Lecture 20

Last week we showed that support for terrorism within a given country does not tend to come from the poorest people within the country.

But it could still be the case that terrorists tend to emerge more from relatively poor countries than from relatively rich countries.

Krueger pursues this possibility, using a data set for which each data point describes a pair of countries - one country in the pair is the target of terrorists and the other is the country from which the attacks on the target country originate.

For each pair of countries the dataset records the number of attacks by people from the originating country made on people from the target country - it also records information on each country alone and also on the pair.

The former type of information includes variables such as GDP per capita and population while the latter information is the volume of trade and the geographical distance between the two countries.

The following table summarizes results of a model that tries to explain the number of incidents based on the explanatory variables.

Table 2.4 Summary of Findings for Terrorism Determinants in 11,026 Pairs of Countries

	Origin country variables	Target country variables
1. GDP per capita	0	++
2. Greater civil liberties	– –	++
3. Lagged GDP growth (1990–96)	0	NA
4. Population	++	++
5. Volume of trade between countries	–	–
6. Geographic distance between countries	– –	– –
7. Literacy rate	0	NA
8. Religion of origin country	0	NA
9. Occupier	NA	++
10. Occupied	+	NA

Notes: ++ denotes a strong positive association; – – denotes a strong negative association; 0 denotes no association. A positive or negative association that is weak or particularly sensitive to the inclusion of other variables is indicated by a single plus or minus. The volume of trade and the distance between countries are variables that are specific to origin and target pairs. NA means not applicable or not a focus of the analysis. See Appendix 2.1 for an example of the underlying statistical model reflected in the table.

Here are some of the notable results from this analysis:

1. The economic characteristics of the origin countries (GDP per capita and the growth of GDP) do not seem to be associated with terrorist incidents but the richer the country the more it is targeted

2. More civil liberties in the origin country and less civil liberties in the target countries are associated with fewer terrorist incidents.

3. Greater population is associated with more terrorism.

4. More trade seems to be associated with less terrorism.

5. Greater distance between countries is associated with less terrorism between them.

6. Literacy does not seem to matter - this is the only variable connected directly with education.

7. Religion does not seem to matter.

8. Occupiers tend to get attacked and occupied countries seem to export terrorists.
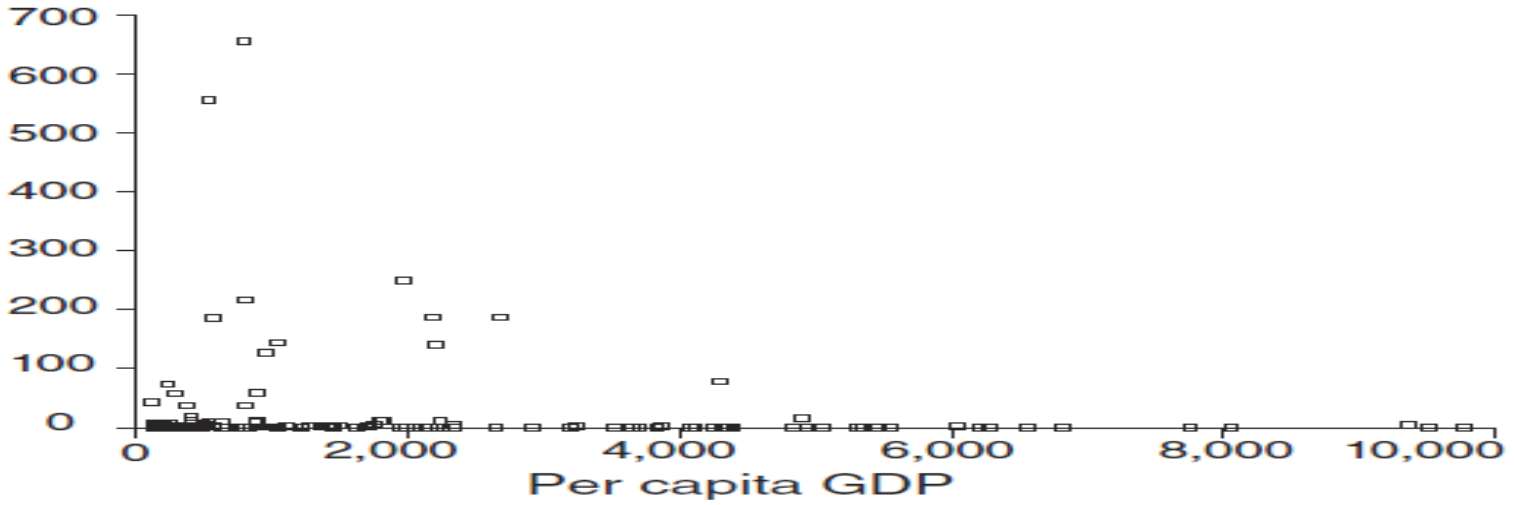
The Enders and Hoover (E & H) paper finds some evidence for a limited association between poverty and terrorism.

The paper has two main innovations:

1. E & H distinguish between domestic terrorism and international terrorism, estimating separate relationships for each. Specifically, they use the GTD database and classify as "domestic" the events for which the location, perpetrators and victims all have the same nationality. The categorize all the other events as "international".

2. E & H consider nonlinear relationships, i.e., they allow for the possibility that the risk of terrorism could be increasing with income within some ranges of income and decreasing with income within some other ranges.

The following slide shows what the E & H data look like.

Panel A. Domestic incidents

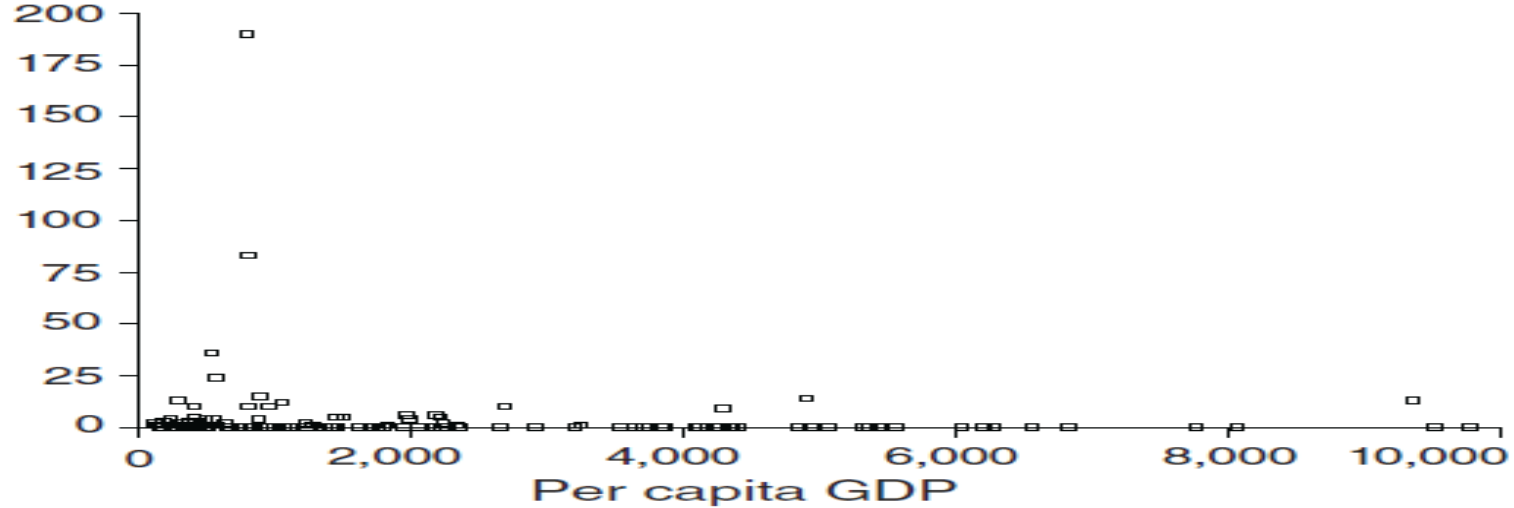## Panel B. Transnational incidents

FIGURE 1. DOMESTIC AND TRANSNATIONAL INCIDENTS VERSUS PER CAPITA GDP

It is clear that terrorism mostly affects that poorest countries – there is hardly any terrorism once you get past GDP of $5,000 per capita.

Moreover, the pictures are truncated at $10,000 since there is only very limited activity above that level.

There is a long, flat region beginning at $5,000 or even lower that will dominate any regression across the whole GDP range, making it pretty much impossible to find a statistically significant relationship between terrorism and GDP per capita extending over the whole GDP range.

Indeed, the estimated coefficients on the GDP variables are statistically insignificant in this equation:

$$(1) \quad \hat{T}_i = \exp[-4.77 + 0.59\ lgdp_i$$
$$(-1.01) \quad (0.43)$$

$$- 0.05\ (lgdp_i)^2 + 1.16\ lpop_i];$$
$$(-0.52) \quad\quad\quad\quad (8.44)$$

$$\eta = 2.56$$
$$(11.80),$$

where $\hat{T}_i$ = estimated number of domestic terrorist incidents, $lgdp$ = log of real per capita GDP, $lpop$ = log of population, η^2 = is the variance parameter of the negative binomial distribution, i is a country subscript, and the t-statistics (constructed using robust standard errors) are in parentheses.[2]

However, E & H then divide the countries into low and high income classes based on World Bank classifications and get significant coefficients on their GDP variables (those are now t statistics in parentheses):

$$(2) \quad \hat{T}_i = \exp[-1.49 - 0.62 \, lgdp_i$$
$$\quad\quad\quad (-1.02) \quad (-2.50)$$

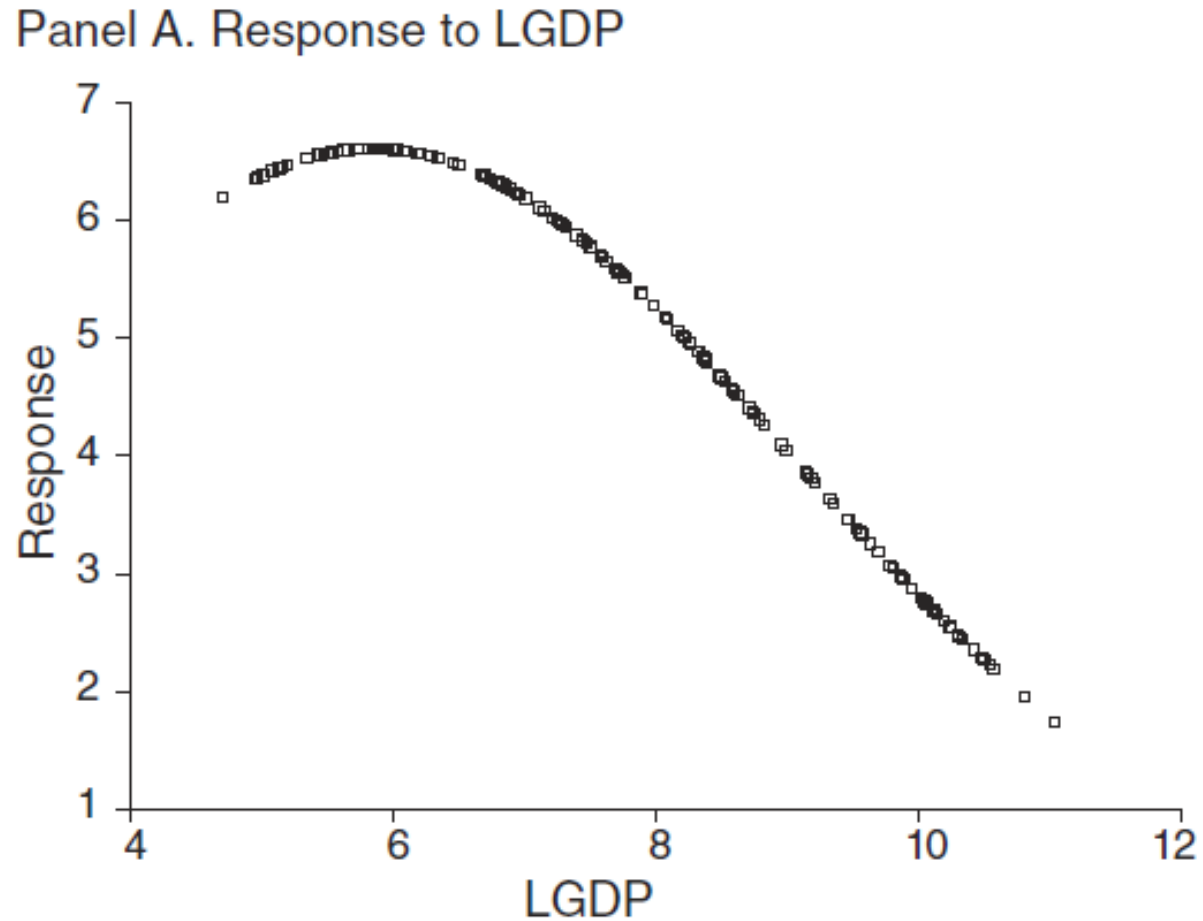$$+ \ 0.06 \, (lgdp_i)^2 + 1.15 \, lpop_i];$$
$$(2.31) \quad\quad\quad (6.74)$$

$$\eta = 2.08$$
$$(11.07),$$

and for those countries in the higher-income group

$$(3) \quad \hat{T}_i = \exp[-66.56 + 13.23 \, lgdp_i$$
$$\quad\quad\quad (-3.37) \quad\quad (3.01)$$

$$- \ 0.70 \, (lgdp_i)^2 + 1.43 \, lpop_i];$$
$$(-2.85) \quad\quad\quad\quad (4.78)$$

$$\eta = 4.31$$
$$(5.84).$$

E & H then smooth out the relationship between income and domestic terrorism, eliminating the sudden jump in coefficients after the arbitrary switch from the low-income to the high-income equation. They hold population constant at its mean and get this smooth curve:

Panel A. Response to LGDP

The graph on slide 11 increases very slightly at very low income levels and then drops sharply beginning at around $1,000 per capita.

Note that the graph is potentially confusing because E & H label the X axis in the [base e] logarithm of GDP rather than in natural units – so, for example, a GDP of $1,000 per capita corresponds to approximately 6.9 on the X axis.

The main point of the picture is that after you make the division into low and high income countries then it does start to look like poverty is associated with terrorism.

E & H also find that terrorist incidents are increasing in inequality as measured by [Gini coefficients](#):

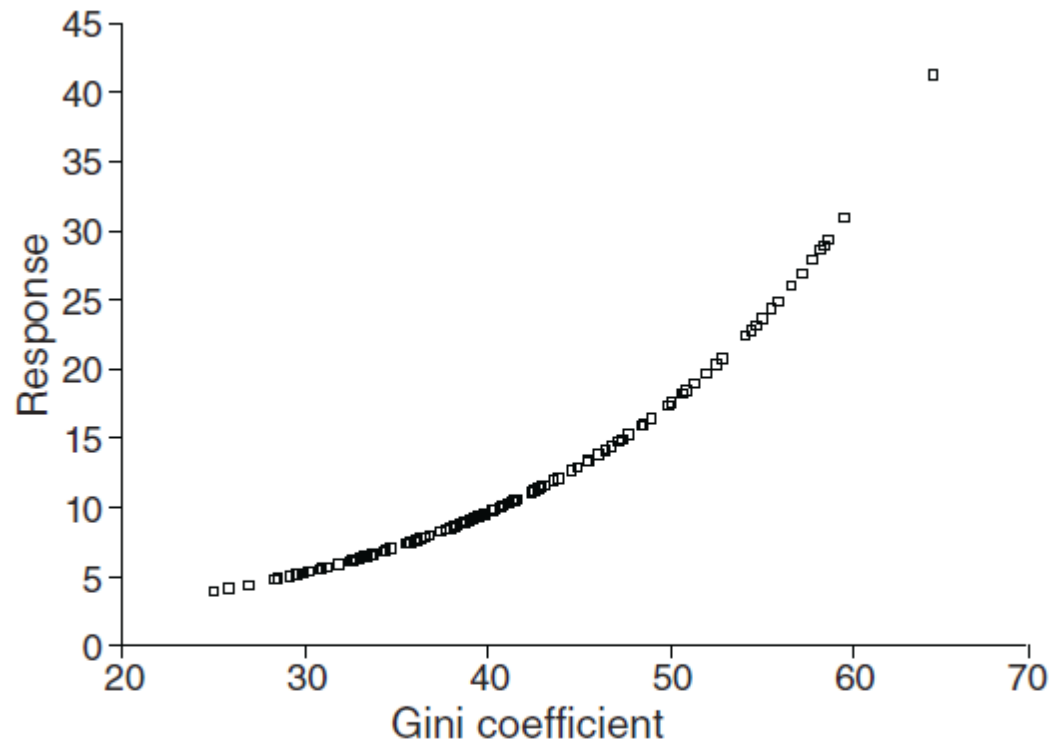Panel B. Response to income distribution

FIGURE 2. RESPONSE OF DOMESTIC TERRORISM TO REAL PER CAPITA GDP AND THE GINI COEFFICIENT

Here is the E & H picture for transnational terrorism:

FIGURE 3. RESPONSE OF TRANSNATIONAL TERRORISM TO REAL
PER CAPITA GDP

Economic Conditions and Suicide Terrorism

In lecture 19 and the beginning of this lecture we presented the views of Alan Krueger (and others) that poverty and low education are not risk factors for people becoming terrorists.

Yet [Ethan Bueno de Mesquita](#) suggests that economic conditions can still have an effect on how likely people are to turn to terrorism.

Let's briefly review his theoretical argument before moving on to the empirical evidence.

First rank all N people living in a country according to their suitability for use in a terrorist organization - imagine that these numbers are stamped onto the foreheads of all of the people on this list. :

1

2

3

4

.

.

.

.

.

.

N

Note that this ranking is likely to be positively correlated with peoples' education levels and wages in the legitimate economy.

Now suppose that the terrorist organization is not keen to expand too far since it is a secretive organization whose operatives might get exposed if there are too many of them – in particular, we assume that the terrorist organization has a target size and refuses to expand beyond this size.

Second, rank the same N people according to how inclined they are to join a terrorist organization (slide 19 below) - the strange numbers on this second list (below) are the numbers stamped onto the people from the first ranking only now these numbers don't progress from smallest to largest because we are ordering based on how much these people want to join the terrorist organization rather than based on how much the terrorist organization wants them to join.

In making this ranking we leave aside economic considerations.

So, for example, the first person on the second list is considered by the terrorist to be very incompetent for their purposes, i.e., he is low on the first list, but he is extremely keen to join, i.e., he is on the top of the second list.

The last person on the list is highly competent but is totally uninterested in joining.

13,974,365

165

5,426,496

6821

.

.

.

M(w)

.

.

.

200

Third, we account for economic conditions in the legal economy in a simplified way.

Summarize the state of the legal economy by the wage rate, "w" - when the economy is doing well then w is high and when the economy is doing poorly then w is low.

M(w) is defined as the marginal individual who is just willing to join the terrorist organization if asked - we assume that all individuals above M(w) on the list (slide 19) will also join if asked since they are even more inclined than M(w) to join.

As economic conditions improve, wages rise and M(w) rises, i.e., fewer and fewer people are willing to join the terrorist organization (take some time to think about this because these movements can be confusing).

However, the terrorist organization limits its expansion so when the economy is doing badly and wages are low the terrorist organization takes advantage of its improved recruiting pool by signing up better qualified people than it is able to do when economic conditions are good.

In other words, good economic conditions translate into relatively low average quality of terrorists and bad economic conditions translate into high average quality of terrorists.

That is the theory…..now for the empirical work by Benmelech et al..

Benmelech et al. have data on 157 Palestinian suicide terrorists:

Table 1

Summary Statistics on the Characteristics of Suicide Terrorists and their Attacks

	Number of Observations	Mean	Standard Deviation	Median	Minimum	Maximum
A. Characteristics of Suicide Terrorists						
Suicide Terrorist has Academic Education	157	0.197	0.399	0	0	1
Age of Suicide Terrorist	156	21.397	5.727	21	12	64
Suicide Terrorist Previously Involved in Terror	157	0.121	0.327	0	0	1
B. Characteristics of Targeted Locality						
Targeted Locality's Population above 50,000	157	0.745	0.437	1	0	1
Regional Capital	157	0.535	0.500	1	0	1
C. Logistics of Suicide Attack						
Distance Suicide Terrorist's Locality to Target (km)	156	26.607	22.768	23.230	0	142.4
Distance Terror Head Quarters to Target (km)	133	25.903	23.633	19.782	0	142.4
D. Outcome of Suicide Attack						
Caught Suicide Terrorist	157	0.248	0.433	0	0	1
Casualties from Suicide Attack	157	29.535	39.397	10	0	181

Notes: The summary statistics reflect authors' calculations based on Israeli Security Agency reports of suicide terrorists. The targeted cities population refers to their population within the metro area of the city according to the population figures for the year 2003 of the Israeli Central Bureau of Statistics.

"Academic education" here means at least some higher education.

19.7% in the sample have this, compared to only about 8% for the general population.

This is consistent with the Krueger perspective terrorist do not tend to be people with unusually low education levels.

Benmelech et al. use the variables in panel B as measures of the importance of the targets that are hit.

Note that the term "casualties" means killings plus injuries.

Next, Benmelech et al have survey data on economic and demographic characteristics of all the districts in the West Bank and Gaza Strip.

Table 2

Economic and Demographic Characteristics of Districts (Quarterly Averages)

	Mean	Standard Deviation	Median	Minimum	Maximum
Unemployment Rate	0.591	0.049	0.589	0.419	0.728
Group Specific Unemployment Rate	0.370	0.078	0.368	0.157	0.654
Income Inequality	1.099	0.208	1.080	0.596	1.679
Percentage Employed in Israel	0.051	0.043	0.044	0	0.207
Years of Schooling	9.203	0.513	9.234	7.431	10.346
Refugee Camp	0.170	0.178	0.112	0	0.696
West Bank	0.688	0.464	1	0	1
Age	33.633	0.968	33.660	31.133	35.804
Male	0.502	0.013	0.502	0.460	0.539
Married	0.572	0.031	0.573	0.496	0.659
Population Size (over 15 years old, hundreds)	1388	606	1446	200	3081

Notes: Entries in the table represent districts-quarters statistics of the respective variable. The number of observations equals 448 for all variables.
Data source: Palestinian Labor Force Survey of the West Bank and Gaza Strip between the years 2000 to 2006.

The unemployment rate is extremely high according to the table although we should be aware that the definition is non-standard.

This definition counts as unemployed anyone not working regardless of whether or not they are trying to work.

Note that there is also a variable for what they call a "Group Specific Unemployment Rate" which applies only to males aged 15 to 35.

139 out of the 157 suicide bombers in the data are in this age group.

Finally there are district-level data on measures taken by the Israeli security forces.

Table 3

Israeli Security Measures and Districts' Level of Violence

	Mean	Standard Deviation	Median	Minimum	Maximum
Palestinian Fatalities	8.732	14.210	4	0	121
Days with Curfew	3.889	12.413	0	0	89
Suicide Terrorists	0.348	0.914	0	0	8
Israeli Casualties from Suicide Terror Attacks	10.248	37.214	0	0	362

Notes: Entries in the table represent districts-quarters statistics of the respective variable. There are 304 observations for days with curfew and 448 observations for all the other variables. The data on the number of Palestinian fatalities was obtained from B'tselem. The data cover the years 2000 to 2006. The data on days with curfew was obtained from the U.N. office for the coordination of humanitarian affairs. The information for this variables is available only from May 2002 to December 2006. The data on the number of suicide terrorists and Israeli casualties from suicide terror attacks was obtained from reports of the Israeli Security Agency. These data cover the years 2000 to 2006.

The equations Bemmelech et al. estimate are of the form:

$$(Quality\ of\ Suicide\ Terrorism)_{i,t} = \alpha(Economic\ Variables)_{i,t\text{-}1} + \beta(Demographic\ Variables)_{i,t\text{-}1}$$

$$+ \gamma(Security\ Measures)_{i,t\text{-}1} + \varepsilon_{i,t} \qquad (1)$$

They use a variety of variables to proxy for quality beginning with characteristics of the individuals making the attacks (table 4), moving on to characteristics of the targets (table 5) and finally characteristics of the outcomes of the attacks (table 7).

It is important to understand here that the "i's" in this equation refer to the individual terrorists on the left-hand side of the equation.

Then, somewhat confusingly, the i's on the right-hand side refer to the districts from which the individual terrorists come.

So, for example, when quality is measured by whether or not a suicide terrorist has some university education ("1" for yes and "0" for no) then the unemployment rate pertaining to each suicide terrorist will be the unemployment rate in the district that terrorist comes from (one period before he/she actually attempts to strike).

The table on the next slide gives results on the relationship between economic conditions and the characteristics of suicide bombers.

Table 4

The Effect of Economic Conditions on the Characteristics of Suicide Terrorists

Dependent Variable	A. Education of Suicide Terrorist			B. Age of Suicide Terrorist			C. Suicide Terrorist Previously Involved in Terror		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Unemployment Rate	1.056 [0.827]	1.372 *** [0.146]	0.613 *** [0.137]	0.660 *** [0.047]	0.616 ** [0.308]	0.316 [0.661]	1.530 *** [0.062]	0.806 ** [0.407]	0.496 *** [0.248]
Palestinian Fatalities	-0.002 *** [0.001]	-0.003 [0.002]	-0.005 [0.004]	-0.003 *** [0.001]	-0.003 [0.003]	-0.004 [0.004]	-0.0002 [0.002]	-0.0002 [0.002]	0.0005 [0.001]
Days with Curfews			0.002 [0.002]			0.004 * [0.002]			-0.0003 [0.0005]
Group Specific Unemployment Rate	1.419 *** [0.260]	1.760 *** [0.017]	1.593 *** [0.478]	0.239 [0.565]	0.632 *** [0.208]	0.169 [0.268]	0.217 [0.352]	0.452 *** [0.125]	-0.085 [0.157]
Palestinian Fatalities	-0.002 * [0.001]	-0.003 * [0.001]	-0.002 [0.005]	-0.003 *** [0.001]	-0.003 [0.003]	-0.002 [0.002]	0.0000 [0.002]	0.0001 [0.002]	0.0007 [0.001]
Days with Curfews			0.000 [0.003]			0.002 *** [0.000]			-0.000 [0.001]
Income Inequality	-0.174 *** [0.046]	-0.159 [0.375]	0.262 [0.293]	0.756 *** [0.038]	0.474 *** [0.014]	0.706 ** [0.346]	0.502 *** [0.182]	0.566 ** [0.251]	0.219 *** [0.043]
Palestinian Fatalities	-0.002 *** [0.000]	-0.003 [0.002]	-0.004 * [0.002]	-0.002 ** [0.001]	-0.002 [0.003]	-0.003 * [0.002]	0.001 [0.001]	0.001 *** [0.000]	0.001 [0.001]
Days with Curfews			0.002 [0.002]			0.003 ** [0.001]			0.0002 [0.001]
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	156	141	64	143	143	74	156	143	79

Notes: Each column reports the estimated marginal effects of a separate Probit regression model in which the dependent variable is an indicator of the education of suicide terrorists, an indicator of their age, and an indicator of their experience. In addition to the explanatory variables listed on the left, regressions in Columns 1, 4, and 7 add each district average years of education, population size over the age of 15, proportion of males, married, proportion living in a refugee camp and whether the district is in the West Bank as explanatory variables. We subsequently add to these regressions years fixed effects (regressions in Columns 2, 5 and 8) and days with curfews (regressions in Columns 3, 6 and 9). Robust standard errors (adjusted for clustering at the regional level) are in parentheses. *, **, *** denote statistically significance at the 10, 5 and 1 percent level respectively.

The right-hand-side variables in these estimations are all meant to be measures of the quality of the suicide terrorists themselves - either they have some higher education (panel A), they are a bit older, hence more mature (panel B) or they have some previous experience (panel C).

Probably the most striking result in the table is that at least one of the unemployment variables comes out positive and significant except in specification 6 - also, economic inequality is positive and significant in most specifications.

These findings are consistent with the Bueno de Mesquita idea that terrorist organizations can recruit better people when economic conditions are bad.

The next slide gives results on the relationship between economic conditions and the characteristics of suicide attack targets.

The Effect of Economic Conditions on the Characteristics of Targeted Cities

	Targeted City Population			Regional Capital		
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	1.116 [1.517]	2.259 *** [0.202]	2.728 [3.569]	1.914 [2.003]	0.010 [1.076]	1.316 *** [0.279]
Palestinian Fatalities	-0.003 *** [0.000]	-0.002 *** [0.000]	-0.002 [0.002]	0.000 [0.001]	0.001 [0.001]	-0.002 [0.001]
Days with Curfews			-0.001 [0.002]			0.005 ** [0.002]
Group Specific Unemployment Rate	0.470 [0.562]	0.773 *** [0.047]	0.092 [0.334]	0.463 [0.943]	-0.022 [0.811]	3.716 * [2.109]
Palestinian Fatalities	-0.003 *** [0.000]	-0.002 *** [0.000]	-0.003 *** [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.003]
Days with Curfews			0.0004 [0.000]			0.005 ** [0.001]
Income Inequality	0.789 *** [0.276]	0.829 *** [0.230]	1.866 *** [0.504]	1.494 *** [0.177]	1.529 *** [0.360]	2.387 *** [0.345]
Palestinian Fatalities	-0.001 *** [0.000]	0.000 [0.000]	0.001 * [0.001]	0.004 *** [0.001]	0.005 *** [0.001]	0.005 [0.005]
Days with Curfews			-0.004 *** [0.000]			0.003 ** [0.004]
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	156	143	66	156	156	79

Notes: Each column reports the estimated marginal effects of a separate Probit regression model in which the dependent variable is an indicator of the targeted city population (equals one for cities with over 50,000 inhabitants) and whether the city is a regional capital. In addition to the explanatory variables listed on the left, regressions in Columns 1 and 4 add each district years of education, population size over the age of 15, proportion of males, married, proportion living in a refugee camp and whether the district is in the West Bank as explanatory variables. We subsequently add to these regressions years fixed effects (regressions in Columns 2 and 5) and days with curfews (regressions in Columns 3 and 6). Robust standard errors (adjusted for clustering at the regional level) are in parentheses. *, **, *** denote statistically significance at the 10, 5 and 1 percent level respectively.

For this table the concept of high target quality is that the cities that are hit are relatively large and/ or they are regional capitals.

Economic inequality always comes out positive and significant in these specifications while unemployment also comes out positive and significant in two of the six specifications.

The next slide gives results on the relationship between economic conditions and the outcomes of suicide attacks.

Table 7

The Effect of Economic Conditions on the Outcomes of Suicide Attacks

	Caught Suicide Bomber			Casualties from Suicide Attack		
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	-0.710 ***	0.606 **	1.516 ***	2.551 ***	0.259	-8.716 ***
	[0.279]	[0.296]	[0.183]	[0.349]	[0.316]	[0.233]
Palestinian Fatalities	0.006 ***	0.005 ***	0.010 ***	-0.007 ***	-0.003 ***	-0.006 **
	[0.001]	[0.000]	[0.002]	[0.002]	[0.001]	[0.003]
Days with Curfews			-0.002 *			0.004
			[0.001]			[0.004]
Group Specific Unemployment Rate	-0.385	-0.156 *	0.421	1.766 ***	0.747 *	-2.211 **
	[0.292]	[0.092]	[0.629]	[0.198]	[0.448]	[1.042]
Palestinian Fatalities	0.006 ***	0.005 ***	0.010 ***	-0.007 ***	-0.003 ***	-0.003 **
	[0.001]	[0.000]	[0.001]	[0.002]	[0.001]	[0.002]
Days with Curfews			-0.002 ***			0.002
			[0.001]			[0.006]
Income Inequality	-0.516 ***	-0.620 ***	-1.206 ***	0.638 ***	0.579 **	0.942 ***
	[0.059]	[0.195]	[0.121]	[0.154]	[0.296]	[0.032]
Palestinian Fatalities	0.005 ***	0.004 ***	0.007 ***	-0.005 *	-0.001	0.004
	[0.001]	[0.000]	[0.000]	[0.003]	[0.002]	[0.003]
Days with Curfews			-0.001 *			-0.002
			[0.001]			[0.005]
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	156	156	79	155	155	79

Notes: Each column reports the estimated effects of a separate regression in which the dependent variable is whether the suicide terrorist was caught (estimated using a Probit model), and the number of casualties from suicide attacks (estimated using a Poisson model). In addition to the explanatory variables listed on the left, regressions in Columns 1 and 4 add each district average years of education, population size over the age of 15, proportion of males, married, proportion living in a refugee camp and whether the district is in the West Bank as explanatory variables. We subsequently add to these regressions years fixed effects (regressions in Columns 2 and 5) and days with curfews (regressions in Columns 3 and 6). Robust standard errors (adjusted for clustering at the regional level) are in parentheses. *, **, *** denote statistically significance at the 10, 5 and 1 percent level respectively.

These results on the impact of the attacks are rather ambiguous.

At least one of the unemployment measures is always significant but the sign changes back and forth from positive to negative as we range across specifications so it is hard to know what we should conclude about this variable.

For example, specification 1 suggests that suicide bombers are less likely to get caught when unemployment rates are high while specifications 2 and 3 suggest exactly the opposite – high unemployment rates are associated with high probabilities of getting caught.

For economic inequality the story is much cleaner than it is for unemployment:

1. Greater inequality is associated with a lower probability of getting caught across all three specifications.

2. Greater inequality is associated with more casualties across all three specifications.

That said, unemployment is much more central to the Benmelech et al. story than is inequality so the table on slide 33 has to be regarded as a fairly big disappointment for Benmelech et al..

You could say that just one out of the three tables returns mixed results so most of the results are favorable to the Benmelech et al. theory.

But, really, this last table is the most important of the three because it evaluates the real end product of all the effort directed at producing "high quality" suicide attacks.

In other words, we could ask how happy should terrorist organizations really be during recessions?

Sure, these organizations may be able to recruit better qualified people who attack more important targets than less qualified people would have been able to attack – but if, in the end, these attacks do not do more damage than the attacks they launch when the economy is doing well then it is not clear that recessions really help these organizations all that much in the end.

Finally, it has been a pleasure and a privilege to teach all of you. Keep working hard and I will see you all at graduation!!