The Hotel Market in Israel

Ran Sharabani* and Yigal Menashe**

Research Department, Bank of Israel   http://www.boi.org.il
* Ran Sharabani – E-mail: ran.shahrabani@boi.org.il ; Phone: 972-2-6552633
** Yigal Menashe – E-mail: yigal.menashe@boi.org.il; Phone: 972-2-6552605

שוק בתי המלון בישראל

רן שהרבני ויגאל מנשה

תקציר

בעבודה זו נבחנו הקשרים ארוכי הטווח של היצע הלינות בבתי המלון בארץ ושל הביקוש להן. הניתוח האמפירי מתבסס על מסגרת תיאורטית הכוללת שיווי משקל בין בתי מלון לצרכנים הפועלים בתנאי תחרות. קבוצות הצרכנים במודל – תיירים וישראלים – נבדלות זו מזו ברגישותן לתעריף הלינה ולטרור ובטעמיהן לגבי קנייה סמוך למועד הצריכה לעומת הזמנה מראש. האמידה האמפירית מתחשבת בקשרים הסימולטניים שבין ההיצע לביקוש בשוק ובטעמיהן השונים של קבוצות הצרכנים. לראשונה נבחנה גם ההשפעה של הטרור על מידת הרגישות של ביקוש התיירים לתעריף. השוני בין ישראלים לתיירים בגורמים המשפיעים על הביקוש ללינות ממלא תפקיד מרכזי בהסבר הפער בין התעריפים לשתי הקבוצות: בתקופה הנחקרת (1997:I עד 2009:IV) שילמו התיירים על לינות בבתי מלון בישראל, בממוצע, מחיר הגבוה בכ-8 אחוזים מזה ששילמו הישראלים. תוצאות האמידה מראות כי הביקוש של ישראלים ללינות רגיש לתעריף הלינה יותר מזה של התיירים. כנגד זאת נמצא כי רגישותן של לינות הישראלים למצב הביטחוני נמוכה משמעותית מזו של התיירים. הביקוש של תיירים ללינות מושפע כצפוי משער החליפין הריאלי של השקל ומעלויות החופשה שלהם ביעדים אלטרנטיביים. הביקוש של ישראלים ללינות מושפע מההכנסה לנפש בישראל ומעלויות החופשה לישראלים בחו"ל. בתרחישים המבוססים בין היתר על גמישויות שנמצאו באמידה האמפירית ועל הנחות סבירות, למשל ביחס ליציבות במצב הביטחוני, נמצא שיש להגדיל את קיבולת חדרי בתי המלון, העומדת כיום על כ-47 אלף חדרים, בכ-6 עד 9 אלפי חדרים בחמש השנים הקרובות.

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Abstract

This study evaluates the long-term connections between the supply of hotel overnights in Israel and the demand for them. The empirical analysis is based on a theoretical framework that includes equilibrium between hotels and consumers operating under competitive conditions. The consumer groups in the model—Israelis and foreign tourists—differ from each other in their sensitivity to the rates for overnights and to terrorism, and in their preferences for making purchases close to the consumption date, in contrast to making advance reservations. The empirical estimate takes into account the simultaneous connections between the supply and demand in the market, and the contrasting preferences of the consumer groups. For the first time we test the effect of terrorism on the sensitivity of foreign tourists' demand to overnights rates. The difference between Israelis and tourists in the factors affecting the demand for overnights plays a key role in explaining the gap between the rates for the two groups: during the period of the study (the first quarter of 1997 through the fourth quarter of 2009), foreign tourists paid an average of about 8% more than Israelis for hotel overnights in Israel.

The results of the estimation show that demand from Israelis for overnights is more sensitive to the rate for overnights than the demand from tourists. On the other hand, it was found that the sensitivity to the security situation of Israeli overnights was significantly less than that of the tourists. As expected, the demand from tourists for overnights was affected by the real shekel exchange rate and their vacation costs for alternative destinations. The demand from Israelis for overnights was affected by the per capita income in Israel and the costs of overseas vacations for Israelis. In scenarios based, among other things, on the elasticity found in the empirical estimate and on reasonable assumptions concerning stability in the security situation, for example, it was concluded that the current hotel room capacity of about 47,000 rooms should be increased by 6,000-9,000 rooms over the next five years.

1. Introduction

World tourism in general and accommodation of tourists in hotels in particular is an important industry in terms of its scale and its weight in global exports, alongside high-tech industries such as computers and electronic equipment. The two major components of the tourism industry—the export of tourism services and internal tourism—contribute to GDP and to growth. The rate of growth of the industry worldwide in the years 1995 to 2005 was greater than the growth rate in the United States, which highlights its particular importance as a supplier of jobs, particularly for people with a lower educational level.

In Israel the added value of tourism services, including tourism services for Israelis and tourists and flight services, was estimated in 2004[1] at around NIS 9 billion,[2] which constituted around 1.8 percent of the net domestic product (NDP), as against 3.4 percent in 1995. From 2004 to 2007, the industry grew by around 29 percent as a result of the recovery in tourists' overnights. In 2004 the industry employed more than 90 thousand people, and since then the growth trend of employment in the industry has continued. A large proportion of employees in the industry are drawn from the periphery, noticeable among which is the high proportion of employees without an academic education. These characteristics of the composition of employees in tourism highlight the importance of the industry in Israel, beyond its contribution to growth—importance that arises from its ability to supply jobs to people with a low educational level, people whose rate of participation in the technological advances of recent years, is lower than that of people with a high educational level.

Israel's share of the tourism market, as reflected in the number of rooms per GDP or per capita, decreased in the past 10 years relative to the OECD countries: while the number of rooms relative to the population in the OECD grew from 2000 to 2008 by 6 percent, in Israel it decreased in this period by 5 percent. Overall, the tourism industry in Israel is small relative to the OECD countries, even the small ones among them. Table 1 presents an international comparison of the weight of tourism consumption (incoming and local) in GDP, and the weight of the tourism employment relative to the overall number of employees. We see from the table that the tourism industry's share in Israel is low by international comparison.

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[1] The data relate to 2004, because this was the last year in which the tourism satellite account in Israel was drawn up according to the Tourism Value Added (TSA) method, which was developed by the United Nations World Tourism Organization (WNWTO) and facilitates inter-country comparison of the size of the industry. According to Freeman's (2010) estimate, the tourism gross product in 2007 amounted to around 11.6 billion dollars.

[2] In base prices.

Israel's advantage in the area of tourism is that of an attractive destination, combining heritage and historical sites, and entertainment and recreation sites, such as beaches. The level of services offered to the tourist is also as high as in any developed country. Israel's salient disadvantages are the unstable security situation, and to some extent also the high price level relative to other destinations. Government expenditure on tourism and tourists' expenditure as a percentage of GDP are low by international comparison (World Economic Forum 2009).

Table 1: The Weight of Tourism Consumption (Incoming and Local) in GDP and the Weight of Tourism Employment Relative to Overall Employment

	Year	In GDP Terms		In Terms of Number of Jobs
		Incoming Tourism Consumption Relative to GDP	Local Tourism Consumption Relative to GDP	Percentage of Jobs in the Tourism Industry Relative to Total Jobs in the Economy
Australia	2003-2004	2.3	6.6	4.8
Austria	2005	5.9	5.6	7.2
Canada	2002	1.6	3.3	11.1
Chile	2003	1.5	5.1	2.6
China	2002	0.8	8.1	2.3
Colombia	2000	1.0	2.7	
Cyprus	2006	15.7	3.0	
Czech Republic	2006	3.7	3.0	3.3
Denmark	2006	2.2	2.1	5.5
Ecuador	2003	8.4	19.1	1.8
Finland	2006	1.7	3.2	
France	2005	2.5	5.9	
Honduras	2005	5.1	6.1	5.3
India	2002-2003	1.3	5.7	4.6
Ireland	2000	3.5	3.0	4.5
Japan	2007	0.3	4.1	2.8
Latvia	2004	2.6	2.7	9.0
Lithuania		1.9	2.5	2.6
Mexico	2006	1.6	10.2	6.7
Morocco	2006	9.3	3.8	
Holland	2007	1.2	5.0	4.3
New Zealand	2007	5.3	6.8	9.7
Oman	2007	1.0	3.5	
Peru	2001	1.4	4.1	3.1
Philippines	2007	3.0	13.0	9.7
Poland	2002	1.8	1.2	4.8
Romania	2001	1.8	2.0	8.3
Saudi Arabia	2005	1.9	3.0	3.9
Slovakia	2006	3.4	2.7	7.3
Slovenia	2003	4.7	3.7	11.5
Spain[1]	2006	4.7	4.6	11.8
Sweden	2007			4.1
Switzerland	2005	2.6	4.0	4.4
United States	2007	0.6	4.5	6.2
Israel	**2004**	**1.5**	**2.4**	**2.6**
Mean		3.2	4.9	5.7
Median		2.05	3.9	4.8

[1] In Spain, consumption is for 2006, and the supply of jobs is for 2004.
Source: TSA Data Around the World, World Tourism Organization, Statistics and Tourism Satellite Account (TSA) Programme, Madrid, June 2010.

The tourism industry is based on hotels.[3] While hotel overnights constitute only around 30 percent of the tourist's expenditure in Israel,[4] the shortage of hotel rooms is a barrier to the development of the industry, which provides the tourist, in addition to accommodation, food services, transportation, commerce, etc. It is clear therefore that in order to understand the factors affecting the tourism industry, it is necessary to analyze the hotel market, an analysis that will be based on demand factors from both Israelis and tourists, as well as on the supply side.

Demand factors: The major factor affecting tourism demand in Israel, besides the standard variable of the overnight rate, is the security situation. Another factor that we examined in this study, similar to research projects worldwide, is connected to the influence of the rise in the standard of living in Israel and in the countries from which tourists come to Israel, on the demand from Israelis and tourists for hotel overnights. Other factors examined are the relative costs of a vacation outside Israel, the effective exchange rate, and Israel's image in the world. We did not examine Israel's attractiveness as a factor drawing Jewish and pilgrimage tourism, owing to a lack of data.[5]

The demand for overnights in Israel can be divided into two types—demand from tourists (from abroad) and demand from Israelis. These demands have different characteristics, and in particular the tourists' sensitivity to terrorism is far greater than that of the Israelis. On the other hand, the tourists are less sensitive to overnight rates, even though their sensitivity has grown during times that terrorism has subsided, in the wake of change in the mix of the tourists—a growth in the weight of tourists visiting for sightseeing and vacation purposes, at the expense of the weight of business people and those coming to visit relatives. The distinction between the demand from Israelis and tourists is further enhanced in light of the salient trend, since the early 1990s, of a rise in the weight of Israeli overnights in the overall number of overnights, against the background of the increasing standard of living of Israelis in this period.

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[3] And to the extent that this concerns tourists—also on flight services.

[4] In 2008, a tourist's average expenditure in Israel was around 1,200 dollars, around 380 dollars of which on accommodation. Besides this, a tourist spends around 300 dollars on flight services through Israeli companies (this is the average expenditure; some tourists purchase flight services from foreign companies).

[5] This assumption was not examined in the study, because we were unable to quantify Israel's attractiveness and changes in it as a result of attractions and heritage sites over time. The data cover only a few years: The Travel and World Economic Forum: Tourism Competitiveness Report, 2009.

Supply factors: The hotel industry, similar to the air travel industry, is characterized by high fixed costs, and low marginal costs. These characteristics lead to the fact that the supply of rooms determines the number of overnights in the long term, and therefore has the most significant influence on the size of the industry. As against this, in the short term the change in the supply of the rooms is limited, and increasing the supply takes considerable time. Also, reducing the supply of rooms by closing and converting hotels takes considerable time.

The empirical estimate is based on the assumption[6] that tourists usually reserve hotel overnights in Israel in advance, while Israelis usually made reservations close to the time that the hotel is required. We can therefore view the supply of rooms to Israelis as a residual supply.[7]

The number of vacant rooms in a hotel, and particularly the rooms that remain vacant for occupancy mainly by Israelis (close to the time of consuming the product) has a negative impact on overnight rates, especially the rates for Israelis. The number of Israeli overnights is not supposed to affect the rate, because the marginal cost is fixed and low.

An additional factor that can affect the rate offered by the hotels is wage costs. Bear in mind that a large proportion of employees in the industry earn minimum wages, which are determined exogenous to the industry. On the assumption that the industry operates under competitive conditions, so that hotels do not have monopolistic power, an increase in the minimum wage will also be reflected in a rise in the overnights rates.

In this study we analyzed the hotel market from the demand side and the long-term supply side. Furthermore, we facilitated estimation of these equations by taking into consideration a simultaneous connection between demand and supply—based on the assumption that the number of overnights and their rates are determined at the same time.

The theoretical framework is based on a group of studies using a stochastic dynamic pricing game approach, and especially that of Levin, McGill, and Nediak (2009). Hotels operate under competitive conditions. There are many periods in which an encounter is possible between a customer who is interested in reserving a room in a hotel, and a hotel that is interested in selling its capacity. If the room is not sold in the last period, it disappears (perishable good). The major competitive conditions are: a large number of hotels (players)

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[6] That is supported by auxiliary estimates of the supply equations; see Chapter 5, Section d.2.
[7] This study also estimates an aggregate supply equation, in which expected results are obtained. The disadvantage of this estimate, however, is that is does not include an important element in the supply—the number of vacant rooms close to the time of consuming the product.

that do not coordinate among themselves,[8] and a large number of customers—the people reserving the rooms. The customers have information about the prices of the rooms, which is obtained by various means, such as the internet or by phone, and are able to choose between hotels. We assume that the people reserving rooms are heterogeneous regarding their perception of the quality of the product, and the importance they attribute to reserving some time in advance as opposed to reserving close to the time of consumption. In determining the rate offered, the hotels take into account the inventory of vacant rooms and assessments of the pace of occupying them up to the time of consumption of the product. Furthermore, the consumers and the hotels behave in a strategic manner—they take into consideration that slow sales at the initial stages will lead to many rooms being vacant close to the date of consumption of the product. Moreover, the intensiveness of searching for a room on the part of the consumers (shopping) is limited; this implies that even if a hotel drastically lowers its prices, it will take some time for it to achieve full occupancy. In these conditions, equilibrium exists between hotels and consumers in the sense that it will not be worthwhile for any hotel to deviate from the price list that it offers, and it will not be worthwhile for any consumer to deviate from the level of intensiveness of searching for a hotel.

As a consequence of this, the theoretical framework allows for variance between overnights rates arising from timing differences (for example, discounts or a rise in prices close to the time of consumption).[9] In this sense the theoretical framework is sufficiently flexible in order to enable the existence of price differences over the years between overnights rates for tourists and for Israelis, which is also reflected in practice in the data (see Figure 3 below).

The present study, as we have said, assumes that the hotel market in Israel operates under competitive conditions. Heterogeneity between people reserving rooms allows for the existence of groups with different preferences and different demand characteristics, particularly tourist groups and Israeli groups. Therefore the estimation of the hotel market in Israel includes two demand equations for overnights—of tourists and of Israelis.

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[8] This assumption seems to be reasonable, because in 2008 there were 338 hotels in Israel. Some of these were organized in several hotel chains.

[9] An additional factor that could produce variance in rates between Israelis and tourists is assumptions about organizing by groups of work committees. This factor was not investigated in the model.

In accord with the theoretical framework, we also assume in the empirical analysis that the product the hotels offer—hotel overnights—is identical for tourists and Israelis.[10] Therefore we estimate one supply equation.

The theoretical framework proposes equilibrium in which the prices of the rooms and the number of rooms sold are obtained simultaneously. This is reflected by the simultaneous estimation of a system of equations. Even though the theoretical framework suggests a very large number of periods in which rooms are reserved for a particular day, we estimate only quarterly averages of the variables.

As mentioned, the theoretical framework enables timing differences in reserving the product as a result of different time preferences of Israelis and tourists, and particularly—we assume that tourists reserve the overnights far earlier than the Israelis.[11] For this reason, and also because the hotel rates are determined according to rational considerations that relate to the inventory of vacant rooms and assessments of the pace of occupying the rooms up to the period of consumption of the product, it is advisable to estimate the supply equation residually—an aggregate supply equation after deducting the number of overnights reserved by the tourists. This equation enables us to estimate an important element in the theoretical framework—the impact of several rooms that have remained vacant up to close to the time of consumption of the product at the rate.

The empirical framework includes, therefore, two demand equations for overnights—for Israelis and for tourists—and a residual supply for Israelis that was estimated for the period 1997:1-2009:4. Israelis' demand includes the cost of alternative vacation destinations for Israelis abroad, per capita GDP in Israel, and the overnights rate. Tourists' demand includes the overnights price, per capita costs outside their countries, the real exchange rate, the number of hotel rooms in Israel's neighboring countries, and first and foremost the security situation, which affects tourists' demand, both directly and in interaction with the rates variable. The supply includes the number of vacant rooms and other standard factors such as wages. The analysis was conducted for the long term in the framework of cointegration, from which the elasticities in this range were derived. Tests were conducted that reinforce the existence of cointegrative connections for these equations.

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[10] Identical with respect to each hotel. We do not intend to claim that the products of all hotels are identical.
[11] The assumption that tourists prefer to reserve earlier than Israelis is supported also by empirical examinations.

The results of the estimation show that the demand sensitivity of Israelis for overnights in hotels in Israel relative to a higher price for tourists (for tourists the elasticity of demand is 0.4-0.9; for Israelis the elasticity is unitary). The greater the improvement in the security situation, the greater the tourists' elasticity, a development that leads to an increase in the weight of tourists for sightseeing and vacation purposes, which are sensitive to the rate. In estimating tourists' demand we find that a rise of one level in the quality index that reflects security instability (an index of 19 levels), will lead to a decrease of ten percent in tourists' demand for overnights. In estimating the demand for Israelis' overnights, we find positive elasticity and greater than one relative to real per capita GDP (per capita income), a finding that matches the assessment that the tourism product is still a luxury product. Estimation of the (residual) supply equation of Israelis shows that the elasticity of quantity relative to price is very high—around five, and in certain cases infinite (a completely elastic supply curve).

This study attempts to deal with the policy question of the number of hotel rooms that should be built from 2011 to 2015 in order to meet the demand. For this purpose we examined several scenarios, based, among other things, on elasticities that were found in the empirical estimation, and on reasonable assumptions regarding the stability of the security situation and/or its worsening, the change in the real exchange rate, growth worldwide and in Israel, and also regarding the situation in which the VAT exemption for tourists on accommodation and transportation services is canceled. We found that the capacity of hotel rooms, which currently stands at around 47 thousand rooms, should be increased by 6 to 9 thousand rooms.

The structure of the study is as follows: Chapter 2 reviews the empirical literature on the tourism market worldwide and in Israel. Chapter 3 presents the theoretical approach on which the empirical estimation is based. Chapter 4 presents the data and the stylized facts relevant to the study, Chapter 5 presents the definition of the variables for the estimation, the estimation methods, the empirical results and the analysis derived from them, and Chapter 6 concludes the study.

2. Brief literature review

World tourism in general and income from accommodating tourists in hotels in particular, is an important industry in terms of its scale and its weight in global exports. Because of the importance of this industry, many research projects have focused on understanding the

demand for tourism services. Lim (1997) reviewed dozens of studies that described the demand for tourism in various countries, by means of a single equation in which the demand is influenced by the relative prices, income factors in the tourists' countries of origin, and the tourists' travel costs to the country of destination. This approach is represented by Uysal and Crompton (1984) who researched the factors influencing the number of tourists to Turkey in the 1960s and 1970s from 11 different countries of origin. As expected, this research found positive long-term influences of the exchange rate level and per capita income on the demand for tourism, and a negative influence of the relative price of tourism services. Similar findings were obtained also in studies that examined the demand from various countries for tourism in Greece (Dritsakis and Athanasiadis, 1994) and in Spain (Munoz and Amaral, 2000).

Another study by Ordonezl and Torres (2010) that examined the demand for tourism in Spain, found that it is important to add a variable to the equation that measures the geographical distance between the country of origin and the country of destination (Spain). This variable will negatively affect the demand for tourism, because it constitutes an estimate of the tourists' travel cost from that country to Spain. In all the above studies the focus was on the demand side, on the assumption that there is no supply problem of hotel rooms in that country, and that if there is an occupancy limitation in hotels in specific areas of the country, this can be solved with the help of the transportation infrastructure. A slightly different approach can be found in the work of Aslan, Kula and Kaplan (2009) who examined a (short-term) dynamic model for tourism in Turkey from different countries, and found that the demand equation is influenced not only by variables such as the income level and the relative price, but also by supply factors such as the utilization of hotels and the rate of investment in public transportation (ports, railways, hospitals and roads).

This approach of including supply factors led to the examination of the tourism market that includes both the supply and the demand. Included in the few studies that examined the tourism market using this approach, are the following two: Zhou, Bonham and Gangnes's 2007 study of tourism to Hawaii, and Fleischer and Buccola's 2002 study of the hotel market in Israel.

As opposed to the present study, these two studies focused on the empirical side and did not include a complete theoretical framework. Zhou et al. (2007) examined a model of demand and supply equations for the number of tourists visiting Hawaii from the United States and Japan with the use of long-term equations that maintain cointegration. On the demand side it

was found that the price elasticity was relatively low, 0.4-0.55, both for the demand equation of the Japanese and that of the Americans, while the income elasticity was greater than unitary. A positive influence of the real exchange rate was also found between the yen and the dollar on the demand from Japanese tourists for tourism services in Hawaii. On the supply side, it was found that the number of tourists hardly affected the price quoted for overnights, which hints at a completely elastic supply curve. The study emphasizes the differentiation between the short and the long term in characterizing the hotels in Hawaii. In the short term, price discrimination[12] was assumed, taking into account the low and high seasons in the reservation of rooms, and with the aim of reaching full occupancy of rooms and maximizing the hotel owners' profits. In the long term, however, it is difficult to distinguish discrimination of this kind.

Fleischer and Buccola (2002) focused on the overnights market of tourists and Israelis in hotels in Israel on a monthly basis in the years 1987-1999. They assumed that overnights of Israelis and of tourists are two different products, so that in practice they estimated two demand and two supply equations, which included the price and the number of tourist overnights respectively. The price differences that were found between overnight rates for tourists and for Israelis arose therefore from the assumption of the different markets, which operate under conditions of perfect competition, and not from the assumption of monopoly or cartel that discriminates between the prices. In our view, the assumption of two separate products is unreasonable, in that a hotel room can be used by both a tourist and an Israeli, and a priori we are talking about identical rooms (products). The price differences could reflect heterogeneous characteristics between two types of customer, that is expressed, among other things, by timing differences in reserving the product: the tourists reserve rooms earlier than Israelis,[13] who reserve them closer to the time of consumption (the day of the overnight), and therefore there are differences in the valuation of the product. In addition to these, Israelis may tend to make more group reservations (work committees), and to obtain a discount on the rate.[14]

Beyond the regular cost and income variables, which appear on the supply side, Fleischer and Buccola (2002) also add the variable of terrorism, which negatively influenced tourists'

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[12] Zhou et al. (2007) assume a manipulative market structure with markup, but in practice they estimate the supply and demand equations in which an additional explanatory variable is introduced into these equations—the hotels' occupancy rate, which is a result of both demand and supply.

[13] Fleischer and Buccola (2002) also indicated that tourists tend to reserve earlier than Israelis.

[14] For more details on this issue see Figure 3.

demand for overnights in Israel. The estimation in their study was made by means of a qualitative variable that ranks the intensity of the various kinds of terror. We also estimated the influence of terror using the same variable as Fleischer and Buccola (2002). Bental and Regev (2010) presented an alternative method, and found a significant influence of the growth in the probability of terror on the tourism product and on GDP. The estimation in their study was conducted for several countries, including Israel, on the basis of a theoretical model that makes it possible to examine the influences of the alternative on tourists' decisions about their travel destinations according to the probability of being harmed by a terror event that they attribute to each destination.

Fleischer and Buccola (2002) did not examine the existence of long-term cointegrative relationships in the various demand and supply equations, and this despite the fact that the estimation of these equations was undertaken for level variables, which are not stationary. Furthermore, the empirical analysis in their study does not consider the possibility of a simultaneous connection between the variables of the number of overnights and the overnights rate. We considered both the simultaneity problem and the need to estimate the long-term connections in the framework of cointegration. Similar to the work of Zhou at al. (2007) and Fleischer and Buccola (2002), we also examined a dynamic element in the supply equation, which reflects inertia over time in the overnight rates.

3. Schematic description of the theoretical model[15]

The theoretical framework aims primarily to support the empirical estimation, which is based on competition between hotels and consumers. The theoretical model includes various assumptions, some that can be backed up by both the stylized facts and the empirical results. The model describes a game between several hotels and many consumers who can purchase a hotel overnight. The game is dynamic (takes place over many periods, each time anew). In each period the hotel announces the price of the product—overnights on a particular day—and the consumers go shopping: they purchase, with a certain probability, overnights in the hotel for the period in question. If the product is not purchased by the last period (the date of the overnight), it disappears.

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[15] For a detailed description see Levin, McGill and Nediak, 2009.

Basic assumptions

1. The planning horizon: there are many periods (T) in which the consumers can decide about purchasing overnights and the hotels about overnights rates.

2. Hotels: hotels compete with each other. Each hotel sells a uniform product. The products between the hotels are similar (overnight stay per person), but not identical. The difference between rooms is reflected in the grade and the location. If a hotel does not sell the product by the last period, the product disappears (perishable good). The cost of the product for the hotels is very low, and can even be zero.

3. The consumer and the characterization of the population: we assume two consumer sectors—tourists and Israelis. The differences between them, among other things are: their sensitivity to terror—the tourists are more sensitive than the Israelis; and in their preferences regarding the products—the tourists perceive the product as being of a higher quality than the Israelis do (less sensitive to rates). Another difference is that the tourists are myopic ("short-sighted")—they buy if the price offered is less than the specific threshold price for all tourists, while the Israelis are strategic: they decide on their purchase by comparing the rates today to the expected rates close to the time of consumption. This characteristic encourages the Israelis to postpone their date of purchase closer to the time of consumption. This correspondence between the level of strategies and the type of population sector is known to all the players—the hotels and the consumers. A consumer purchases at the most one unit of overnights.

4. Characterization of the consumer's choice between the products: each consumer from a particular sector has a different preference regarding the product. The preference includes an element that is known to everyone, and a stochastic element that only the consumer himself knows. At the same time, the distribution of the stochastic element within the sector is known to all the players. From the various preferences, different values of the product are derived in the eyes of the various consumers. There are thus two distributions of valuations of the product (a distribution for each sector), which are not necessarily identical. For example, the distribution of the tourists' valuations of the product is higher than that of the Israelis. In a similar manner, it is possible to derive a distribution of product valuations for each sector, results of its assessment of the intensity of the terrorism, the economic situation, currency rates, etc. The hotels know to which sector each consumer belongs.

Modeling Assumptions

1. Information: in every period consumers and hotels have full information about the characteristics of the market: the number of vacant rooms in each hotel, prices in the market, the consumer sectors and their characteristics, including the number of individuals in each sector. We also assume that gathering the information does not entail any cost.[16]

2. Hotels and consumers behave rationally: each player (each of the hotels and every consumer) knows fully how to forecast the strategic behavior of the other players. For example, if there is a high probability that the hotel will remain with vacant rooms close to the date of consumption, the strategic player (the Israeli) will wait until then with the expectation that the price will be reduced. Against this, the myopic player (the tourist) will not change his decision. In fact, each player can anticipate the equilibrium strategy of the other players, and therefore calculate his optimum strategy.

3. Characterization of the demand: we have two aggregate demand curves resulting from two different sectors—tourists and Israelis. A specific sector's demand is obtained from a summation of the individual demands, and is connected to time, price, and other market conditions. From this it follows that we can define the probability of purchasing an overnight stay (shopping intensity) for a single consumer. Consumers react to current prices and to other market conditions, for example, the capacity of the rooms that have not yet been sold, by changing their shopping intensity for overnights. Consumers cannot control the timing of their purchase precisely, but relatively low prices encourage them to buy.[17]

4. The choice model: consumers allocate their shopping intensity among various products: each hotel offers a slightly different product from the others, in the grade of the hotel and its location. The difference between consumers could arise from a difference connected to the type of sector (for example, the strategy level of tourists compared with Israelis), which reflects a deterministic difference. Another source of

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[16] This is indeed a very strong assumption, and attempts are currently being made to model without this assumption (Levin et al., 2008, and Perakis and Sood, 2006).

[17] At the same time there is always a tendency to postpone the purchase, even if the price is low. In fact, for the whole range of prices there is a constant maximum probability that the purchase will be executed in the current period.

difference between consumers is connected to differences between individuals, given a specific sector's valuation of the product, which is stochastic.

The game

In each period the hotel announces the rate, and the consumer decides on his shopping intensity. The hotel announces a uniform rate, and is not entitled to differentiate between the consumer sectors in determining the rate,[18] the implication being that at any time there is no discrimination between the sectors. In announcing the rate the hotel is influenced by the following data: how much room capacity has remained vacant in each hotel and particularly the hotel in question? How many potential consumers from each sector have not yet purchased a room? And how many periods still remain until the product disappears? All the consumers, in deciding their shopping intensity, are influenced by precisely the same considerations as well as by the hotel's price support. In equilibrium,[19] the result is that only one consumer strategy and one hotel strategy maximizes the benefits of each of the consumers and the profits of the hotels.

The major results

The results of the game are based on simulation as reported by Levin, McGill and Nediak (2009).[20]

Price discrimination: There is no ex ante price discrimination, because in the model the hotel is not entitled to offer different rates to tourists and to Israelis. At the same time, the difference in the characterization of the sectors leads to the Israeli segment enjoying cheaper prices on average.

From the simulations in equilibrium we see that the average rate close to the time of consumption is far lower than the rate at the start of the sales season—long before the time of consumption of the product. The conditions for this are that one consumption sector has a low valuation and the second sector is short-sighted and has a high valuation. The assumption that

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[18] The model produces a gap in rates between Israelis and tourists even without the strong assumption that these gaps are produced by the ability to differentiate between a tourist and an Israeli by means of the demand to present a passport or identity card. Even though technically the hotel could discriminate between consumers in this way, but in competitive conditions price discrimination on the basis of identifying the sector cannot exist when the hotels maximize profits: if the rates for Israelis is competitive, and the rate for tourists, as mentioned above, is higher, a tourist who is willing to pay a slightly higher rate (ε) than the rate to Israelis, cannot purchase an overnight in the hotel. This is of course unreasonable.

[19] The equilibrium concept is Markov perfect equilibrium.

[20] For more details see the appendix to their study in e-companion Levin, McGill and Nediak, 2009.

Israelis have a low valuation of the product, while tourists are myopic and have a high valuation acts therefore—according to the results of the simulation—to create a significant gap between the average rate for tourists and Israelis.[21] In practice, at the beginning of the sales season, hotels try to sell the rooms to myopic consumers who value the product highly. In this period, those with a low valuation of the product (whether myopic or strategic) hardly purchase rooms because of the high prices, and wait until closer to the time of purchase. Closer to the purchase time, average prices fall and the consumers with a low valuation start to buy.

If, alternatively, the difference between the two sectors does not lie in the valuation of the product, but rather on the strategic level only, so that the myopic tourist becomes one with a low valuation, while the Israeli remains strategic and with a low valuation, we obtain from the simulation that the average rate close to the date of consumption is only slightly lower than the rate at the opening of the sales season. This change in the tourist's valuation can arise due to growth in the weight of the tourists for vacations and sightseeing, and for pilgrimages (a low valuation of the product) at the expense of business people (with a high valuation of the product). This change in the tourism mix took place during the transition from a period of security instability to calmness—see Appendix 4.

	(sector 1) Low Valuation of Strategists and (sector 2) High Valuation of those with Myopia (a reasonable scenario in times of security instability)	(sector 1) Low Valuation of those with Myopia and (sector 2) High Valuation of those with Myopia	(sector 1) Low Valuation of those with Myopia or Strategists, and (sector 2) a High Valuation of Strategists	(sector 1) Low Valuation of those with Myopia and (sector 2) low Valuation of Strategists (a reasonable scenario in times of security calmness)
Change in price close to the time of consumption relative to the start of the selling season	**Large decrease**	Large decrease	Small decrease	**Small decrease**
Comments	The Israelis (the strategists with a low valuation of the product) buy closer to the date of consumption, and therefore enjoy cheaper average prices relative to tourists (who are myopic and have a high valuation of the product). If the Israelis also become myopic, on condition that their valuation of the product is low, and the tourists remain myopic with a high valuation of the product, prices will fall similar to the fall close to the time of consuming the product.		If the high valuation of the product is that of the strategists, the rate will not decrease close to the time of consumption.	In calm times more non-business tourists arrive, whose valuation of the product is lower.

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[21] Support for this result can be found in Section d.2 of Chapter 5.

The level of competitiveness in the hotel industry: the greater the competitiveness (the more hotels there are) the greater the influence of consumers' strategic behavior—postponing the decision to purchase a room until close to the date of consumption with the aim of obtaining a lower price—in lowering the overnights rate.

A deviation from equilibrium strategy is not economically worthwhile: for example, if a firm incorrectly feels that the consumer is myopic, when in fact he is strategic, it loses money.

4. The relevant data and stylized facts for the study

a. Security instability greatly affects tourists' demand

Figure 1 shows that tourists' entries and their overnights react immediately and severely to terrorist attacks and to the worsening of the security situation worldwide, particularly in Israel and the region. Against this, for Israelis this impact is far weaker, so that, in the main, even during periods in which the security situation is precarious, the rising trend in these overnights continues. In this sense the Israeli overnights constitute a substitute for tourist overnights in times of security instability. A salient example was the period of the Second Intifada in which there was a dramatic decrease in the number of tourist entries and overnights, which led hotel owners to reduce the overnights rates, thereby encouraging the occupancy of the rooms with locals as a substitute for tourists.

Figure 1: Tourist Arrivals and Israel Overnights in Hotels in Israel, 1985-2009

The data are seasonally adjusted.
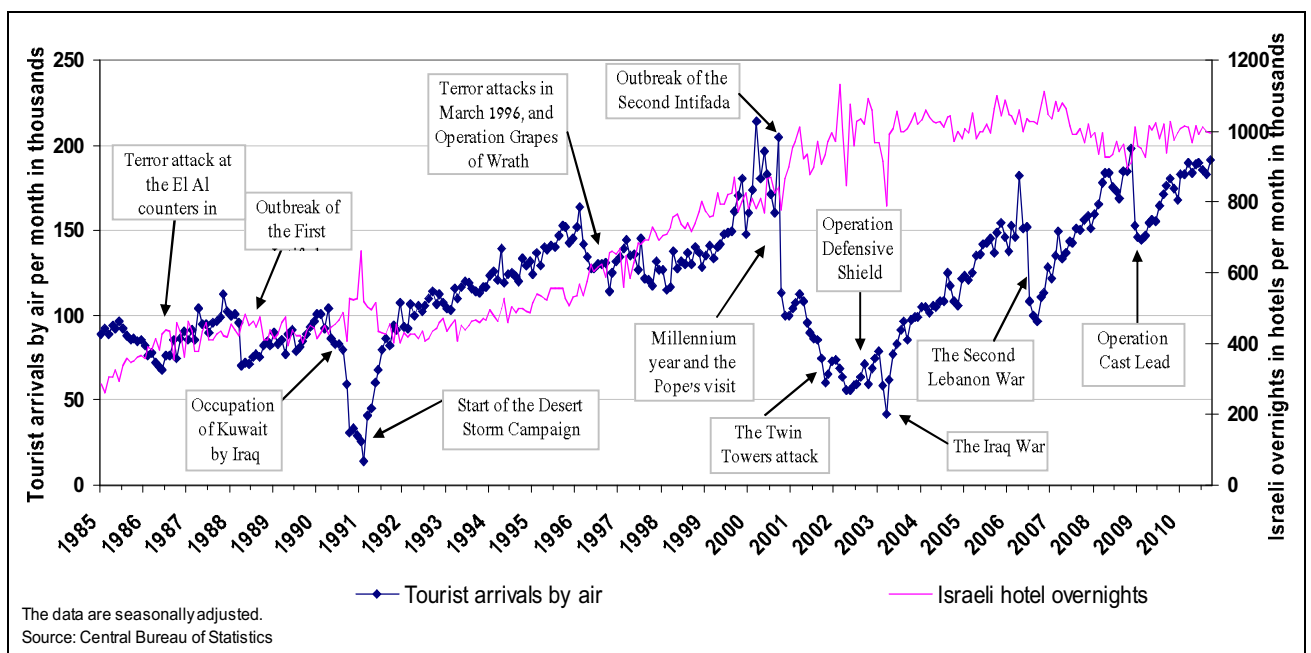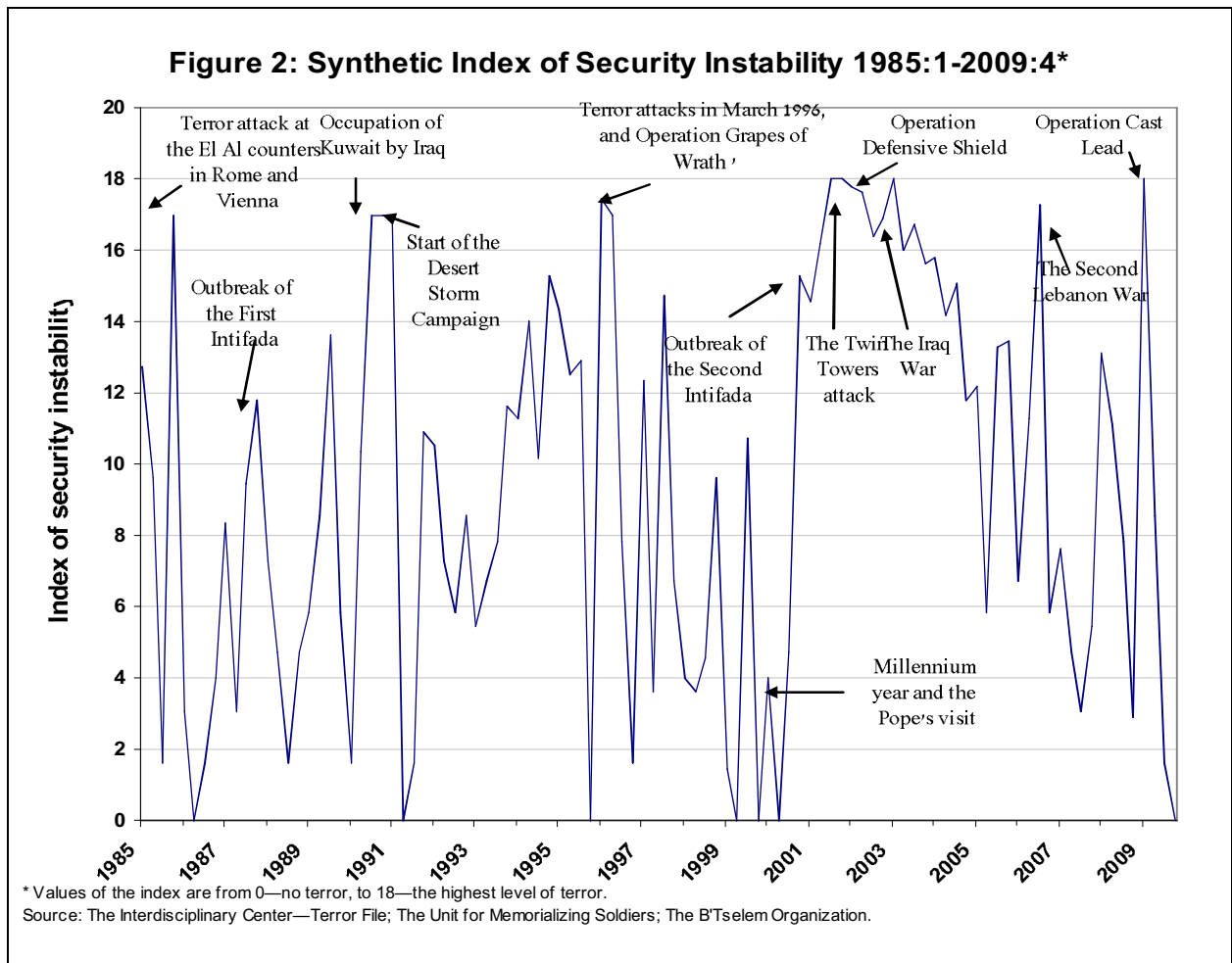Source: Central Bureau of Statistics

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Figure 1 points to the importance of defining a variable that describes the security uncertainty, one that encompasses the full impact of tourists' demand for overnights in Israel. A variable of this kind has to relate not only to events that took place in Israel, for example the number of fatalities in terrorist attacks, but also events connected to wars that Israel is not a direct party to, such as the Iraq War, the "Desert Storm" Campaign, and the attack on the Twin Towers.

For the purpose of the regressions, we defined a synthetic index of security instability,[22] the variable Ter (Figure 2). The index is based on data of fatalities—the number of Israel civilians killed in hostile destructive activity, soldiers killed in hostile actions and wars, and Palestinians. From these data a linear index of terrorism was constructed, which weights the fatalities data. We divided the index into 19 levels, on a scale between 0 (calmness) and 18, according to the percentile of the linear index in each level. The implication of this is that the synthetic terror index is not linear with respect to fatalities. A very small number of people injured from terrorism is sufficient to move from level 0 to level 1, while the transition from level 17 to 18 takes place in the event of a very large number of people injured. In some of the quarters, security instability is not well reflected by the number of fatalities, and discretion is therefore required in determining the level of the index. Discretion was used in the First Gulf War in quarters 3 and 4 in 1990, and in the first quarter of 1991; in Operation Grapes of Wrath in April 1996; in the attack on the Twin Towers on 9/11/2001; in Operation Defensive Shield from March to May 2002, and in the Second Gulf War in March 2003.[23]

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[22] The index was defined in a similar manner to Fleischer and Buccola's 2002 Index of Terrorism.
[23] Because the security events have a cumulative effect on the demand for overnights, at least with respect to the recent past, we examined the variable in the regressions as a moving average of the past five quarters.

Figure 2: Synthetic Index of Security Instability 1985:1-2009:4*

Index of security instability (y-axis, 0 to 20)

Annotations on chart:
- Terror attack at the El Al counters in Rome and Vienna
- Occupation of Kuwait by Iraq
- Terror attacks in March 1996, and Operation Grapes of Wrath
- Operation Defensive Shield
- Operation Cast Lead
- Outbreak of the First Intifada
- Start of the Desert Storm Campaign
- Outbreak of the Second Intifada
- The Twin Towers attack
- The Iraq War
- The Second Lebanon War
- Millennium year and the Pope's visit

x-axis: 1985, 1987, 1989, 1991, 1993, 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009

* Values of the index are from 0—no terror, to 18—the highest level of terror.
Source: The Interdisciplinary Center—Terror File; The Unit for Memorializing Soldiers; The B'Tselem Organization.

b. The overnight rate is higher for tourists than for Israelis

A frequent claim made in the public discourse, as well as in the economic literature, is that price discrimination exists between overnights rates of tourists and that of locals (Israelis). In order to examine this claim, we calculated the overnights rates of tourists and Israelis in the years 1997-2009. The calculation is based on revenue differences of Israeli and tourist overnights,[24] after deducting VAT from the revenue from Israelis in all locations except for Eilat, as well as the non-tourism revenue (weddings, conferences, etc.). We also neutralized the influence of the different mix of overnights of tourists as opposed to Israelis by the regions and the class of hotels in Israel, by charging tourists the mix of overnights of Israelis

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[24] The data on rates for tourists in every class and region of hotel is in current dollars. In order to calculate the gap between them and the rates and revenue of Israeli overnights, they were converted into shekel terms at fixed prices on the basis of the 2008 index.

in hotels, for every class and region and every year.[25] Furthermore, we assume that the weight of the food component (the basis of the accommodation: half board, full board, etc.) in the overall overnights rate is identical for Israelis and tourists.[26]
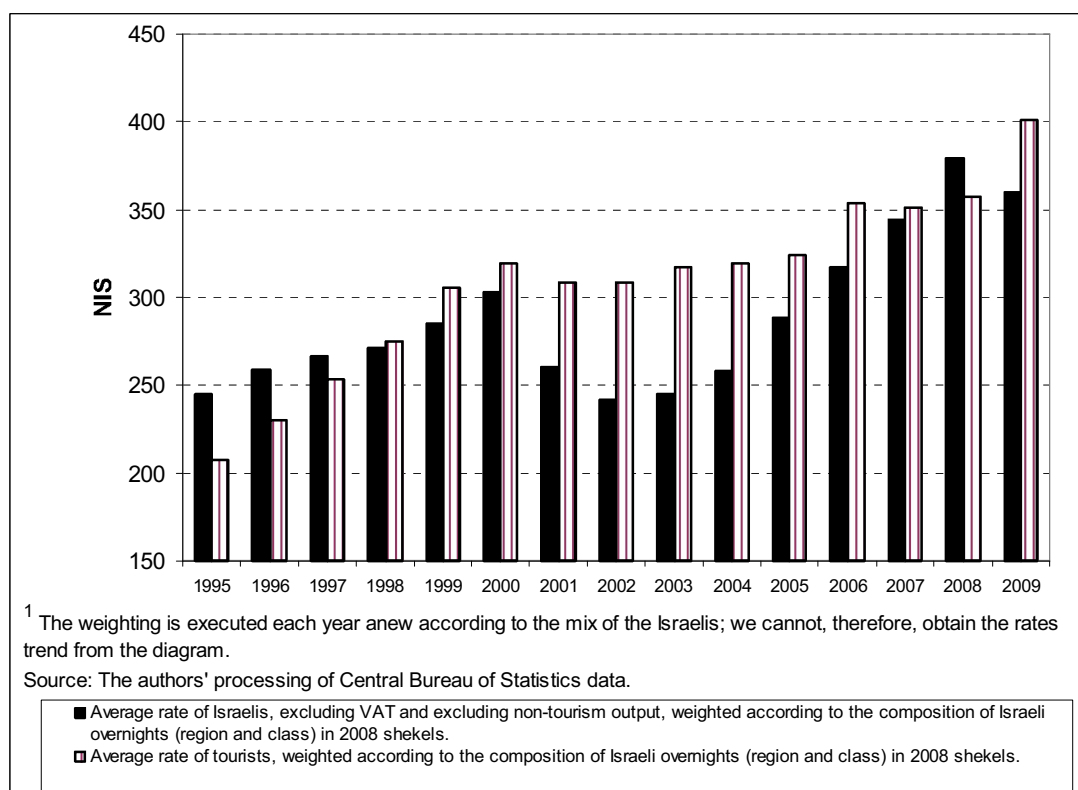
Figure 3 describes the average overnights rates per person, for an identical mix of tourists and Israelis, of hotel classes and of regions. We see that in most years the tourist overnights rate is higher than that for Israelis (except for some years in the 1990s and in the years 2007-2008), and a particularly large gap was recorded at the start of the 2000s when the number of incoming tourists to Israel fell sharply during the Second Intifada, which led hotel owners to offer discounted rates. On average, in the period examined, tourists paid around 8 percent more than Israelis for hotel overnights in Israel, while after deducting the Intifada years, the gap narrowed to only around 3 percent. Note that it is not possible to draw conclusions from the diagram about the real rate trends over time, but only about the gap between the rates, because the overnight mixes, which are identical for Israelis and tourists, change from year to year.[27] For a real development of the rate for Israelis over time, see the diagram in Appendix 1.

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[25] Even though we do have data on the revenue of hotels from tourists and Israelis at the micro level, that is to say, a cross-section of class and region, the non-tourist revenue can only be deducted at the macro level, and not by a cross-section of class and region. We therefore cannot present the rates gaps for a region or a particular class of hotel, but only for hotels in general.

[26] Other reasons may explain the gap in rates: 1. Bias in the rate in favor of Israelis. The number of people sleeping in the room occupied by tourists is possibly less than that occupied by Israelis. Possibly also the proportion of children (who are entitled to discounts in the overnight rate) in the tourists' overall overnights is less than the parallel proportion for Israelis. 2. A bias in the rate in favor of the tourist. The tourists' length of stay is longer than that of the Israelis, and discounts are given for an extended stay. Furthermore, the tourists use the hotels more in mid-week—when the rate is relatively low—while the Israelis tend more toward weekend overnights, when the rate is higher.

[27] For example, if the relative weight of expensive overnights (in high-grade hotels in Tel Aviv) grows at the expense of the cheaper hotels, we see a rise in the index in Figure 3. This is a change in the mix, and not a real rise in the rate.

**Figure 3: Overnight Hotel Rates for Tourists and Israelis
(in 2008 NIS prices)**

¹ The weighting is executed each year anew according to the mix of the Israelis; we cannot, therefore, obtain the rates trend from the diagram.

Source: The authors' processing of Central Bureau of Statistics data.

■ Average rate of Israelis, excluding VAT and excluding non-tourism output, weighted according to the composition of Israeli overnights (region and class) in 2008 shekels.

▢ Average rate of tourists, weighted according to the composition of Israeli overnights (region and class) in 2008 shekels.

The findings regarding the differences in rates between different groups is not new, and the economic literature has until now provided two explanations for it: a) Fleischer and Buccola (2002) claim that tourist and Israeli overnights are different products, and it is thus possible for there to be differences between them. This explanation does not seem to us to be reasonable, in that a hotel room for an Israeli is identical to that for a tourist, and there is no distinction between the two types of customers in the management of the rooms and their occupancy. Furthermore, at the start of the Second Intifada and during other events (see Figure 1) Israelis substituted for tourists even in regions considered as preferable for tourists, such as Tel Aviv and Jerusalem, where hotels attracted Israelis by offering cheap rates; b) Zhou et al. (2007) claim that the hotel market operates as a monopoly that maintains price discrimination (in the short term), whose source could also be seasonal, and that in the long term, according to them, price discrimination does not exist. This explanation also seems problematic, in that the discrimination that we have found exists in the long term; while in the short term, in their study, the source of the discrimination is unclear, and whether the discrimination is between consumers. Nothing in the Israeli data suggests price coordination

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and a cartel between hotels. Furthermore, empirical findings in our study also support a situation in which the market is not conducted under monopoly conditions, but rather under competitive conditions. We therefore propose a different explanation and even provide support for it in the estimation.

Our approach, according to the theoretical model, is that of a competitive structure in the hotel market, but with the existence of heterogeneous characteristics between the two customers (tourists and Israelis) that is reflected in gaps in their overnights rates. These characteristics are reflected, among other things, in differences in the timing of reserving the product (overnights)—the tourists reserve rooms earlier than the Israelis,[28] who reserve them closer to the time of consumption (the day of the overnights)—as well as in the valuation of the product. We assume that Israelis value the product as less prestigious than the tourists. The Israelis (who are strategists with a low valuation of the product) purchase close to the time of consumption, and therefore enjoy lower average prices than the tourists (who are myopic and have a high valuation of the product). At the start of the selling season, hotels try to sell mainly to people with a high valuation, and they succeed in this regard. Those with the high valuation are myopic tourists. The rate close to the time of consumption decreases considerably; the Israelis benefit from the decrease—most of them have not yet purchased the product. The assumption that tourists reserve overnights earlier than Israelis could also be explained in other ways: the tourists, who in 2009 made their reservations on average 80 days prior to their visit,[29] as opposed to the Israelis, are unfamiliar with the hotel market in Israel, and because of an abhorrence of risk prefer to reserve the overnights earlier. Another explanation is that flights reserved in advance are usually cheaper than reservations close to the day of consumption, and tourists therefore reserve their overnights earlier as well.

However, in times of security calmness, the assumption that tourists have a high valuation of the product is not always correct. In these periods the proportion of business people and people visiting relatives (those with a high valuation of the product) in the tourists' mix decreases, and the proportion of tourists visiting for vacation, sightseeing and pilgrimage purposes (those with a low valuation of the product) increases—see Appendix 4. The change in this mix will lead to a decline in the tourists' average valuation of the tourism product, and therefore they become more similar to the Israelis—in the two sectors there is then a low

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[28] Fleischer and Buccola (2002) also noted that tourists tend to reserve overnights earlier than Israelis.
[29] The figure is taken from the Incoming Tourists Survey of 2009 of the Ministry of Tourism. There is no data on the reservation habits of Israelis.
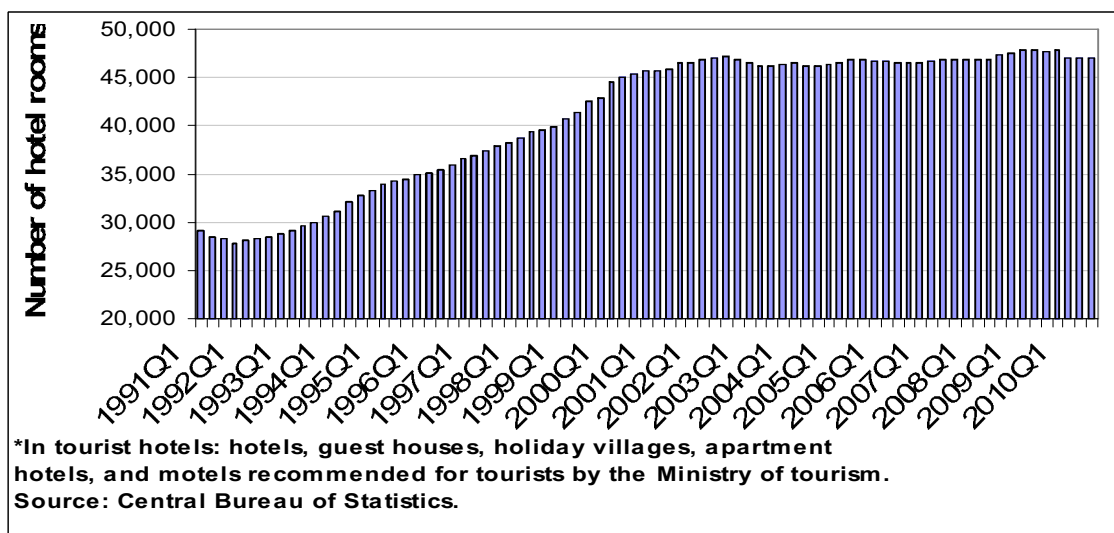
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valuation of the product. In this situation the reduction in the rate close to the time of consumption is smaller than in the situation in which the tourists' evaluation of the product is high.

Support for this approach is provided in Chapter 5, Section d.2 by empirical evidence that tourists reserve rooms earlier than Israelis, and that tourists value the tourism product higher than the Israelis do.

c. The number of hotel rooms in Israel has hardly changed in the past decade

Figure 4 shows that following a continuous rise in the number of hotel rooms in Israel in the 1990s, from 2001 onward hardly any new hotels were opened. During the same period, however, in most of the developed countries, and particularly those in the Mediterranean Basin, the number of rooms increased. According to the Central Bureau of Statistics, the number of rooms in both rural accommodation and non-tourist hotels hardly changed at all in the past five years, and their number at the end of 2009 stood at 7,600 and 4,800, respectively.

Figure 4: Number of Hotel Rooms in Israel* 1991:1-2010:3

*In tourist hotels: hotels, guest houses, holiday villages, apartment hotels, and motels recommended for tourists by the Ministry of tourism.
Source: Central Bureau of Statistics.

The process of building a hotel takes several years—from finding the land, authorizing the investment, completing the design, and the actual construction. Most of the investment is in the construction itself, so that until this begins the process is reversible. Therefore, if events occur that affect the investors' assessment of the demand, for example, a worsening in the security situation that mainly influences tourists, it can be expected that even investments that have been approved will not be implemented.

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In the wake of the decrease in the number of tourists to Israel at the beginning of the 2000s because of the worsening in the security situation, there seemed to be little need to increase the inventory of rooms.[30] In recent years, however, the demand from Israelis for overnights in Israel has grown, together with a rise in tourist overnights against the backdrop of the security improvement. This increase brings the overall overnights in recent years closer to a situation of full occupancy, particularly in peak periods and in specific areas, such as Jerusalem and Tel Aviv. It is also clear that if the demand from Israelis and tourists grows in the future, and particularly if the security situation continues to improve—stability or advancement of the peace arrangements—there will be a need to increase in inventory of rooms to meet the increased demand.[31]

We therefore have attempted to deal also with the policy question of the number of hotel rooms that should be built between 2011 and 2015 in order to meet the future growth in demand. For this purpose we examined several scenarios, based, among other things, on reasonable assumptions regarding the stability of the security situation and/or its worsening, the change in the real exchange rate, growth worldwide and in Israel, the possibility of canceling the VAT exemption for tourists, and regarding the elasticities that were found in the empirical estimation. We found that the capacity of hotel rooms, which today stands at 47 thousand rooms, should be increased by between 6 and 9 thousand rooms.

Note that beyond assessments regarding demand, the supply of rooms could be influenced by additional factors and obstructions, such as competition for land uses. In certain periods, the use of land for residential building could be more profitable for an investor than its use for hotels. We do not, however, have data on this issue, and in any event the law (Outline Plan No. 13) differentiates between residential land use and use for hotels, so that legally, there is no competition for the use of the land.[32]

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[30] The index of security instability points to a worsening of the security situation in the 2000s. The average from 2001 to 2009 was 12, as against an average from 1986 to 2009 of 9.

[31] The Ministry of Tourism estimates that if the security quiet is maintained, a further 1.6 million tourists will visit Israel in 2015, over and above the approximately 3.4 million who visited in 2010.

[32] Rezoning of land, however, is possible. Thus, for example, in the "Holyland" and the "Herzliya Marina" affairs, according to the original plan, hotels were to be built, but ultimately the land designation was changed to residential.

5. Definition of the variables for estimation, the estimation methods, and the empirical results

We examined a series of variables in this study in order to analyze the long-term relationships of the supply of overnights in Israeli hotels and the demand for them. All the data are examined after seasonal adjustment,[33] in quarterly frequencies and in fixed prices. The sample includes the period from the first quarter of 1997 to the fourth quarter of 2009. Most of the data was taken from publications of the Central Bureau of Statistics and from Bank of Israel data. Data on guest rooms in the world in general and in Israel's neighbors in particular was taken from the World Tourism Organization. Full details of the variables appearing in the study, the method of calculating them, and their sources, are provided in Appendix 1.

The empirical analysis in the study includes estimating a system of simultaneous equations (structural equations) for the hotel market in Israel for the period 1997Q2-2009Q4. The empirical part is based on major assumptions that were presented in the theoretical framework: the overnights are a uniform product for Israelis and tourists; the structure of the market is competitive; the tourists are myopic and have a high valuation of the product, as against the Israelis. The empirical model examines some of these assumptions. The system includes two demand equations of tourists and of Israelis for overnight stays (per person) in hotels, together with a supply equation for Israelis, which is a residual supply, after deducting from the aggregate supply equation the number of overnights that the tourists reserved. Viewing the supply to Israelis as residual relies on the fact that the tourists usually reserve overnights in Israeli hotels earlier than the Israelis do. According to the theoretical framework, we also assume in the empirical analysis, as we have said, that the product offered by the hotels—overnights in the hotel—is identical for tourists and Israelis, and therefore a single supply equation is estimated.

Tourists' demand for overnight stays in Israeli hotels:

$$\log(QF_t) = \alpha_0 + \alpha_1 \log(PF_t) + \alpha_2 \log(SCF_t) + \alpha_3 \log(REER_t) + \alpha_4 \log(J\_RO_t + EG\_RO_t) + \alpha_5 TER\_MA_t + \alpha_6 VOL\_MA_t + \varepsilon_t$$

Where: QF is the amount of tourist overnights (per person); PF is the price (rate) of tourists' overnights (per person); MA_TER is the index of security stability; REER is the real

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[33] Seasonal adjustment of original series was done using the X-12 method. The seasonal adjustment that includes also the influence of the Jewish holidays and festivals did not change the results of the regressions.

effective exchange rate; SCF is the real weighted price for a day's stay outside the tourist's country; VOL_MA is a variable that reflects Israel's image in the world, and is measured by means of the number of volunteers who come to Israel to work on kibbutzim (beyond the trend); and J_RO+EG_RO is the number of hotel rooms in Jordan and Egypt—countries that maintain a peace relationship and open border crossings with Israel.

Israelis' demand for overnight stays in Israeli hotels:

$$\log(QL_t) = \beta_0 + \beta_1 \log(PL_t) + \alpha_2 \log(SCL_t) + \alpha_3 \log(GDPL\_CAP_t) + \upsilon_t$$

Where: QL is the number of Israeli overnights (per person); PL is the price (rate) of Israeli overnights (per person); SCL is the real cost of an Israeli's day's stay abroad; and GDPL_CAP is the real per capita GDP in Israel.

The (residual) supply of Israelis for overnight stays in Israeli hotels:

$$\log(PL_t) = \beta_0 + \beta_1 \log(QL_t) + \alpha_2 \log(WAGE\_R_t) + \alpha_3 \log(QTOT_t - QF_t) + \eta_t$$

Where: $QTOT = QL + QF + EMPTY$

WAGE_R is the real wage of hired employees in the guest-services industry; QTOT is the capacity of beds in hotels that can be occupied each night in the quarter, which is equal to the number of nights in the quarter that the Israelis (QL) and the tourists (QF) have reserved, plus the number of beds per night that have remained unoccupied by guests (EMPTY).[34]

In light of the importance of analyzing the structure of the market in the long term, with all its connections and elasticities, we estimated the equations for level variables. Consequently, the major variables in the study—the quantity and price variables, as well as most of the additional variables that were estimated in the regressions, are not stationary and maintain a unit root (Appendix 2). As is usual in these cases, we assumed a constant elasticity for most of the variables, and therefore the variables entered into the regressions are presented in logs (except for the variables that represent the level of terrorism and Israel's image in the world).

The estimation of the long-term demand and supply equations was done in three ways:
1) Open least squares (OLS) estimation together with examining the existence of cointegration. This estimation is designed to deal with the problem of the variables not being stationary.

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[34] This figure clearly has to also take into consideration the maximum occupancy rate, which for technical and other reasons does not reach 100 percent, and is estimated in Israel, as in other countries, at around 70 percent.

2) Estimating the equations by the GMM/TSLS method together with examining the existence of cointegration. This estimation is designed to deal both with the problem of the variables not being stationary, as well as the problem of the simultaneity between the demand and the supply.[35]

3) Estimation of the TSLS equations while introducing a dynamic element (a lag-dependent variable). This estimation is intended to deal both with the problem of the simultaneity between demand and supply, and the problem of the variables not being stationary. The estimates obtained, however, reflect not only the long term, but rather express also the short-term dynamic relationship. This relationship is particularly important in the supply equation, in that the price in the current period is usually very much influenced by the price in the previous period. In practice, in order to enable the existence of a dynamic factor, in every equation we used Blundell and Bond's (1998) specification, in terms of which in estimating the level equation, the auxiliary variables will be the differences of the variables on the right side of the equations, and this with lags (hereinafter: TSLS_BB).[36] This assumption of inertia does not exist in the theoretical framework.

a. The demand curve for tourists' hotel overnights

Table 2 summarizes the results of the estimation of the tourists' demand function for hotel overnights in Israel for each of the three estimation methods that examine the existence of a cointegrative relationship between the quantity of tourists' overnights (QF), the price of tourists' overnights (PF), and a group of additional variables: (TER_MA; REER; SCF; VOL_MA; J_RO+EG_RO)

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[35] Even though empirically there is nothing to prevent the estimation of the cointegrative relationship of the supply and the demand equations by means of least squares, because the equations are identified together, an estimation of this kind is liable to lead to bias in the estimates (elasticities). The equations were therefore estimated by TSLS, and the auxiliary variables are the explanatory variables in the reduced form equations. The equations were estimated taking the simultaneity into consideration, even though the tourists' overnights are determined on the one hand simultaneously with the price in the demand equation, and on the other hand they are determined in advance in the residual supply equation.

[36] This specification is particularly good for panel data and less for seasonal series. These results should therefore be considered as a stability test for the estimates of the other methods.

Equation Number	Estimation Method	The Variables									The Statistics		Examination of the Residuals	
		C	LOG(PF)	TER_MA* LOG(PF)	LOG(SCF)	LOG(REER)	TER_MA	LOG(J_RO+EG_RO)	VOL_MA	LOG(QF_LAG)	R^2Adj	D.W.	A.D.F	D.W.[1]
1.א	OLS	14.464	-0.804		-1.22	0.61	-0.10	3.89E-03	3.65E-05		0.898	1.480	-5.48*	1.940
	OLS	17.250	-0.936	0.007	-1.440	0.650	-0.120	-0.109	4.03E-05		0.868	1.360	-6.20*	1.955
2.	TSLS	12.473	-0.612		-1.16	0.836	-0.095	0.011	5.54E-05		0.897	1.450	-5.38*	1.940
3.	TSLS_BB	6.088	-0.379		-0.704	1.196	-0.095	0.020	7.12E-05	0.168	0.879	1.330	-4.97*	1.960

Table 2

The Cointegrative Relationship of the Demand for Tourists' Overnights in Israeli Hotels
(Sample Period: 1997:2 to 2009:4)

The estimated cointegrative relationship:
$$LOG(QF)_t = \gamma_0 + \sum_{i=1}^{m} \gamma_i' X_{it} + \varepsilon_t$$

1) Belongs to the equation that estimates the A.D.F.
The level of significance of A.D.F. is matched to the number of variables and the number of observations.
*Significant at the 5% level of significance.

We see that in all the estimation methods a cointegrative relationship exists in the demand function, and the residual is stationary at a 5 percent level of significance. The elasticity of demand of tourists relative to price is negative, as expected, less than unity, and ranges between 0.8 in the least squares estimation to 0.4-0.6 in the estimations based on auxiliary variables (TSLS).[37] This range of demand elasticity matches the elasticity values obtained in many research studies in economies in the United States, Canada, Turkey, Spain, and Greece. This is a more reasonable result than the high elasticity (-2) obtained in Fleischer and Buccola's (2002) study. For the other variables as well, elasticity and influences were obtained in the expected direction: a rise in the real price of a foreign tourist's stay outside his country (SCF) will lead to a decrease in that tourist's demand for foreign tourism, including a decrease in his demand for overnights in Israeli hotels (negative elasticity of 0.7-1.2).

The influence of the real exchange rate (REER) is positive and with an elasticity of 0.6-1.2, which implies that in the wake of a depreciation in the real exchange rate, the buying power of tourists holding foreign currency increased for services whose prices are quoted in shekels, which increased their demand for overnights in Israel. A further channel of influence of the change in the real exchange rate on tourists' demand for overnights is by means of the rate for tourists (PF): a depreciation in the real exchange rate will lead to a decrease in the rate for tourists, and hence to an increase in their demand for overnights. This latter effect, however,

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[37] Very similar results to those obtained from the TSLS estimation were obtained from the estimation by means of GMM.

is already included in the price elasticity (PF) in the equation. The finding in the study that the elasticity (REER) is greater than the price elasticity (PF), is consistent with the fact that only around 30 percent of the tourist's overall costs are for the hotel, while the rest is for expenditure elsewhere, which is influenced, among other things, by changes in REER .

An important variable affecting the tourists' demand is security instability. This variable is captured by means of an index that examines the intensity of terrorism and security-related events, and a significant and stable negative influence is obtained in all the regressions. A rise in the level of the index, which includes 19 levels of severity (0 to 18), will reduce the demand for tourist overnights by around 10 percent.[38] A transition from a severity level of 0 to a level of 18 lowers the tourists' demand approximately six fold.[39] An example of this was at the end of 2000 with the start of the Second Intifada, when the instability index rose sharply and the tourists demand reacted accordingly. Note that in Fleischer and Buccola's (2002) study, the influence of change in the index of security instability was far less.

Two additional variables were found to positively influence tourists' demand and to add to the long-term cointegrative relationship: the number of volunteers coming to Israel to work on kibbutzim (after deducting the trend) (VOL_MA), and the number of hotel rooms in Jordan and in Egypt (J_RO+EG_RO). The significance of the positive relationship between demand and the number of rooms in Jordan and Egypt is that even though in the short term the growth of the supply of rooms there could divert tourists from reserving overnights in hotel rooms in Israel and lead them to prefer a day stay in Israel and an overnight in these countries, in the long term there is a complementary relationship, even though it is very small (elasticity of only 0.02). Note that the results of the estimation, which include the dynamic factor (TSLS_BB) are not very different from those obtained by the TSLS method, even though the explanatory power and the strength of cointegration are lower. The research also examined how tourists' demand in Israel is influenced by two indices that represent potential

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[38] We recall that this index reflects 19 levels of severity of security instability. On average over the sample period examined in this study, the level of instability was 9. A rise in the instability index to level 10 will lead to a decrease of around 10 percent in tourists' demand for overnights in Israeli hotels. If, alternatively, we enter only the number of fatalities from terrorist activities and ignore the influence of wars such as the Second Lebanon War, the Iraq War etc., we obtain a smaller negative effect on the demand—a growth of ten percent in the number of fatalities will reduce the demand for tourists' overnights by around three percent. In this situation, however, the strength of the cointegration is affected, so that this examination supports the addition of the influence of the war to the security instability variable.

[39] According to $18^{(1-0.095)} \approx 0.166$, in other words, if the number of tourists is X and the Ter index is 0 (the best security situation) then a rise in Ter by each level of the security situation leads to a decrease of 9.5 percent in tourists' demand for overnights, and a rise of 18 levels to Ter=18 (the worst security situation) will lead the tourists' demand for overnights to be only around 17 percent of the original demand.

negative implications of events worldwide, such as epidemics, terrorist attacks, and earthquakes, on tourism around the world and in the Middle East region.[40] It was found that only the index that represents the influence of the global events on the region contribute to cointegration of the demand equations, and even this only slightly and in some of the specifications we examined.

b. The demand equation of Israelis' overnights in hotels

The estimation results of the demand function of Israelis for overnights in Israeli hotels for the period 1997:2-2009:4 presented in Table 3, show that in all the estimation methods a long-term cointegrative relationship was obtained between the variables estimated.

Table 3
The Cointegrative Relationship of the Demand for Israelis' Overnights in Israeli Hotels
(Sample Period: 1997:2 to 2009:4)

The estimated cointegrative relationship:
$$LOG(QL)_t = \gamma_0 + \sum_{i=1}^{m} \gamma_i' X_{it} + \varepsilon_t$$

Equation Number		*The Variables*						*The Statistics*		*Examination of the Residuals*	
	Estimation Method	C	LOG(PL)	TER_MA * LOG(PF)	LOG(SCL)	LOG(GDPL_CAP)	LOG(QL_LAG)	$R^2 Adj$	D.W.	A.D.F	D.W.[1]
1.	OLS	3.494	-1.001		0.161	1.722		0.899	2.07	-7.29*	2.02
1א	OLS	4.050	-1.089	-0.00045	0.145	1.711		0.897	2.09	-7.34*	2.01
2.	TSLS	1.944	-0.939		0.312	1.843		0.888	2.13	-7.40*	2.02
3.	TSLS_BB	6.416	-0.933		0.095	1.191	-0.046	0.819	1.08	-4.74*	2.32

1) Belongs to the equation that estimates the A.D.F.
The level of significance of A.D.F. is matched to the number of variables and the number of observations.
*Significant at the 5% level of significance.

A major finding is the negative and unitary elasticity of demand (the quantity) of Israelis' overnights in hotels (QL) to the overnight price for Israelis (PL). This unitary elasticity is stable in all the estimation methods, and is also found in the study of Fleischer and Buccola (2002), who estimated the demand equation of Israelis' overnights in Israeli hotels in the years 1987-1999. In our study, according to the widespread conception, we found that the tourist's elasticity in response to changes in price is lower than the Israeli's elasticity, as opposed to Fleischer and Buccola's (2002) findings. This fact, combined with the tourists' considerable sensitivity to security instability, produces a substitution between Israelis' overnights and tourists' overnights in times of worsening of the security situation (Figure 1). In a simulation we conducted, we found that an increase of one level in the index of security instability, which reduces the number of tourist overnights by 9.5 percent, will lead to a

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[40] The indices consist of a scale from 0—no event, to 10—an event whose potential influence on tourism in the world and in the region, respectively, is the highest.

reduction of 4.8 percent in the rates offered to Israelis, and a similar rise in the number of their overnights.

The elasticity of demand relative to per capita income, which was measured by the real per capita GDP (GDPL_CAP), is positive and greater than unity—ranging in the area of 1.2-1-1.8, which is compatible with findings worldwide that accommodation in hotels is still perceived as a luxury product (a normal product has a higher-than-unity elasticity for income). The rise in the per capita income level over the years, which contributes positively to Israelis' demand for overnights, increases also the potential substitution between Israelis' and tourists' overnights, particularly in times of worsening of the security situation. The elasticity of demand relative to the real cost of a day's stay of an Israeli abroad (SCL including flight costs) obtained, as expected, a positive value, which reflects the substitution effect to an Israeli between a vacation in Israel and one abroad. At the same time, the effect obtained in this study is only 0.2-0.3, while Fleischer and Buccola (2002) obtained a far greater effect—unitary elasticity. Possibly the relatively low effect obtained in our study reflects the greater exposure of Israelis to overseas in recent years, which has possibly led to a change in preferences and a differentiation between the products—a vacation in Israel and a vacation abroad. It should be emphasized that the security instability variable did have a negative influence on the demand and overnight reservations of Israelis, but since its addition had an adverse affect on the cointegrative relationship, it does not appear in Table 3.

c. The (residual) supply equation of Israelis' overnights in Israeli hotels

The estimation results of the residual supply function of Israelis' overnights in hotels in Israel for the period 1997:2-2009:4 presented in Table 4, show that in all the estimation methods a long-term cointegrative relationship was obtained between the variables estimated. In estimating the equation a specification was added that is presented in Table 4, in which the variable that describes the difference between the number of potential overnights that can be actualized by Israelis and the tourists' overnights (that are reserved in good time), was replaced by a variable that describes the relationship (the rate) of this difference compared with the inventory of potential overnights, which is derived, as mentioned above, from the

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capacity of rooms in each period. The estimate in the equation according to this specification was made using the TSLS method.[41]

Table 4

The Cointegrative Relationship of the (Residual) Supply of Overnights for Israelis in Israeli Hotels
(Sample Period: 1997:2 to 2009:4)

The estimated cointegrative relationship: $LOG\left(PL\right)_t = \gamma_0 + \sum_{i=1}^{m} \gamma_i' X_{it} + \varepsilon_t$

Equation Number	*The Variables*							*The Statistics*		*Examination of the Residuals*	
	שיטת האמידה	*C*	*LOG (QL)*	*LOG (WAGE_R)*	*LOG (QTOT-QF)*	*(QTOT-QF) /QTOT*	*LOG (PL_LAG)*	$R^2 Adj$	*D.W.*	*A.D.F*	*D.W.*[1]
1.	OLS	3.764	0.016	1.132	-0.529			0.791	1.16	-4.41*	1.97
2.	TSLS	4.169	0.254	0.954	-0.687			0.769	1.45	-5.22*	1.99
3.	TSLS_BB	1.122	0.232	1.147	-0.529		0.183	0.783	1.65	-5.99*	2.00
4.	TSLS	4.141	-0.159	0.540		-1.054		0.862	1.36	-5.00*	1.91

1) Belongs to the equation that estimates the A.D.F.
The level of significance of A.D.F. is matched to the number of variables and the number of observations.
*Significant at the 5% level of significance.

The price elasticity offered by hotels for Israelis' overnights (PL) in the wake of changes in the quantity of the overnights (QL) is low: in the least squares estimation it is almost zero. This implies that a growth in the number of Israeli overnights will not affect the price of the overnights. In the two other methods, each growth of one percent in quantity will lead to an increase of around 0.25 percent in the price offered. This finding matches similar findings regarding the price elasticity in Israel and worldwide, even though some studies, for example Zhou, Bonham and Gangnes (2007), found that the price elasticity in the supply function was higher—around 0.5 percent. The price elasticity in equation (specification) 4, while negative, is relatively low. Note that the residual supply curve of the Israelis in this last specification as well is relatively flat, and its slope is far less (in absolute value) than the slope of Israelis' demand curve (unitary elasticity), so that according to the Marshall conditions, stable equilibrium is maintained.

An additional variable that explains the price offered is the difference between the number of potential overnights for actualization according to the inventory of rooms in a given period (QTOT) and the number of overnights reserved by tourists (QF). This variable reflects the assumption that tourists reserve earlier than Israelis, and therefore the supply of rooms to

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[41] The advantage of this specification is that it connects demand and supply directly already in the supply equation, and therefore it obviously necessitates estimation by means of auxiliary variables, and enables us to run simulations that examine the extent to which the capacity of the rooms has to grow in various scenarios that increase demand in the future (see the analysis in Section d.3 of this chapter).

Israelis is a residual supply. It was found that the elasticity of this variable relative to price is negative, around 0.5-0.7. In the quarterly specification we obtain a unitary coefficient between the price to Israelis and the rate of potential beds for occupancy by Israelis. The elasticity derived from this coefficient, between growth in the supply of rooms and the price, is lower and ranges around 0.25 (elasticity at the point of the averages).

Yet another variable that explains the price offered is the real wage in the guest-services industry (WAGE_R). The elasticity of this variable relative to price is positive, but its value, around unity, is relatively high (except in the last specification, in which the value of the elasticity is lower (0.54)). Possibly this attests to the absence of additional cost variables in the equation that could influence the price offered, such as variables connected to capital or current financing.[42]

The study also estimated an aggregate supply equation in which the only quantitative variable is QTOT, and the expected results were obtained. The disadvantage of this estimation, however, is that is does not include an important supply element—the number of vacant rooms close to the time of consuming the product. This fact seems to have weakened the strength of the cointegrative relationship of the equation relative to the residual supply equation.

We also estimated an auxiliary equation in which the supply of rooms is endogenous and is determined according to the demand from tourists and Israelis. We found that the supply of rooms is built to a large extent on the basis of the Israelis' demand and less on the basis of the tourists' demand—a reasonable fact in light of the volatility that characterizes the tourists' demand as against the constant growth of the Israelis' demand.

In all the estimation methods examined above, we obtained a cointegrative relationship. However, as opposed to the demand equations, the strength of the relationship in the supply equations seems better when the equation contains a dynamic factor in estimating with the TSLS_BB method. This finding is not surprising, in that it is reasonable that the price variable is characterized by more inertia than the quantity variable—the dependent variable in the demand equations. The inertia in the price variable can be explained by the fact that the

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[42] In alternative supply regressions of overnights for Israelis, in which additional cost variables were added, such as the input prices, a wage elasticity was obtained of around 0.7; the cointegration strength, however, was significantly weakened. In equation 4 as well, in which a low wage elasticity value was obtained, a low strength of the (residual) cointegration factor was obtained, relative to its parallel equation 2.

hotels update price on the basis of the existing price. The results using this method are not much different from those obtained using the TSLS method.[43]

d. Analysis of the results

Table 5 presents a sensitivity analysis of the quantity elasticity relative to the price in the demand equations, and of the price elasticity relative to the quantity in the supply equation. This analysis used different estimation methods for demand and supply curves in logs (constant elasticity), and for linear demand and supply curves (variable price elasticity). Estimating the linear demand curve enables us to the examine the assumption that the hotels operate monopolistically.[44]

Similar to the results obtained in the estimation with constant elasticity, the estimation with variable elasticity points to the existence of cointegration in both supply and demand, but the strength of the relationship is not identical between the specifications. In each of the three equations of tourists' and Israelis' demand, and the residual supply for Israelis, in estimating the variable elasticity at the averages point, we obtain elasticity values similar to those obtained with constant elasticity.[45]

Table 5: Analysis of Price Elasticities in Demand and Supply Equations With Constant Elasticity and Variable Elasticity and Using Different Estimation Methods*

Type of Equation	Constant Elasticity (Endogenous Variables in Logs)	Variable Elasticity (Endogenous Variables without Logs)	
		At the minimum point	At the averages point
1. *Israelis' demand*			
OLS	-1.00	-1.14	-0.71
TSLS	-0.94	-1.52	-0.94
TSLS_BB	-0.93		
2. *Tourists' demand*			
OLS	-0.80	-2.33	-0.71
TSLS	-0.61	-2.15	-0.66
TSLS_BB	-0.38		
3. *Israelis' supply*			
OLS	0.02	-0.01	-0.02
TSLS	0.25	0.15	0.25

* The elasticity in the demand equations is defined as the ratio between the percentage of change in the number of overnights to the percentage of change in the price (the rate) for the overnights. As against this, in the supply equation the elasticity that is presented in Table 5 is defined as the ratio between the percentage change in the price (the rate) for the overnights and the percentage change in the number of overnights, so that an elasticity of zero reflects a totally elastic supply curve relative to quantity.

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[43] Very similar results to those obtained with the TSLS estimate were obtained by estimating by means of GMM.

[44] A monopoly operates only in the area in which the elasticity of demand is greater than 1.

[45] The elasticity in relation to security instability at the averages point is similar to the parallel elasticity in Table 2. As against this, in the other variables such as the exchange rate, a difference in the elasticities is obtained between estimation with constant elasticity (with logs) and estimation with variable elasticity at the averages point.

d.1. Empirical support for the approach that the market structure is competitive

The view that the hotel market is competitive is indicated in previous studies, such as Fleischer and Buccola (2002), and Aslan, Kula and Kaplan (2009), while in the work of Zhou, Bonham and Gangnes (2007) a monopoly is assumed in the short term. We present below empirical support for the view that the structure of the market in Israel is competitive:

Elasticities of the linear demand curves: From Table 5 we see, as expected, that at the averages point (of the prices and the quantities) demand elasticities are obtained that are not greater than unity (see also Appendix 3). At the same time, at the minimum point (of the quantity variable), we obtain elasticity that is two times higher than the tourists' demand, and above the unity of the Israelis' demand. Because the number of observations around the minimum point is small, only in these extreme situations is there support for the assumption that hotel owners act as a monopoly. Note that the demand elasticities in the estimation, which assume constant elasticities (with logs), are at the most 1, which lends support to the view that the market operates under competitive conditions.

The supply—high transmission between the costs and the price offered: Further empirical evidence that reinforces the competition assumption is the high rate of costs that is loaded on the offered overnight price. In perfect competition the growth in costs is fully loaded on the offered price,[46] while in monopoly only part of the growth in costs is loaded on the offered price.[47] The wage elasticity that is obtained (0.95-1.1) (Table 4) is high, a finding that supports a model of competition, and not one of monopoly, for which we would expect far lower elasticity (less than 0.5).

d.2. Empirical examination of the assumption that tourists reserve rooms earlier than Israelis

The assumption that tourists reserve rooms in good time, while Israelis reserve them close to the time of consumption, is required in order to generate the gaps in rates between tourists and Israelis, as noted in the section on the stylized facts. In the theoretical model this assumption is obtained as a result of two major factors: 1. Tourists value the tourism product more than Israelis do; and 2. Tourists are myopic. We present empirical support for these.

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[46] On the assumption that 70 percent of the hotels' costs are wages, the elasticity of the real wage in hotels relative to the rate offered **in competition** is 0.7.

[47] Thus, for example, in monopoly with a linear demand curve, only half of the growth in the marginal cost will be reflected in the price.

Tourists value the tourism product more than Israelis do: Possible empirical support for the hypothesis that tourists value the tourism product more than Israelis do, can be found in the estimation results (Table 5), in which the Israelis' elasticity of demand is higher (in absolute value) than that of tourists. This result attests to the Israelis' greater sensitivity to price changes than the tourists. We can interpret this high sensitivity as a lower valuation of the product by Israelis, in that they can be easily persuaded, relative to tourists, to buy the product by lowering its price.

At the same time it is reasonable to assume that in times of security instability, the demand sensitivity of tourists to price is lower than in periods of security calmness, a result of the change in the tourists' mix. In times of security calmness the weight of tourists visiting for vacation and sightseeing purposes, which are sensitive to rates, grows at the expense of the weight of business people and people visiting relatives, who are less sensitive to the rates (see Appendix 4). This claim is consistent with the large gap between overnight rates for tourists and the rates for Israelis in periods of high security instability (Figure 1). An example of this is during the years of the Second Intifada at the beginning of 2000 when the number of tourists fell sharply, while an increase was recorded in Israeli overnights as a result of the substantial reduction in rates offered by the hotels.

In order to examine this claim, we added an interaction variable between the index of security instability and the price variable in the demand equation for tourists. We see in Table 2 that even though the price elasticity grew in the periods in which there were no terrorist attacks to around -0.93, it was still lower than that of the Israelis (unitary elasticity). The elasticity of demand relative to price in the periods in which the index of security instability reaches its maximum (level 18), was lower, around -0.8.[48] In the same way, entering the interaction variable between the index of security instability and the price charged for Israelis' overnights (Table 3) did not change at all the Israelis' elasticity of demand for overnights relative to price, and this remained unitary both in periods of terrorism and those without terrorism. It is however true that a change in the mix during periods of security instability does lead to more reservations by tourists close to the time of consumption.[49] As mentioned above, according to the theoretical model, the hotel announces a uniform rate at any particular time, but lowers

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[48] The estimate was obtained from the sum of the price elasticity (-0.93) and the interaction elasticity (0.007), multiplied by the maximum level of terror (18). See Table 2, equation 1.a.

[49] In 2009 tourists reserved on average 80 days prior to their date of visiting Israel, while at the height of the Intifada in 2003, tourists reserved on average 44 days prior to the date of the visit.

the rates close to the time of consumption. In times of security instability, therefore, the business tourists, who reserve close to the time of consumption, will enjoy cheaper rates. At the same time, the hotel can avoid lowering the price for this market segment by lowering rates for population groups that do not characterize business people, for example, for people remaining during the weekend, a couple in a room, or for children, and therefore to reduce rates only very close to the time of consumption.

Tourists are myopic: We are unable to examine directly the assumption that tourists are myopic relative to Israelis. At the same time, there is empirical support for the assumption that tourists reserve overnights relatively earlier than Israelis.[50] In the residual supply equation (Table 4) we found that the number of rooms that remained available for Israelis (QTOT-QF) negatively influences the rates offered to Israelis in the long term. As against this, in the examination of the residual supply equation for tourists, in which we assume that Israelis reserve earlier than tourists, so that the explanatory variable of the tourist rates is QYOT-QL, the strength of the cointegrative relationship is adversely affected. These findings can possibly be interpreted as reinforcing the claim that the tourists reserve overnights earlier than the Israelis.

d.3. Scenarios for the growth in the number of hotel rooms in order to meet the demand from 2011 to 2015

The question of whether it is necessary to increase the supply of rooms in light of the rise in demand is an important policy issue. Its importance has been magnified in recent years as the security situation has improved, which has led to a growth in tourists' demand for overnights in Israel. This growth in the number of tourist overnights in conjunction with the continuing increase in the demand from Israelis, has brought the hotels in recent years to almost full occupancy.[51] The appropriate framework for examining the above question is that of the long term, because increasing the inventory of rooms (building hotels) takes time.

We examined this question by means of a simulation that included five scenarios (Table 6). The simulations, which use coefficients from the estimation, present, under various assumptions, the expected growth in demand for tourist and Israeli overnights in the coming five years (2011-2015), and how many hotel rooms need to be added in order to meet this

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[50] This is a result of the theoretical model in which tourists are myopic, Israelis are strategists, and tourists value the tourism product as being of higher quality than the Israelis do.
[51] An occupancy of 60-70 percent is regarded as full occupancy.

growth in demand.[52] The scenarios include identical assumptions regarding per capita GDP growth (1.8 percent a year), alternative costs for tourists of overnights abroad, and global per capita growth (2.5 percent a year). We assumed a relatively moderate influence of the global growth on tourists' demand—the income elasticity in the simulation is unitary—even though it would have been possible to assume an elasticity greater than one, the implication being that an overnight stay in a hotel is a luxury product.

The scenarios are differentiated by assumptions regarding the level of security instability, the level of real wages in the hotel industry, the change trend in the real exchange rate, and the cost to Israelis of traveling abroad. In scenarios 1 (basic) and 5, we assumed that in the coming five years the real effective exchange rate would remain unchanged, while in scenarios 2 (appreciation), 3 (appreciation and growth in real wages in the hotel industry) and 4 (appreciation and cancellation of the VAT exemption), we assumed the real effective exchange rate will appreciate by two percent each year in the coming five years.[53] In scenario 3 (appreciation and a rise in real wages), we assumed that the real wage in the hotel industry will increase at a relatively rapid pace of around 0.8 percent a year, while in the other scenarios wages grew by only 0.5 percent. In scenario 4 we assumed that starting in the first quarter of 2011 the VAT exemption to tourists on accommodation and transportation services will be canceled. A VAT exemption for both tourists and Israelis would thus remain only in Eilat. The cancellation of the VAT exemption translates into a rise of only 5 percent in overnight rates for tourists.[54] This estimate is based on the assumption that cancellation of the VAT exemption, and in its wake a rise in the overnight rate for tourists of 16 percent, will not completely influence the tourists' demand. We assume, therefore, that the relevant overnight rate in the tourists' demand equation reflects the overall cost of the visit (including the flight), which, as mentioned above, will increase by only 5 percent. (For details of the calculation see Appendix 5.)

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[52] Note that in estimating the supply equation we used a specification in which the explanatory variable was the rate of potential overnights for actualization by the Israelis QTOT/(QTOT-QF). For a discussion on the differences between this specification and the specification in which the explanatory variable is (QTOT-QF), see Appendix 6.

[53] Furthermore, we assumed that the cost to Israelis of traveling abroad will decrease by three percent each year. This decrease consists of a decrease of one percent, which also exists in the basic scenario, and a further two percent because of the real appreciation.

[54] This estimate is based on the assumption that the cancellation of the VAT exemption and in its wake a rise in the overnight rate for tourists of 16 percent, will not completely influence the tourists' demand. We assume, therefore, that the relevant overnight rate in the tourists' demand equation reflects the overall cost of the visit (including the flight), which, as mentioned above, will increase by only 5 percent.

In scenario 5 (worsening of security stability) we assumed that the level of security instability changes over the five years. In the scenario a severe worsening in security takes place at the end of 2011, which continues for a short time followed about a year later by an improvement in the security situation, so that on average for the whole period of the simulation the level of security instability is equal to the average level that existed in the years 1986-2010. In the other scenarios we assumed that the level of terrorism in the coming five years will be constant and equal to the average level in 2008.[55] While this level is slightly lower than the long-term average from 1986 to the present, it includes also the high level of security instability at the end of 2008 because of the fighting in the Gaza Strip. In all the scenarios, except for scenario 5, the objective was to achieve full occupancy of rooms at the end of the period.[56] In scenario 5 the objective was to minimize the deviation from full occupancy— deviation both above and below, because in scenarios 1 to 4, the deviation from full occupancy is only from above, until the supply catches up with the demand, while in scenario 5 the deviation from full occupancy is both from above and below, according to the security situation.

Table 6: Results of the Scenarios in the Hotel Industry 2011-2015

	Scenario 1—Basic		Scenario 2—Appreciation of the real exchange rate*		Scenario 3—Appreciation of the real exchange rate and a rise in real wages*		Scenario 4—Appreciation of the real exchange rate and cancellation of the VAT exemption for tourists**		Scenario 5—Worsening of security stability	
a.	In order to supply the future demands of Israelis and tourists, the capacity of the hotels has to be increased from 2011 to 2015 by:									
	9,000 rooms		6,500 rooms		6,000 rooms		5,900 rooms		7,500 rooms	
b.	Rates for Israelis decrease each year by:									
	0.2 percent		0.5 percent		0.3 percent		0.6 percent		0.25 percent	
c.	The number of Israeli and tourist overnights in 2015 (thousands) compared with the base year (2008) in which there were 11,403 thousand Israeli overnights and 10,150 thousand tourist overnights.									
	Israelis	Tourists	Israelis	Tourists	Israelis	Tourists	Israelis	Tourists	Israelis	Tourists
2015	13,821	11,855	13,677	10,825	13,541	10,825	13,718	10,526	13,975	11,168

* Around 2 percent a year. ** Which raises the tourist rates by 5 percent.

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[55] In the scenario of a security deterioration in the period, the occupancy rate of beds decreases but the occupancy rate of rooms decreases less. This is because in this period there is a change in the mix of tourists, so that the weight of business people, who generally sleep alone, increases. The study estimates the occupancy of beds and not of rooms, but the demand from Israelis in times of terrorism activity is influenced by the decrease in the tourists' demand for rooms. Increasing the income elasticity of tourists to 1.5 artificially reduces the number of vacant rooms. In this way we artificially increased the tourists' demand for overnights, so that it will be similar to their demand for rooms.

[56] Full occupancy is equal to the average between the rates of occupancy of 1999 and 2008, which were peak years for tourism.

In Table 6 we see that in all the scenarios there is an increase in future demand for overnights of Israelis and tourists, but that the increase in these overnights is sensitive to various assumptions. In the basic scenario, in order to meet future demands, it is necessary to raise the room capacity by 9,000 rooms from 2011 to 2015. In scenarios 2 (appreciation), 3 (appreciation and increasing real wages in the hotel industry), and 4 (appreciation and cancellation of the VAT exemption), the room capacity has to be increased by around 6,500, 6,000, and 5,900 rooms, respectively. In the fifth scenario (worsening in security stability), the capacity has to be increased by 7,500 rooms.[57] In scenarios 2 to 5, in which factors are operating to reduce demand, particularly from tourists (worsening of security stability, real appreciation, and cancellation of the VAT exemption), the weight of Israelis' overnights in the overall overnights grew in comparison with the basic scenario, because of the partial substitution of tourist overnights with Israeli overnights.[58]

In these five scenarios we see that parallel to the increase in the capacity of rooms, there is a slight decrease in overnight rates for Israelis. The decrease in rates is only slight because we assume that the supply of rooms grows according to demand, so that the rates do not change in the wake of gaps between the supply of rooms and the demand.

The research focuses on the level of the economy as a whole, and does not analyze demand at the regional level or according to tourist segments (vacation, business, and pilgrimage). Consequently, the results of the scenarios should be viewed only in a national context. At the same time, the scenarios provide a picture of growth in Israelis' demand and a moderate growth in tourists' demand. Because tourist overnights are concentrated in specific areas (Jerusalem and Tel Aviv), while Israeli overnights are concentrated mainly in Eilat and the Dead Sea, we can, in general terms only, point to areas of demand. On the other hand it should be noted that the considerations for selecting the area in which a hotel should be built have to be broader, and need to take into account that the added value of a tourist's visit to Israel is higher than that of an Israeli.

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[57] The addition of rooms obtained in these scenarios is significantly less than the assessment of the Ministry of Tourism of the need to increase the inventory of hotel rooms by 19 thousand in the coming five years, if the security situation does not worsen. Source: Ministry of Tourism—Infrastructure Development & Investments Administration, "Policy for encouraging the establishment of tourism storage installations: Summary document" 2010. (Rotem Strategies)

[58] The overnight rate for Israelis decreased each year in comparison with the basic scenario, because of the decrease in the quantity of tourist overnights caused by the appreciation, or alternatively in the wake of the worsening security situation, and with the aim of filling these vacant rooms with Israelis.

6. Summary and conclusions

In this study we examined two aspects of the hotel market—the demand and the supply—in the long term. The empirical analysis is based on a theoretical framework that includes equilibrium between hotels and consumers operating in competitive conditions. The consumers group in the model—tourists and Israelis—are differentiated by their sensitivity to the overnight rate, to terrorism, and by their buying preferences close to the date of consumption as opposed to reserving in advance.

The empirical estimation takes into consideration the simultaneous connections between the supply and the demand in the market, and the different preferences of the consumer groups. As a consequence of their different preferences, we estimated two separate demand equations—for tourists and for Israelis. As against this, seeing that the product offered by the hotels (overnights) is identical for tourists and Israelis, the estimate included a single supply function. In practice, we estimated a supply equation for Israelis only, which constitutes residual supply from the aggregate supply equation, after deducting from it the number of overnights reserved by the tourists. Viewing the supply to Israelis as residual is supported by the fact that tourists' hotel reservations in Israel are generally made earlier than the Israelis' reservations.

The different characteristics of the consumer sectors—the tourists and the Israelis—presented in the theoretical model and in the empirical framework, are the major source of the price differences observed in the overnight rates between Israelis and tourists: on average in the years 1997-2009 tourists paid around 8 percent more for hotel overnights than Israelis.

The empirical estimation was computed for the long term in the context of cointegration using three methods of estimation—least squares (OLS), auxiliary variables (TSLS), and auxiliary variables with an inertia factor (TSLS—Blundell & Bond). As is customary, we did tests to substantiate the existence of cointegrative relationships for the demand and supply curves, as well as tests to examine the stability of the elasticities.

The results of the estimation show that the Israelis' demand sensitivity in relation to price changes is greater than that of the tourists: for tourists the elasticity of demand is 0.4-0.9, while for Israelis the elasticity is unitary. The tourists' elasticity grew as the security situation improved, against the backdrop of the rise in the weight of tourists visiting for vacation and sightseeing purposes. The result obtained in our study of the tourists' elasticity of demand is

similar to the finding of Zhou et al. (2007). An additional result of the study is that an increase of one level in the Index of Security Instability (out of an index of 19 levels) will lead to a decrease of around ten percent in tourists' demand for overnights. A combination of these results, according to which the tourists' demand is greatly affected by the security instability variable, and that the tourists' elasticity of demand in relation to price is lower than that of the Israelis, enables hotel owners to make use of Israelis as "shock absorbers" during times in which tourist demand falls because of the security situation. Thus, for a fall of ten percent in tourists' overnights, an increase of five percent will be recorded in Israelis' overnights. In other words, in this situation the proportion of Israeli overnights in the overall number of overnights grows, which reduces the negative effects of terrorism on the demand for overnights in Israel. This reduction of the negative effect has been made possible in recent years by the growth in the potential for Israeli overnights as the standard of living in Israel increases.

We examined several scenarios in this study for the growth in the number of hotel rooms in order to meet the demand (derived from assumptions regarding the stability of the security situation, the absence of change in the real exchange rate or its moderate appreciation, moderate growth worldwide and in Israel, and the possible cancellation of the VAT exemption for tourists) in the years 2011-2015. It was found that it is necessary to increase the capacity of hotel rooms, which currently stands at around 47 thousand rooms, by 6 to 9 thousand rooms.

The empirical findings obtained from the demand estimate (demand elasticities whose values do not exceed unity) and the supply estimate (high transmission between wage costs in the industry and the offered price) support the competitive structure of the hotel market.

Most of the results in the study match findings worldwide, and are consistent with economic intuition and with the results of the theoretical model. At the same time, the study still lacks several important characteristic of the hotel market in Israel. The study did not relate to regional data of overnights, but only to the level of the economy as a whole. We also did not discuss explicitly the issue of the factors attracting tourism (attractions such as heritage sites and access to the beach), mainly because of data limitations. Future studies should focus on the composition of tourist overnights (pilgrims, business people, sightseeing and vacations, or according to various source countries). Discussion of these issues could give answers to

questions such as where the major growth potential of tourist and Israeli demand lies, and what policy steps should be taken in light of these developments.

Appendices

Appendix 1 – Definition of the Variables

REER—The real effective exchange rate of the shekel relative to the basket of currencies, obtained by multiplying the nominal effective exchange rate by the relationship between the average CPI of Israel's trading partners and Israel's CPI. The nominal effective exchange rate is calculated as the weighted average of the exchange rate of the shekel against 28 currencies (that represent 38 countries), according to Israel's weight of trade with these countries. *Source: The Bank of Israel.*

SCL—The real price per day for an Israeli's stay abroad (including and excluding travel costs) = the ratio includes in the numerator the category in the balance of payments of Israelis' expenses abroad (travel) and where the figure *travel* includes travel costs. This dollar figure is multiplied by the nominal NIS/$ exchange rate and divided by the CPI. In the denominator—the average number of days the Israelis spend abroad multiplied by the number of Israelis who traveled abroad in the quarter.[59] The index obtains a value of 100 in 1991:1. *Source: Processing of Central Bureau of Statistics data and the Bank of Israel.*

SCF—The real weighted price for a day's stay abroad of a resident of the four countries from which most tourists to Israel originate (United States, Great Britain, France and Germany). The nominal cost of a day's stay is obtained by dividing the nominal expenses of the foreign residents (the *travel* category in the balance of payments) by the number of days spent abroad for each of the four countries.[60] The nominal cost for a day's stay in the local currency is divided by the CPI in the local currency for each of the four countries. The weighting is done according to the weights of the tourists days of stay from those countries in Israel. Days of stay in each country are calculated by multiplying tourist entries by the average days of stay

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[59] SCL is a function of three things: a. The nominal NIS/$ exchange rate divided by the local CPI and multiplied by the overseas CPI; b. Changes in the price of spending a day abroad for Israeli tourists; and c. Change in the composition of Israelis' destinations. If we take an additional explanatory variable—the effective (basket) real exchange rate (REER)—then the SCL will reflect the residual, that is to say, change in the composition, and partially changes in price beyond the price changes in the destination countries (trade) of Israelis.
[60] From 1997:1 to 2009:4, the weight of the four countries; up to 1996:4 the weight of Great Britain and the United States only.

of the tourists from each of the countries in Israel. The data are seasonally adjusted. *Source: Processing of Central Bureau of Statistics data and the Bank of Israel.*

PL—The real rate of Israelis' person overnights in tourism hotels—hotels recommended by the Ministry of Tourism for tourists (see the diagram below).

The index is calculated as follows:

The nominal overnight rate is obtained by dividing the hotel's revenue from Israelis in current shekels by the number of Israelis' overnights. The nominal rate is calculated separately for each class of hotel. In this way three individual indices are obtained: PL_1, the index of Class 1 hotel prices for Israelis; PL_2, the index of Class 2 hotel prices for Israelis; and PL_3, the index of Class 3 hotel prices for Israelis. The three indices were weighted into an overall index of hotel rates for Israelis according to their share in the overall revenue. The real rate is obtained by dividing this index by the CPI. The index obtains a value of 100 in 1997:Q2. Seasonal smoothing is applied to the index, taking into account the Jewish holidays. *Source: Processing of Central Bureau of Statistics data.*

Reservation: The revenue includes also revenue from food and beverages, and revenue from events. If there were changes during the period in the patterns of these revenues, the index does not take them into account. If, say, the hotels recorded a decrease in revenue resulting from a decline in popularity of events in hotels, for example weddings, this too was not taken into account.

PL
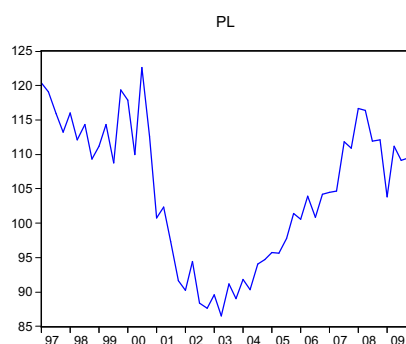
PF—The real rate of tourists' person overnights in tourism hotel. The rate is real in terms of Israel's effective exchange rate (in trade terms).

The index is calculated from the nominal overnight dollar rate for a foreign tourist. The nominal rate (PF_CUR) is obtained separately for each class of hotel. The weighted nominal dollar rate by classes (PF_TOT_CUR) was calculated in a similar way to the price calculation

for Israelis. The real rate is obtained by multiplying the nominal rate by the NIS/\$ exchange rate (E) and dividing by the NIS/\$ exchange rate (weighted by the weight of Israel's trading partners) (S) and by the weighted level of world prices (P*):

$$PF = \frac{PF\_TOT\_CUR \cdot E}{P* \cdot S}$$. In practice we used the real effective exchange rate (REER);

$$REER = \frac{p* \cdot S}{P\_ISR}$$ where P_ISR is the CPI in Israel. We see that it is possible to obtain the PF

by the formula $$PF = \frac{PF\_TOT\_CUR \cdot E}{REER \cdot P\_ISR}$$.

The data are seasonally adjusted. *Source: Processing of Central Bureau of Statistics data.*

QL—Number of Israelis' overnights (per person) in tourist hotels during the quarter, in thousands. Log, seasonally adjusted. *Source: Central Bureau of Statistics.*

QF—Number of tourists' overnights (per person) in tourist hotels during the quarter, in thousands. Log, seasonally adjusted. *Source: Central Bureau of Statistics.*

QTOT—The overall number of rooms and the number of beds in tourism hotels (including hotels that are operating and those that are not operating because of renovations, etc.). *Source: Central Bureau of Statistics.*

E_beds—The number of vacant beds at night on average in tourism hotels. *Source: Central Bureau of Statistics.*

Ocp_beds—Occupancy of the beds at night in tourism hotels (percentages). *Source: Central Bureau of Statistics.*

Ocp_rooms—Occupancy of the beds at night in tourism hotels (percentages). *Source: Central Bureau of Statistics.*

Ter—*Synthetic index of security instability*
The index is based on data of fatalities: Israeli civilian fatalities, soldiers in hostile actions and wars (excluding accidents), and Palestinians. From these figures a linear index of terrorism was constructed, which weights the fatalities data. We divided the index into 19 levels, from 0 (calm) to 18. The division was done according to the percentile of the linear index in each level, the implication of which is that the synthetic index of terrorism is not linear. A very small number of victims of terrorism is sufficient to move from level 0 to level 1, and only a very large amount of victims leads to a transition from level 17 to 18. In some

of the quarters the security instability was not well reflected by the number of fatalities, and judgment was necessary, as for example in the First Gulf War in the third and fourth quarters of 1990 and the first quarter of 1991; Operation Grapes of Wrath in April 1996; the attack on the Twin Towers on September 11, 2001; Operation Defensive Shield from March to May 2002; the Second Iraq War in March 2003.

With regard to Israeli fatalities who are not soldiers, it should be emphasized that security events connected to other areas of conflict, including Israel's wars, do not appear in the terrorism file of the Interdisciplinary Center. This data was therefore entered manually. Because of the influence of the level of terrorism in the recent past on tourists' current demand, for the purpose of the regression we have calculated the variable as a moving average of the past five quarters. *Sources: The Interdisciplinary Center—Terrorism File that relates only to the West Bank; The Unit for Memorializing Soldiers; The B'Tselem Organization.*

Vol[61]—Israel's image[62]—calculated as the number of volunteers coming to Israel from abroad to work on kibbutzim. Seasonally adjusted and trend adjusted. *Source: The Kibbutz Movement.*

J_RO+EG_RO—The number of hotel rooms in neighboring countries—Jordan and Egypt. *Source: Various publications of the World Tourism Organization: Compendium of Tourism Statistics.*

GDPL_CAP—Per capital GDP in Israel, in constant prices. Log, seasonally adjusted. *Source: Central Bureau of Statistics.*

WAGE_R_SA—The nominal wage of hired employees in the guest services industry, divided by the CPI. *Source: Central Bureau of Statistics.*

CPA110_FOO_BVR_TAB—Price index of food and beverages, divided by the CPI. *Source: Central Bureau of Statistics.*

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[61] The authors wish to thank Noam Zussman for his suggestion to use this variable.

[62] Several alternatives were examined regarding Israel's image in the world, for example, the number of anti-Semitic incidents worldwide (The Institute for the Study of Contemporary Anti-Semitism and Racism at Tel Aviv University). This variable might not represent Israel's image in the world to a great extent, because some of the anti-Semitic incidents in the world are the result of demographic trends in Europe, and not Israel's image in the world. We found that the best explanation is that of the variable that was chosen.

Appendix 2 – Results of the ADF Tests for Major Series in the Study

Name of Variable	The Level (P-VALUE percentages)	The Differences (P-VALUE percentages)	Conclusion
PF	50.5	0.0	I(1)
PL	33.5	4.3	I(1)
QF	55.7	0.0	I(1)
QL	7.2	0.0	I(1)
REER	62.5	0.0	I(1)
SCF	8.6	0.0	I(1)
SCL	38.4	0.0	I(1)
WAGE_R	15.7	0.0	I(1)
GDPL_CAP	84.0	0.0	I(1)
QTOT-QF	29.9	0.0	I(1)
J_RO+EG_RO	80.8	1.5	I(1)
VOL_MA (without trend)	2.6		I(0)

Appendix 3—Results of the estimate of linear demand equations (the variables are not in logs)

Table 3.1

The Cointegrative Relationship of the Demand for Tourists' Overnights in Israeli Hotels

(Sample Period: 1997:2 to 2009:4)

The estimated cointegrative relationship:
$$QF = \gamma_0 + \sum_{i=1}^{m} \gamma_i' X_{it} + \varepsilon_t$$

Equation Number	Estimation Method	C	PF	SCF	REER	TER_MA	J_RO+EG_RO	VOL_MA	QF_LAG	$R^2 Adj$	D.W.	A.D.F	D.W.[1]
1.	OLS	4945.0	-15.870	-9.283	0.611	-138.0866	0.027	0.002		0.875	1.17	-4.58*	1.82
2.	TSLS	4706.3	-14.659	-8.329		-134.9869	0.002	0.057		0.875	1.17	-4.57*	1.82

1) Belongs to the equation that estimates the A.D.F.

The level of significance of A.D.F. is matched to the number of variables and the number of observations.

*Significant at the 5% level of significance.

Table 3.2

The Cointegrative Relationship of the Demand for Israelis' Overnights in Israeli Hotels

(Sample Period: 1997:2 to 2009:4)

The estimated cointegrative relationship:
$$QL = \gamma_0 + \sum_{i=1}^{m} \gamma_i' X_{it} + \varepsilon_t$$

Equation Number	Estimation Method	C	PL	SCL	GDPL_CAP	QL_LAG	$R^2 Adj$	D.W.	A.D.F	D.W.[1]
1.	OLS	-688.46	-18.817	10.819	34.906		0.951	1.67	-6.56*	2.00
2.	TSLS	49.818	-24.933	8.996	35.437		0.880	2.23	-7.83*	2.03

1) Belongs to the equation that estimates the A.D.F.

The level of significance of A.D.F. is matched to the number of variables and the number of observations.

*Significant at the 5% level of significance.

Appendix 4—Mix of Tourist Entries 1999-2009

Purpose of Visit (in percentages)

	Vacation, touring and sightseeing, and pilgrimage	Visiting relatives	Business, conferences, studies and research, and medical treatment	Solidarity and other
1999	74	12	13	1
2000	69	17	12	1
2001	43	31	22	5
2002	29	44	20	6
2003	32	42	20	6
2004	34	39	20	7
2005	42	37	18	3
2006	41	43	14	2
2007	59	36	12	2
2008	66	20	14	0
2009	59	26	16	0

Source: Central Bureau of Statistics and the Ministry of Tourism

Appendix 5—Scenario of Canceling the VAT Exemption for Tourists

Tourists are exempt from VAT on accommodation services, certain transportation services, and on various purchases. According to Ministry of Finance estimates, the value of this exemption in 2008 was NIS 650 million, or around 180 million dollars.

The scenario of canceling the VAT exemption presented in Table 6 is based on the calculation of this exemption in percentages of the overall cost of the tourists' visit in Israel. We calculate the cost of a tourist's visit to Israel and multiply it by the number of tourists who visited in 2008:

Calculating the cost of a tourist's visit to Israel in 2008 terms: the cost of the visit is around $1,979, including expenses in Israel of around $1,188 (according to the 2008 Incoming Tourism Survey) and a cost of reaching Israel of $791.

− Expenses in Israel: A tourist's average expenditure in Israel in 2008 was $1,188 according to the Tourism Survey (Ministry of Tourism, 2010). A similar result was obtained from balance of payments data in which the average income from a tourist stood at $1,040. The overall income from tourists in 2008 was thus $2.672 billion dollars, based on 2.57 million tourists.

− Cost of reaching Israel: The cost of reaching Israel is calculated as the weighted average of the cost of arriving by air and the cost of arriving overland.

a. The cost of arriving by air: This cost was calculated according to the cost of flight tickets for Israelis and tourists on El Al Airlines, which holds around 40 percent of the airline market to and from Israel. El Al's revenue from flight tickets was 1.831 and 1.489 billion dollars in 2008 and 2009, respectively, and the number of passengers was 1.786 and 1.785 million, respectively. The average cost of the ticket was, therefore, $1,025 in 2008, and $835 in 2009, and on average $939.

b. Cost of arriving overland. We assume a cost per person of $150.

The average cost of reaching Israel: Of the 2.57 million tourist entries in 2008, 2.11 million were by air, and the rest overland. These figures enable us to calculate the weighted cost of reaching Israel at around $791.

–   The average and the total cost of a visit: The average cost of a visit is $1,979: expenses in Israel ($1,188) and cost of reaching Israel ($791). We multiply these costs by 2.57 million tourists in 2008, so that the overall cost of tourists' visits to Israel was 5.09 billion dollars.

Calculation of the increase in the total cost of the visit resulting from the VAT exemption: By dividing the estimate of the exemption of 0.179 billion dollars in 2008 by the overall cost of the visit to Israel of 5.09 billion dollars, we obtain an increase of 3.5 percent as a result of canceling the VAT exemption.

Even though the increase is 3.5 percent, we assumed in the scenario, for reasons of conservatism and caution, that the tourist believes that the increased cost of the visit is 5 percent. Possibly the tourist initially sees the costs that have become more expensive (accommodation and car hire), so that in his behavior in determining his demand for visiting Israel, he attributes a greater significance to the cancellation of the exemption. In other words, the elasticity of demand in relation to the overnight price will operate on an increase of 5 percent in the price and not 3.5 percent, and the result will reflect a decrease in demand, not only for overnights, but also for visits to Israel.

Note that in this scenario we raised the PF by 5 percent in the first quarter of 2011. If the VAT exemption is cancelled, this result can be obtained by estimating the model so that it includes an interaction variable between PF and a dummy variable that obtains a value of "1" only for the period of the cancellation of the exemption.

Appendix 6—Different specifications for estimating the supply equation

In estimating the supply equation we used a specification in which the explanatory variable is the potential rate of overnights for actualization by Israelis (QTOT-QF)/QTOT (Equation 4 in Table 4). In this specification we see that the elasticity between the change in the supply of rooms and the change in the rate to Israelis, is smaller than the specification in which the explanatory variable is the difference between the inventory of rooms and the amount of overnights reserved by the tourists (QTOT-QF) (Equation 2 in Table 4). For example, if in contradistinction to the scenarios in Table 6, we assume that there is no change in the factors determining the demands of both Israelis and tourists, and despite this the hotels' capacity grows by 10 percent, we see that the rate offered to Israelis in the specification appearing in Equation 4 in Table 4 decreased by around 2.5 percent, as opposed to a decrease of 6.1 percent in the specification described in Equation 2 in Table 4.[63]

However, the assumption that the tourists will not change their behavior seems somewhat severe. In the theoretical model we can assume that the tourist's shopping intensity is connected, among other things, to the overall number of hotels (in Israel and abroad) that he sees. If the growth in the number of hotels in Israel does not adversely affect the probability that he will purchase a room in a hotel that already exists in Israel, then the probability will increase that he will choose a hotel in Israel. This assumption is reasonable in the event that the tourism marketing efforts abroad grow in direct proportion to the capacity of the hotels. Thus, if the weight of tourist overnights in the number of hotel overnights does not change, the price offered to Israelis will decrease by only around 5 percent in the specification described in Equation 2 in Table 4.

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[63] According to 0.53, the QTOT-QF coefficient, and QF determined according to the average over the period of the sample.

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