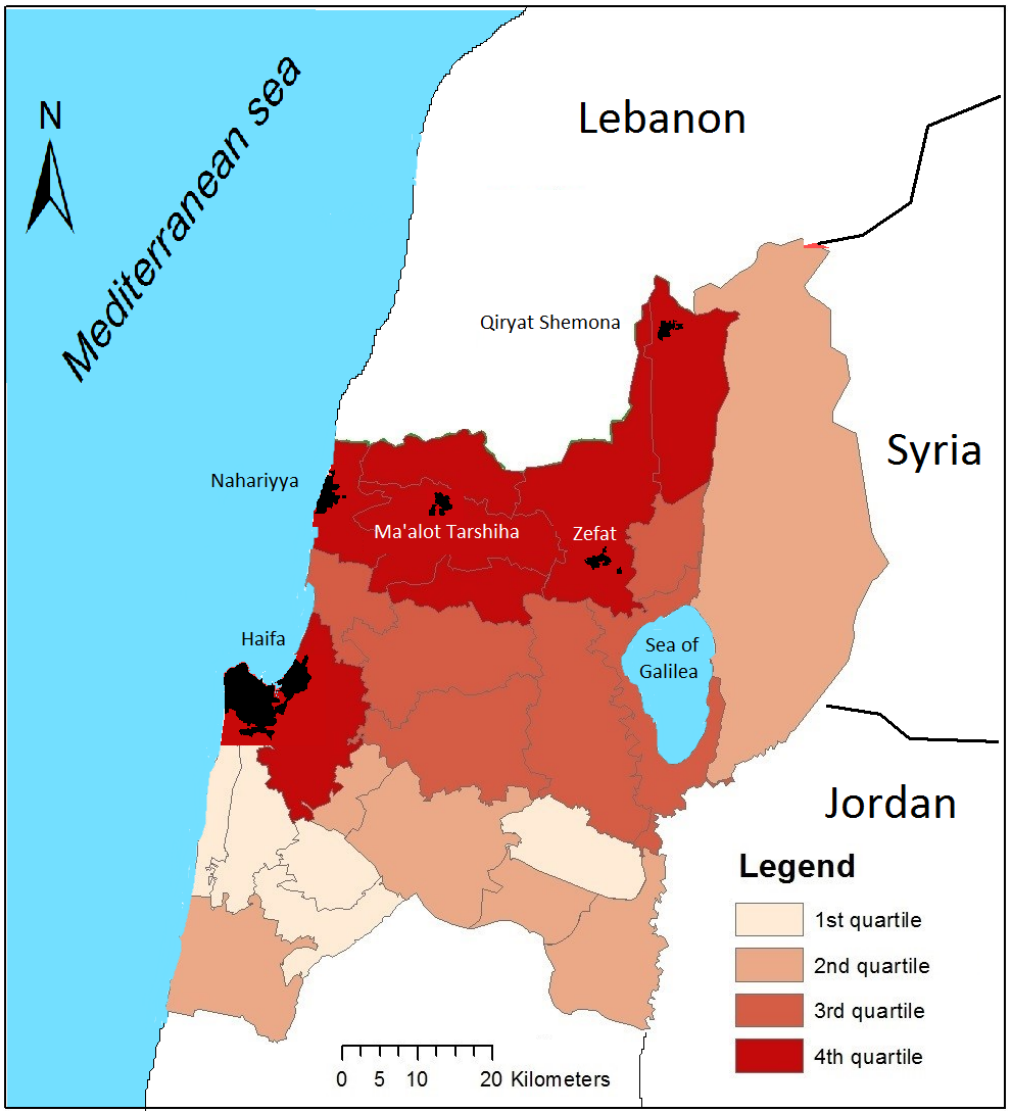
*, **, *** represent statistical significance at the 10, 5, and 1 percent levels.

Table A6
Pre-War Differences in Population Characteristics

		Top5			Non-*Top5*			Difference	
Dataset	Variable	Mean	S.D.	N	Mean	S.D.	N	Coef.	S.E.
Labor force survey	Labor force participation rate (%)	81.8	38.5	14,756	83.9	36.8	36,050	-2.02***	0.37
	Unemployment rate (%)	9.7	29.6	12,077	9.5	29.3	30,232	0.24	0.32
	Age	39.5	8.9	14,756	40.3	8.6	36,050	-0.77***	0.09
	Married (%)	71.1	45.3	14,756	77.9	41.5	36,050	-6.77***	0.43
	Number of Children	1.02	1.27	14,756	1.20	1.27	36,050	-0.19***	0.01
	Highly educated (%)	57.8	49.4	14,733	50.4	50.0	36,002	7.42***	0.49
Income survey	Monthly gross wage (NIS)	7,431	6,545	4,396	7,005	5,405	9,083	427***	114
Sample of wage earners	Employment rate (%)	84.0	36.7	40,636	83.9	36.8	87,836	0.11	0.22
	Age	35.2	5.8	40,636	35.8	5.7	87,836	-0.55***	0.04
	Married (%)	68.2	46.6	40,636	74.3	43.7	87,836	6.14***	0.27
	Number of Children	1.26	1.39	40,636	1.53	1.42	87,836	-0.27***	0.01
	Monthly gross wage (NIS)	7,729	8,759	34,480	7,175	7,755	74,381	554***	55

Sources. Sample of wage earners – The Israel Tax Authority (via the Bank of Israel). All other data are from the Israeli Central Bureau of Statistics.
Notes. Period covered is 2000-2005. We restrict the sample to individuals of prime working age (25-54). "Highly educated"- more than 12 years of education. The average exchange rate between the NIS and the $US in 2000-2005 was 4.42.

Figure A1
Rocket Range in Northern Israel
(number of hits by natural area)



Sources: Home Front Command of the Israeli Defense Forces; GIS Lab, Department of Geography, The Hebrew University of Jerusalem.