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THE PRICE OF TERROR: EFFECTS OF THE SECOND PALESTINIAN INTIFADA ON JERUSALEM HOUSE PRICES

(Preliminary and Incomplete)

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BACKGROUND

- In late September, 2000, the Palestinian uprising, that began with the visit of the Opposition Leader (at the time) Ariel Sharon, in the Temple Mount in the Old City of Jerusalem, have gradually spread and evolved to what is today known as the 2nd Palestinian Intifadah (the El-Aqsa Intifada).
- In part of the events, casual shootings have erupted on the neighborhood of Gilo (occupied and annexed to Jerusalem after the 1967 war) from the neighboring Palestinian village, Beit Jallah.

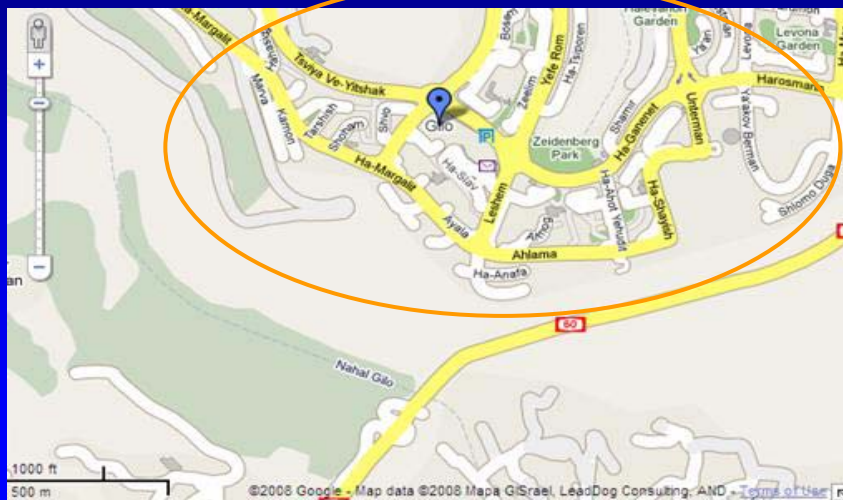
BACKGROUND

Gilo and Beit Jallah



BACKGROUND

Gilo – frontline streets



GENERAL OBJECTIVE

Explore the effect of violent events on real estate prices.



More generally, to estimate the real estate price of violent conflicts!

OBJECTIVES

1. To what extent are Intifada effects capitalized into real estate prices?
2. Do real estate prices maintain a long-term memory of the violent events?
3. Is the price effect of the violent events immediate or gradual?

OUTLINE OF THE REST OF THE PRESENTATION

- Brief literature review;
- Data;
- Empirical model and results;
- Summary.

LITERATURE REVIEW

Economic analysis of the determinants of terrorism

(Krueger and Maleckova, 2003; Abadie, 2006; Piazza, 2006; Dreher and Gassebner, 2008);

Macroeconomic consequences of terrorism

(Becker and Rubinstein, 2004; Eckstein and Tsiddon, 2004);

The impact of terrorism on financial markets

(Eldor and Melnick, 2004; Jeffrey *et. al.*, 2004);

The impact of terrorism on future development and growth of cities

(Glaeser and Shapiro, 2002; Mills, 2002; Hazam and Felsenstein, 2007);

The effect on commercial real estate

(Dermisi, 2006; Dermisi, 2007; Abadie and Dermisi, 2008).

DATA

We observe a total of 617 housing transactions in the neighborhood of Gilo, Jerusalem, over the period 1997-2007.

We merge data that is collected from two sources:

- a local real estate appraiser (we thank Moti Bier for his invaluable assistance);
- and the real estate taxation office within the Israeli Tax Authority.

VARIABLES SUFFICIENT STATISTICS

Table 2a: Summary statistics and unit root tests for the **1997-2000** (October) sample period prior to the outbreak of the Intifada

<u>Variables</u>	<u>Obs.</u>	<u>Mean</u>	<u>Std</u>	<u>Min</u>	<u>Max</u>
Price	135	595,966	185,446	237,855	1,874,700
Frontline	136	0.46	0.50	0.00	1.00
Price in Frontline	63	577,738	148,627	237,855	904,176
Construction	135	1,981	8.13	1,970	2,000
Rooms	136	3.40	0.68	1.00	6.00
Floor	136	1.77	1.42	0.00	5.00
Floors	136	4.24	0.86	2.00	7.00
Area	136	77.63	19.49	20.00	150.00
PriceIndex	136	740,176	67,139	635,444	840,567

VARIABLES SUFFICIENT STATISTICS II

Table 2b: Summary statistics and unit root tests for the 2000-2007 sample period subsequent to the outbreak of the Intifada

<u>Variables</u>	<u>Obs.</u>	<u>Mean</u>	<u>Std</u>	<u>Min</u>	<u>Max</u>
Price	524	618,581	302,003	202,375	2,954,875
Frontline	524	0.19	0.39	0.00	1.00
Price in Frontline	99	585,622	312,090	331,628	2,502,500
Construction	437	1,980	5.02	1,968	2,005
Rooms	524	3.49	0.79	1.00	9.00
Floor	513	2.13	1.33	0.00	7.00
Floors	516	4.13	0.89	1.00	9.00
Area	521	85.07	23.42	29.00	218.00
PriceIndex	495	826,684	88,755	674,791	1,005,100

EMPIRICAL MODEL

Consider the hedonic-price equation

$$(1) \quad \begin{cases} y_{1j} = \alpha_{1j}i + X_{1j}\beta_{1j} + u_{1j} & \text{for } t \leq t^* \\ y_{2j} = \alpha_{2j}i + X_{2j}\beta_{2j} + u_{2j} & \text{for } t > t^*, \end{cases}$$

where

t – date of the transaction (where all transactions are organized in a chronological order);

t^* – date in which the violent events have erupted (October 1, 2000);

j ($j=1,2$) – index for units located in frontline and non-frontline streets;

y_1 and y_2 – vectors of natural logarithms of transaction prices;

i – vector of ones;

X_1 and X_2 – matrices of explanatory variables;

a_1, a_2, b_1, b_2 – estimated coefficient vectors;

u_1, u_2 – random disturbance terms.

EMPIRICAL MODEL

To what extent are Intifada effects capitalized into real estate prices?

- We estimate Equation (1) generating 4 sets of coefficients: pre- and post-intifadah prices for both frontline and non-frontline housing units.
- We construct two price estimates for each housing unit: the price in the actual location of the property and a price under the assumption that the same unit, with its specific characteristics, is re-located from the frontline (non-frontline) to the non-frontline (frontline) streets.
- This procedure allows us to compute the difference in the market price of a unit that is located in the non-frontline streets and that of an identical unit that is located in the frontline.
- By averaging this price difference across all units, for each of the two sub-samples (pre- and post-Intifadah), we produce a quality-adjusted spatial price difference between frontline and non-frontline streets.

RESULTS

Table 3a: Hedonic regression results for periods prior and subsequent to the outbreak of the Intifada (1997-2007) for dwelling units located on *non-frontline* streets.

Coefficient of:	Full Model		Significant Coefficients	
	Before	After	Before	After
Constant	11.0672 (2.0896)*	12.2521 (2.2754)*	12.4544 (146.1045)*	11.9935 (86.9472)*
Construction	0.0007 (0.2583)	-0.0001 (-0.0508)	-	-
Rooms	0.1370 (2.6972)*	0.0579 (1.5246)	0.1308 (2.6587)*	-
Floor	-0.0229 (-1.7674)**	-0.0282 (-2.5577)*	-0.0229 (-1.8251)**	-0.02824 (-2.5933)*
Floors	-0.0158 (-0.6767)	-0.0096 (-0.6497)	-	-
Area	0.0052 (2.8289)*	0.0086 (6.2796)*	0.0054 (3.0234)*	0.01054 (15.7035)*
Priceindex	1.12×10^{-7} (0.4043)	5.55×10^{-7} (3.6513)*	-	5.35×10^{-7} (3.54305)*
Observations	72.0000	24.0000	72.0000	324.0000
D.W. Statistics	1.7821#	2.0353##	1.7824##	2.2785
Adjusted R-Square	0.7213	0.4884	0.7305	0.4930
MSE= $\hat{\sigma}^2$	0.0206	0.0584	0.0199	0.05845
F-Value	31.6300	52.4000	65.1500	103.7200

RESULTS

Table 3b: Hedonic regression results for periods prior and subsequent to the outbreak of the Intifada (1997-2007) for dwelling units located on *frontline* streets.

Coefficient of:	Full Model		Significant Coefficients	
	Before	After	Before	After
Constant	-5.5567 (-0.7513)	5.6096 (0.5215)	-1.4870 (-0.2264)	11.8750 (46.1861)*
Construction	0.0089 (2.3900)*	0.0032 (0.5781)	0.0070 (2.0780)*	-
Rooms	0.0545 (0.7645)	0.0359 (0.7723)	-	-
Floor	-0.0094 (-0.5583)	-0.0468 (-3.2643)*	-	-0.0473 (-3.4481)*
Floors	0.0912 (0.0353)	-0.0085 (0.0332)	0.0914 (2.6898)*	-
Area	0.0042 (1.6757)**	0.0086 (4.3216)*	0.0057 (3.2070)*	0.0100 (9.8229)*
Priceindex	3.36×10^{-7} (0.8256)	6.63×10^{-7} (2.2705)*	-	6.26×10^{-7} (2.2357)*
Observations	63.0000	75.0000	63.0000	75.0000
D.W. Statistic	2.5453#	1.3221##	2.3134##	1.1470
Adjusted R-Square	0.4714	0.6069	0.5081	0.6197
MSE= $\hat{\sigma}^2$	0.0364	0.0273	0.0356	0.0264
F-Value	10.2200	20.0400	20.3200	41.1900

RESULTS

Table 4a: Distribution of estimated price differences (in percentage points) between non-frontline and frontline dwelling units for the pre- and post-Intifada periods.

	Pre-		Post-	
	Non-frontline	Frontline	Non-frontline	Frontline
Mean	4.14*	-9.69**	15.78**	-13.94**
Std	13.13	10.36	3.36	2.19
Min	-22.94	-38.00	9.75	-21.06
Max	33.26	18.77	24.23	-7.55
Observations	63.00	72.00	90.00	392.00

EMPIRICAL MODEL

Do real estate prices maintain a long-term memory of the violent events?

- We divide the post-intifadah sample into two equal parts: the first from October 1, 2000 to May 5, 2004 and the other from May 6, 2004 to December 24, 2007—thus, t^* in Equation (1) now represents the date of May 6, 2004.
- We then re-estimate the coefficients from Equation (1) for the two time-series sub-samples (separately, for units located on the non-frontline and frontline streets) and compare the price difference that is generated by relocating the non-frontline-street (frontline-street) units into the frontline (non-frontline) area.
- This technique allows us to test the dynamics of the post-Intifadah quality-adjusted prices and, particularly, to address the question whether the quality-adjusted average price has eventually returned to its pre-Intifada levels.

RESULTS

Table 5a: Distribution of estimated price differences (in percentage points) between non-frontline and frontline dwelling units for two post-Intifada periods.

	First Period: from October 1, 2000 to May 5, 2004		Second Period: from May 6, 2004 to December 24, 2007	
	<u>Non- frontline</u>	<u>Frontline</u>	<u>Non- frontline</u>	<u>Frontline</u>
Mean	18.03**	-12.44**	16.08**	-19.77**
Std	7.31	5.29	17.02	10.12
Min	-0.24	-31.34	-18.02	-53.58
Max	30.89	10.75	64.75	8.27
Observations	50.00	215.00	40.00	177.00

EMPIRICAL MODEL

Is the price effect of the violent events immediate or gradual?

To address this question we compare two models:

- 1) The unrestricted model from Equation (1) that potentially allows for an immediate and sudden change in the coefficients at the switching point (t^*);

and

- 2) A linear-spline model, allowing for a gradual price change, implying an intersection point between the regression line that corresponds to the sub-samples pre- and post-Intifada.

EMPIRICAL MODEL

Consider the hedonic-price equation

(1)

$$\begin{cases} y_{1j} = \alpha_{1j}i + X_{1j}\beta_{1j} + u_{1j} & \text{for } t \leq t^* \\ y_{2j} = \alpha_{2j}i + X_{2j}\beta_{2j} + u_{2j} & \text{for } t > t^*, \end{cases}$$

where

t – date of the transaction (where all transactions are organized in a chronological order);

t^* – date in which the violent events have erupted (October 1, 2000);

j ($j=1,2$) – index for units located in frontline and non-frontline streets;

y_1 and y_2 – vectors of natural logarithms of transaction prices;

i – vector of ones;

X_1 and X_2 – matrices of explanatory variables;

a_1, a_2, b_1, b_2 – estimated coefficient vectors;

u_1, u_2 – random disturbance terms.

EMPIRICAL MODEL

To obtain the linear-spline model, for $t=t^*$ we impose on Equation (1):

$$(3) \quad \alpha_1 + X_1^* \beta_1 = \alpha_2 + X_1^* \beta_2$$

where X_1^* represents the numerical values of the explanatory variables at the switching point time t^* .

Subtracting $X_1^* \beta_2$ from both sides of Equation (3) yields

$$(3a) \quad \alpha_2 = \alpha_1 + X_1^* (\beta_1 - \beta_2)$$

To obtain the linear-spline model, we now substitute the restriction in (3a) into Equation (1). If the restriction is not statistically rejected, then the hypothesis of an immediate change is rejected in favor of the gradual change.

RESULTS

Table 6b: Significance of immediate or gradual average price change at the switching point for dwelling units located in non-frontline and frontline streets .

<u>Null Hypothesis</u>	<u>Degrees of Freedom</u>	<u>Calculated Statistic</u>	<u>p-Value</u>
(1) The Linear-Spline Model implying a gradual change of price level fits the data for non-frontline dwelling units and the switching point t^* =September 24, 2000	(1,454)	0.06	0.80
(2) The Linear-Spline Model implying a gradual change of price level fits the data for frontline dwelling units and the switching point t^* =August 30, 2000	(1,126)	0.00	0.99

SUMMARY

- ✓ We find a significant gradual, long-lasting, housing price drop in the neighborhood of Gilo (in Jerusalem) – a neighborhood that suffered direct gun-shooting from the neighboring Palestinian Beit-Jallah village during the 2nd Intifadah.

In particular, we find:

- ✓ Quality-adjusted housing prices on frontline streets dropped by about 4-11 percent compared to those located on non-frontline streets.
- ✓ A sustained, long-term, homebuyer aversion and related depressed pricing of units that were in the line of fire. These price effects were long-lived, as evidenced in our data some 7 years following the onset of the shootings.
- ✓ The negative price effect of the Intifadah has been gradual rather than immediate.

THE END