Fear and the Response to Terrorism: An Economic Analysis*

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PRELIMINARY AND INCOMPLETE

First draft: October 2003

August 1, 2004

1 Introduction

In the aftermath of the tragic events of September 11, terror is no longer a phenomenon limited to specific areas of conflict. Terrorism, in the form of "premeditated, politically motivated violence perpetrated against noncombatant targets by sub-national groups or clandestine agents, usually intended to influence an" (the US State Department definition; 1983) is not a new phenomenon. However, the current events carried out by suicide terrorists who are motivated by religious and cultural ideas are not similar to what we

*We profited from discussions with Itzhak Gilboa, Rani Spiegler and Daniel Tsiddon. We thank Reuben Gronau, Dan Peled and Manuel Trajtenberg for valuable comments. Dror Brenner deserves special thanks for superb research assistance. We are in debt to Shlomo Yitzhaki, the Israeli Government Statistician, Yoel Finkel Associate Government Statistician and Yafit Alfandari, the Head of Consumption and Finance Division at the Central Bureau of Statistics for helpful suggestions and valuable data assistance.

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have known so far. It is thus not surprising that understanding the *causes* and the *consequences* of terrorism, especially in its current form, is a challenge economists find hard to resist. So far public opinion, as well as the academic community, focused mainly on: (i) understanding why young and educated people commit suicide while killing others in the name of 'God' (see: Krueger and Malečkova 2003), (ii) estimating the causal effect of terror on aggregate outcomes (Abadie, 2003; Eckstein and Tsiddon, 2004).

Outside academic journals it is common knowledge that even in terror-stricken countries the likelihood to be harmed (by terror) is very low. Nonetheless, terrorism does generate, borrowing Webster's Encyclopedic Unabridged Dictionary definition for terror "an intense fear which is somewhat prolonged and refer to imagined or future dangers". Extreme fear caused by small probability events is not limited to what is known as terror actions. Illustrative examples are the outburst of the "Mad Cow" disease (Creutzfeld-Jakob disease when contaminating humans) in early 1996, and recently the SARS epidemic where, although the likelihood to be infected was practically zero, visits to the "infected" regions came to a halt. Neither the standard expected utility model nor its state-dependent version explain why a negligible change in the probabilities of the underlying states of nature (healthy, non-healthy in the case of SARS) has such a substantial effect on peoples' behavior. In these models, expected utility is linear in the probabilities of the underlying states of nature, and therefore, it is hard to fit the observed reaction to SARS, terror attacks and the like by using the standard state-dependent expected utility model.

Hence, it is thus surprising that most previous studies ignore the issue of why terrorism generates large influence on peoples' behavior. The large-scale effects of terror were often attributed to peoples' "ignorance", either of the objective (true) probabilities using Tversky and Kahneman (1979) prospect theory or of the underlying process that generate the shock to the economy (Hansen and Sargent, 2002).[1]

[1]Eckstein and Tsiddon (2004) study the effect of terror on the change in trends and business-cycles in Israeli economy. In their model terror endangers peoples' life such that the value of the future relative to the present is reduced. As a result of that investment declines and long-run income declines. They find that a very low increase in the probability to die due to terror nonetheless economic slow-down is large.

At first glance, this might cast doubt as to whether a rational choice model can be employed to explain such phenomena. Nonetheless, we argue that it is possible to explain large reactions by very small changes in the states of nature objective probabilities using the framework of a rational choice model. In the standard state-dependent utility model the uncertainty agents face is with respect to the states of nature. However, when consumption eventually takes place, the state of nature is already known. We argue that this view misrepresents the "agents' problem" since in many cases consumption takes place when the state of nature is not fully realized. Therefore, the standard state-dependent expected utility model understates the effect of uncertainty on the expected utility.

Our argument is based on two corner stones. The first, the likelihood to be harmed affects persons' utility in each state of nature. The fear of being infected/harmed/killed affects the extent at which persons enjoy their activity in the healthy and the non-healthy state. The other corner stone is that persons can handle their fears. They do so by acquiring the necessary skills. Like other investments in human capital, this investment is not a *free-lunch.* Moreover, it does not pay back the same to anyone. Persons who are more likely to benefit from engaging in what had turned into a "risky" activity will invest and overcome their fears. Others will substitute to other consumption or production activities.

The earliest work that we know of, in which persons' belief is an argument in their utility function, is Akerlof and Dickens (1982). In their study, people affect their well being by influencing their beliefs. Caplin and Leahy (2001) incorporate into the expected utility theory situations in which agents experience feelings of anticipation prior to the resolution of uncertainty. By introducing fear as an argument into the utility function we allow uncertainty to affect persons' utility and well-being. Unlike Caplin and Leahy we allow people to invest and handle their fears. Those who find investment "profitable" pay its cost, accumulate *mental* capital and overcome their fears. Unlike Akerlof and Dickens, in our model agents overcome fear by accumulating mental skills and not by understating

Eckstein and Tsiddon reconcile this puzzle pointing out the differences between objective and individuals subjective probabilities.

the objective probabilities.

Hence, an exogenous shock to the underlying probabilities affect agents' choices via two different channels: (i) the *risk* channel: a change in the underlying probabilities keeping (marginal) utility in each state constant; (ii) the *fear* channel: a change in the underlying probabilities *also* determines agents' optimal choice by affecting the expcted utility from consumption in each state.

A simple, and hopefully illustrative, example of the *fear effect* is the experience of unsafe sex in the era of AIDS. It is common knowledge that people involved in sexual relationship with occasional partners do not know whether they are infected while engaging in sexual activity. This is true even when they have full information on the conditional probabilities to be infected. In fact, they will learn about their health status only weeks later. It is hard to believe that the presence of AIDS does not affect the utility agents gain from this activity. The fear of being infected during sexual relationship with occasional partners affects utility from this activity in "real time". Their health status, realized only in the future, has obviously no effect on the utility gained in the past. The presence of AIDS increases the probabilities for becoming non-healthy from sexual relationship with occasional partners. Therefore, unsafe sex is less pleasurable under these conditions even if eventually one is not infected. The analogy to the "Mad Cow" disease and the sharp decline in the consumption of beef during the mid-1990s is trivial.

Our model points out to the differential effect of fear on persons facing the same objective probabilities - i.e., risk. This is a unique implication of our theory which differentiate it from alternative explanations. Therefore our empirical study focuses on this point. Suppose we could distinguish among people who face the same objective probabilities (and posses similar subjective probabilities) between (a) those whom our model predicts to be more likely to invest in overcoming fear and (b) the others**;** then we could test to what extent exogenous change in the likelihood to be harmed affects their choices relative to other persons' choices.

Employed with our model we identify the role of fear by comparing the effect of terror on the economic behavior of people whom our model projects will not invest in eliminating

fear with those whom our model predicts will invest in overcoming fear. Using groups which face similar objective (and subjective) probability to be harmed however different incentive for overcoming fear we identify the role of fear generated by terror on their economic behavior.

Naturally, standard micro and macro data sets were not designed to collect and provide information about the questions discussed in this project. Therefore, rather than analyzing one data set in isolation, we study various data sets, some of them collected and constructed especially for the sake of this study, in order to explore different aspects of terror and fear on persons' economic activities. We employ both aggregated and micro data, from the US and Israel. The study of the US data is qualitative, and based on comparing between outcomes after and before September 2001. The ongoing violence in Israel, characterized by weekly and sometimes daily deadly events, enables us to estimate long-run elasticities, as well as, contemporaneous effects of terror on persons' economic activities.

Using data from the US and Israel we focus on three cases: (i) the effect of September 11th on the demand for air flight and on pilots' monetary compensation, (ii) the effect of suicide bomber attacks carried out on buses on the demand for bus services and the monetary compensation for bus drivers in Israel, and (iii) the effect of suicide bomber attacks on the labor markets outcomes in the market for security guards in Israel. We find that on both sides of the Atlantic, terror attacks generate substantial effects, which cannot be attributed either to the change in the likelihood to be harmed or to other factors correlated with terror events. Moreover, we provide evidence that the effect of terror varies across individuals in accordance with our theory. We find that those who are more likely to be paying the fixed costs of overcoming terror fear are less likely to be affected by terror.

Air-passenger miles in the US declined sharply after September 11th, above and beyond the effect of the economic activity on air transportation. Pilots wages dropped by approximately 15 percentage points suggesting that the change in their wages reflects mainly the change in demand for air flight services rather than monetary compensation

for exposure risk and fears.

Using Israeli aggregate and micro data on the use of public transportation and the labor market outcomes of bus drivers, we find that while a suicide bomber attack carried out on a bus decreases the number of bus passengers in the corresponding month by 20 percentage points, neither the compensation for bus drivers nor their likelihood to quit their jobs was affected. The differential effect of terror on the "demand" and "supply" sides also holds for the security guards market. We find that suicide bomber attacks increase the likelihood of an Israeli worker to be employed as a private guard by 10 percents, yet without affecting their wages.

The fact that bus drivers do not respond to terror in the same manner as bus passengers may reflect other factors rather than their decision to invest and overcome fear. For instance, if bus drivers posses specific skills, they may prefer keeping their jobs even without compensation for the increasing exposure to risk and fears. This is less likely to hold for consumers who equalize, at the margin, the utility from consumption with its cost. Therefore, we estimate the effect of terror on the use of bus transportation separately for high frequency and low frequency users, as measured prior to terror incidents. We find that while suicide bomber attacks carried out on buses generate substantial average effects, they have no effect on the use of public bus rides by high frequency users. Using micro data we find that on average people substitute bus rides by taxi rides when suicide bomber attack carried out on bus take place. Yet, this does not hold for the high frequency users. Controlling for income, age, and education level we find no effect what so ever of suicide bomber attacks on the number of bus rides taken by high frequency users. Micro data on the consumption in coffee shops make it very clear that while moderate consumers substantially decrease their consumption when terror strikes, consumers who had previously spend more of their income in coffee shops did not change their habits. Evidence from the "Mad Cow" crisis in France (1996) support our theory as well. According to Adda's (2000) findings, consumers who had previously eaten large quantitative of beef did not change their consumption while those with intermediate levels of past consumption decreased significantly their consumption.

Finally, using our estimates we address the following question: to what extent should people's fear and risk aversion be in order to fit the data? The nature of this section is to search for parameters for which peoples' projected outcome match their observed outcomes.[2] We use the benchmark utility function employed in the macro/finance literature - the Constant Relative Risk Aversion (hereafter CRRA) - to calibrate the *risk* and the *fear* aversion parameters.[3] The fear factor in our model stands for the rate at which fear depreciates the utility from consumption. That is, the higher the fear factor is the lower peoples' risk aversion should be in order to explain their respond to terror. Using our estimates we calibrate the risk aversion parameter for different levels of fear. We find that if suicide bomber attack carried out on buses reduces the marginal utility of a bus ride by 20 percent - that is, the value of a 5 NIS ride drops by 1 NIS[4] - then the risk aversion parameter which fits the data equals 1! Note that for a moderate deprecation of only 10 percent the risk aversion parameter needed in order to fit the data equals 1.5. In general, if a suicide bomber attack depreciates the utility from a bus ride by 5 percent or more we need risk aversion values that do not exceed three (3) to mimic the effect of suicide bomber attacks on the usage of public buses.[5]

Hence, terror takes advantage of people being human and rational. By generating fear, terror, even in the form of a low probability event, may generate substantial effects.

[2] This type of questions is very popular in the Macro/Finance/Risk and Uncertainty literature (examples: Mehra and Prescott 1985, Rabin, 2000).

[3] A special form of the CRRA power function that has significant operational advantages is when a equals to one. In this case, so-called "everyone's utility function" postulated by Daniel Bernoulli (1738) the utility function is defined to be logarithmic function which is the limit of the above function as a approaches one.

[4] 1 US$ $\approx$ 4.5 NIS

[5] Arrow (1971) argues on theoretical grounds that the risk aversion parameter should be approximately one. Kydland and Prescott (1982) found that the risk aversion parameter needs to be between one and two to mimic observed variability in aggregate consumption and investment. Anderson and Dillon (1992) proposed a rough and ready classification of degree of risk aversion, based on the magnitude of the relative risk aversion coefficient, that some may find plausible: between 0.5 - hardly risk averse at all - to 3.0 very risk averse and 4.0 - extremely risk averse

1 The Model

Consider an economy where individuals live for $T = 2$ periods, perfect capital market and a full actuarially fair annuity system. At each period individuals can borrow or lend without restrictions at a fixed rate r. The economy consists of two consumption goods: a risky good (c_1) and a risk-less good (c_2). In each period individuals face the risk of not lasting till the end of the period The probability of surviving periods 1 and 2 is solely determined by agents' consumption plan. As long as they consume from the risk-less good only, their probability to survive equals 1. The more they consume from the risky good**,** the less likely they are to survive. Consumption takes place prior to the resolution of uncertainty.

Utility in each period is a function of agents' consumption plans and their mental state. Individuals experience different mental states such as fear or excitement which affect their well- being. In our model we use the word "fear" to account for agents' mental state, in situations at which consumption takes place prior to the resolution of uncertainty. People can handle their fears. They do so either by avoiding consumption of risky good or by investing in human capital accumulating the required mental capital. Agents maximize their expected utility subject to their budget constraints. Expectation is taken over survival probabilities.

Technology

The likelihood to survive is determined by agents' consumption plans. We assume no "learning by doing", that is, the probability to survive as function of c_1 decreases at a constant rate. To simplify we assume that the probability to survive takes the following form:

$$\pi_t(c_{1,t}) = \exp(-\gamma c_{1,t}) \quad \text{for } t = 1, 2, \tag{1}$$

where the parameter γ is the rate at which consumption from the risky good (c_1) depreciates the probability to survive ($\gamma > 0$).

Fear and mental human capital

Fear, measured by F, is determined endogenously by consumption and investment plans. It is also affected by the extent at which extreme consequences associated with consumption of risky goods turn into a *salient* phenomenon measured by S.

To illustrate that, consider fear in the context of terror. Terror incidents generate fear not only by affecting the probability of surviving, but mainly by turning terror into a

salient phenomenon. It is not only their "physical consequences" that makes them salient, but also the attention they receive at the mass media.

People can handle their fears. They do so by accumulating mental capital. Investment in mental skills, like other investments in human capital, is not a *free-lunch.* To simplify without losing generality, we assume that fear can be eliminated. In order to do so individuals must pay a fixed monetary cost of $M = m$ during their first period of life. We assume that $F(t)$ is linear (positive) in c_1 for any given level of S. The fear function takes the following form:

$$F(t) \equiv c_{1,t} \cdot f(S, M) = \left\{ \begin{array}{ll} c_{1,t} \cdot f(S) & \text{if } M < m \\ 0 & \text{if } M = m \end{array} \right\} \quad \text{for } t = 1, 2, \tag{2}$$

where $f(S)$ is the fear associate with consumption of a unit of risky good. We assume that $F(t)$ is increasing with S, that is $f_S > 0$ and concave, that is $f_{SS} < 0$.

Preferences:

We assume additive separability of preferences over goods and time. We allow for heterogeneity in individuals' taste. There are individuals who like consumption of c_1 more than others. Fear (F) is *good dependent*, meaning that consumption of risk-less goods generates no fear. Yet, this does not hold for risky good. The utility function $W_i(\cdot)$ has a good additive representation that exhibits the following form:

$$W_i = \sum_{t=1}^{2} \beta^{t-1} \left(\alpha_i \cdot U(c_{1,t}, F_t(\cdot)) + V(c_{2,t}) \right), \tag{3}$$

where α_i is a taste parameter indicating the extent at which person i likes c_1 relative to c_2 and β is the discount factor. We assume that all people like c_1, that is $\alpha_i > 0$ for all i.. We also assume that $U(\cdot)$ and $V(\cdot)$ are concave and increase with c_1 and c_2 respectively, while $U(\cdot)$ decreases with F.

Budget constraint:

We assume a perfect capital market and a full actuarially fair annuity system. We assume that prices do not vary over time and normalize the price of investment in each period to equal 1. The discount factor β is assumed to equal $1/(1+r)$. The budget constraint can be written as:

$$\pi_1 \left((p_1 c_{1,1} + p_2 c_{2,1} + M) + \pi_2 \frac{(p_1 c_{1,2} + p_2 c_{2,2})}{(1+r)} \right) \leq I, \tag{4}$$

where p_1 and p_2 are the relative prices of c_1 and c_2 respectively and I is the risk adjusted present value of agents' endowments:

$$I = \pi_1 \left(I_1 + \frac{\pi_2 I_2}{(1+r)} \right)$$

Agents problem:

Agents maximize expected utility subject to investment and consumption constraints, where the expectation is taken over survival probabilities, which is the only source of uncertainty in our analysis:

$$\begin{aligned} \max_{c_{1,t}, c_{2,t}, M} E(W_i) &= \pi_1 \sum_{t=1}^{2} (\pi_t \beta)^{t-1} \left(\alpha_i \cdot U(c_{1,t}, F_t) + V(c_{2,t}) \right) \\ s.t. &: \pi_1 \left((pc_{1,1} + p_2 c_{2,1} + M) + \pi_2 \frac{(pc_{1,2} + p_2 c_{2,2})}{(1+r)} \right) \leq I. \end{aligned} \tag{5}$$

The Lagrangian expression is:

$$L = E(W_i) - \lambda \left[\pi_1 \left((pc_{1,1} + p_2 c_{2,1} + M) + \pi_2 \frac{(pc_{1,2} + p_2 c_{2,2})}{(1+r)} \right) - I \right], \tag{6}$$

with λ being the Lagrangian multiplier.

FOC with respect to consumption:

The first order optimality conditions for c_1 and c_2 are:

1. FOC with respect to $c_{1,t}$:

$$L_{c_{1,t}} = 0 : \alpha_i \cdot \left(U_{c_{1,t}} + U_F \cdot f(S, M) \right) = \lambda p_1 + \frac{\gamma_t}{(\pi_t \beta)^{t-1}} \cdot \sum_{t}^{2} (\pi_t \beta)^{t-1} W_i(t), \tag{7}$$

where $F(t)_{c_{1,t}} = f(S, M)$ and $\pi_t' / \pi_t = \gamma$.[1]

[1]Note that $\frac{1}{(\pi_t \beta)^{t-1}} \cdot \sum_{t}^{2} (\pi_t \beta)^{t-1} W_i(t)$ is the expected value of life for individuals who survive period t. For $t = 1$ this expression equals $W_i(1) + (\pi_2 \beta) W_i(2)$.

2. FOC with respect to $c_{2,t}$:

$$L_{c_{2,t}} = 0 : V_{c_{2,t}} = \lambda p_2 \quad \text{for } t = 1, 2. \tag{8}$$

The LHS's of Equations (7) and (8) give the expected marginal utility from increasing $c_{j,t}$ for those who survive period t. The RHS's give the expected marginal costs.

Equations (7) and (8) are essentially the well-known equilibrium conditions adjusted for fear and risk. As in the standard expected utility models, the expected marginal cost consists of two elements: (i) the marginal monetary cost of consumption evaluated by the marginal utility of money, and (ii) the probability of not surviving (at the margin) evaluated by the value of life.

Optimal investment:

Agents choose to invest in mental capital if and only if investment is expected to pay back. Given our assumptions fear is linear in c_1. Its slope (see FOC (7)) equals:

$$\alpha_i \cdot U_F \cdot f(S). \tag{9}$$

Therefore, the expected disutility generated by fear is the product of (9) and the expected (discounted) consumption of risky goods:

$$-\pi_1 \cdot (\alpha_i \cdot U_F \cdot f(S)) \cdot \left(c^*_{1,1} + \pi_2 \beta c^*_{1,2}\right), \tag{10}$$

where $c^*_{1,t}$ is person's i optimal level of $c_{1,t}$ and $\pi_1 \left(c^*_{1,1} + \pi_2 \beta c^*_{1,2}\right)$ is the expected (discounted) consumption of risky goods over the life cycle. The expected investment cost, evaluated by the marginal utility of money, equals:

$$\pi_1 \cdot \lambda \cdot m, \tag{11}$$

with λ being the marginal utility of money.

Agents decide to invest and overcome fear if and only if their expected disutility exceeds expected cost:

$$-\alpha_i \cdot U_F \cdot f(S) \cdot \left(c^*_{1,1} + \pi_2 \beta c^*_{1,2}\right) - \lambda \cdot m \geq 0. \tag{12}$$

Denote by α^* the level of α in which persons are indifferent between the two investment programs, then α^* equals:

$$\alpha^* = -\frac{\lambda m}{U_F \cdot f(S) \cdot \left(c^*_{1,1} + \pi_2 \beta c^*_{1,2}\right)}. \tag{13}$$

The selection of individuals into those who choose to invest and overcome fear and the others is determined by the cutoff value of α^*, which is implicitly defined by the zero expected net utility condition (13). Investment is "profitable" only if $a \geq \alpha^*$ which means that:

$$M = \left\{ \begin{array}{ll} m & \text{if } \alpha_i \geq \alpha^* \\ 0 & \text{else} \end{array} \right\}. \tag{14}$$

Our results are summarized in the following Propositions:

Proposition 1: For any $S > 0$ the solution to (5) implies

1. There exists a_i such that $M_i = m$ and $F_i = 0$.

2. For any two individuals i and j for whom $a_i > a_j$ individual i is more likely to invest and overcome fear than individual j.

Figure T.1 depicts these results graphically. Panel (a) illustrates investment cost and expected utility from eliminating fear for individuals with different a_i. Panel (b) illustrates the optimal level of fear of the same individuals. As Figure T.1 shows, individuals with $a_i \geq a^*$ invest and overcome fear.

Proposition 2: For any $S > 0$ the solution to (5) dictates that more individuals accumulate mental capital the lower the price of the risky good (p_1) is.

Agents consume more of the risky good the lower its own price is. As Equation (14) makes clear, the more they are expected to consume from the risky good the higher the expected return to investment in mental capital is.

Proposition 3: For any $S > 0$ the solution to (5) implies

1. The higher π_2 the more likely individuals are to invest and overcome fear .

2. The higher S the more likely individuals are to invest and overcome fear .

3. For any two investment costs m_0 and m_1 such that $m_0 > m_1$ more individuals are likely to invest and overcome fear when $m = m_1$ than when $m = m_0$.

The intuition for the first result springs from an intertemporal substitution argument. Agents invest in the first period of their life but realize over their life cycle. The higher the survival probability, the lower the opportunity cost of accumulating skills is. As for

the effect of S: fear increases with S for any (positive) level of c_1. The higher fear is the more agents gain from overcoming it. Figure T.2 depicts the third result graphically. This figure illustrates investment cost and expected utility for individuals with different a_i for two levels of m : m_0 and m_1 $(m_0 > m_1)$. Point A and point B are the break-even points for m_0 and m_1 respectively.

Proposition 4: For any $S > 0$ and $\gamma \cong 0$ the solution to (5) implies

1. Aggregate consumption of risky goods falls with S.

2. Consumption of individuals for whom $a_i \geq a^*$ falls with S, yet without changing the composition of goods.

3. Individuals for whom $a_i < a^*$ substitute from risky to safe goods.

Figure T.3 shows the expected utility for different levels of c_1/c_2 in the benchmark case of an economy with $S = 0$ curve (1) and in the case were $S > 0$, curve (2). Point A is the optimal consumption plan in the benchmark case, where c_1^* stands for the optimal level of c_1. The comparison between these curves illustrate the role of fear in our model. Fear affects only the expected utility from c_1. Therefore, for $c_1 = 0$ utility is identical in both cases as curve (1) and curve (2) make clear. Our assumption that fear depreciates the expected marginal utility from consumption of risky good c_1 is reflected in the lower slope of curve (2) relative to curve (1). As expected, the optimal level of c_1 when $S = 0$

exceeds the level of c_1 in the optimal consumption when $S > 0$ (points A and B respectively).

Figure T.4 shows the expected utility of "c_1 lovers" for different levels of c_1/c_2 for the two possible investment plans. Curve (1) shows the expected utility for the benchmark case where $S = 0$. Curve (2) shows the expected utility in the case where agents do not invest. Curve (3) shows the expected utility when agents invest. Point A' is the optimal consumption plan for $M = 0$, where c_1^{**} stands for the optimal level of c_1/c_2 in this case. This is the point where utility is maximized without investment. Point C is the optimal consumption plan for $M = m$. Point B is the break-even point where the expected utility with and without investment is equal, where $\hat{c_1}$ stands for the corresponding level of consumption of c_1/c_2. Note that for any $c_1/c_2 > \hat{c_1}$ expected utility with investment exceeds expected utility with no investment. As in the standard investment problem, expected utility when agents invest is lower for $c_1 = 0$ than expected utility without investment. The slope, the expected marginal utility with respect to c_1, is higher with

investment for any given level of c_1 than without investment. As Figure T.4 makes clear, agents will choose to invest in eliminating fear if the optimal level of c_1 is higher than the level of c_1 at the break-even point.

Figure T.5 presents a case for "c_2 lovers" where the break-even point is to the left of the optimal consumption of c_1/c_2 without investment. In this particular example the maximum expected utility obtained under investment is lower than the maximum expected utility gained with no investment

Previous studies:

By introducing fear as an argument into the utility function we allow uncertainty to affect persons' mental state, and by that their utility and well-being. Akerlof and Dickens (1982) is the earliest work that we know of, in which agent's belief enters as an argument into their utility function. They allow agents to affect their well-being by influencing their own (subjective) believes. This is essentially different from our argument; in our model agents overcome fear by accumulating the required *mental* capital and not by overstating the true objective survival probability**.**

Recently Caplin and Leahy (2001) incorporated into the expected utility theory situations in which agents experience feelings of anticipation prior to the resolution of uncertainty. In there model people influence their feelings only by substituting to less risky activities. This is essentially different from our model where we allow people to invest and overcome fear.

3 The econometric approach, the data and main findings in brief

3.1 The econometric approach

Employed with our model, we identify the role of fear by comparing the effect of terror on the economic behavior of people who, according to our model, *will not* invest in eliminating fear with those who *will*. By comparing persons facing a similar objective (and subjective) probability to be harmed, *but* different incentive for overcoming fear, we identify the role of fear, generated by terror, on their economic behavior.

Our analysis rests on three identifying assumptions: (i) Terror incidents, in the US as well as in Israel, are exogenous to measured outcomes, and (ii) People can be divided into groups according to the objective probabilities to be harmed and their likelihood to invest and overcome fear.

We estimate both the treatment effect of terror as well as the fear and risk parameters. We start with treatment effects estimation. Then, restricting for particular Constant Relative Risk Aversion (CRRA) utility function we estimate the role of fear and calibrate the fear and risk parameters.

3.2 The data

As for the data we employ in this study: naturally, standard micro and macro data sets were not designed to collect information for the questions discussed here. Therefore, rather than analyzing one data set in isolation, we study various data sets, some of them collected and constructed especially for the sake of this study, in order to explore different aspects of terror and fear on persons' economic activities. We employ both aggregated as well as micro data, from the US and Israel. In each section we provide a brief description of the data employed. The study of the US data is qualitative based on comparing between outcomes after and before September 2001. The ongoing violence in Israel, characterized by weekly and sometimes daily deadly events, enables us to estimate long-run elasticities,

as well as, contemporaneous effects of terror on persons' economic activities.

The main data sources used in this paper are:

1. Current Population Surveys, Monthly Files, January 1998 - December 2002.
2. U.S. Department of Transportation, Bureau of Transportation Statistics, Air Carrier Traffic Statistics Monthly, April 2003
3. Israeli Labor Force Surveys for the years 2000 to 2002
4. Israeli Income Surveys for the years 2000 to 2002.
5. Israeli Family Expenditures Surveys for the years 1999 to 2002
6. The Israeli Central of Bureau Statistics data sets on tourism and transportation.
7. Terror events, casualties etc., self collected.

3.3 Findings in brief:

Using data from US and Israel we show that terror events, on both sides of the Atlantic, generate substantial effects, which cannot be solely attributed to either the change in likelihood to be harmed by terror or to other factors correlated with terror events. Moreover, we provide evidence that the effect of terror varies across individuals in accordance with our theory. We find that those who are more likely to be paying the fixed costs of overcoming terror fear effects are less likely to be affected by terror. For instance we show that while terror does generate large effects on consumers, especially in low frequency usage like air passengers, it had little effect on the compensation (wages) of those employed in the infected industries. Disaggregating consumers by their ex-ante consumption levels shows that the effect of terror declines with the ex-ante consumption levels pointing to the role of the fixed costs. These results suggest that terror affects personal economic activities via other channels than the linear effect on the expected utility.

Finally, using the Constant Relative Risk Aversion (hereafter CRRA) - to calibrate the *risk* and the *fear* aversion parameters. We find that for if suicide bomber attack

depreciates the utility from a bus ride by 5 percent or more we need risk aversion values that do not exceed three (3) to mimic the effect of suicide bomber attacks on the usage of public buses.

4 Estimating the treatment effect of terror via fear

4.1 Notation:

Let $Y_i^{*,1}$ denote the potential outcomes of agent type i if treated by terror. Let $Y_i^{*,0}$ denote the potential outcome of agent type i if not treated - i.e. not exposed to terror. For the sake

where backing up β is trivial.

4.2 The identifying strategy

In the absence of a controlled experiment we do not observe agents in both states. Let $Y_{i,t}^1$ denote the *actual* outcomes of agent i if treated and let $Y_{i,t}^0$ denote the *actual* outcome of agent i if not treated. For instance, in the case of passengers in public buses and suicide bomber attacks $Y_{1,t}^1$ stands for the number of passengers in periods with terror attacks where $Y_{1,t}^0$ equals to the number of passengers under no suicide bomber attacks. Note that the *actual* outcomes equations are no longer free from selection bias. We assume that terror incidents are exogenous to outcomes. Yet, the actual evolution of actual outcomes over time might reflect other factors then risk or fear treatment effects. That is:

$$Y_{i,t}^1 = \quad \beta_i + \gamma_i + g \quad + U_{1,i,t} \quad 1,2;\ t = 1,...,T \tag{4}$$

where g stands for the effect of terror via other channels but the effect of either risk or fear on persons' outcomes. We estimate $(\beta_i + \gamma_i + g)$ by comparing outcomes under treatment, $D_{i,t} = 1$, with outcomes under no treatment:

$$\delta_i = E\left(Y_{i,t} \mid D_{i,t} = 1\right) - E\left(Y_{i,t} \mid D_{i,t} = 0\right) \tag{5}$$

where $\delta_i = (\beta_i + \gamma_i + g)$. We disentangle g from $(\beta_i + \gamma_i)$ by constructing a counterfactual $Z_{i,t}$:

$$\begin{aligned} Z_{i,t}^0 &= \qquad + \mu_{i,t} \quad t = 1,...,T \\ Z_{i,t}^1 &= \quad g \quad + \mu_{i,t} \quad t = 1,...,T \end{aligned} \tag{6}$$

where $\mu_{i,t}$ is an error term. Hence, we assume that $Z_{i,t}$ is affected by terror, yet, not via fear or risk.

We estimate the effect of treatment through other channels but risk or fear by comparing the Z outcomes under treatment (terror) with the outcomes with no treatment: $g = E\left(Z_{i,t} \mid D_{i,t} = 1\right) - E\left(Z_{i,t} \mid D_{i,t} = 0\right)$. We condition out the effect of other factors (g)

to obtain consistent estimates for the risk and fear effects:

$$\delta_i = (\beta_i + \gamma_i) = E\left(Y_{i,t} \mid D_{i,t} = 1\right) - E\left(Y_{i,t} \mid D_{i,t} = 0\right) - E\left(Z_{i,t} \mid D_{i,t} = 1\right) - E\left(Z_{i,t} \mid D_{i,t} = 0\right) \tag{7}$$

We estimate the effect of fear by differencing out the risk effect using our estimates for type 1 and type 2 persons:

$$\gamma = \delta_1 - \delta_2 \tag{8}$$

5 First glance at the data

We preview our rigorous estimation of the effect of fear with a set of evidence on the overall effect of terror on the consumption of terror infected goods and the labor market outcomes of those who provide them.

5.1 The effect of terror on the use of terror-struck transportation means:

In the US as well as in Israel, terrorists took advantage of transportation facilities (air flights in the US and public line buses in Israel) to commit deadly suicide attacks. It would be almost natural to start our empirical study by estimating the effect of deadly terror events on the use of these facilities in both side of the Atlantic. Four main facts emerge:

1. Terror affects the use of air flights in the US and public transportation in Israel.

2. The decline in the number of air passengers in the US after September 11th 2001 was approximately 10 percentage points above and beyond the effect of the economy on the use of air transportation facilities.

3. We find similar results for Israel: the usage of public transportation (buses) is about 20 percentage points lower in months when suicide bomber attacks took place on buses.

4. Moreover, we find that the number of passengers in public buses is affected ONLY by suicide bomber on buses, and not by other types of terror, not carried out on buses.

5.1.1 The use of air transportation in the US:

To estimate the effect of terror on the use of air flights we compare the number of air passengers before and after the tragic events of September 11th 2001. We do so by taking

advantage of monthly data on domestic air passenger miles and freight ton-miles, for the years 1979 to 2003 (April) drawn from the U.S. Department of Transportation, Bureau of Transportation Statistics and Air Carrier Traffic Statistics.

The use of air flights was growing constantly since it became available to public use, (see data since 1979). Data from 1979 show that passengers' air miles were growing at an annual rate of 2.5 percent, with little fluctuations around the trend (see Figure 1.USA). This also holds for the air freight ton miles (Figure 2.USA). The use of air transportation is presumably also affected by fluctuations in economic activity (although we find a low correlation between the de-trended air passengers' time series and the aggregate unemployment rates). Hence, comparing the number of air passengers before and after September 11th 2001 may generate a biased estimator for the effect of terror events on the use of air transportation by the public. Therefore, we use the change in air fright ton-miles as an instrument for the effect of other factors besides terror on the usage of air transportation facilities. Note that this is basically a Differences-in-Differences estimator which is widely used by labor economist especially in time-series analysis ("before" and "after")

Findings:

1. The use of air transportation by passengers shrank by about 15% percentage point just after September 11th 2001.

2. In fact, we find that by the end of 2003, air passengers' figures were still lower than before September 11th.

3. Controlling for long run trends as well as for economic fluctuations, an even more contrasted picture emerges.

4. We find that the ratio of air passengers to air-fright shrank by about 10 percentage points just after September 11th 2001. By the end of 2003 we find no evidence for a recovery in the use of air transportation.

5. It is worth noticing that the ratio of air passengers to air-frights was constant since the mid 1990s, suggesting that the decline in 10 percentage points in this ratio reflects the treatment effect of terror on the use of air transportation.

6. As Table 1.USA shows, the decline in the ratio of air passenger to air freight, since September 2001, is significant.

Finally we take an anecdotal look at the flights from/to New-York City (NYC). To control for heterogeneity in the economic activity within the US, we examine the change in the number of passengers in international flight from the US to out of the country. According to the Department of Transportation, Bureau of Transportation Statistics data, the NYC-Paris and the Chicago-London are the top 2 international routes. Comparing the number of passengers using these routes before and after September 2001, we find that the ratio of NYC-Paris to Chicago-London declined by more than 10 percentage points, showing no recovery until mid 2003.

5.1.2 The use of public bus transporation in Israel

Many suicide bombers terror attacks in Israel took place in public buses. These days, pictures of exploded buses are familiar to many around the world. Therefore, we start our analysis of the Israeli data by estimating the effect of terror events, measured by the number of deadly events, suicide bombers attacks, fatalities, and other indicators, on the use of public ground transportation in Israel.

The ongoing violence, characterized by weekly and sometimes daily deadly events, enable us to estimate, not only the long-run elasticities, but also the contemporaneous effect of terror on the use of public ground transportation.

The use of public buses is affected by other factors than terror. We take advantage of data sets constructed by the Israeli Central Bureau of Statistics (hereafter: CBS). The Israeli CBS provides monthly data about revenues and prices of the bus transportation industry in Israel. Data is disaggregated by type of lines into two main categories: (i) regular lines, within and between cities, and (ii) special lines which stand for tourists or

other organized travels. It is worth noticing that none of the terror attacks was carried on a special line bus. Therefore we study the effect of terror by comparing the change in the number of passengers in regular lines – where all terror events on buses took place – with the change in the number of passengers in the special lines. We do so using monthly data collected by the Israeli Central Bureau of Statistics.

Findings:

First glance: The number of passengers, proxied by price adjusted revenues, shows almost no change till the third quarter of 2001. (see Figure 1.ISR). During the first year of violence, since October 2000, terror was not carried out on buses. (see Figure 2.ISR). To control for other factors than the effect of terror on the usage of public transportation we look at the ratio of passengers in regular lines to passengers in special lines. As this series shows, the period between January 2000 and April 2003 can be divided into two sub periods, before and after October 2001 (! – is it just a coincidence? I am not sure – it is worth checking). As Figure 4.ISR makes clear, the ratio of passengers in regular line to special lines after October 2001 declined by about 1/4 than the ratio before that. Note that the average number of suicide bomber attacks per month was approximately 1 during the months after October 2001, yet we observe none at the period before. Simple back of the envelope calculation suggests that the effect of a ("successful") suicide bomber attack carried out in public buses decreases the number of passengers by about 25 percentage points.

Closer look at the data: The negative correlation between the number of passengers in the regular bus lines and the number of suicide bomber attacks carried out on buses might reflect other factors than the causal effect of terror on the usage of public transportation. We therefore take our analysis one step further. The detailed Israeli data (collected by the authors) allow us to distinguish between suicide bomber terror attacks which were carried out on buses and other terror events, including suicide bomber, in other places. Note that if indeed, the fear associated with terror attacks, is the underly-

ing process generating the observed stylized facts, then we should find that the number of passengers using regular lines is affected by suicide bombers attack carried out on buses rather than by other terror events.

We take this hypothesis to the data. We find that (see Table 1.ISR):

1. The number of passengers in regular lines in months in which suicide bomber attacks occurred was about 20 percent lower than in months in which no suicide bomber attacks is carried out on buses.

2. As Table 1.ISR makes clear, the number of passengers in regular lines is correlated with other indicators of terror incidents (with fatalities). This holds through a wide range of indicators such as: the total number of suicide bomber attacks (in the present month), the number of terror incidents with fatalities, the number of people killed etc.

3. However, introducing all variables together, without restrictions, we find that ONLY suicide bomber attacks carried our on buses affect the number of passengers using the regular lines.

4. We find that a suicide bomber attack decreases the number of passengers in regular lines by approximately 20 percentage points.

5. Conditional on the number of suicide bomber attacks carried out on buses, we find that other terror events had no significant effect on the number of passengers using the regular lines. In fact, as Table 1.ISR makes clear, the point estimators (of some of them) are literally zero (0).

So far we estimated the instantaneous effect of terror attacks on the number of passengers. Since fear is more likely to have "post" rather the "pre" effects we took a closer look at the time structure. We find that:

1. Introducing the lagged (last month) number of suicide bomber attacks carried out on buses we find that much of the effect is noticed one month after the attack. Note

that in this analysis we use aggregate monthly data. Results suggest that much of the effect takes place in the week(s) after the attack.

2. Finally we show that our findings are robust to different cut points of the data (see table 3.ISR).

5.2 The effect of terror on the labor market outcomes of risky-terror jobs: US pilots, Israeli bus drivers and security guards

5.2.1 The labor market outcomes of US pilots

In this section we study the effect of September 11th on the wages and employment of pilots in the US. We take advantage of the Current Population Survey files over the past 5 years to estimate the change in pilots' employment and wages over time.

Two main findings emerge: First, the relative wages of pilots shrank by about 15 percentage points, which is about 1/2 of their wage premium. In addition to that their employment rate decreased by 5 percentage points. Hence, we find no evidence for an increase in pilots' compensations pointing out the role of the change in the demand for air transportation services in determining pilots' labor market outcomes. In the rest of this sub-section we describe the data set we use and our findings.

Data These data come from a series of 60 consecutive Current Population Surveys Monthly files (hereafter: CPS) from January 1998 to December 2002. The CPS sample is a probability sample. The sample is designed primarily to produce national and state estimates of labor force characteristics of the civilian noninstitutional population 16 years of age and older.[6]

The vast majority of empirical analyses of the CPS data either use a single cross-section data point, or a series of consecutive CPS surveys, treating them as a series of repeated cross-sections. The CPS data have, in fact, a longitudinal component. In

[6]For further details see CPS official web site www.bls.census.gov/cps/cpsmain.htm

this paper we take advantage of the CPS basic monthly files - a probability sample of housing units in the US - to construct a panel data. Sample is partitioned into eight representative sub-samples called "rotation groups" used in the CPS rotation scheme. The rotation scheme follows a 4-8-4 pattern. Each unit is interviewed for four consecutive months, followed by two quarters of break, and then by another four monthly interviews. Overall, eight interviews are dispersed across 16 months, which means that each household is (potentially) observed at the same months for two consecutive years. Wage data is collected only during the fourth and the eighth interview - among what is known as the "outgoing rotation groups." Data on schooling, employment, occupations and industries, is available for the entire sample.

If there is no change in the composition of occupants, we have a panel of individuals. Yet, since people switch locations, it might be the case that the same id number was being shared by two (or more) individuals over time. Following Madrian and Lefgren (1999) individuals are identified in our panel data not only by their ID number but also by matching a set of time-invariant characteristics. In this way we can be sure that we do not combine different persons into one artificial observation. The likelihood to be observed over 16 months might vary with age and education. We do find differences by age, (see appendix) however we do not find evidence for differences between education categories.

Employment: Using a balanced sub-sample of men aged 25 to 54 who report working before September 2001 we study the effect of September 11th on pilots' employment outcomes.[7] The idea is quite simple, we compare the probability of pilots to be non-employed after September 2001 with the probability of other male workers. We estimate both non-employment and unemployment rates (non-employment for those who choose to participate). We present our findings in Table 2.USA. Panel A and panel B show the probit estimates for the change in the non-employment and the unemployment rates respectively.

[7] Overall we observe about 900 pilots in our sample less than 5 percent of them women. Thus we restrict our sample to include men only.

The first column in each panel shows the average non-employment rate, since September 2001, of those observed working as pilots before September 2001 relative to the average non-employment rates in the sample population. The number 0.042 at the first column of this table means that the non-employment rate of pilots is 4.2 percentage points higher than the non-employemt rate of the average male in this sub-sample. As this table makes clear, pilots post September 2001 employment rates are about 5 percentage points lower than the employment rates of men with similar observed characteristics. Yet, as this table shows, much of it, is common to the air transportation industry rather than a pilot effect. These findings also hold for the sub-sample of participants.

Wages: In this section we estimate the change in pilots relative wages after September 2001. The (relatively) negligible change in employment rates after September 2001 suggest that cross-section comparison would not be meagerly contaminated from composition bias. We therefore estimate the effect of September 11th on pilots' wages by comparing their relative wages before and after. We use a sub-sample of full-time male workers.

We present out findings in Tables 3.USA (a and b). As Table 3.USA makes clear male pilots earned, before September 2001, about 30 percentage points more than their counterparts. This does not hold for the period after September 2001. Pilots' hourly wages after September 2001 were about 15 percentage points lower (relative to others' wages) then they used to be.

5.2.2 The wages and the employment of Israeli bus drives

In this section we study the effect of terror on the labor market outcomes of Israeli bus drivers. We address two questions: First, does terror affect the wage compensation of bus drivers? Second, are bus drivers less likely to keep their jobs when terror, in the form of suicide bomber attacks carried out on buses, takes place?

We take advantage of aggregate data collected by the Israeli CBS on wages in the Israeli transportation industry as well as the Israeli CBS Labor Force and Income Surveys for estimating the effect of terror incidents, and especially suicide bomber attacks carried out

on buses on the real wages and employment of Israeli bus drivers.

Using our aggregate data we find that the mean wage per driver was higher during months with higher number of suicide bomber attacks than in months with no suicide bomber attacks carried out on buses. This does not hold for the micro data. We find no change in the conditional wages of bus drivers between quarters with more or less suicide bomber attacks. Employment data suggests that the change in mean wages may reflect a composition effect rather than treatment effect of terror. We find that Israeli workers are less likely to be employed as bus drivers in quarters with more suicide bomber attacks in comparison with quarters with less suicide bomber attacks. If the change in the fraction of workers employed as bus drivers reflects mainly demand shocks (rather than supply shock) the slight change in the unconditional mean wages may reflect changes in the composition of bus drivers rather than an increase in the compensation bus drivers get.

First glance on the wages of bus drivers using aggregate data Public bus transportation in Israel, excluding tourist or special lines, is operated solely by two cooperatives EGGED and DAN. EGGED, Israel's biggest public transportation company provides services in the entire country but the Tel Aviv (hereafter: TLV) metro area. DAN controls the TLV metro lines. In addition to cooperative members, these companies hire salaried workers both for driving and non-driving jobs. Public transportation in Israel is regulated by the Israeli government. Prices in regular lines are under government control. EGGED and DAN are subsidized by the government based on their outputs. This is presumably one of the main reasons that the CBS collects detailed data on the public transportation industry, including wages by workers classification.

The Israeli CBS provides the wages (indices) of cooperative members , salaried workers and drivers. We take advantage of CBS disaggregation into drivers and all other workers to study the effect of terror attacks on the wages of those exposed to risk and fear.

It is worth noticing that the mean wages in Israel declined by 8 percentage points since 2000. We therefore estimate the effect of fear and risk using the relative wages of

drivers, salaried workers and cooperative workers. We identify the overall risk and fear effects by comparing the change in drivers' wages relative to cooperative member wages. We present our findings in Table 4, Table 5 and Table 6.

Table 4.ISR presents the OLS estimates for the contemporaneous effect of suicide bomber attacks carried out on buses on the relative wages of bus drivers.

Two main facts emerge from Table 4.ISR. While suicide bomber attacks carried out on buses does affect the mean wages of bus drivers, we find that other terror events have no effect on bus drivers' wages.

The first column in Table 5 shows the OLS regression coefficient of log wages on the number of suicide bomber attacks carried out at the same month. The number 0.054 means that on average the wages of drivers are about 5 percentage points higher during months when one suicide bomber attack carried out on a bus occurs than during months when no suicide bomber was carried out on a bus. Columns (ii) and (iii) show that we find no similar effect of the overall number of suicide bomber attacks nor the number of deadly events. The point estimators are approximately 0. Allowing all type of terror incidents to affect drivers' wages (columns (iv) and (v)) we find that only the number of suicide bomber attacks carried out on buses affects drivers wages.

In column (vii) we introduce, in addition to details of terror incidents data, the wages of cooperative and salaried workers. As this column makes clear, terror suicide bomber attacks carried out on buses increases the mean wages of drivers above and beyond the mean wages of their colleagues. In other words, the effect of terror attacks on drivers' wages cannot be attributed to the mean wages in the transportation industry.

So far we estimated the instantaneous effect of terror attacks on drivers' wages. In Table 5 we take a closer look at the timing. Introducing the lagged (last month) number of suicide bomber attacks carried out on buses we find that much of the effect is noticed one month after the attack. Assuming wages do not immediately respond, these findings may point to the role of suicide bomber attacks carried on buses in the real compensation of drivers.

Closer look using micro data Do bus driver earn more in periods with higher levels of terror attacks carried out on buses? In this sub-section we take advantage of the Israeli Labor Force and Income surveys for the years 2000 through 2002 to study this question (and others). [We provide details on the Israeli Labor Force and Income Survey in the section on security guards].

We start by estimating the effect of suicide bomber attacks carried out on buses on the wages of bus drivers. Table 7.ISR shows the OLS estimators for the effect of suicide bomber attack carried out on a bus on the wages of bus drivers. As Table 7.ISR makes clear, we find no effect of terror on the conditional wages of bus drivers.

We next take a first glance on the effect of terror on the likelihood to serve as a bus driver. We estimate the likelihood of workers to be employed as bus drivers as a function of the number of suicide bomber attacks carried out on buses. We present our findings in Table ISR.8. The first row shows the probit estimates of the change in the probability to be employed as a bus driver between quarters with N-1 suicide bomber attacks carried out on buses and quarters with N attacks. In the second row we estimate the effect of suicide bomber attacks which were NOT carried out on buses.

We estimate these probabilities first using the population sample of workers and then separately using a sub-sample of all types/classes of professional drivers. All specification include the aggregate controllers such as the total number of buses as well as personal characteristics such as education, origin and marital status.

Two main facts emerge: First, as Table ISR.8 makes clear, while suicide bomber attacks carried out on buses do affect the likelihood to be employed as a bus driver this does not hold for suicide bomber attacks which were not carried out on buses.. Second: drivers, as expected, are more likely to be affected than others do.

5.3 The market for security guards in Israel

Since the State of Israel was established in 1948, a 3 years military service is mandatory to every man and woman (2 years) aged 18 (with some exceptions). Approximately 20 thousand soldiers died over the last 50 years in wars and other waves of violence (equivalent

to 1 million Americans). Not surprisingly the mandatory army service is being viewed by many as the entry pass to the Israeli society.

Despite the substantial growth in the population of Israel over the past five decades,voluntary army is still out of the consensus. The popular view is that money may (perhaps) buy love but it cannot buy soldiers who will be willing to put their lives in danger. It is thus surprising to find that private security guards were involved actively in a substantial number of terror incidents. This "puzzle" was not ignored by the Israeli public opinion. (see articles pointing out to the role of the private security guards).

We take advantage of the Israeli Labor Force and Income surveys for the years 2000 through 2002 to study the effect of terror on (i) the demand for private security guards and (ii) the compensation of private guards.

We preview our analysis with a few basic facts. Table ISR.9 shows the fraction of Israelis employed either as policemen or as private security guards. Three major facts emerge. First, more than 1 percent of Israelis aged 22 to 65 report being employed either as policemen or security guards. Since these numbers exclude the cohorts of birth aged 18 to 21, this fraction underrates the share of male and female occupied by the security sector. Second, more than 4 percentage points of prime aged male workers are employed either as policemen or as security guards. Third, 3/4 of them are employed by the private sector. Hence, at least as measured by the number of workers, much of the security services in Israel are being provided via the labor markets.

We next proceed to estimate the effect of terror on the demand for security guards. Table ISR.10 shows the Probit estimators of the likelihood of an Israeli worker to be employed either as a policeman or as a private security guard. In the first panel we do not distinguish between the public and the private sector. In the second and the third panels we estimate the likelihood to be employed as a policeman or as a private security guard respectively. We measured terror using both the average number of suicide bomber attacks during the quarter as well as the number of Israeli fatalities. In all specifications we control for personal characteristics such as education, age, marital status and origin (Asia-Africa, Europe-America etc.). In addition we distinguish between veteran Israelis and immigrants

from the former USSR who immigrated to Israel since 1989. Two main facts emerge from Table ISR.10: First, the fraction of Israelis employed as policeman/guards responds to the level of terror. Second, this is solely via the private sector. For instance, the likelihood of being employed as a private security guard is 0.7% higher in a quarter with one suicide bomber attack per month than in a quarter with no suicide bomber attacks which turn to be about 30 percents higher than the probability of the average Israeli worker to be employed as a private security guard when there are no suicide bomber attacks.

Who are those who switch to work as private security guards when the level of terror goes up? We take advantage of the panel structure of the Israeli Labor Survey to address this question. Like the US Current Population Survey Monthly files, the Israeli Labor Force Survey (hereafter: LFS) is a probability sample. The sample is designed primarily to produce national labor force characteristics of the civilian noninstitutional population 15 years of age and older.

The LFS data have, in fact, a longitudinal component. In this paper we take advantage of the LFS basic quarterly files - a probability sample of housing units in Israel - to construct a panel data. Sample is partitioned into four representative sub-samples called "panels" used in the LFS rotation scheme. The rotation scheme follows a 2-2-2 pattern. Each unit is interviewed for two consecutive quarters, followed by two quarters of break, and then by another two quarters interviews. Overall, four interviews are dispersed across 18 months. Wage data is collected only for the fourth panel that is in the last interview. Data on schooling, employment, occupations and industries, is available for the entire sample. For reasons of privacy the Israeli CBS split the information collected into two separate files: (i) the Labor Survey file with detailed information on employment status and personal characteristics, and (ii) Income survey file, with the earnings data and the basic personal characteristics. Personal ID numbers were scrambled in order to avoid trivial matching of these files. Using a vector of personal and family characteristics which overlap in both files we were able to construct an algorithm which identifies individuals within each file. Hence, we create a new ID which is based on personal characteristics available in both files. Using our ID we are able to match the "observations" in the LF

file with the "observations" in the Income Survey. In Table ISR.12 we take advantage of the panel structure of the LFS.

We split workers into those who were employed during the previous interview (last quarter) and those who were not. We estimated separately for these groups the likelihood to be employed as a private security guard. We present the Probit estimators (in fact the dF/dX - the change in the probability for an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for dummy variables). As Table ISR.12 makes clear, the added security guards come from the pool of those who were not employed during the previous quarter. Rows (10) and (11) in Table ISR.12 show the observed and the predicted probability to be employed as a private security guard. Approximately 6 percent of former non-employed report working during the week of interview as private security guards. This is three times higher than the average fraction among their employed counterparts. We find that the likelihood of former non-employed to be working as a security guard to be 1.5 percentages higher in quarters with an average of N suicide bomber attack than in quarters with an average of N-1 attacks. This is an increase of about 25 percent in their conditional probability to serve as a private security guard. We find almost no effect of suicide bomber attacks on the probability of their counterparts to be employed as security guards.

Following the collapse of former USSR, about 1 million immigrants arrived to Israel during the 1990s. As in other countries, the Israeli labor markets do not treat immigrants as their veteran counterparts. (for further details see:). Therefore we may expect an increase in the demand for security guards to have a larger impact on recent immigrants than on veteran. We re-estimate the likelihood to be employed as a private security guard separately for those who migrated to Israel since 1989 and veterans. We report our findings in Table ISR.13. As expected we find that the effect of suicide bomber attacks on the probability of immigrants to be employed as security guards is significantly higher than on veterans.

Finally we estimate the effect of suicide bomber attacks on the wages of security guards. Table ISR.14 shows the OLS estimators of a suicide bomber attack on the wages

of policemen and private security guards. As Table ISR.14 makes clear, private guards earn approximately 40 percentage points less than their counterparts. Given our main identifying assumption that terror attacks are exogenous both to outcomes as well to other explanatory variables, the OLS generates an unbiased estimate for the average effect of suicide bomber attacks on the wages of drivers. We find that suicide bomber attacks have no effect on the wages of bus drivers.

5.4 First glance at the role of fear

The fact that consumption is more likely to be affected by terror than labor market outcomes is consistent with our theory, however one could suggests alternative explanations. For instance, pilots who invest and accumulate specific skills may find it too expensive to quit. As Table US.3 shows, pilots still earn 15 percentage points more than their counterparts. This does not hold for Israeli bus drivers. The average wage of an Israeli bus driver is not significantly higher than the mean wage of their counterparts.[8] If the cost of quitting a bus driver job is higher than the cost of waiting for a while before taking it, our theory predicts that current drivers have more incentive to overcome fear than potential drivers do. Note that this does not hold for temporary jobs as unskilled security guards. In these jobs we expect current workers and others to be similarly affected from terror.

In this section we test these predictions using Israeli data on bus driver and unskilled security guards. We take advantage of the LFS panel structure to estimate the effect of terror on the likelihood to be work as a (i) bus driver, (ii) security guard, separately for those who already work as (i) or (ii) and others. Following our previous findings we use the number of suicide bomber attacks to measure the level of terror. We present our findings in Table ISR.15 and Table ISR.16.

Two main facts emerge from these tables: (i) terror does not affect the likelihood of bus drivers to quit their jobs. This does not hold for their counterparts. (ii) we find no effect of terror on the likelihood to serve as private security guard. This holds both for those who already serve as security guards as well as their counterparts. These findings provide

[8] See Table ISR.7.

evidence in favor of our theory. Table ISR.15 shows the Probit estimators for the effect of suicide bomber attacks on the likelihood to serve as bus driver. Table ISR.15 consists of two panels. In the first column we show the effect using the population sample of current workers. In columns (ii), (iii) and (iv) we restrict our sample to those we observed working two quarters ago. Among those observed working in time t-2 we distinguish between all workers (ii) all drivers (iii) and sub-sample of bus drivers and taxi drivers only (iv). The idea is quite trivial, if taxi-drivers are more likely to work as bus driver than the average worker, then this sub-group should be used as a benchmark group. The first row shows the effect of suicide bomber attacks on the likelihood of persons from the benchmark group to be working as bus drivers. The second row presents the effect of suicide bombers attacks carried out on buses on the likelihood of bus drivers at t-2 to serve as bus drivers at time t, above and beyond its effect on the benchmark group. As Table ISR.15 makes clear, the level of terror on buses does affect the likelihood of those non bus drivers to serve as bus drivers. This is especially strong among taxi drivers. The probability that a worker observed working as taxi driver half a year ago to be working as bus driver today is approximately 20 percentage points during quarter with N suicide bomber attacks carried out on buses than in quarters with N-1. This does not hold for that report working as bus drivers half a year ago. For them we find no significant change in their likelihood to serve as bus drivers. The differential effect, in this case, is consistent with our theory.

We next proceed to estimate the differential effect of terror in the case of unskilled jobs – private security guards. We present our findings in Table ISR.16. We find that suicide bomber attacks have no effect on the likelihood to serve as a private security. This holds both for those who already work as guards as well as for their counterparts.

6 How big should be peoples fear and risk aversion in order to fit the data?

Finally we address the following question: to what extent should people's *fear* and *risk* aversion be in order to fit the data? The nature of this section is to search for risk and fear parameters for which peoples' projected outcome match their observed outcomes[9]. Consumer behavior and risk assessment require knowing both probabilities and preferences for outcomes held by decision makers.

6.1 Technology

The likelihood for being healthy is solely determined by agents' consumption plans and the level of terror incidents. As long as agents consume from the safe good only ($c = c_2$), their likelihood to be healthy equals 1. Therefore, the likelihood to stay healthy is given by:

$$\pi(c) = \exp(-\gamma \cdot Tr \cdot c_1) \tag{9}$$

where $\gamma_1 Tr$ is the change in the probability to be harmed conditional on being healthy (hazard rate) due to a marginal change in c_1 for level of terror Tr. The number of terror incidents per unit of time is a random variable. To simplify we assume that terror incidents are $i.i.d$ with mean $\bar{T}r$ and variance σ_T^2. Therefore, the expected hazard rate equals:

$$E\frac{\pi^{'}(c)}{\pi(c)} = \gamma_1 \bar{T}r \tag{10}$$

6.2 Risk and fear using CRRA utility function

A simple measure of risk aversion is the Constant Relative Risk Aversion (CRRA) function. A special form of the CRRA which is much in used is the utility function $c^{(1-\alpha)}/(1-\alpha)$. Therefore we restrict the utility function to be of the constant relative risk aversion class of the following form:

[9] This type of questions is very popular in the Macro/Finance/Risk and Uncertainty literature (examples: Mehra and Prescott 1985; Rabin, 2000)

$$W = \frac{c_1^{(1-\alpha)}}{(1-\alpha)} F + \frac{c_2^{(1-\alpha)}}{(1-\alpha)} \tag{11}$$

where the parameter α measures the curvature of the utility function and F stands for the "fear" discount factor $F \in (0, 1]$. The fear factor is determined by the level of terror and the investment made by decision makers. Terror incidents generates fear not only by affecting the likelihood to be harmed but mainly by turning terror into a salient phenomenon (mass media etc.). To simplify we assume that terror incidents depreciate the utility from consumption of the risky good (c_1) by a constant rate. Hence F takes the following form:

$$F(\pi,\ S(T),\ M(D)) = D + (1-D)\exp(-\beta \cdot Tr)$$

where Tr stands for the level of terror, D is a binary variable which equals 1 if investment was made and β is the rate at which terror depreciates the marginal utility from the risky good as long as consumers do not invest in eliminating fear.

6.2.1 Consumption with no investment:

At the optimum, consumers equate the marginal utility with the marginal cost, that is:

$$c_1^{-\alpha} \cdot \exp(-\beta \cdot Tr) = \lambda P^{0,*} \tag{12}$$

where $P^{0,*}$ equals the marginal cost from consumption of c_1:

$$P^{0,*} = \left(p + \gamma_1 \bar{T}r W^0\right) = p\left(1 + \gamma_1 \bar{T}r \frac{W^0}{\lambda p}\right) \tag{13}$$

$W^0 = W(D = 0)$ and λ is the marginal utility from income. By substituting (13) into the FOC in (12) and taking logs the optimal consumption of c_1 (in logs) can be expressed as a linear function of terror incidents, in addition to the monetary and non monetary cost:

$$\ln c_1 = -\frac{1}{\alpha}\ln\lambda + -\frac{1}{\alpha}\ln p - \frac{\beta}{\alpha}Tr - \frac{1}{\alpha}\ln\left(1 + \gamma_1 \bar{T}r \frac{W^0}{\lambda p}\right)$$

The fear-risk ratio $\frac{\beta}{\alpha}$ is the rate at which terror incidents decreases the optimal level of c_1. It is worth noticing that since the likelihood to be harmed by a terror incident is practically

zero $\ln\left(1+\gamma_1\bar{T}\frac{W}{p}\right) \approx \gamma_1\bar{T}\frac{W}{\lambda p}$ which means that the optimal level of consumption equals:

$$\ln c_1 = -\frac{1}{\alpha}\ln\lambda - \frac{1}{\alpha}\ln p - \frac{\beta}{\alpha}Tr - \frac{\gamma_1}{\alpha}\bar{T}W^{0,*} \tag{14}$$

where $W^{0,*} = \frac{W^0}{\lambda p}$ is the value of life (in terms of c_1 prices).

6.2.2 Consumption of the risky good for those who choose to investment:

Those who choose to invest pay fixed cost and eliminate the effect of fear. They end up with lower disposal income yet with higher marginal utility from consumption, which is no is no-longer discounted by fear. Consumers equate the expected marginal utility with the expected marginal cost:

$$c_1^{-\alpha} = \lambda P^{1,*} \tag{15}$$

where $P^{1,*}$ equals:

$$P^{1,*} = \left(p + \gamma_1\bar{T}rW^1\right) = p\left(1+\gamma_1\bar{T}r\frac{W^1}{\lambda p}\right) \tag{16}$$

$\frac{W^1}{\lambda p}$ is the value of life time income after paying the fixed cost. Similarly to those who do not invest the optimal consumption of those who choose to invest is a linear function of the marginal utility of income, the monetary cost and higher non monetary costs. Unlike them the optimal level of c_1 is no longer affected (directly) from fear:

$$\ln c_1 = -\frac{1}{\alpha}\ln\lambda - \frac{1}{\alpha}\ln p - \frac{\gamma_1}{\alpha}\bar{T}rW^{1,*} \tag{17}$$

6.2.3 In general:

The optimal level of c_1 (in logs) can be expressed using the following switching model:

$$\ln c_1 = -\frac{1}{\alpha}\ln\lambda - \frac{1}{\alpha}\ln p - (1-D)\frac{\beta}{\alpha}Tr - \frac{\gamma_1}{\alpha}\bar{T}W^{1,*} + D\frac{\gamma_1}{\alpha}\bar{T}r\left(W^{1,*} - W^{0,*}\right) \tag{18}$$

7 Identifying the fear and the risk factors

7.1 Identifying the effect of fear using micro data

Our model generates the following estimating linear equation:

$$\ln c_{1,i,t} = b_0 - b_1 \ln p_t - (1 - D_i)\, b_2 Tr_t - b_{3,t} W_{i,t}^{0,*} \bar{T}r_t + b_4 D_i \left(W_{i,t}^{1,*} - W_{i,t}^{0,*} \right) \bar{T}r_t + u_{i,t} \quad (19)$$

where $c_{1,i}$ is the consumption of c_1 by person i at time t,.$b_0 = -\frac{1}{\alpha} \ln \lambda$,$b_1 = -\frac{1}{\alpha}$, $b_2 = -\frac{\beta}{\alpha}$, $b_3 = \frac{\gamma_1}{\alpha}$, $b_4 = \frac{\gamma_1}{\alpha}$, whereas the unmeasured consumption friction u_{ij} is assumed to be $i.i.d.$ with mean zero and variance σ_u^2, that is: $u_{ij} \sim N(0, \sigma_u^2)$.

Assuming that $W_{i,t}^{1,*} \approx W_{i,t}^{0,*}$ then:

$$\ln c_{1,i,t} = b_0 - b_1 \ln p_t - (1 - D_i)\, b_2 Tr_t - b_{3,t} W_{i,t}^{*} \bar{T}r_t + \theta_1 D_i + u_{i,t} \quad (20)$$

where $\theta_1 = E\left(u_{i,t} \mid D_i = 1\right) - E\left(u_{i,t} \mid D_i = 0\right)$.[10]

The conditional expectation function is:

$$E\left(\ln c_{1,i,t} \mid \bullet\right) = b_0 - b_1 \ln p_t - (1 - D_i)\, b_2 Tr_t - b_{3,t} W_{i,t}^{*} \bar{T}r_t + \theta_1 D_i + E\left(u_{i,t}\right) \quad (21)$$

Since terror is exogenous the OLS provides a consistent estimate of the parameters of interest b_2 and b_3, once $W_{i,t}^{*}$ and D_i are known:

$$p \lim b_2^{OLS} = \frac{\beta}{\alpha}$$

whereas:

$$p \lim b_1^{OLS} = \frac{1}{\alpha}$$

and therefore, using the OLS estimates of b_1 and b_2 we obtain a consistent estimate of the fear factor:

$$p \lim \left(b_2^{OLS} / b_1^{OLS} \right) = \beta$$

In the case where not all observations consume positive amounts of c_1 we correct for selection bias following Tobin's (1958) model (Tobit).

[10] According to our model, all other things equal, $\Pr\left(D_i = 1\right)$ is an increasing function of u_i.

7.2 Risk and fear in a representative agent model:

By aggregating to a representative agent model we obtain the following linear equation:

$$\ln \bar{c}_{1,t} = d_0 - d_1 \ln p_t - d_2 Tr_t - d_{3,t} \bar{W}_t^* \bar{T} r_t + u_t \tag{22}$$

where $d_2 = \left(1 - \bar{D}\right) b_2$. Note that if all people invest then $d_2 = 0$ whereas $d_2 = 1$ if all persons do not.

The conditional expectation function equals:

$$E\left(\ln c_{1,t} \mid \bullet\right) = d_0 - d_1 \ln p_t - d_2 T_t - d_{3,t} \bar{W}_t^* \bar{T} + E\left(u_t\right) \tag{23}$$

whereas:

$$p \lim d_2^{OLS} = \frac{\beta}{\alpha}\left(1 - \bar{D}\right)$$

7.3 Calibrating the fear and risk parameters

The nature of the test is to search for parameters α and β for which agents' projected outcome match their actual outcomes. Employed with our estimates for b_2 and d_2 we address the following question: what should be the risk aversion parameter for different levels of β in order to fit the data? The OLS estimates for b_2 and d_2 provide the best fit. Therefore, we calibrate the risk aversion parameter for different levels of fear aversion by setting $\hat{\alpha}$ to be equal:

$$\hat{\alpha} = \frac{\check{\beta}}{b_2^{OLS}}$$

where $\check{\beta}$ is the level of fear aversion imposed.

8 Estimating the fear effect

We take advantage of the Israeli Expenditure survey for the years 1999 through 2002 to estimate the effect of fear caused by terror on consumption plans. We report our findings in Table ISR.17 through Table ISR.21. We estimate the effect of terror and identify the role of fear using data on the usage of public bus and taxi services and expenditures in coffee shops. We take advantage of personal observed characteristics to instrument consumption in times with no terror in order to identify the *ceteris paribus* effect of fear.

8.1 Fear and the use of public bus services

We start by estimating the effect of suicide bomber attacks carried out on buses on the use of public bus services as reported by households. The vast majority of suicide bomber attacks took place in Haifa, Jeusalem and the Tel-Aviv area.[11] Therefore, taking advantage of our micro data, we distinguish between the population in these cities and in the rest of the country. We report our findings in Table ISR.17. Four main facts emerge: (i) a suicide bomber attack carried out on a bus decreases the use of public bus transportation by approximately 30 percentage points, (ii) neither fatalities nor other measures of terror affect the use of public buses, (iii) the effect varies over cities; though it affects consumption in the most populated cities (that experienced suicide bomber attacks), it has almost no effect on the use of public bus services in other locations. The effect of terror carried out on buses is well reflected in the use of taxi services. We report our findings in Table ISR.18. As this table shows, suicide bomber attacks increase the use of taxi services only in the largest cities.

So far we have shown that the use of public bus services responds to terror as projected by our theory. To distinguish between our theory and alternative explanations we compare the effect of terror on the use of bus services by high and low frequency users. We do so by comparing the effect of terror on the consumption paid by daily tickets with the effect of

[11] Disaggregating the population into location which had experienced suicide bomber attacks carried out on a bus and other location makes the difference between the groups even stronger.

terror on the use of bus services of multiple-rides ticket holders or monthly pass holders. We report our findings in Table ISR.19. We find that a suicide bomber attack carried out on a bus affects the use of public bus transportation solely by affecting low frequency daily use. That is, a suicide bomber attack decreases the use of public bus services paid on a daily basis by almost 40 percentage points, having no effect on the use of public bus services paid on a monthly/weekly basis. Table ISR.20 shows that it is not due to income effects.

8.2 Fear and consumption at coffee shops

Coffee shops, restaurants were as "popular" target for terror attacks as public buses. Some of the most "horrible" took place in restaurants and coffee shops. We take advantage of the Israeli expenditure Survey, which collects data on the consumption of food and beverages in restaurants/coffee shops. Employed with these data we estimate the average effect of terror incidents and identify the role of fear. We present our findings in Table ISR.21 and ISR.22.

We start by estimating the effect of terror incidents on consumption in coffee shops. We present our findings in Table ISR.21. The first panel shows the average effect of terror, as measured by either suicide bomber attacks carried out on a bus or the number of fatalities in the corresponding month on consumption. Note that suicide bomber attacks carried out on a bus have no effect on consumption in restaurants in contracts to the number of fatalities, reflecting other modes of terror. In column (ii) and column (iii) we disaggregated the population sample into those living in one of the three largest cities in Israel and others. We find that the number of fatalities affect consumption in the largest cities.

Finally we proceed to identify the role of fear. We do so by disaggregating the population sample into frequently users of coffee shops and others. We instrument that by peoples' martial status. To control for alternative explanations, we restrict the sample to include households reporting having no children. The first and the second panels show the effect of terror incidents on married and single populations respectively. To ensure that

the correlations reflect the effect of terror, we use the number of suicide bomber attacks curried out NOT on a bus to measure terror. As column (i) and column (iii) make clear, terror affects the consumption of low frequency users having no effect on high frequency consumers. While a suicide bomber attack decreases the consumption of married people by 28 percentage points, it has no effect on the consumption of single people. To control for income and age effects (non parametrically) we restrict the sample to include people aged 22 to 35. We report our findings in columns (ii) and (iv).

8.3 Calibrating the fear and the risk aversion factors

Based on the results from the common coefficient specification we calibrate the risk aversion parameter for different levels of fear.[12] We report our findings in Figure ISR.5. We find that if a suicide bomber attack carried out on a bus reduces the marginal utility of a bus ride by 20 percent - that is, the value of a 5 NIS ride drops by 1 NIS - then the risk aversion parameter which fits the data equals 1! Note that for a moderate deprecation of only 10 percent the risk aversion parameter needed in order to fit the data equals 1.5. In general, if a suicide bomber attack depreciates the utility from a bus ride by 5 percent or more we need risk aversion values that do not exceed three (3) to mimic the effect of suicide bomber attacks on the usage of public buses.

[12] What should be α? Arrow (1971) argues on theoretical grounds that α should be approximately one. Kydland and Prescott (1982) found that α needs to be between one and two to mimic observed variability in aggregate consumption and investment.

8.4 Evidence from the "Mad Cow" crisis in France

Another prominent example for the role of fear in explaining large effects caused by low probability events is effect of what is known as "Mad Cow" Disease on the consumption of beef. The "Mad Cow" Disease (MCD) is the commonly used name for Bovine Spongiform Encephalopathy (BSE), and Creutzfeldt-Jacob disease (CJD) in people, is a slowly progressive, degenerative, fatal disease affecting the central nervous system of adult cattle. A variant form of CJD (the vCJD) is believed to be caused by eating contaminated beef products from BSE-affected cattle. BSE in cattle was first reported in 1986 in the United Kingdom (UK). Only since 1996, evidence has been increasing for a causal relationship between ongoing outbreaks in Europe of a disease in cattle, BSE, and a disease in humans, vCJD. To put things in perspective From 1995 through June 2002, a total of 124 human cases of vCJD were reported in the United Kingdom, 6 cases in France, and 1 case each in Ireland, Italy, and the United States.[13]

In this section we provide evidence from the "Mad Cow" crisis in France (1996), as reported by Adda (2001), to support our theory.

Employed with a unique data panel set which follows households before and after March 1996, just after the public was first informed of a causal relationship between the disease in cattle, BSE, and the new variant of the disease in humans, vCJD, Adda estimates the effect of the MCD on beef consumption. Adda estimates the effect of the MCD, as measured by the change in consumption of beef, allowing the effect to vary by the level of consumption households used to have prior to March 1996. According to Adda's (2001) findings, consumers who had previously eaten large quantitative of beef did not change their consumption while those with intermediate levels of past consumption decreased significantly their consumption.

We summarize the main relevant findings as reported by Adda in Table FRC.1.

[13] For further details see: http://www.cdc.gov/ncidod/diseases/cjd/bse_cjd.htm

9 Conclusions

In the aftermath of September 11, terror is no longer a phenomenon limited to particular areas of conflict. Outside academic journals it is common knowledge that the likelihood to be harmed by terror is very low. The "intense fear which is somewhat prolonged and refer to imagined or future dangers" (Webster Encyclopedic Unabridged Dictionary) is often attributed to peoples' "ignorance", either of the objective probabilities or the underlying process that generate a shock to the economy. Contrary to these explanations, we put forward an alternative theory based on the framework of a rational choice model.

We point to the role of *fear*. We argue that an exogenous shock to the underlying probabilities to be harmed affects peoples' choices in two different channels: (i) the *risk* channel: by changing the weights of the "good" and the "bad" states, as in the standard expected utility models; (ii) the *fear* channel: unlike the standard models, the probability to be harmed affects persons' utility in each state of nature. *Fear* can be managed. Persons can handle their fears. They do so by accumulating the necessary skills. Like other investments in human capital, it is not a *free-lunch* and it does not pay back the same to anyone. Those who are more likely to benefit from the risky activity will invest and overcome their fears, while others will substitute the risky activity by other consumption or production plans.

Using data from the US (before and after September 11th) and from Israel (during the last wave of violence starting in the year 2000) we identify the role of fear on economic behavior by comparing the effect of terror on people who face similar objective (and subjective) probability to be harmed, *but* different incentive for overcoming fear. We find that those who are more likely to be paying the fixed costs of overcoming the terror fear effects are less likely to be affected by terror. For instance we show that while terror does generate large effects on consumers, especially in low frequency usage like air passengers or bus passengers, it has little effect on the compensation (wages) of those employed in the infected industries. Suicide bomber attacks decreases the likelihood of drivers to serve as bus drivers, however it has no effect on the likelihood of bus drivers to quit their jobs.

Using micro data on the use of public bus routes and taxis we find that suicide bomber attacks carried out on buses have a substantial negative effect on bus rides and positive effect on the use of taxis. Decomposing the treatment effect by the likelihood to use bus we find, consistent with our theory, that suicide bomber attacks affect those who are at the margin of using public buses, having no effect on others.

Finally, using our estimates we address the following question: to what extent should people's fear and risk aversion be in order to fit the data? We calibrate the *risk* and the *fear* aversion parameters restricting the utility function to be of the constant relative risk aversion class (CRRA). We find that if suicide bomber attack carried out on buses reduces the marginal utility of a bus ride by 20 percent then the risk aversion parameter which fits the data equals 1!

Fear is not limited to terror. Large scale effects generated by low probability events are part of our daily life. Needless to say that our model shed new insight on that too. Evidence from the "Mad Cow" crisis show, in accordance with our theory, that those who consumed high level of beef did not change their consumption at all while those who consumed less reduced their beef consumption substantially.

Terror takes advantage of people being human and rational. By generating fear, terror, even in the form of a low probability event, may generate substantial effects. Hence, terror generates large scale effect by damaging the quality of our life rather than the "quantity" of life.

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[22] http://www.cfsan.fda.gov/

[23] http://www.cdc.gov/

10 Appendix

Insert file #2

Figure T.1:
Costs and Benefits from Investment in Mental Capital – First Glance

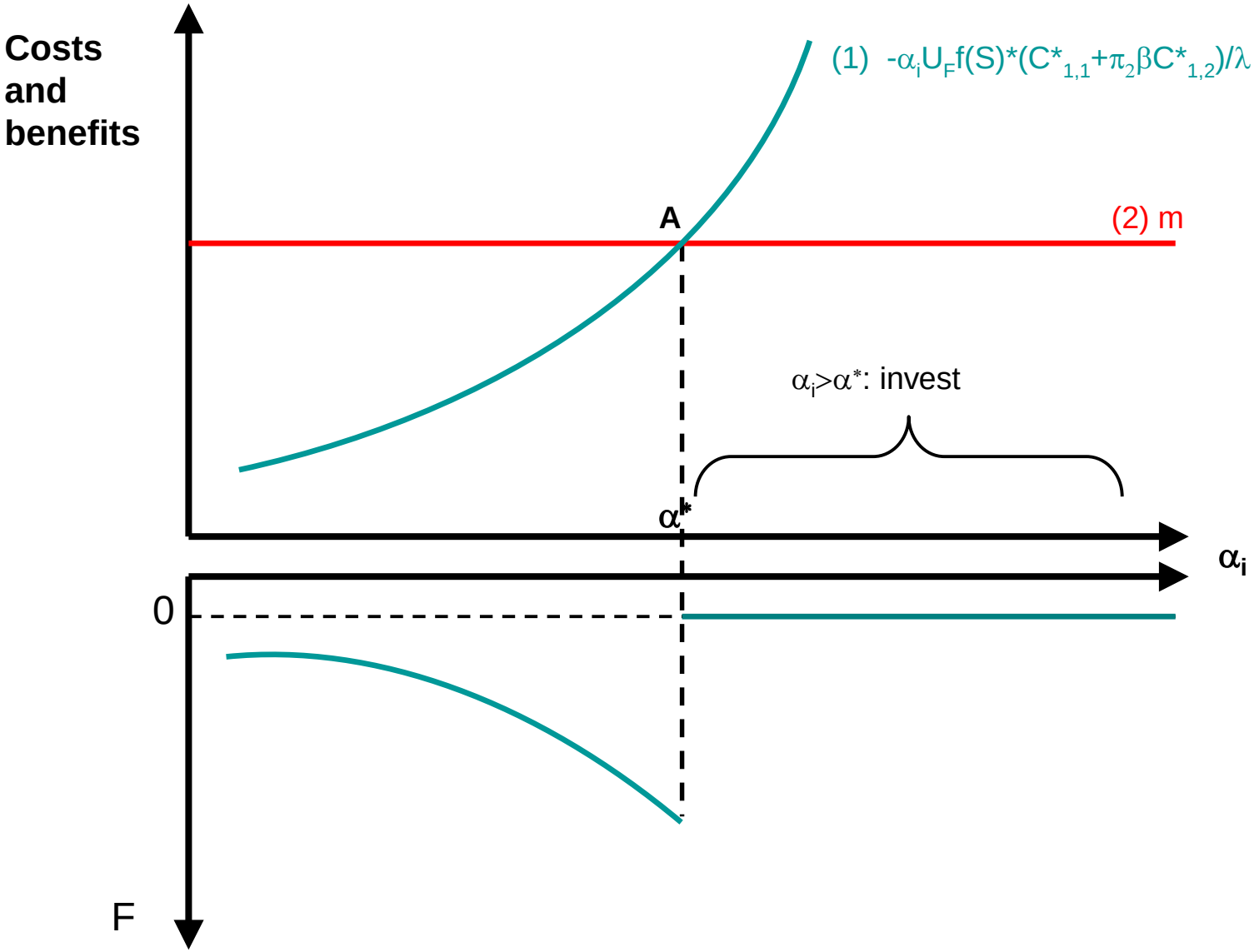


Figure T.2:
Costs and Benefits from Investment in Mental Capital - II

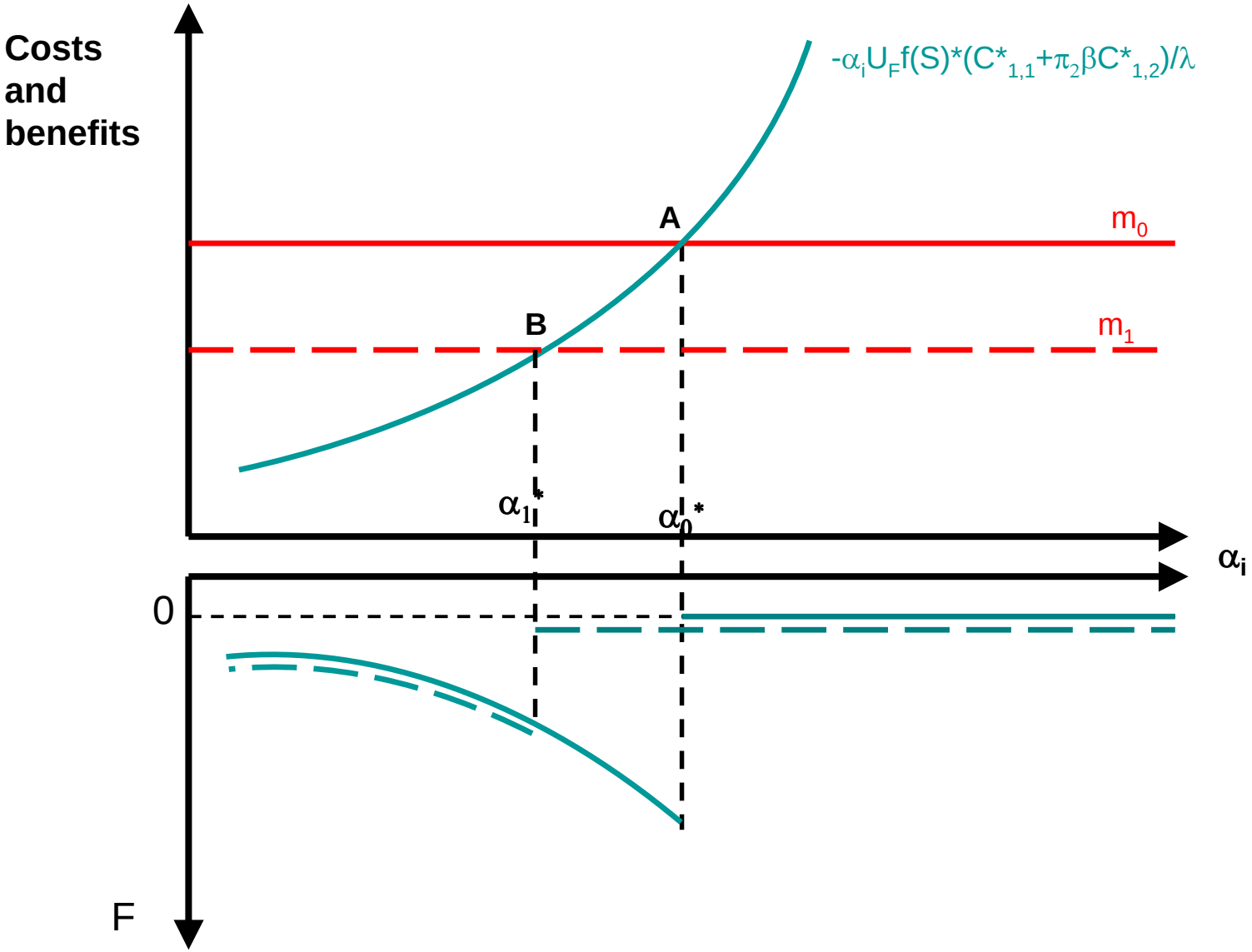


Figure T.3:
Consumption and Investment with and without Fear (F(S))

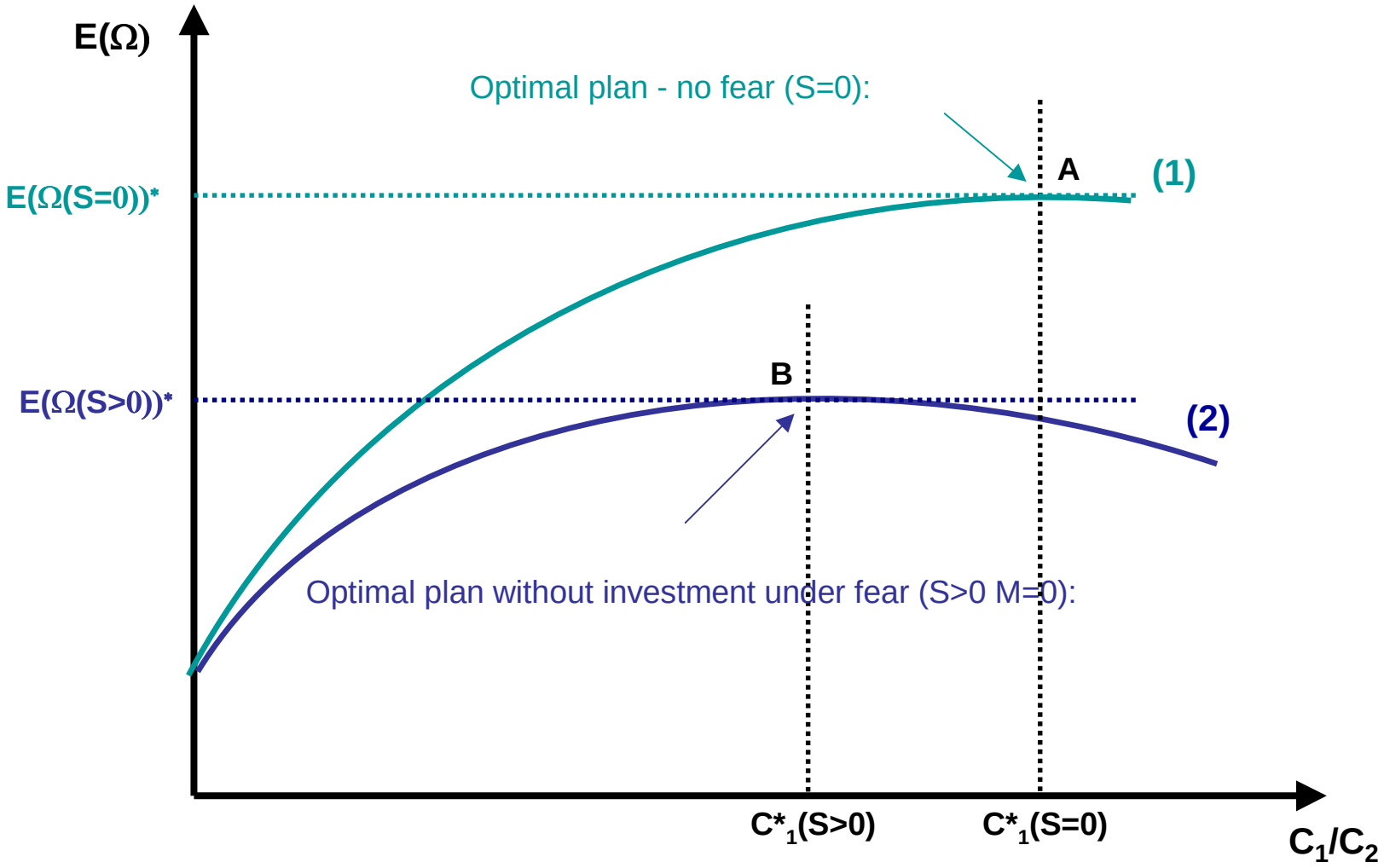


Figure T.4:
Consumption and Investment for C1 "Lovers"

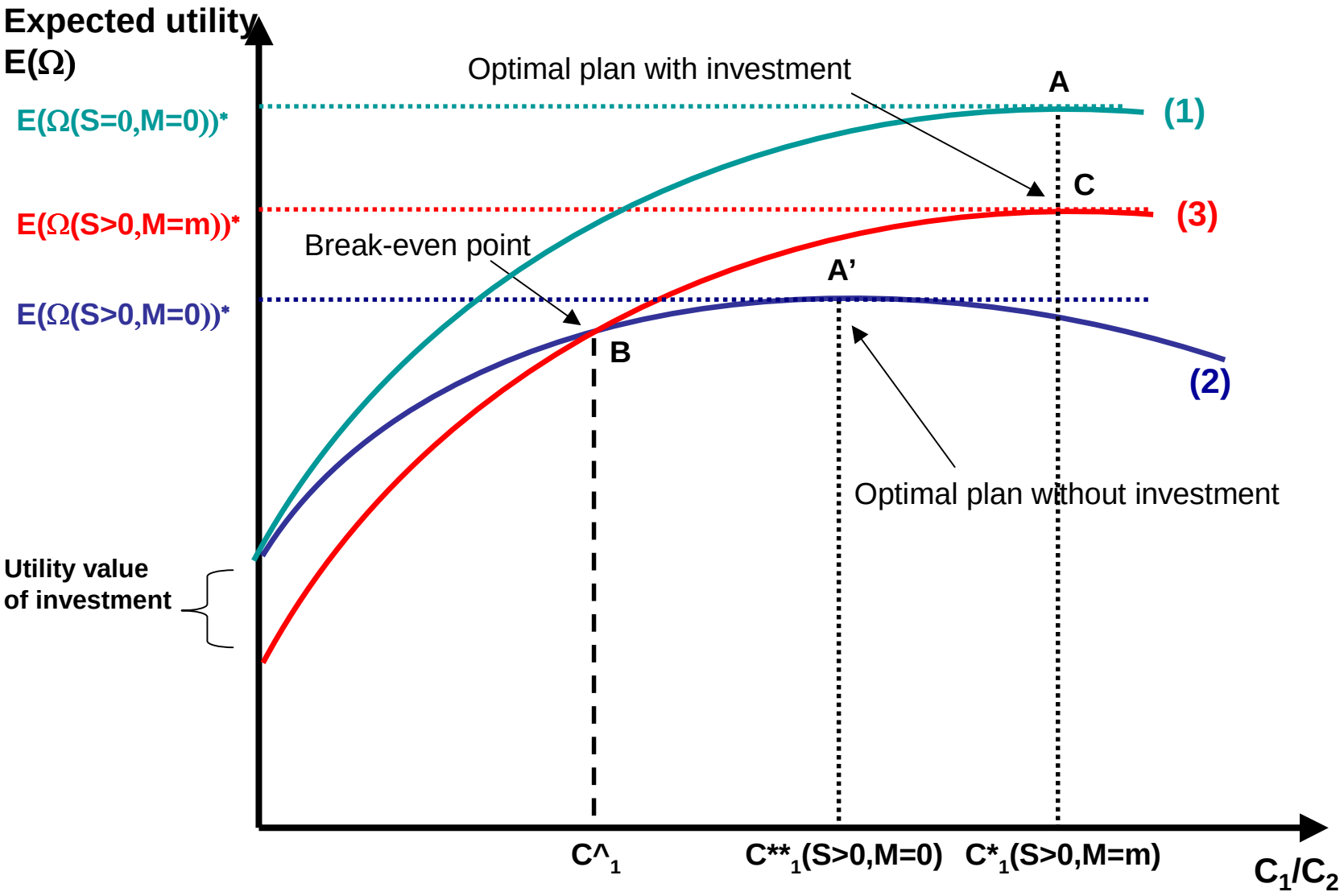


Figure T.5:
Consumption and Investment for C2 "Lovers"

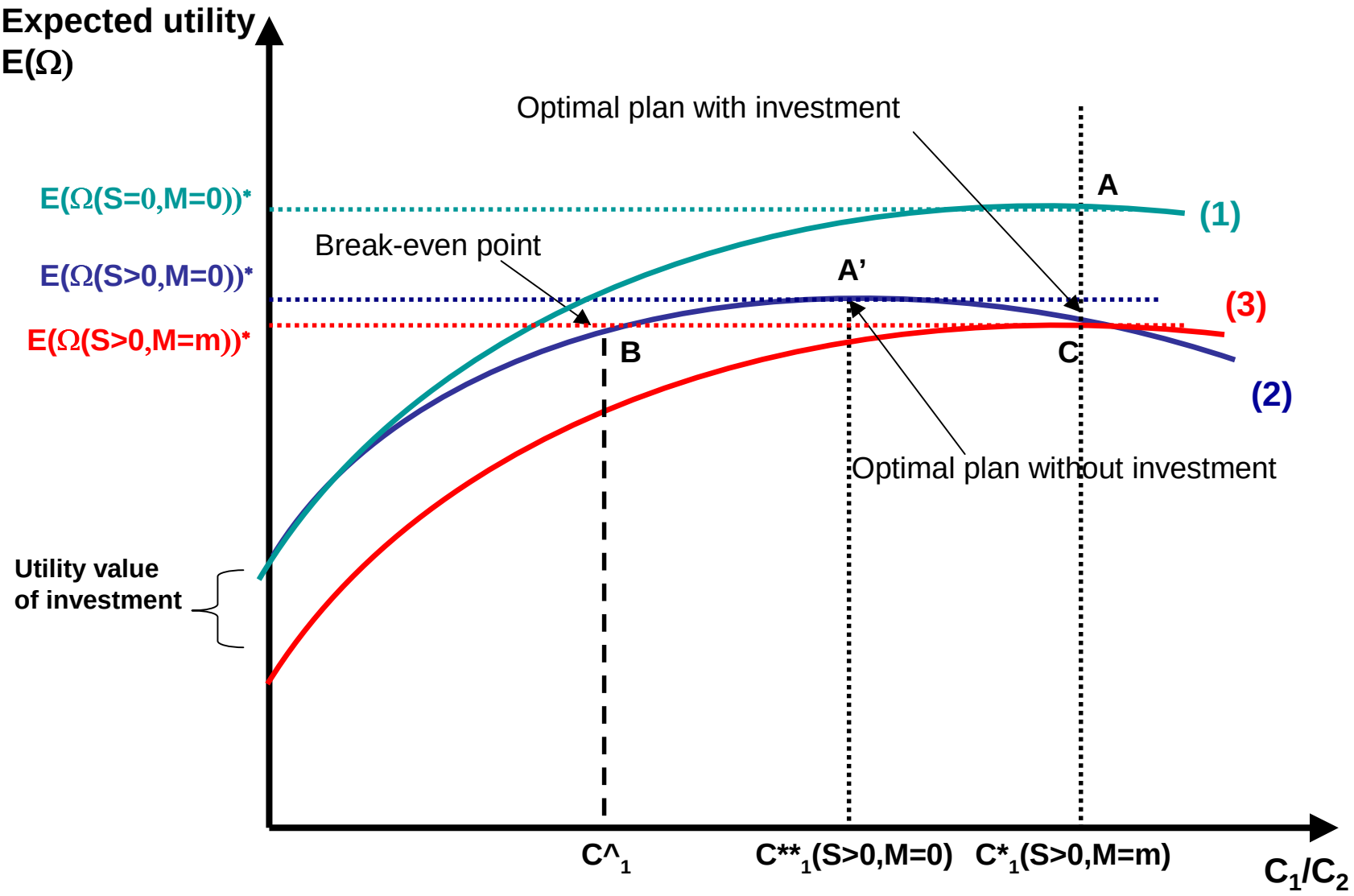


Figure 1.USA: Domestic Flights: Air Passengers

Domestic Air Seat and Passenger Miles (monthly data, not seasonally adjusted)

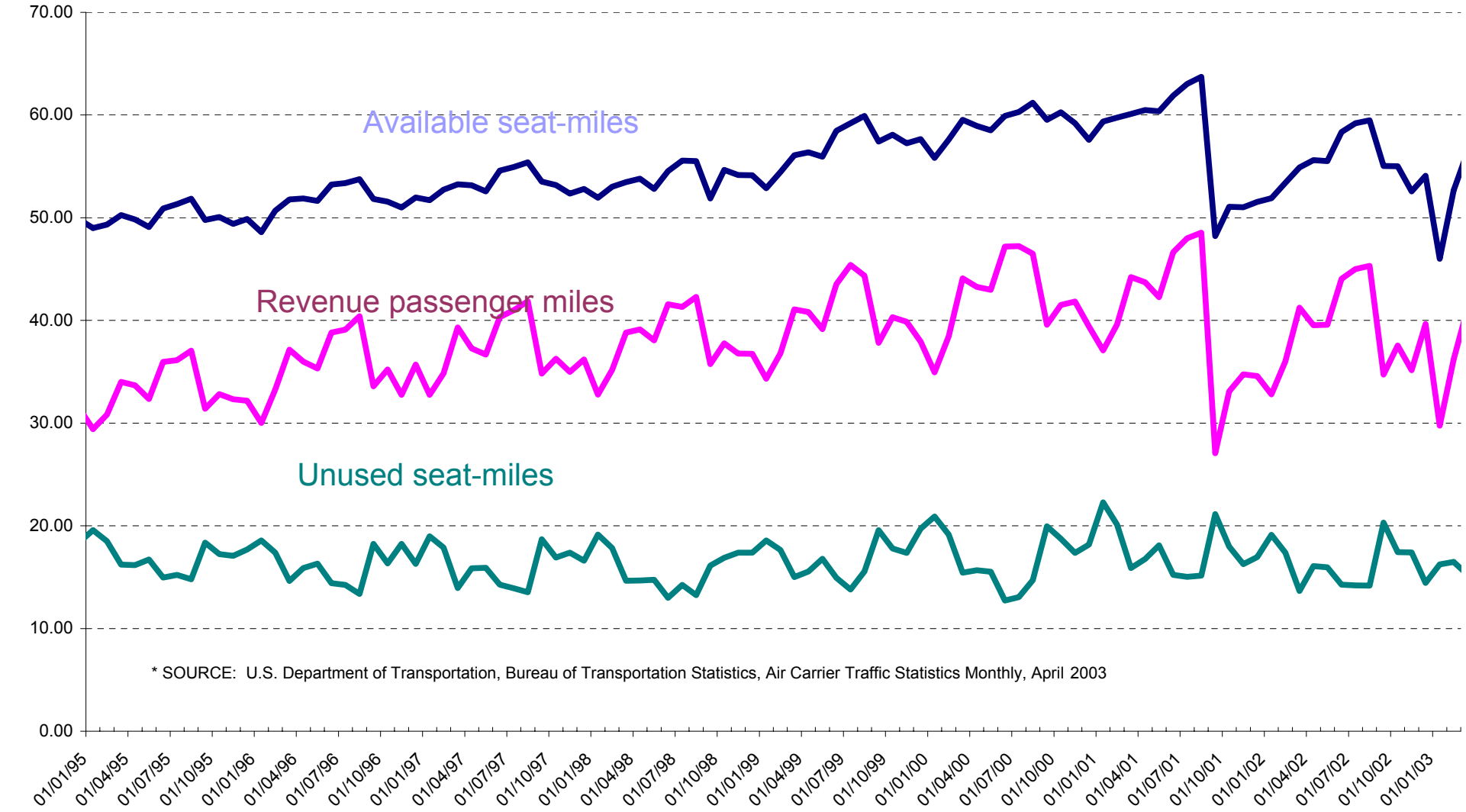


Figure 2.USA: Domestic Flights: Air Freight

Domestic Air Freight Ton-Miles (monthly data, not seasonally adjusted)

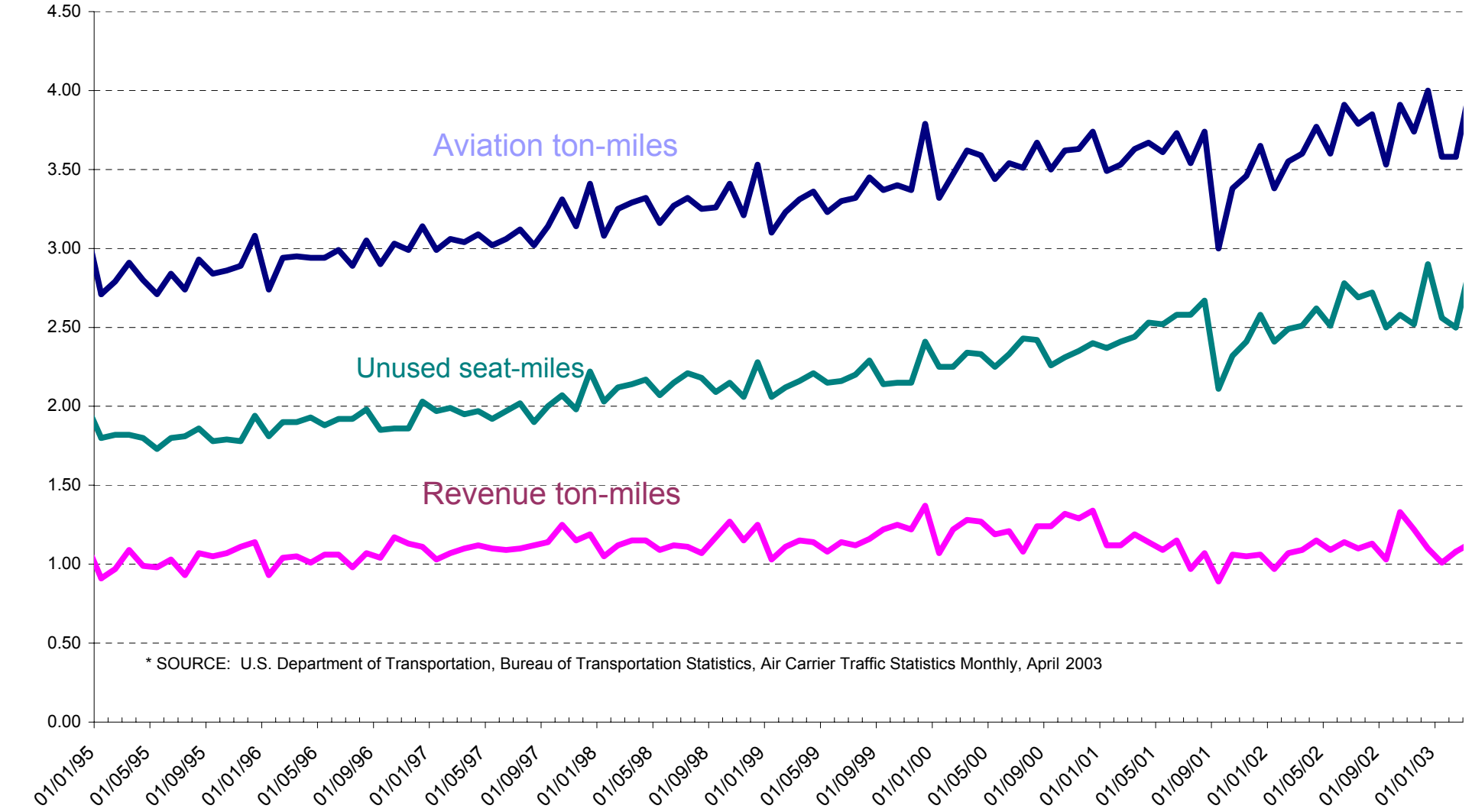


Figure 3.USA: Domestic Flights: Index of Air Passengers Air Freight Ratios
Domestic Air Seat and Passenger Miles and Air Freight Ton-Miles (monthly data, not seasonally adjusted)
January 1997 = 100.0

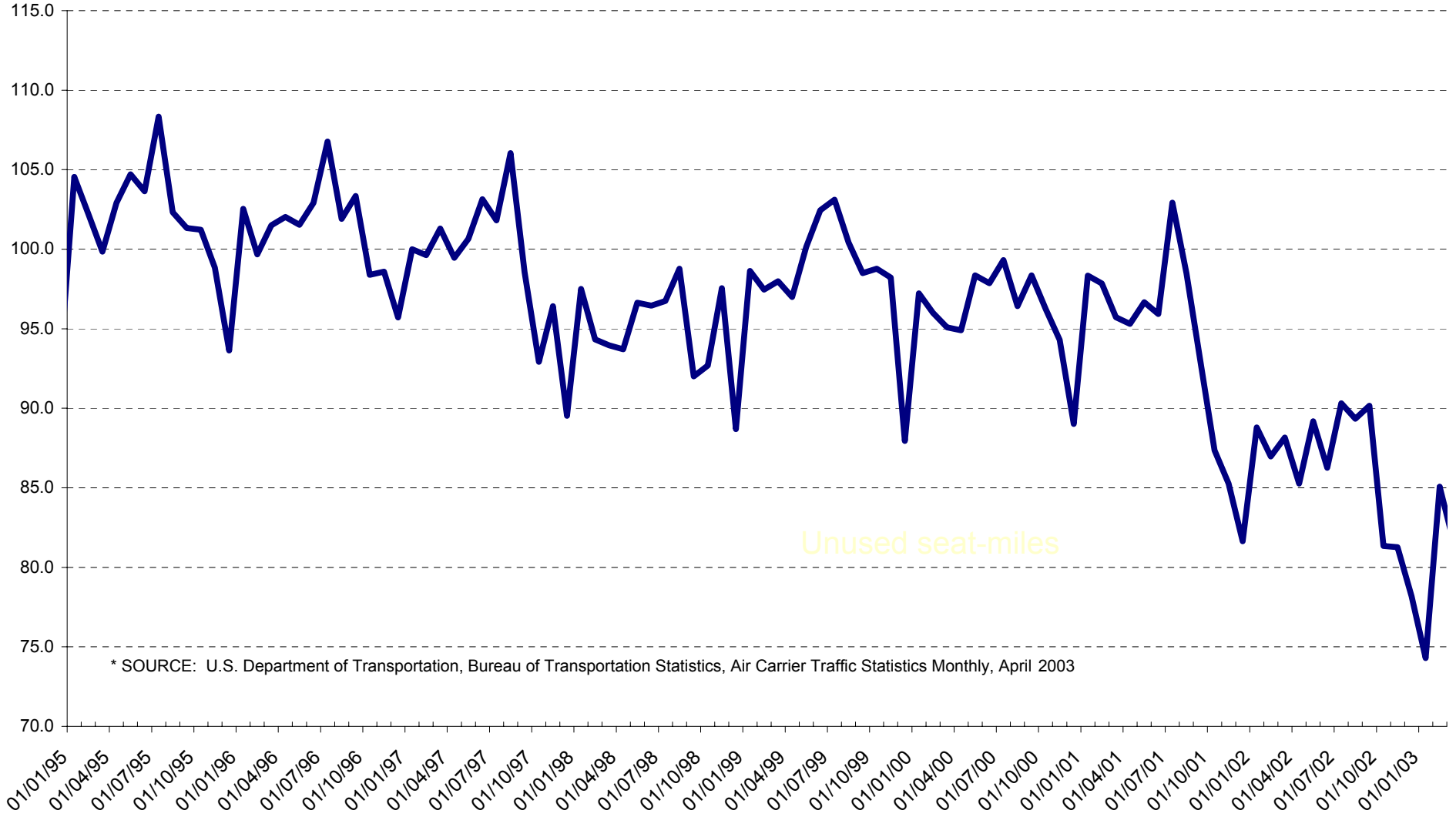


Figure 4.USA: Domestic Flights: Passengers Transported on the Top 2 Intl. Routes
Index of New York-Paris - Chicago-London Ratios
January 2000 = 100.0

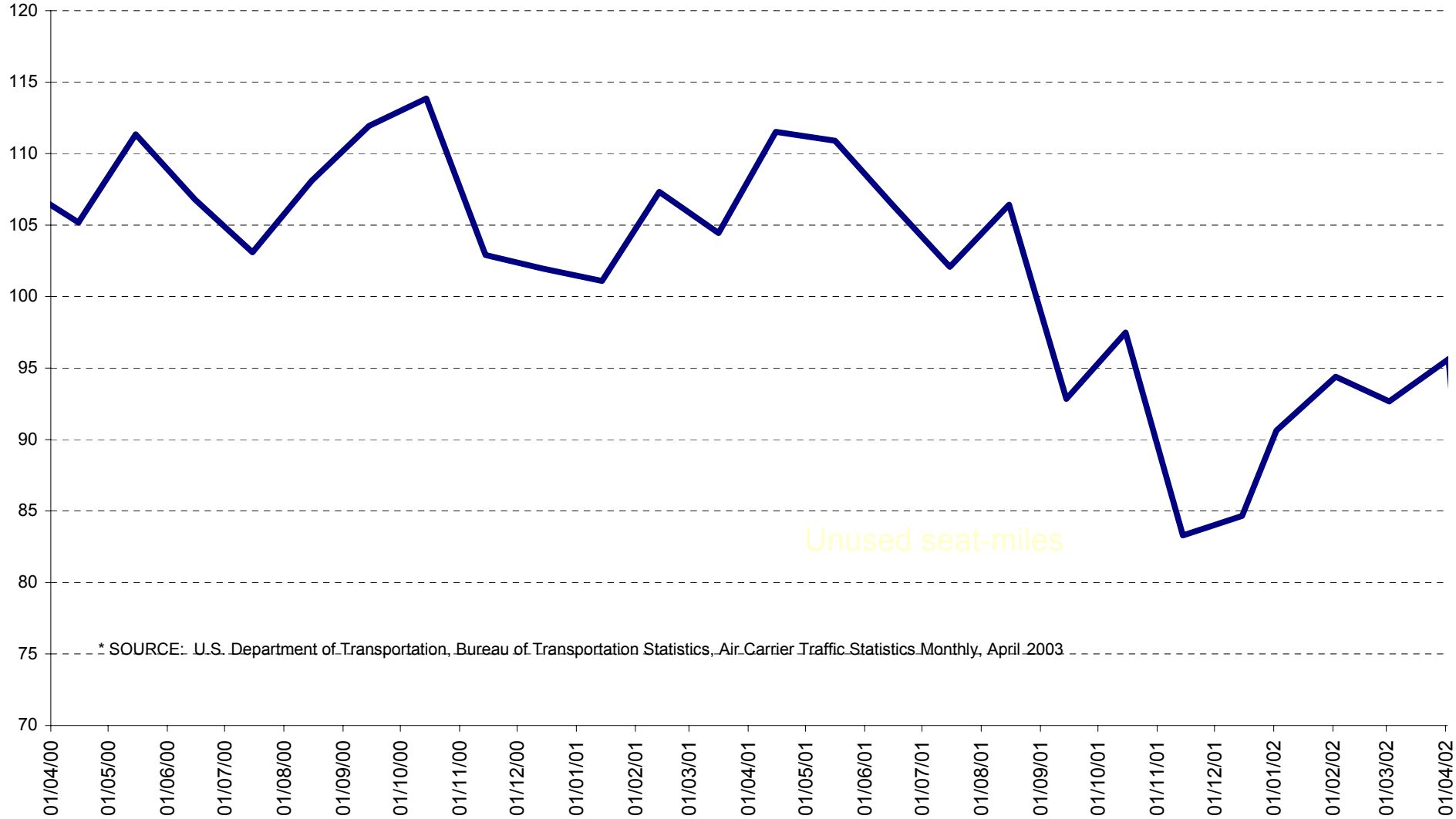


Figure 1.ISR:
Revenues (price adjusted) in Regular Bus Lines - Index
Israel, January 2000 - Decmber 2002
January 2000 = 100.0

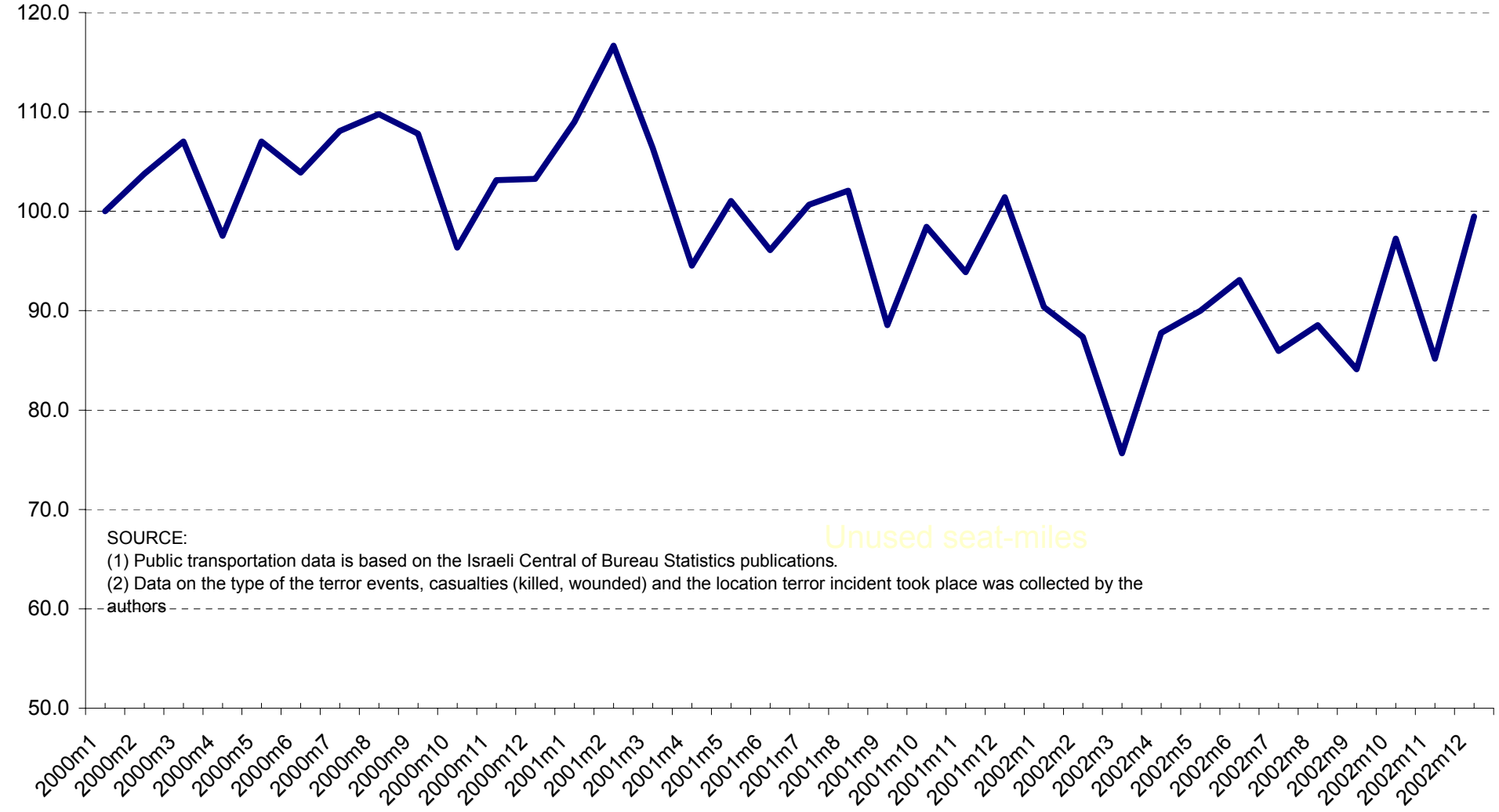


Figure 2.ISR:
The Number Suicide Bomber Attacks and Fatalities by Month: Overall and Carried Out on Buses
Israel, January 2000 through April 2003

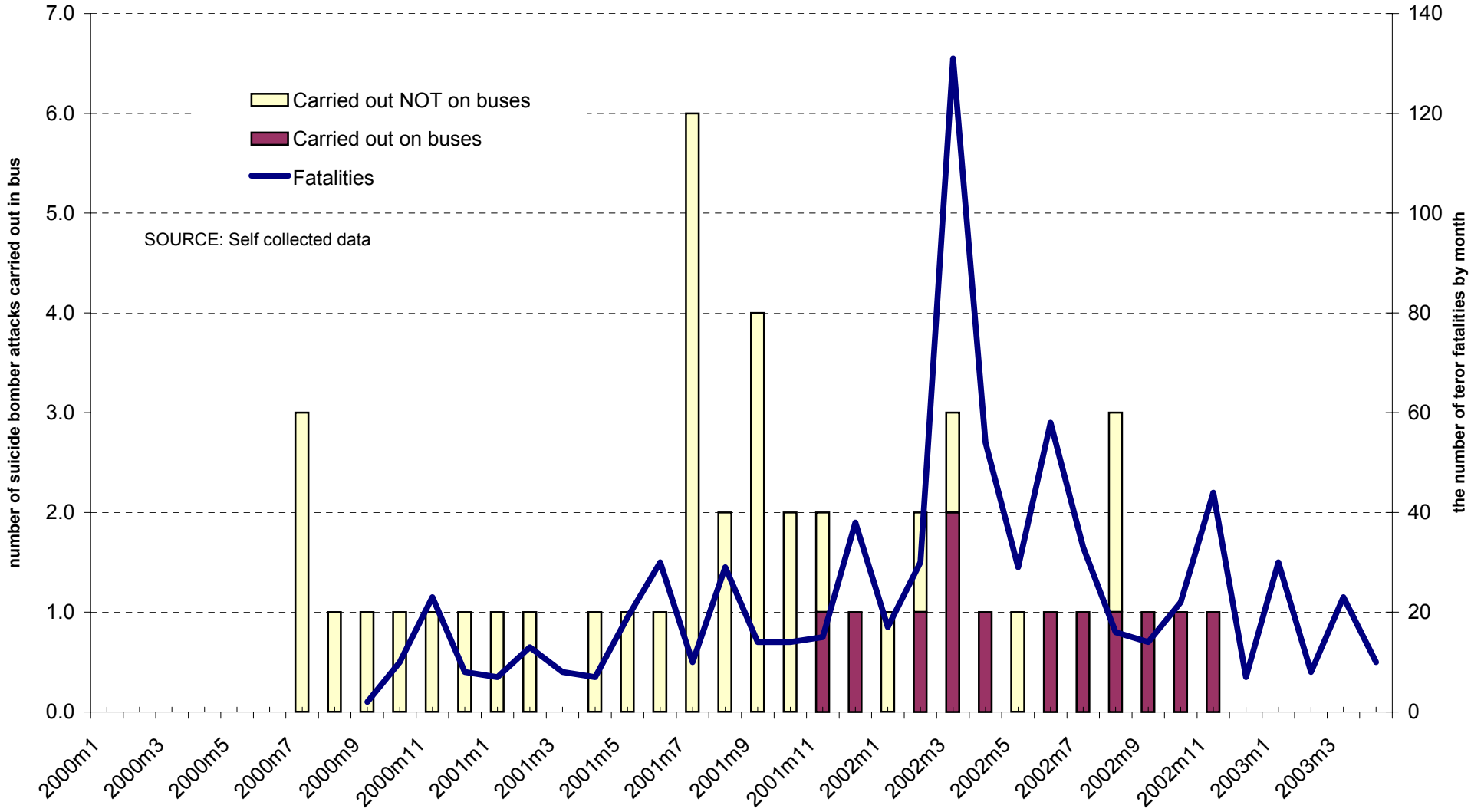
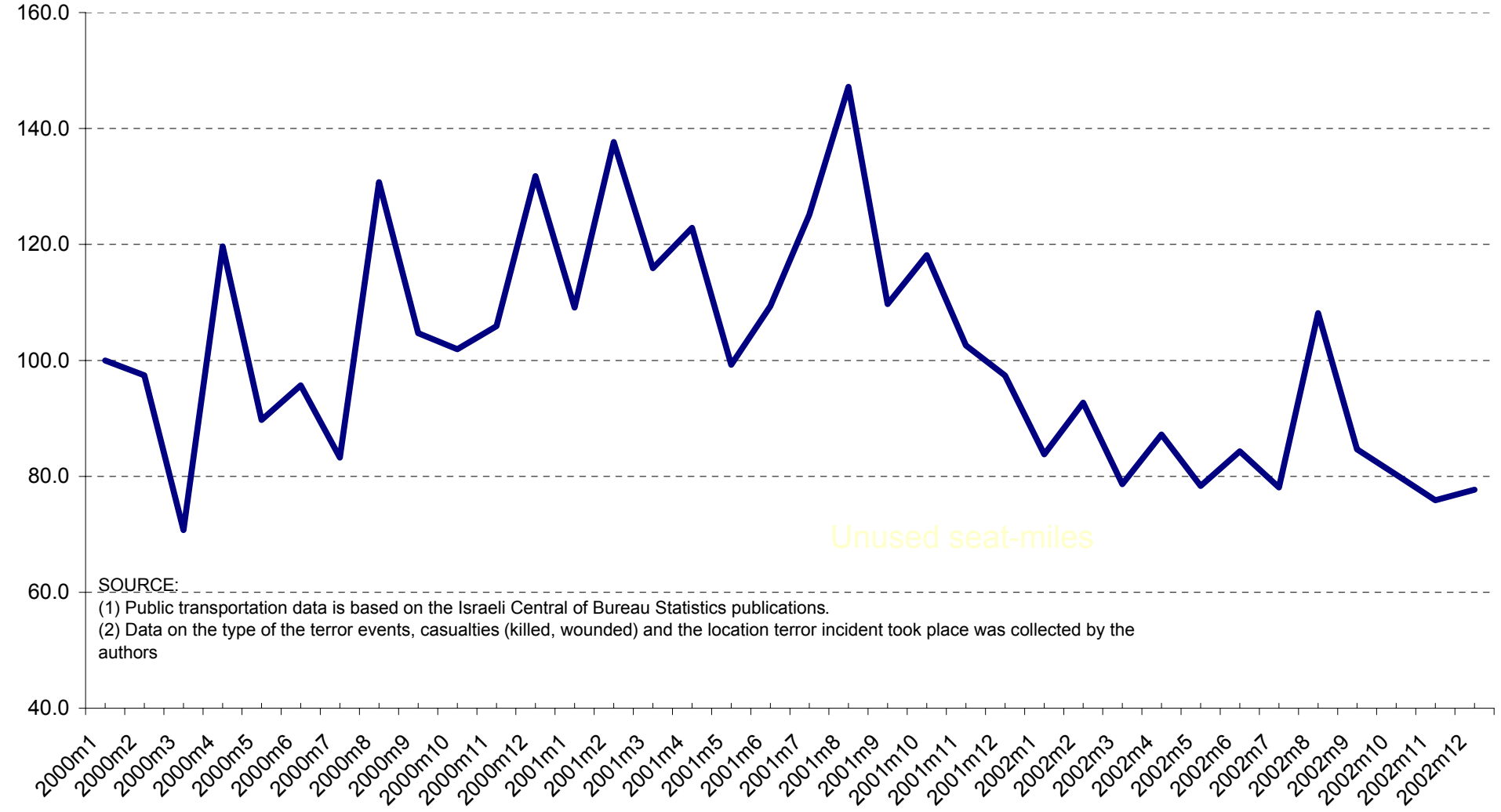


Figure 3.ISR:
Index of the Ratio of Revenue (price adjusted) in Regular Bus Lines to Revenue in Special Lines
Israel, January 2000 - Decmber 2002
January 2000 = 100.0



SOURCE:
(1) Public transportation data is based on the Israeli Central of Bureau Statistics publications.
(2) Data on the type of the terror events, casualties (killed, wounded) and the location terror incident took place was collected by the authors

Figure 4.ISR:
Index of the Raatio of Revenue (price adjusted) in Regular Bus Lines to Revenue in Special Lines and the Average Number of Suicide Bomber Attacks Carried Out on Bus
Israel, Monthly Data, January 2000 - Decmber 2002

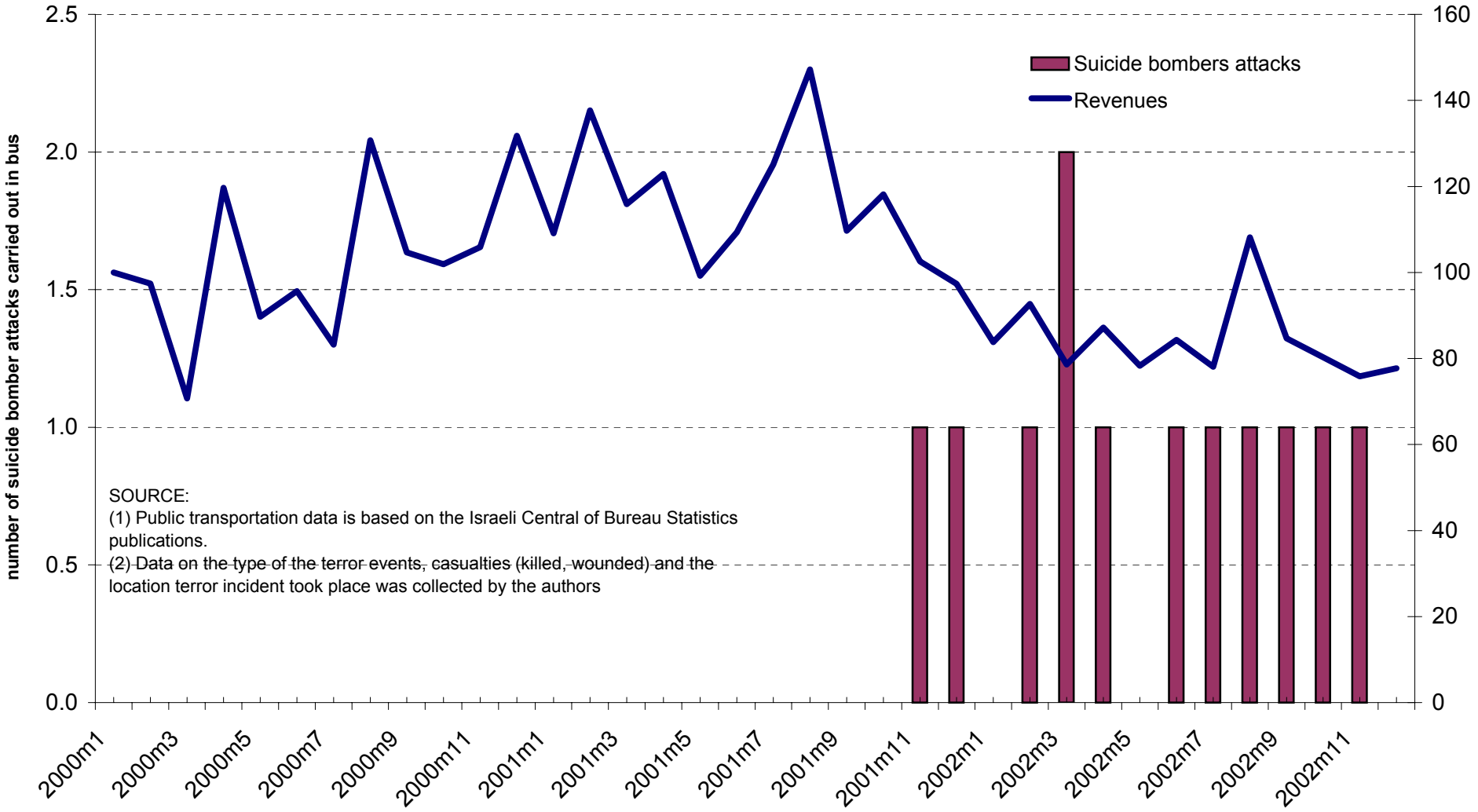


Table 1.USA:
The Effect of September 11th 2001 on the Number of Domestic Air Passengers in the US
Dependent variable: the ratio of air passengers miles to air freight ton-miles (in logs
USA, January 1995 to April 2003

Variables	(i)	(ii)	(iii)	(iv)	(v)
September 2001 April 2003	-0.147	-0.100			-0.105
	(0.011)	(0.014)			(0.014)
Linear time trend		-0.001	-0.002		-0.001
		(0.000)	(0.000)		(0.000)
September 2001			0.030	-0.029	0.085
			(0.051)	(0.075)	(0.041)
Months / observations	100	100	100	100	100
Adj R-Square	0.6318	0.6993	0.5444	0	0.7091

Note:
* SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Air Carrier Traffic Statistics Monthly, April 2003
( ) Standard errors in parenthesis

Table 2.USA:
Not Employed After September 2001: Pilots and Air Transportation Relative to All Other Workers
Sample Includes only those Observed Before and After September 2001.^
Male, Aged 21 to 55 when First Observed
CPS, Monthly Files, 2001-2002
Dependent variable: Not Working (0, 1) after September 2001. 1=not working. Probit estimates

	All				**In the Labor Force after September 2001**			
Variables	**(i)**	**(ii)**	**(iii)**	**(iv)**	**(v)**	**(vi)**	**(vii)**	**(viii)**
Pilot* ^^	**0.043**	**0.013**	**0.051**	**0.019**	**0.041**	**0.014**	**0.050**	**0.021**
	(0.024)	(0.017)	(0.026)	(0.019)	(0.024)	(0.018)	(0.026)	(0.020)
Air transportation* ^^		**0.025**		**0.023**		**0.023**		**0.021**
		(0.012)		(0.012)		(0.012)		(0.011)
Other personal characteristics								
Years of schooling completed			-0.002	-0.002			-0.002	-0.002
			(0.0002)	(0.0002)			(0.0003)	(0.0003)
Black*			0.014	0.014			0.019	0.019
			(0.003)	(0.003)			(0.003)	(0.003)
American Indian*			0.026	0.026			0.034	0.033
			(0.008)	(0.008)			(0.010)	(0.009)
Asian*			0.004	0.004			0.005	0.005
			(0.004)	(0.004)			(0.004)	(0.004)
Hispanic*			0.002	0.002			0.001	0.001
			(0.002)	(0.002)			(0.002)	(0.002)
Constant	0.021	0.021	0.020	0.020	0.024	0.024	0.022	0.022
Observations	53509	53509	53509	53509	48692	48692	48692	48692

Notes:
^ Sample includes only those employed (or out of the LF) before September 2001 and Observed after September 2001
(*) dF/dx is for discrete change of dummy variable from 0 to 1
^^ Pilot =1 for occupation 226: Airplane pilots
^^ Air transportation = 1 for industry 421: Air-transportation
( ) Standard errors in parenthesis

Table 3.a.USA:
The Wages of Risky Jobs Before and After September 2001
CPS Monthly Data, 1998 to 2002
Male, Full-Time workers
Dependent variable: Hourly wage (in logs)

	Age			
	22 - 65	25 - 55	25 - 55	25 - 55
Variables	(i)	(i)	(i)	(i)
Pilot	**0.297**	**0.291**	**0.291**	**0.292**
	(0.032)	(0.034)	(0.034)	(0.034)
Ait-transportation	-0.003	-0.008	-0.007	-0.006
	(0.013)	(0.014)	(0.014)	(0.014)
Firefighting			-0.032	-0.032
			(0.019)	(0.019)
Police			0.096	0.096
			(0.012)	(0.012)
Oct20001-Dec2002	0.014	0.014	0.014	0.021
	(0.004)	(0.004)	(0.004)	(0.002)
Before - After:				
Oct20001-Dec2002 * Pilot	**-0.154**	**-0.145**	**-0.145**	**-0.145**
	(0.064)	(0.069)	(0.069)	(0.069)
Oct20001-Dec2002 * Aifr-transportation	**0.006**	**0.001**	**0.001**	**0.000**
	(0.025)	(0.027)	(0.027)	(0.027)
Oct20001-Dec2002 * Firefighting			0.038	0.038
			(0.035)	(0.035)
Oct20001-Dec2002 * Police			-0.021	-0.020
			(0.023)	(0.023)
Other personal characteristics				
Experience	0.032	0.026	0.026	0.026
	(0.000)	(0.001)	(0.001)	(0.001)
Experience square	-0.001	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
School years completed	0.088	0.089	0.089	0.089
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Educational category FE	No	No	No	No
Year dummies	Yes	Yes	Yes	No
Adj R-square	0.232	0.217	0.218	0.218
Observations	296901	251983	251983	251983

Note:
CPS monthly files: January 1998 to December 2002
All specification include dummies for region of residence, and weekly worked hours (in logs)
( ) Standard errors in parenthesis

Table 3.b.USA:
The Wages of Risky Jobs Before and After September 2001
CPS Monthly Data, 1998 to 2002
Male, fFull-Time workers
Dependent variable: Hourly wage (in logs)

	Age			
	22 - 65	25 - 55	25 - 55	25 - 55
Variables	(i)	(ii)	(iii)	(iv)
Pilot	**0.252**	**0.245**	**0.245**	**0.246**
	(0.032)	(0.033)	(0.033)	(0.033)
Ait-transportation	0.009	0.004	0.005	0.006
	(0.012)	(0.013)	(0.013)	(0.013)
Firefighting			0.000	0.000
			(0.019)	(0.019)
Police			0.106	0.106
			(0.012)	(0.012)
Oct20001-Dec2002	0.013	0.014	0.014	0.021
	(0.004)	(0.004)	(0.004)	(0.002)
Before - After:				
Oct20001-Dec2002 * Pilot	**-0.150**	**-0.147**	**-0.147**	**-0.148**
	(0.063)	(0.068)	(0.068)	(0.068)
Oct20001-Dec2002 * Aifr-transportation	**0.005**	**-0.001**	**-0.001**	**-0.002**
	(0.025)	(0.027)	(0.027)	(0.027)
Oct20001-Dec2002 * Firefighting			0.034	0.034
			(0.035)	(0.035)
Oct20001-Dec2002 * Police			-0.027	-0.026
			(0.023)	(0.023)
Other personal characteristics				
Experience	0.034	0.031	0.031	0.031
	(0.000)	(0.001)	(0.001)	(0.001)
Experience square	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
School years completed				
Educational category FE	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	No
Adj R-square	0.248	0.233	0.233	0.233
Observations	296901	251983	251983	251983

Note:
CPS monthly files: January 1998 to December 2002
All specification include dummies for region of residence, and weekly worked hours (in logs)
( ) Standard errors in parenthesis

Table 1.ISR:
The Effect of Suicide Bombers on the Number of Passengers in Regular Bus Lines
Israel, October 2001 to April 2003
Dependent variable: the ratio of passegers in regular lines to passengers in special lines (in logs)

Variables	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Num. of suicide bomber events - on buses only - this month	-0.191			-0.168	-0.187	-0.206	-0.219
	(0.054)			(0.059)	(0.064)	(0.067)	(0.089)
Num. of all suicide bomber events this month		-0.053		-0.023	-0.036	-0.053	-0.046
		(0.026)		(0.025)	(0.029)	(0.035)	(0.043)
Fatal incidets			-0.008		0.007	0.003	-0.002
			(0.007)		(0.007)	(0.008)	(0.011)
Fatal incidents with 1967 borders						0.020	0.034
						(0.022)	(0.025)
Num people killed by terror action this month							0.004
							(0.005)
Num. people wounded							-0.001
							(0.001)
Months / observations	28	28	28	28	28	28	28
Adj R-Square	0.2998	0.1076	0.0228	0.2958	0.29	0.2848	0.2627

Note:
Sources:
1. Public transportation data is based on Israeli Central of Bureau Statistics datasets
2. Data on the type of the terror events, casualties (killed, wounded) and location was collected by the authors
( ) Standard errors in parenthesis

Table 2.ISR:
The Effect of Suicide Bombers on the Number of Passengers in Regular Bus Lines
Israel, October 2001 to April 2003
Dependent variable: the ratio of passegers in regular lines to passengers in special lines (in logs)

Variables	(i)
Num. of suicide bomber events - on buses only - this month	-0.082
	(0.061)
Num. of suicide bomber events - on buses only - last month	-0.179
	(0.061)
Num. of ALL suicide bomber events - this month	-0.017
	(0.023)
Num. of ALL suicide bomber events - last month	0.003
	(0.023)
Months / observations	28
Adj R-Square	0.2998

Note:
Sources:
1. Public transportation data is based on Israeli Central of Bureau Statistics datasets
2. Data on the type of the terror events, casualties (killed, wounded) and location was collected by the authors
( ) Standard errors in parenthesis

Table 3.ISR:
The Effect of Suicide Bombers on the Number of Passengers in Regular Bus Lines
Israel, October 2001 to April 2003
Dependent variable: the ratio of passegers in regular lines to passengers in special lines (in logs)

Variables	(ii)	(iii)	(iv)
Num. of suicide bomber events - on buses only - this month	-0.232 (0.049)	-0.208 (0.056)	-0.201 (0.064)
Months / observations	27	21	18
Adj R-Square	0.1076	0.0228	0.2958

Note:
Sources:
1. Public transportation data is based on the Israeli Central of Bureau Statistics publications.
2. Data on the type of the terror events, casualties (killed, wounded) and the location terror incident took place was collected by the authors
( ) Standard errors in parenthesis

Table 4.ISR:
The Effect of Suicide Bombers on the Real Wages of Bus Drivers
Israel, October 2001 to April 2003
Dependent variable: The mean wages of drivers relative to the mean wages per worker (in logs)

Variables	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Num. of suicide bomber events - on buses only - this month				0.052	0.057	0.061	0.078
	(0.015)			(0.017)	(0.019)	(0.020)	(0.026)
Num. of all suicide bomber events this month		0.011		0.002	0.005	0.009	0.016
		(0.008)		(0.007)	(0.009)	(0.010)	(0.013)
Fatal incidets			0.002		-0.002	-0.001	0.002
			(0.002)		(0.002)	(0.002)	(0.003)
Fatal incidents with 1967 borders						-0.004	-0.006
						(0.006)	(0.007)
Num people killed by terror action this month							-0.002
							(0.001)
Num. people wounded							0.000
							(0.000)
Cooprative members' compensation							-0.074
							(0.042)
Salaried workers' wages							-0.011
							(0.100)
Months / observations	28	28	28	28	28	28	28
Adj R-Square	0.2926	0.0417	0.0049	0.2665	0.2665	0.2559	0.3674

Note:
Sources:
1. Public transportation data is based on Israeli Central of Bureau Statistics datasets
2. Data on the type of the terror events, casualties (killed, wounded) and location was collected by the authors
( ) Standard errors in parenthesis

Table 5.ISR:
The Effect of Suicide Bombers on the Real Wages of Bus Drivers
Israel, October 2001 to April 2003
Dependent variable: The mean wages of drivers relative to the mean wages per worker (in logs)

Variables	(i)	(ii)
Num. of suicide bomber events - on buses only - this month	0.028	0.028
	(0.018)	(0.018)
Num. of suicide bomber events - on buses only - last month	0.043	0.041
	(0.018)	(0.018)
Num. of ALL suicide bomber events - this month	-0.001	0.001
	(0.007)	(0.007)
Num. of ALL suicide bomber events - last month	0.000	-0.002
	(0.007)	(0.007)
Cooprative members' compensation	0.000	-0.075
	(0.000)	(0.040)
Salaried workers' wages	0.000	-0.001
	(0.000)	(0.087)
Months / observations	28	28
Adj R-Square	0.3639	0.4187

Note:
Sources:
1. Public transportation data is based on Israeli Central of Bureau Statistics datasets
2. Data on the type of the terror events, casualties (killed, wounded) and location was collected by the authors
( ) Standard errors in parenthesis

Table 6.ISR:
The Effect of Suicide Bombers on the Real Wages of Bus Drivers
Israel, October 2001 to April 2003
Dependent variable: The mean wages of drivers relative to the mean wages per worker (in logs)

Variables	(ii)	(iii)	(iv)
Num. of suicide bomber events - on buses only - this month	0.058	0.044	0.039
	(0.014)	(0.016)	(0.018)
Months / observations	27	21	18
Adj R-Square	0.3739	0.2586	0.1773

Note:
Sources:
1. Public transportation data is based on the Israeli Central of Bureau Statistics publications.
2. Data on the type of the terror events, casualties (killed, wounded) and the location terror incident took place was collected by the authors
( ) Standard errors in parenthesis

Table ISR.7:
The Effect of Suicide Bomber Attacks on the Wages of Bus Drivers
Matched Income and Labor Force Surveys, Israel, 2000 to 2002 *, **
Dependent variable: (log) Hourly Wage ***

Variables	(i)	(ii)
(1) Bus driver	0.081	0.108
	(0.096)	(0.090)
(2) Taxi driver	-0.401	-0.469
	(0.177)	(0.121)
The effect of suicide bomber attacks:		
(3) Num. of suicide bomber events carried out on buses this quarter^ (SBB t)	**-0.008**	
	(0.009)	
(4) Num. of suicide bomber events carried out on buses last quarter (SBB t-1)		**0.014**
		(0.009)
Interactions:		
(5) SBB t * Bus driver	**-0.009**	
	(0.065)	
(6) SBB t-1 * Bus driver		**-0.034**
		(0.056)
(7) SBB t * Taxi driver	**-0.063**	
	(0.121)	
(8) SBB t-1 * Taxi driver		**0.016**
		(0.038)
Personal Characteristics:		
(9) Years of schooling completed	0.077	0.077
	(0.002)	(0.002)
(10) Yeshiva (last school)	-0.054	-0.054
	(0.020)	(0.020)
(11) Immigrated to Israel after 1988	-0.424	-0.424
	(0.023)	(0.023)
(12) Quarter fixed effect	Yes	Yes
(13) Observations	5633	5633
(14) Adj. R-square	0.317	0.317

Notes:

Based on the Israeli Income and Labor Force Surveys for the years 2000 through 2002

* For reasons of privacy the Israeli CBS excludes income data from the Labor Force surveys.
Income data is provided in a separate file known as the Income Survey.
Personal (or household) IDs were scrambled to avoid the (easy) possibility of merging back these files.
Using personal characteristics available in both files we were able to match observations from both files.

** The sample excludes (i) Israeli Arabs, (ii) workers who earn less then 1500 NIS (less than 1/2 of minimum wage)
(iii) workers who work less than 10 hours a week

*** All specifications include experience and experience square, origin related dummies and marital status

^ Suicide bomber attacks carried out on buses = the average of suicide bomber attacks carried out on buses in the q

( ) Standard errors in parenthesis

Table ISR.8:
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers to be Employed as Bus Drivers
Dprobit Estimators (dF/dX): the change in the probability for an infinitesimal change in each variable
CBS, Labor Force Surveys, Israel, 2000 to 2002
Dependent variable: Bus driver (0, 1)

	Population					
	All			Drivers		
Variables						
(1) Num. of suicide bomber events carried out on buses this quarter	**-0.002** (0.001)		**-0.002** (0.001)	**-0.098** (0.033)		**-0.122** (0.048)
(2) Num. of suicide bomber events carried out NOT on buses this quarter		**-0.001** (0.001)			**-0.020** (0.014)	
Time Trend / Aggregates:						
(3) Number of buses in the public transporation ^			0.000 (0.007)			-0.149 (0.242)
Personal characteristics:						
(4) Years of schooling completed	-0.001 (0.000)	-0.001 (0.000)	-0.001 (0.000)	0.022 (0.007)	0.024 (0.008)	0.022 (0.007)
(5) Observations	37482	37482	37482	885	885	885
(6) Observed Probability	0.009	0.009	0.009	0.152	0.152	0.152
(7) Predicted Probability at X bar	0.007	0.007	0.007	0.132	0.135	0.132
(8) Pseudo R-Square	0.059	0.059	0.059	0.076	0.063	0.077
(9) % effect of suicide bomber attacks at X bar (1)/(7)	-0.287	-0.122	-0.282	-0.744	-0.151	-0.929

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002
* The sample excludes (i) Israeli Arabs and (ii) workers in rural areas
Workers are those who report being employed during the week of interview
^ Suicide bomber attacks carried out on buses = the average number of suicide bomber attacks carried out on buses during the quarter

Table ISR.9:
The Fraction of Protective Workers in the Israeli Labor Force*
Israel, 2000 through 2002
Israeli CBS Labor Surveys

	All		Workers aged 22 to 65	
Fraction of:		**Aged 22 to 65**	**All**	**Male**
Fraction of labor force	1.3	1.7	2.5	4.1
Among them:				
Male	88.4	90.0	90.0	--
Female	11.6	10.0	10.0	--
Protective Workers in the Israel:				
Police and detectives (Public^)	26.0	28.1	27.1	25.7
Firefighters (Public^)	0.8	0.9	0.8	0.9
Prison guards (Public^)	0.4	0.4	0.5	0.5
Other protective workers (Private^^)	41.1	40.3	39.0	38.0
Watchpersons (Private^^)	31.8	30.4	32.6	34.9

Notes:
* Based on Israeli Central Beaureu of Statistics Labor Surveys for the years 2000 to 2002
Labor force does not include slodiers serving in the Israeli army (IDF)
^ Public: most of the employers, including the top largest one, calssified as public sector according to economic branch (3 digits)
^^ Private: most of the employers, including the top largest one, calssified as private sector according to economic branch (3 digits)

Table ISR.10:
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers to be Employed as Policemen or Security Guards*
Israel, 2000 to 2002
CBS, Labor Force Surveys

Variables	All (i)	Public Sector (ii)	Private Sector (iii)
(1) The average number of suicide bomber attacks	0.0015	-0.0007	0.0023
	(0.0007)	(0.0003)	(0.0006)
Personal characteristics:			
(2) Jew	0.0184	0.0031	0.0137
	(0.0017)	(0.0007)	(0.0014)
(3) School years completed	-0.0004	0.0000	-0.0004
	(0.0002)	(0.0001)	(0.0001)
(4) Age	-0.0042	0.0027	-0.0047
	(0.0004)	(0.0002)	(0.0003)
(5) Age square	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)
(6) Observations	52012	52012	52012
(7) Observed Probability	0.0400	0.0117	0.0283
(8) Predicted Probability at X bar	0.0370	0.0073	0.0252
(9) Pseudo R-Square	0.0243	0.045	0.0331
(10) The % effect of suicide bomber attacks at X bar (1) / (10)	3.9%	-9.0%	9.1%

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002
* The sample excludes workers in rural areas
Workers are those who report being employed during the week of interview
( ) Robust standard errors in parenthesis

Table ISR.11:
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers to be Employed as Policemen or Security Guards*
Dprobit Estimators (dF/dX): the change in the probability for an infinitesimal change in each X var
CBS, Labor Force Surveys, Israel, 2000 to 2002
Dependent variable: working as a policeman or a private security guard (0,1)

Variables	All		Public Sector		Private Sector	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
(1) Suicide bomber attacks^	**0.0020**	**0.0072**	**-0.0001**	**-0.0008**	**0.0018**	**0.0070**
	(0.0009)	(0.0038)	(0.0004)	(0.0015)	(0.0007)	(0.0029)
(2) Killed^^		-0.0004		0.0000		-0.0003
		(0.0003)		(0.0001)		(0.0002)
(3) No of events^^^		0.0001		0.0003		-0.0002
		(0.0006)		(0.0002)		(0.0004)
Personal characteristics:						
(4) Jew	0.0105	0.0105	0.0000	0.0000	0.0090	0.0090
	(0.0027)	(0.0027)	(0.0013)	(0.0013)	(0.0019)	(0.0019)
(5) School years completed	-0.0015	-0.0015	0.0002	0.0002	-0.0017	-0.0017
	(0.0003)	(0.0003)	(0.0001)	(0.0001)	(0.0003)	(0.0003)
(6) Yeshiva^^^^	-0.0231	-0.0231	-0.0061	-0.0060	-0.0104	-0.0103
	(0.0055)	(0.0055)	(0.0008)	(0.0008)	(0.0058)	(0.0058)
(7) Age	-0.0029	-0.0029	0.0013	0.0013	-0.0025	-0.0025
	(0.0005)	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
(8) Age square	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
(9) Married	-0.0204	-0.0204	0.0037	0.0037	-0.0284	-0.0284
	(0.0029)	(0.0029)	(0.0008)	(0.0008)	(0.0027)	(0.0027)
(10) Recent immigrant^^^^^	0.0087	0.0087	-0.0062	-0.0062	0.0132	0.0133
	(0.0041)	(0.0041)	(0.0010)	(0.0010)	(0.0035)	(0.0035)
(11) Observations	37482	37482	37482	37482	37482	37482
(12) Observed Probability	0.0389	0.0389	0.0107	0.0107	0.0283	0.0283
(13) Predicted Probability at X bar	0.0342	0.0342	0.0063	0.0063	0.0214	0.0214
(14) Pseudo R-Square	0.0399	0.0401	0.0641	0.0647	0.0748	0.0752
(15) % effect of suicide bomber attacks at X bar (1) / (10)	5.8%	21.1%	-1.7%	-12.0%	8.6%	32.5%

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002
* The sample excludes (i) Israeli Arabs and (ii) workers in rural areas
Workers are those who report being employed during the week of interview
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Killed = the number of Israeli killed by terror during the current quarter
^^^ Number of terror events is the total number of terror events during the quarter
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.12:
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers to be Employed as a Security Guards* by Employment Status at the Previous Quarter
Dprobit Estimators (dF/dX): the change in the probability for an infinitesimal change in each variable
CBS, Labor Force Surveys, Israel, 2000 to 2002
Dependent variable: working as a private security guard (0,1)

Variables	Employment last quarter	
	Yes	No
	(i)	(ii)
(1) Suicide bomber attacks^	**0.0010**	**0.0152**
	(0.0008)	(0.0040)
Personal characteristics:		
(2) Jew	0.0070	0.0233
	(0.0022)	(0.0120)
(3) School years completed	-0.0014	-0.0011
	(0.0003)	(0.0010)
(4) Yeshiva^^^^	-0.0026	--
	(0.0081)	
(5) Age	-0.0025	0.0056
	(0.0004)	(0.0020)
(6) Age square	0.0000	-0.0001
	(0.0000)	(0.0000)
(7) Married	-0.0254	-0.0400
	(0.0034)	(0.0130)
(8) Recent immigrant^^^^^	0.0142	0.0122
	(0.0043)	(0.0210)
(9) Observations	23445	2347
(10) Observed Probability	0.0225	0.0682
(11) Predicted Probability at X bar	0.0166	0.0610
(12) Pseudo R-Square	0.0399	0.0423
(13) % effect of suicide bomber attacks at X bar (1) / (10)	5.8%	24.9%

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002
* The sample excludes (i) Israeli Arabs and (ii) workers in rural areas
Workers are those who report being employed during the week of interview
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Killed = the number of Israeli killed by terror during the current quarter
^^^ Number of terror events is the total number of terror events during the quarter
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.13:
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers to be Employed as a Security Guards* by for Recent Immigrants and Veteran Israelies
Dprobit Estimators (dF/dX): the change in the probability for an infinitesimal change in each variable X
CBS, Labor Force Surveys, Israel, 2000 to 2002
Dependent variable: working as a private security guard (0,1)

Variables	Veteran Israelies	Recent Immigrants
	(i)	(ii)
(1) Suicide bomber attacks^	**0.0014**	**-0.0005**
	(0.0008)	(0.0027)
(2) Suicide bomber attacks last quarter^	**0.0003**	**0.0060**
	(0.0007)	(0.0023)
Personal characteristics:		
(3) Jew	0.0122	0.0013
	(0.0018)	(0.0061)
(4) School years completed	-0.0022	-0.0003
	(0.0003)	(0.0008)
(5) Yeshiva^^^^	-0.0071	--
	(0.0056)	
(6) Age	-0.0021	-0.0050
	(0.0003)	(0.0011)
(7) Age square	0.0000	0.0001
	(0.0000)	(0.0000)
(8) Married	-0.0204	-0.0626
	(0.0027)	(0.0088)
(9) Observations	30469	6993
(10) Observed Probability	0.0234	0.0485
(11) Predicted Probability at X bar	0.0178	0.0396
(12) Pseudo R-Square	0.067	0.0722
(13) % effect of suicide bomber attacks at X bar (2) / (10)	1.4%	15.1%

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002
* The sample excludes (i) Israeli Arabs and (ii) workers in rural areas
Workers are those who report being employed during the week of interview
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Killed = the number of Israeli killed by terror during the current quarter
^^^ Number of terror events is the total number of terror events during the quarter
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1989
( ) Robust standard errors in parenthesis

Table ISR.14:
The Effect of Suicide Bomber Attacks on the Wages of Public and Private Secuirity Guards
Matched Income and Labor Force Surveys, Israel, 2000 to 2002 *, **
Dependent variable: (log) Hourly Wage ***

Variables	(i)	(ii)
Police^	-0.020	-0.007
	(0.074)	(0.070)
Private security guard^^	-0.357	-0.390
	(0.059)	(0.054)
The effect of suicide bomber attacks:		
(1) Num. of suicide bomber events carried out on buses this quarter^^^ (SBB t)	-0.008	
	(0.009)	
Num. of suicide bomber events carried out on buses last quarter (SBB t-1)		0.014
		(0.009)
Interactions:		
(2) SBB t * Police	**0.027**	
	(0.047)	
SBB t-1 * Police		**0.015**
		(0.047)
SBB t * Private security guard	**-0.011**	
	(0.034)	
SBB t-1 * Private security guard		**0.017**
		(0.032)
Personal Characteristics:		
Years of schooling completed	0.076	0.076
	(0.002)	(0.002)
Yeshiva (last school)	-0.051	-0.051
	(0.020)	(0.020)
Immigrated to Israel after 1988	-0.425	-0.425
	(0.023)	(0.023)
Quarter fixed effect	Yes	Yes
Observations	5633	5633
Adj. R-square	0.325	0.325

Notes:
Based on the Israeli Income and Labor Force Surveys for the years 2000 through 2002
* For reasons of privacy the Israeli CBS excludes income data from the Labor Force surveys.
Income data is provided in a separate file known as the Income Survey.
Personal (or household) IDs were scrambled to avoid the (easy) possibility of merging back these files.
Using personal characteristics available in both files we were able to match observations from both files.
** The sample excludes (i) Israeli Arabs, (ii) workers who earn less then 1500 NIS (less than 1/2 of minimum wage)
(iii) workers who work less than 10 hours a week
*** All specifications include experience and experience square, origin related dummies and marital status
^ Police =
^^ Private security guard=
^^^ Suicide bomber attacks carried out on buses = the average of suicide bomber attacks carried out on buses in the quarter
( ) Standard errors in parenthesis

Table ISR.15
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers to be Employed as Bus Drivers
Dprobit Estimators (dF/dX): the change in the probability for an infinitesimal change in each variable
CBS, Labor Force Surveys, Israel, 2000 to 2002
Dependent variable: Bus Driver (0, 1)

	All ^	Worked two quarters ago		
		All	Drivers	Bus and Taxi Drivers
Variables	**(i)**	**(ii)**	**(iii)**	**(iv)**
(1) Num. of suicide bomber events carried out on buses this quarter	**-0.004**	**-0.002**	**-0.117**	**-0.213**
	(0.001)	(0.001)	(0.037)	(0.095)
Interactions:				
(2) Num. of suicide bomber events carried out on buses * Bus driver (t-2)	**0.024**	**0.009**	**0.174**	**0.349**
	(0.001)	(0.001)	(0.037)	(0.095)
Overall effect on bus drivers:				
(1) + (2)	0.021	0.007	0.057	0.136
(3) Prob > chi2	(0.000)	(0.003)	(0.297)	(0.149)
Time Trend / Aggregates:				
(4) Number of buses in the public transporation **	0.002	0.002	-0.070	0.072
	(0.006)	(0.006)	(0.194)	(0.406)
Personal characteristics:				
(5) Bus driver 2 quarters ago	0.501	0.600	0.670	0.731
	(0.077)	(0.069)	(0.061)	(0.058)
(6) Years of schooling completed	0.000	0.000	0.005	0.013
	(0.000)	(0.000)	(0.005)	(0.015)
(7) Observations	25848	13723	885	335
(8) Observed Probability	0.009	0.010	0.152	0.342
(9) Predicted Probability at X bar	0.002	0.001	0.048	0.077
(10) Pseudo R-Square	0.565	0.700	0.639	0.756
(11) % effect of suicide bomber attacks at X bar (3)/(9)	-1.889	-1.810	-2.428	-2.748

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002

* The sample excludes (i) Israeli Arabs and (ii) workers in rural areas
  Workers are those who report being employed during the week of interview
^ Suicide bomber attacks carried out on buses = the average number of suicide bomber attacks carried out on buses during the quarter
** times 1000

Table ISR.16:
The Effect of Suicide Bomber Attacks on the Likelihood of Male Workers
to be Employed as Private Security Guards
Dprobit Estimators (dF/dX): the change in the probability for an infinitesimal change in each variable$
CBS, Labor Force Surveys, Israel, 2000 to 2002*
Dependent variable: working as a private security guard (0,1)

	All	**Worked 2 quarters ago**
Variables	**(i)**	**(ii)**
(1) Suicide bomber attacks^	**0.002**	**0.001**
	(0.0007)	(0.0006)
Interactions:		
(2) Num. of suicide bomber events * P. Security Guard (t-2)	**0.0021**	**0.0001**
	(0.003)	(0.001)
Personal characteristics:		
(3) Jew	0.0076	0.0006
	(0.0018)	(0.0021)
(4) School years completed	-0.0014	-0.0004
	(0.0002)	(0.0002)
(5) Married	-0.0237	-0.0054
	(0.0025)	(0.0024)
(6) Observations	37482	13528
(7) Observed Probability	0.0283	0.0175
(8) Predicted Probability at X bar	0.0190	0.0053
(9) Pseudo R-Square	0.1517	0.5036
(10) % effect of suicide bomber attacks at X bar (2) / (8)	11.3%	2.6%

Notes:
Based on the Israeli Labor Force Surveys for the years 2000 through 2002
* The sample excludes (i) Israeli Arabs and (ii) workers in rural areas
Workers are those who report being employed during the week of interview
^ Suicide bomber attacks = the average number of suicide bomber attacks
$ All specifications include age, age square, origin dummies, fixed effects for recent immigrants and dummy for "Yeshiva"
( ) Robust standard errors in parenthesis

Table ISR.17:
The Effect of Suicide Bomber Attacks Carried Out on Buses on the Use of Public Bus Transportation
Family Expenditure Surveys, 1999 through 2002
Dependent variable: family expenditures (in logs) on public bus rides

Variables	Location: All (i)	All (ii)	Metro Cities(&) (iii)	Metro Cities(&) (iv)	Others(&&) (v)	Others(&&) (vi)
(1) Suicide bomber attacks curried out on a bus^	**-0.310**		**-0.427**		**-0.065**	
	(0.108)**		**(0.120)****		**(0.231)**	
(2) Suicide bomber attacks curried out not on a bus^		-0.069		-0.069		-0.125
		(0.046)		(0.046)		(0.099)
Personal characteristics:						
(3) School years completed	0.088	0.088	0.052	0.088	0.133	0.134
	(0.016)**	(0.016)**	(0.018)**	(0.016)**	(0.034)**	(0.034)**
(4) Income (in logs)^^	-1.336	-1.337	-1.505	-1.337	-1.102	-1.099
	-(0.101)**	(0.101)**	(0.114)**	(0.101)**	(0.222)**	(0.222)**
(5) Age^^^	0.035	0.035	0.023	0.035	0.073	0.073
	(0.004)**	(0.005)**	(0.005)**	(0.005)**	(0.011)**	(0.011)**
(6) Female^^^	0.311	0.298	0.082	0.298	0.668	0.672
	(0.124)*	(0.124)*	(0.137)	(0.124)*	(0.272)*	(0.271)*
(6) Family size	0.228	0.228	0.381	0.228	0.245	0.245
	(0.036)**	(0.035)**	(0.042)**	(0.035)**	(0.071)**	(0.071)**
(6) Recent immigrant^^^^^	1.328	1.342	0.805	1.342	2.388	2.375
	(0.153)**	(0.153)**	(0.162)**	(0.153)**	(0.390)**	(0.389)**
(7) Observations	9811	9811	6566	6566	3245	3245

Notes:
& Jerusalem, Tel-Aviv and Haifa.
&& All other locations
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Income = all source of income
^^^ Head's age / gender.
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.18:
The Effect of Suicide Bomber Attacks Carried Out on Buses on the Use of Taxi Services
Family Expenditure Surveys, 1999 through 2002
Dependent variable: family expenditures (in logs) on taxi services

Variables	Location: All (i)	Metro Cities(&) (ii)	Others(&&) (iii)
(1) Suicide bomber attacks curried out on a bus^	-0.085	0.758	-0.314
	(0.158)	(0.342)*	(0.179)
Personal characteristics:			
(2) School years completed	0.016	0.194	-0.062
	(0.023)	(0.045)**	(0.028)*
(3) Income (in logs)^^	-1.132	-1.072	-1.076
	(0.150)**	(0.283)**	(0.177)**
(4) Age^^^	-0.016	-0.019	-0.018
	(0.007)*	(0.014)	(0.008)*
(5) Female^^^	0.420	-0.129	0.592
	(0.183)*	(0.401)	(0.205)**
(6) Family size	0.107	0.036	0.130
	(0.052)*	(0.107)	(0.060)*
(7) Recent immigrant^^^^^	0.463	-0.428	0.777
	(0.227)*	(0.516)	(0.254)**
(8) Observations	9811	1898	7913

Notes:
& Jerusalem, Tel-Aviv and Haifa.
&& All other locations
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Income = all source of income
^^^ Head's age / gender.
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.19:
The Effect of Suicide Bomber Attacks Carried Out on Buses on the Use of Public Bus Transportation
Consumption by Daily Tickets Vs. Consumption by Multiple-Rides ticket or Monthly Passes
Family Expenditure Surveys, 1999 through 2002
Dependent variable: family expenditures (in logs) on public bus rides

Variables	Daily	Multiple-Rides / Monthly
	(i)	(ii)
(1) Suicide bomber attacks curried out on a bus^	-0.390	-0.007
	(0.125)**	(0.279)
Personal characteristics:		
(3) School years completed	0.032	0.115
	(0.019)	(0.044)**
(4) Income (in logs)^^	-1.462	-1.541
	(0.122)**	(0.279)**
(5) Age^^^	0.025	0.033
	(0.005)**	(0.013)*
(6) Female^^^	0.345	0.541
	(0.148)*	(0.338)
(6) Family size	0.300	0.883
	(0.044)**	(0.099)**
(6) Recent immigrant^^^^^	0.624	2.562
	(0.185)**	(0.409)**

Notes:
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Income = all source of income
^^^ Head's age / gender.
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.20:
The Effect of Suicide Bomber Attacks Carried Out on Buses on the Use of Public Bus Transportation
Daily Rides by Family Income
Family Expenditure Surveys, 1999 through 2002
Dependent variable: family expenditures (in logs) on public bus rides

Variables	Income level		
	All	5 to 10K	10 to 20K
	(i)	(ii)	(ii)
(1) Suicide bomber attacks curried out on a bus^	**-0.499**	**-0.552**	**-0.483**
	(0.171)**	(0.242)*	(0.241)*
Personal characteristics:			
(2) School years completed	0.005	-0.005	-0.014
	(0.029)	(0.041)	(0.040)
(3) Income (in logs)^^	-1.124	-0.917	-1.314
	(0.299)**	(0.546)	(0.650)*
(4) Age^^^	0.032	0.015	0.050
	(0.008)**	(0.012)	(0.013)**
(5) Female^^^	0.304	-0.283	0.807
	(0.205)	(0.294)	(0.288)**
(6) Family size	0.281	0.217	0.332
	(0.061)**	(0.086)*	(0.088)**
(7) Recent immigrant^^^^^	0.893	0.764	0.952
	(0.251)**	(0.343)*	(0.371)*
(8) Observations	4757	2209	2548

Notes:
& Jerusalem, Tel-Aviv and Haifa.
&& All other locations
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Income = all source of income
^^^ Head's age / gender.
^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.21:
The Effect of Terror Fatalities and Suicide Bomber Attacks Carried Out on Buses on Coffee Shops Consumption
Family Expenditure Surveys, 1999 through 2002
Dependent variable: family expenditures (in logs) in Coffee Shops

Variables	Location: All (i)	Metro Cities(&) (ii)	Others(&&) (iii)
(1) Suicide bomber attacks curried out on a bus^	0.076	0.276	-0.018
	(0.191)	(0.358)	(0.224)
(2) Fatalities^^	-0.011	-0.020	-0.008
	(0.005)*	(0.009)*	(0.005)
Personal characteristics:			
(3) School years completed	0.141	0.139	0.112
	(0.021)**	(0.037)**	(0.025)**
(4) Income (in logs)^^^	2.223	1.907	2.423
	(0.130)**	(0.216)**	(0.161)**
(5) Age^^^^	-0.066	-0.083	-0.058
	(0.006)**	(0.011)**	(0.007)**
(6) Female^^^^	0.355	0.558	0.301
	(0.152)*	(0.290)	(0.178)
(7) Family size	-0.717	-0.710	-0.630
	(0.049)**	(0.093)**	(0.058)**
(8) Recent immigrant^^^^^^	-1.386	-2.029	-1.037
	(0.216)**	(0.434)**	(0.249)**
(9) Observations	9811	1898	7913

Notes:
& Jerusalem, Tel-Aviv and Haifa.
&& All other locations
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Fatalities during the month
^^^ Income = all source of income
^^^^ Head's age / gender.
^^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table ISR.22:
The Effect of Suicide Bomber Attacks Carried Out NOT on Buses on Coffee Shops Consumption by Marital Status
Family Expenditure Surveys, 1999 through 2002
Dependent variable: family expenditures (in logs) in Coffee Shops

Variables	Marital Status			
	Married, no children		Singles	
	(i)	(ii)	(iii)	(iv)
(1) Suicide bomber attacks curried out on a bus^	-0.276 (0.081)**	-0.797 (0.364)*	0.035 (0.120)	0.356 (0.245)
Personal characteristics:				
(2) School years completed	0.111 (0.030)**	0.016 (0.155)	0.210 (0.046)**	0.063 (0.130)
(3) Income (in logs)^^^	3.060 (0.199)**	0.734 (0.606)	1.364 (0.261)**	-0.131 (0.462)
(4) Age^^^^	-0.056 (0.009)**	0.293 (0.129)*	-0.084 (0.012)**	0.220 (0.095)*
(5) Female^^^^	0.429 (0.224)	0.711 (0.849)	-0.236 (0.332)	1.106 (0.655)
(6) Family size	-0.517 (0.073)**		-0.185 (0.140)	
(7) Recent immigrant^^^^^^	-1.386 (0.319)**	-1.445 (1.171)	-1.705 (0.410)**	-1.779 (0.910)
Age	All	22-35	All	22-35
(8) Observations	6346	291	2070	327

Notes:
& Jerusalem, Tel-Aviv and Haifa.
&& All other locations
^ Suicide bomber attacks = the average number of suicide bomber attacks
^^ Fatalities during the month
^^^ Income = all source of income
^^^^ Head's age / gender.
^^^^^ Recent immigrant is a dummy variable which equals 1 if person immigrated to Israel since 1990
( ) Robust standard errors in parenthesis

Table FRC.1:
The Effect of Stock on Changes in the Demand for Quality
Source: Adda (2001)

Variable	Before Crisis	During Crisis
Stock [20%,40%]	**-0.410**	**1.89**
	(0.513)	(0.995)
Stock [40%,60%]	**0.280**	**1.92**
	(0.467)	(0.960)
Stock [60%,80%]	**-0.210**	**0.37**
	(0.420)	(0.925)

Notes:
Adda Jerome (2001):
Behavior Towards Health Risks: An Empirical Study Using the CJD Crisis as an Experiment"
Heteroscedastic corrected standard errors were computed.
Regression also controls for lagged changes in quality, region of living, size
of city, occupation, education, family size and income.