Effects of Terrorism on Labor Market: A Case Study of Iraq

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Abstract

This study provides empirical evidence on the economic consequences of terrorism on the labor market and labor force by looking at the case of Iraq. We develop a set of hypotheses from classical labor economic theory around the consumer maximization problem and propose a threshold for endangerment costs that, when reached, cause households to choose not working, and a smaller consumption, rather than work and face the danger of terrorism and violence. As such, we hypothesize that increased endangerment costs lead to fewer people working, less hours worked per week, lower wages, and less job permanence.

To the best of our knowledge, this might be the first study that empirically explores the economic consequences of terrorism on the labor market within a country facing insurgent and sectarian violence. Moreover, the analysis adopts a variety of labor market measures to provide an analysis of short and long run terrorism effects. Finally, the analysis expands on the previous literature to include not only a measure of the impact of own district terrorism, but also builds a geospatial variable to incorporate potential spillover effects of terrorism on neighboring governorates of Iraq. The analysis studies the effect of violence in Iraq on the labor force using a nationwide household socio-economic survey that was conducted at the household and individual level in 2007 by the Iraqi Organization for Statistics and Information Technology (COSIT), Kurdistan Regional Statistics Office (KRSO), and the World Bank. Briefly, our preliminary results show strong evidence in favor of each hypothesis.

1. Introduction

Since the terrorist attacks of 9/11 in the United States, there has been considerable speculation and research about the effect of terrorism. Much of this research has focused on psychological costs rather than direct economic impacts. For instance, it may be the case that terrorist attacks increase the cost of supplying labor. If this is true, one way to measure such a cost is to determine how the suppliers of labor react to endangerment. When economic costs are considered, the analysis is generally limited to the economic consequences of one or non-sequential terrorist attacks. This study addresses each of these limitations in the literature by looking at sequential attacks (monthly) for the year 2007 in Iraq and by providing several estimations of the labor supply's reaction to endangerment costs.

Iraq's economy has experienced a number of economic, psychological, sociological, and political shocks resulting from civil conflict and terrorism. Indeed, in recent years, Iraq has experienced an increasingly complex problem with terrorism as the Islamic State of Iraq and Syria (ISIS) has grown in influence. With this context, then, it is particularly interesting to understand a picture of terrorism in Iraq post-2003 invasion and pre-2011 rise of ISIS. As such, we have taken a 2007 survey dataset to explore the impact of terrorism in Iraq between the two above-mentioned time periods. The importance of this kind of research cannot be understated as the mechanisms through which terrorism impacts a society are still not clearly understood. In fact, from an economic perspective, many studies of terrorism focus on more advanced countries (Eckstein and Tsiddon 2004). Further, these studies often focus on macroeconomic questions, as we will discuss later. However, in Iraq, one of the major economic consequences of the conflict and subsequent terrorist activity has been the shocks to the labor supply. As such, this project can offer a unique

contribution to the literature using microeconomic data to understand terrorism's distortionary impact on the labor market. Additionally, understanding the impact of terrorist attacks on labor supply of countries under severe pressure from terrorism may provide future motivation for research into refugee crises and labor policies of destination countries. This would have policy implications for countries such as the United States that must make decisions about national security and immigration.

This study provides empirical evidence on the economic consequences of terrorism on the labor market and labor force by examining the effect of terrorism in Iraq on the labor supply measured by, employment status, hours worked, wages and job permeance. These contributions complement the work of (Khan and Estrada 2016) who look at the macroeconomic performance in Iraq as a result of terrorism and the rise of ISIS. Indeed, most of the influential studies, like the (Khan and Estrada 2016) paper cited above, tend to focus on the macroeconomic impacts or study the labor market using country-level data. There are relatively few empirical studies that analyze the effect of terrorism on the labor market using household-level data. This paper fills that gap in the literature by taking a newly available dataset that surveys at the household level. Work in this area will complement work done at the macroeconomic level and will demonstrate at a granular level the way in which terrorism acts as a shock to the labor supply. The conceptual framework draws on work done with data from Palestine and, as such, could provide important policy implications for a country facing a multifaceted economic crisis and severe political instability.

2. Literature Review

While there is a growing interest in understanding the impact of violent conflict on various economic indicators, particularly using a micro-level approach (Singh 2012), much of the research focuses on the effects of terrorism on macroeconomic variables. Within the macroeconomic

literature, there has been important work on topics that range from savings to the stock market (For

instance, see (P. Venieris and K. Gupta 1986); (Mauro 1995); (Alesina and Perotti 1996); (Abadie

and Gardeazabal 2003); (Eckstein and Tsiddon 2004); (Miguel, Satyanath and Sergenti

2004). When using data at a broader level, it can be difficult to find conclusive and consistent

results across studies. With this in mind, previous work that includes time-series and cross-country

studies has been inconclusive about the impact of terrorism on economic outcomes (Blomberg,

Hess and Weerapana 2004); (Crain and Crain 2006); (Gaibulloev and Sandler 2008); (Gries,

Krieger and Meierrieks 2011). Depending on the time span of the study, the impact of terrorism

may vary. Particularly when looking at long-run implications of terrorism, some authors have

found that the impact on economic outcomes may be negligible (Becker and Murphy 2001). This

may be due to variation in specifications, and the broad level of data may obscure important

relationships between terrorism and the economy.

When looking at specific parts of the economy, there are well-established links between

terrorism, acting as a negative shock, and a decrease in economic activity in a particular sector.

One sector that has been thoroughly studied has been tourism. Empirical work has shown that

terrorist attacks can have a significant negative effect on tourism (Drakos and Kutan 2003);

(Enders and Sandler 1991); (Enders, Sandler and Lapan 1991); (Greenbaum and Hultquist 2006).

(Drakos and Kutan 2003) show that terrorism even has spillover effects on surrounding countries'

level of tourism, which raises an important question to examine the labor market of governorates

in Iraq with own terrorist activity and spillover terrorist activity.

To think about the theoretical approach of this paper, there are two significant publications

that provide a foundation for this analysis ((Miaari and Sauer 2011) and (Benmelech, Claude and

F.Klor 2010). (Miaari and Sauer 2011) analyze the Israeli-Palestinian conflict to estimate a lower

bound of the labor market costs of political instability. Their conflict measures are the number of overseas foreign workers in the Israeli labor market and the frequency of closures of the West Bank of the Gaza strip. The primary focus of their analysis is the effect of conflict on two economic outcomes in the Palestinian labor force in Israel: The employment rates of the population and the monthly earnings. Using an instrumental variable (IV) approach, they found significant negative effects of the conflict on Palestinian employment. This paper looks at the same economic outcomes, in the Iraqi context, and adds a gendered component that examines specific ideas about how conflict is both a gendered experience and produces gendered outcomes.

Another publication that looks at the case of Palestine is (Benmelech, Claude and F.Klor 2010) They use the Palestinian Labor Force Survey to analyze the economic cost of terrorism on the perpetrators by estimating the effects of suicide terrorist attacks that are completed and the number of casualties from suicide attacks on unemployment and wages in the harboring district.

Their results provide empirical evidence of the high economic consequences in the harboring district as it increases the local unemployment rate and lowers the average wage in addition to lowering the percentage of the district's population working in Israel. This paper expands to include not only a measure of the impact of own district terrorism, but also builds a geospatial variable to incorporate potential spillover effects of terrorism in neighboring governorates of Iraq.

Our contribution to this ongoing literature is studying the effect of terrorism in Iraq on the labor force using several measures of the labor force: employment status, wages, hours worked per week and job performance. To do this, we use a nationwide household socio-economic survey conducted in 2007 by the Iraqi Organization for Statistics and Information Technology (COSIT), Kurdistan Regional Statistics Office (KRSO) and the World Bank. This data was only recently

released and thus is largely unexplored. Indeed, this paper is the first economic analysis that tries

to study the effect of insurgent and sectarian violence on the Iraqi labor supply with micro-level

data.

3. Iraq Labor Market Facts

Iraq is a country in the Middle East bordering the Persian Gulf. Neighboring countries

include Iran, Jordan, Kuwait, Saudi Arabia, Syria, and Turkey. Iran has a strategic location on the

Shatt al Arab waterway and at the head of the Persian Gulf. Two major rivers, the Tigris and

Euphrates, run through the center of Iraq, flowing from northwest to southeast. The government

system is a parliamentary democracy; the chief of state is the president, and the head of government

is the prime minister. Iraq has a mixed economic system which includes some private freedom,

combined with weak centralized economic planning and government regulation. Iraq is a member

of the League of Arab States.

Figure 1: Political Map of Iraq

Iraq, once a relatively skilled and economically prosperous society, has seen its development thwarted by decades of conflict and economic decline. Today it is an upper middle income, resource-rich, yet fragile and conflict-riven country. With years of government instability and a decade of war, Iraqi's have had to suffer through harsh economic woes. With the lack of infrastructure and only the very beginnings of a stable government, the average Iraqi has been affected by the economy the most. In this section we highlight some facts about Iraq's labor market.[1]

Iraq's economy is well known to be heavily dependent on the oil sector. Oil exports traditionally generated about 95% of foreign revenues. Despite this domination, petroleum industries do not create many job opportunities. Job-seeking Iraqis are dependent on public sector employment, or smaller private industries for work. Given this labor market structure, Iraq has seen a high level of unemployment. For the last decade, Iraq's unemployment has stayed alarmingly high. The year that saw the lowest year of unemployment occurred in 2014 when unemployment hit 15 percent. As of 2016, the unemployment in Iraq reached 16 percent (World Bank 2018).

In tandem with the unemployment rate, Iraq has seen a relatively low level of participation in its labor force. Indeed, the participation rate has been dropping since 2003. In 2016, the labor force participation rate was around 46%. This does vary somewhat across the country, with data from 2011 showing Anbar, Najaf, and Wassit governorates as having the highest labor force

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[1] It is should be noted that since 2003 Iraq economic statistic has been scarce to non-existent and there is some uncertainty regarding the labor market data. For this section we mainly depend on World Bank, International Labor Organization, the Iraq Statistical Agency, and the Iraqi Central Organization of Statistics and Information Technology data.

participation (between 47 to 48 percent), and Dahuk, Thi-Qar, and Muthanna the lowest rates (between 37 to 40 percent).

Noticeably, though, the participation rate for men and women has been moving in opposite directions. While men make up the majority of the workforce, the growth of women working has been significant. This can be seen in Figure 2, where the labor force participation rate for women in 1990 was around 5 percent, while it reached just over 14 percent in 2016.

Figure 2

Iraqi Female Labor Force Participation Rate
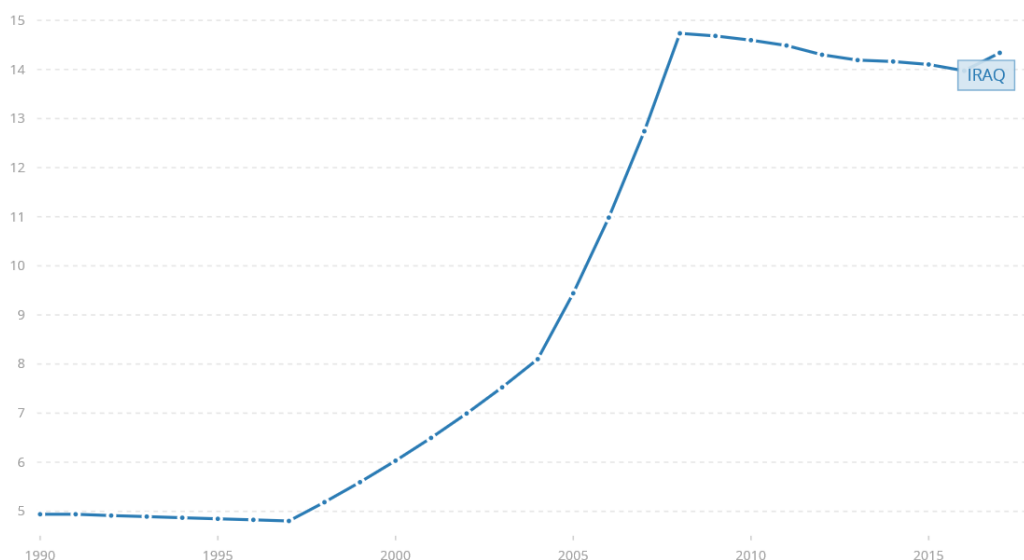
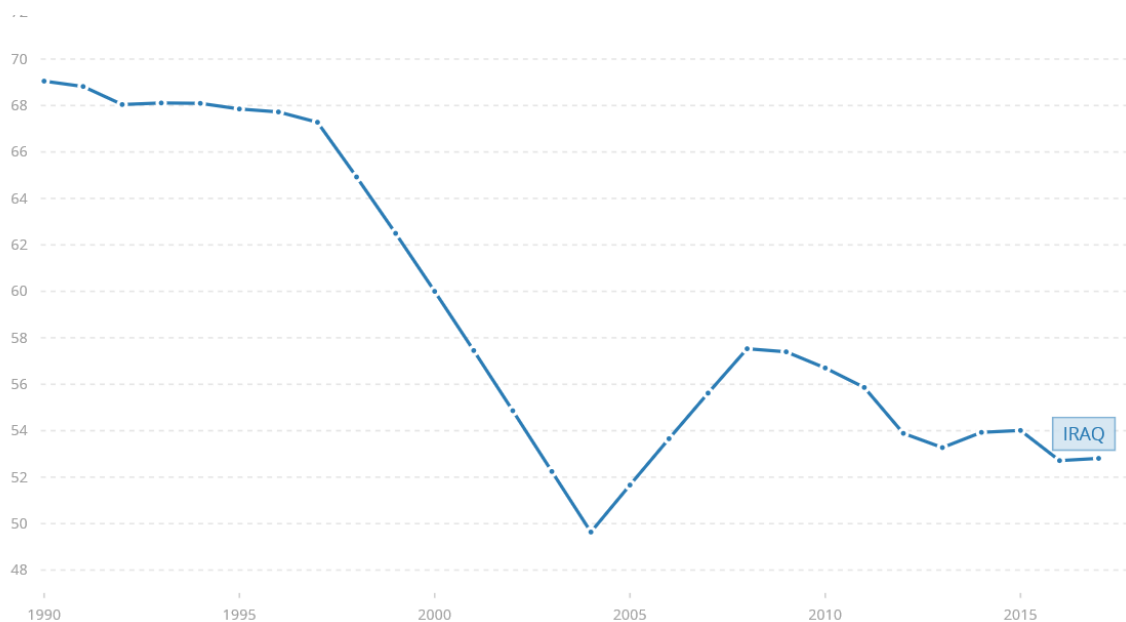Source: World Bank Open Data, 2018

Much of the cause for the particularly low numbers in the 1990s can be attributed to strict restrictions placed on women in the workforce in addition to culture restrictions. Women were pushed out of the workforce in order to make more room for men, particularly in government positions. Some of those more significant restrictions were relaxed with the fall of the Ba'ath party

in 2003, in addition to the mobilization of men due to participate in war and unsecure circumstances, we have seen the growth in women's workforce participation. Data show that women in Iraq tend to find work in the agriculture and services sectors. This is in contrast to men who tend to find opportunities in construction and security.

While women's participation is grown significantly in Iraq's workforce, men's participation has fallen slightly. Between 2002 and 2016, the male labor force participation rate dropped from 51% to 48%. This can be seen in Figure 3.

Figure 3

Iraqi Male Labor Force Participation Rate

Source: World Bank Open Data, 2018

Employment in the public sector represents approximately 42 percent of all jobs. Adding state-owned enterprise (SOE) employees would bring total employment in the public sector to 3.5

million, close to one-half of all jobs in the country. Relatively high public-sector wages and job security make other alternatives appear undesirable, leading to subdued private sector job growth. In the public sector, the job distribution is highly affected by the conflict and security-related employment is large as a share of the total, out of 2.9 million public employees, 46 percent are employed in civilian ministries, 30 percent work for the defense and interior ministries (in both civilian and armed positions), and the remaining 24 percent were unclassified.

Like many of its Middle Eastern peers, Iraq has a demographic that skews young. According to the world bank, 56% of the Iraqi population is under 24 years of age, and the median age is a mere 21 years. While a large proportion of Iraq's population today is children, in a few years, the country will be well-equipped with a sizable labor force that will face a dark future considering the economic struggle of the country. 78.5 percent of the population is literate, and the majority of Iraqis go through at least 10 years of schooling. However, only one out of every ten Iraqis has at least a diploma, and the likelihood of being unemployed or underemployed in the country increases substantially without a degree.

Because the level of unemployment is high in the formal employment sector, many Iraqis are looking to develop skills that can help make them more competitive in the labor market. Often, Iraqis will look to the informal sector to try to develop skills that may help them find a job in the public or private sector. Indeed, it appears that informal employment will often fill the gaps where formal public and private employment cannot. Thus, the underground sector is a large employer of Iraqis and absorbs a good amount of the labor force.

Labor laws in Iraq are in place to protect a worker's rights to associate and bargain collectively, and prevent forced or compulsory labor, but these laws are seldom enforced. With the lack of formal employment opportunities and the prominence of unregulated and informal labor,

many work conditions go unsupervised and fall below satisfactory standards. Half of employed

Iraqis are unprotected, which means that they work without a contract, pension, and annual leave.

In a survey conducted by the National Democratic Institute in 2012, jobs were rated as the Iraqi

people's biggest priority, ahead of even basic services or security.

4. Conceptual Framework

This section provides a conceptual framework which we use to derive several testable

hypotheses. First, it is important to define the terrorism. We adopted the US State Department

definition of terrorism, contained in Title 22 of the United States Code, Section 2656f(d).

Accordingly, "The term 'terrorism' means premeditated, politically motivated violence

perpetrated against noncombatant targets by sub-national groups or clandestine agents, usually

intended to influence an audience." This definition clearly indicates that the terrorist attacks is both

random and exogenous.

Second, we explain the economic conceptual framework. Each individual in each Iraqi

governorate faces some random level of terrorism. In each period, the individual chooses whether

to supply labor or not, as measured either by the working variable we construct or by and allocation

of productive capital. The individual gains wages and faces costs, in particular the endangerment

costs imposed by terrorist activity. Based on the above, we assume the labor supply under terrorist

attacks follows a constrained maximization problem:

$$\text{Max } U(X) \text{ s.t.}$$
$$F = N + wT = pX + wL + wIc$$
$$c < \lambda$$

Here, $U(X)$ is the individual's utility function for consumption X. Let c denote the cost of

endangerment from terrorism whenever hours of work are positive. N is non-labor income, p is

the price of the consumption good X, w, the wage, is the implicit of leisure or commuting, I is an indicator function equal to 1 when c< λ and equal to 0 when c ≥ λ and F is full income.

If an agent from the individual chooses to work, they would undertake the cost of leisure and incur the endangerment cost from terrorism. If they choose not to work, or work less, they would gain more leisure time, but consumption would be lost. Thus, when maximizing utility, we can think about the intersection of two indirect utility curves, one from each of the above scenarios. If the endangerment cost increases, the indirect utility curve for choosing to work would shift down. Thus, an increase in endangerment cost could induce agents to choose not to work. Additionally, by using comparative statics, we would expect that an increase in endangerment costs would decrease the number of hours spent working. This would have an impact on wages, and we would expect wages to fall in areas where endangerment costs are higher. As such, we develop the four following hypotheses:

H1a: As endangerment costs increase, the marginal benefit of working decreases, so individuals choose to supply less labor.

H1b: The number of hours worked is inversely correlated with endangerment costs.

H1c: Individual wages will decrease as endangerment costs increase.

H1d: Job permanence will decline as endangerment costs increase.

5. Data and Statistical Summary

The data on the labor force, demographic, economic, political and socioeconomic measures are constructed using the Iraq Household Socioeconomic Survey. This survey, which is the first nationwide recently released household socio-economic survey, was conducted in 2007 by the Iraqi Organization for Statistics and Information Technology (COSIT), the Kurdistan Regional Statistics Office (KRSO) and the World Bank between Nov 2006 and Nov 2007. It contains data

at the household and individual level in 2007 and has a total effective sample size of 17,822 households. The data is divided into 56 strata where each governorate in Iraq comprises three sections: rural, urban and metropolitan. Only Baghdad is divided into three metropolitan strata. The response rate of the survey is 98 percent.

5.1.Dependent Variables

Using the survey data, we constructed several measures of labor supply to look at mechanisms by which terrorist activity can distort labor market outcomes. First, we construct a binary measure captures the employment status of the survey respondent to reflect whether the respondent worked during any month of 2007. Then, conditioning on the employment status we measure the labor supply using the number of hours worked by the respondent in the past seven days, the amount of the last paycheck, which is a combined measure using the amount last paid in cash and the amount last paid in-kind and the job permanence the summary statistics for these variables are included below in Table (1.1).

Table (1.1)

Descriptive Statistics for Iraq Labor Supply measures

| Variables	observation	Mean	Std. Dev.
Worked during any month of 2007 vs. not	1,526,412	0.227	0.416
Hours worked in past 7 days	127,307	13.2	30.63
Job permanence: Work permeant job with 30 hours a week vs. not	19,564	0.832	0.373
Log of the amount of last paycheck: cash +in-kind (1000 ID)	127,307	-5.30	0.680

According to table (1.1), 22% of the survey respondent were employed at any month of 2007. On average worked 13.2 hours a week and 83.2% of them working permanent job.

5.2. Main Regressors

To measure the level of terrorism in a particular governorate, we use data from the Iraqi Body

Count project (IBC). This data provides the number of terrorism incidents, which we use as a proxy

for the terrorist attacks following the previous literature. IBC compiles these statistics using press

reports to identify the incidents that kill non-combatants. They then document the number of deaths

and this has become a widely used measure which has been included in several papers that study

conflict in Iraq (e.g. Berman et al. (2011)). Additionally, from the IBC, we use a variable for the

number of non-combatant fatalities in a single incident within each governorate. This allows for

some proxy of severity of terrorism in particular regions that may have an impact on agent

decision-making processes. We believe that 2007 is a significant year to study because it was a

peak year for the level of terrorism. This can be seen in Figure 4 below.

Figure 4

Number of Terrorist Attacks by Month in Iraq
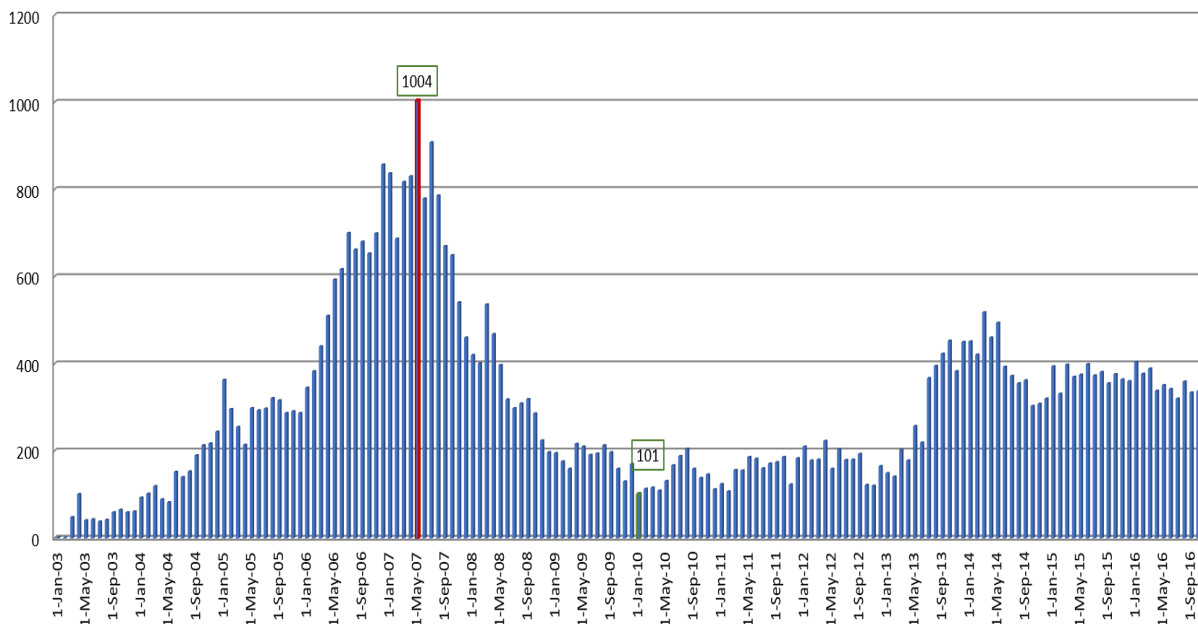
Source: Iraqi Body Counts Database, 2018

The descriptive statistics for the main regressors are listed in Table (1.2). This show, for instance, that the number of terrorist incidents increased year-on-year from 2004 to 2007. The average is calculated across eighteen governorates and there is significant variation between governorates that experience more violence and governorates that experience less violent governorates. The number of non-combatant Iraqi fatalities from terrorism attacks killed variable is also an average across the eighteen governorates. This variable takes the incident with the most casualties from each governorate to construct the data.

Table (1.2)

Descriptive Statistics for Main Regressors (Cross- Sectional Only)

Dependent Variables	Observation	Mean	Std. Dev.
Log of number of Terrorist Incidents in 2007	127,297	-4.81	2.10
Log of number of Terrorist Incidents in 2006	127,297	-4.72	2.04
Log of number of Terrorist Incidents in 2005	127,297	-3.99	1.81
Log of number of Terrorist Incidents in 2004	127,297	-3.50	1.81
Log of number of civilian fatalities in 2007	127,297	-4.97	2.24
Log of number of civilian fatalities in 2006	127,297	-5.03	2.17
Log of number of civilian fatalities in in 2005	127,297	-5.60	2.38
Log of number of civilian fatalities in 2004	127,297	-5.86	2.13

5.3. Control Factors

The control variables are taken from the Iraq Household Socioeconomic Survey, they are split into basic, socioeconomic, and political controls. The basic controls include: governorate, household size, age, sex, size of the governorate (taken from the Iraqi Census data of 2007) and marital status. The socioeconomic controls include: education which we proxy by the highest diploma attained, total household expenditure as proxy for poverty. In addition, we control for the migration effects using a variable that reflects whether the survey respondent born in governate x

or not. Finally, we control for political affiliation using overall voter turnout for the Iraqi 2005

parliament elections (taken from the ESOC – Iraq Civil War Dataset) These variables are

summarized in Table (1.3).

Table (1.3)

Descriptive Statistics for Control Factors

Variable	Observation	Mean	Std. Dev.
Household size	127,307	9.00	4.49
Sex	127,307	0.498	0.499
Age	127,292	22.81	18.39
Born in this governorate	127,291	1.06	0.245
Marital status	84,908	1.63	0.908
Economic sector	19,569	2.05	1.371
Highest diploma attained	52,494	4.54	2.067
Total expenditure (1,000 ID/ person/month) (defl. Paasche)	125,748	126.9	77.8
Percentage of voter turnout	127,307	76.7	9.84

6. Econometric Framework

In this section, we provide a justification for the use of the variables listed above. First,

the variables are described below, with justifications for each, and then each dataset is

considered, cross-sectional and panel data, along with the models employed for each.

6.1.1. Dependent Variables (Labor Supply Measures)

The dependent variables include whether the individual responding to the survey was employed

during 2007, the number of hours worked in the previous week, the job permanence of the

respondent, and the amount of the last payment. We explore these variables based on the different

data structure as following:

3.6.1.a. Cross-Sectional Survey Based

We look at the labor market in a slightly different way than the previous literature on that explore the conflict effects, using variables to examine the stability of the labor market, specifically hours worked per week, compensation, and job permanence. Here, our first variable is the hours worked during the past seven days. Because terrorism can cause disruptions in daily work patterns, this is an important measure of productivity shocks given that employees may not be able to get to work when terrorism is a more regular occurrence. To complement this measure, we also look at the amount of the last paycheck. In the survey data, in kind payments are a significant portion of the amount that is last paid to respondents, so we combine cash payments and in-kind payments to create a more complete measure of compensation.

Because individual decisions are budget-constrained, the consumer problem is significantly impacted by the amount of last compensation. Thus, we feel, from a theoretical perspective, that this particular measure of the labor market is an important indicator for disruptions caused by elevated levels of terrorism, and this is a particularly unique contribution to the literature. Conditioning on the employment status, the measure of job permanence allows this idea to be extended beyond the most recent employment level to look at decisions under a longer time horizon. This question asks respondents "How do you describe your work's continuity (how long it will last)?" Given that the household likely plans over longer periods of time, the impact of terrorism on individual employment stability can be a significant indicator to understand the kinds of problems faced by the survey respondents.

3.6.1.b. Panel-Survey Based

Using the panel dataset, we constructed a binary variable to capture the employment status of the survey respondent where if the respondent indicated they worked in any month of 2007, the

variable under consideration would receive 1 and if they did not work in any month, the variable

received a 0. For the panel dataset, we construct a time series for the 12 months of 2007. The

variable used is the binary from the respondents whether they worked in January or not, whether

they worked in February or not, and so forth. This is possible because each respondent is asked

"During which months did you do this work during the last 12 months" and the respondent puts

an "x" in each month in which they worked. Using the panel dataset, this allows us to examine

how employment changes over time with a sequential measure of terrorist activity (i.e. number

of terrorist attacks in each of those months).

6.2. Explanatory Variables

The main regressors we use proxy for the impact of terrorism on decisions made by the survey

respondents. First, we look at the number of terrorist attacks, and we take both a contemporaneous

and a lagged approach, using the number of incidents from 2007 (the same year as the survey), as

well as the number of terrorist incidents from 2004, 2005, and 2006. These variables are well

established measures of terrorism in the literature and we believe that the number of terrorist

attacks play a significant factor in the lives of individuals, given the increased coverage in the

press, potential for greater financial damage, and disruption to daily life in areas where terrorism

takes place. For both datasets, cross-sectional and panel, we extend the idea of the number of

terrorist attacks to give a geographical weighting to each individual for the impact of terrorism on

their governorate. This uses the governorate centroids to calculate the distance of each governorate

to the terrorism of other governorates as a way to proxy potential spill-over effects that terrorism

in one governorate may have on neighboring governorates. One of the more granular regressors

looks at the event with the number of casualties across all events from the governorate, which

mainly used for the robustness check of our finding under consideration. Thus, in this measure, for

the cross-sectional dataset, one terrorist attack from each governorate provides the number of civilian fatalities in 2007. For the panel dataset, we take the event with the number of civilian fatalities for each month of 2007 by governorate. This complements the previous measure, the number of terrorist incidents, by creating a different approach to measuring impact of terrorism. Rather than frequency of terrorism we are able to look at the largest terrorist event, from a casualty perspective, and determine whether there is a distortion to labor market behavior. This variable also uses a contemporaneous and a lagged approach, with numbers taken from 2004, 2005, 2006, and 2007.

6.3. Controls Factors

Our control variables are split into categories that are added to each model for the sake of robustness. We use individual and governorate characteristics, socioeconomic, and political indictors.

The individual and governorate characteristics basically added to capture certain characteristics of the decision maker such as age, gender, marital status. Those characteristics have great influence on the individual decision of labor supply. Additionally, we control for governorate, household size, and whether the individual is a native citizen of the governorate she lives at during 2007. This captures the internal migration effects. Socioeconomic controls include education attainment and poverty level. We proxy the education attainment of the decision maker by the highest diploma attended, this not only reflects the education level but also the year of schooling which both make a great effect on labor market. We also control for the economic sector. We to control for the poverty level using the total household expenditure. Finally, the political control includes the percentage of voter turnout to the Iraqi 2005 parliament election reflect the political engagement of the survey respondent.

7. Econometric Analysis

To estimate the effect of the terrorism on the Iraqi labor market we estimate a cross-sectional governorate level OLS estimator with the following:

$$\text{B. } Y_{iG} = \alpha_0 + \beta' X_{iG} + \gamma' Z_{iG} + \varepsilon_i G \quad (1.1)$$

Where

Y_{iG}: Labor market outcome of interest for individual i in governorate G

X_{iG} : The set of explanatory variables represent different terrorism measures

Z_{iG}: The set of control factors

ε_{iG} : The error terms

7.1. Estimation Techniques

7.1.a. Cross-sectional Survey

We have more dependent variables in the cross-sectional data, and some of these must be treated differently. We treat the hours worked per week and the last payment amount (combination of cash and in-kind) as continuous variables. Here, for both models, we use a standard OLS estimation. Job permanence is a binary variable and so we are using a Probit model and will also conduct marginal analysis to determine the magnitude of the effect.

7.1.b. Panel Survey

To examine the impact of terrorist activity on whether survey respondents were working over the 12 months of 2007, we employ several models. The first estimation we do is with a Pooled OLS (Linear Probability Model). Here, we use both fixed effects and random effects. Next, we use a Probit model given the binary nature of the dependent variable. Because we are interested in estimating the change of the binary variable from a 1 to a 0. For both the linear probability and

Probit model we use fixed and random effects in addition to evaluate the economics importance

of the coefficients using marginal analysis.

7.2. The Geospatial Analysis

Using the data in hand we construct a geographic regressor to weight the impact of terrorism

around Iraq on the people living in each governorate. Thus, we can measure not only the impact

of same-governorate terrorism, but we can also look at a weighted variable to determine the impact

of terrorism in the country as whole on the specific geographic regions in our dataset. We define

the following

Y_i= labor supply outcome for i.

A = the sum of terrorist acts or deaths in Iraq.

G_i= the sum of terrorist acts or deaths A(k) in governate where individual i is located.

OG_i = the sum of terrorist activities A(k) in all other governates where individual i does not live.

NG_i= the sum of terrorist activities in all governates that are next to the governate where

individual i lives.

For example, for Baghdad, NG_i would equal the sum of all terrorist activities in Anbar,

Salahuddin, Diyala and Babil. For Basrah NG_i would equal the sum of all terrorist activities in

Muthannia, Dhi-Qar and Misan.

DG_i = the sum of terrorist activities in all governates that are not next to the governate where

individual i lives.

For example, for Baghdad, DG_i would equal the sum of all terrorist activities in all governates

except for Anbar, Salahuddin, Diyala and Babil. For Basrah DG_i would equal the sum of all

terrorist activities in the rest of Iraq except for those in Muthannia, Dhi-Qar and Misan.

In addition, we constructed a distance -weighted sum of the terrorist attack Z_i to capture the

spillover effects, as follow:

Let A(j) be the sum of the terrorist attacks in governorate j

Let d(i) = the centroid of the governate where the individual lives and d(j) = the centroid of the

governate where terrorist act occurred.

Then we can define Z_i as follows:

$$Z_i = \sum_{j \neq i} \frac{1}{\left| d_i - d_j \right|} A_j$$

Following the above definition, we estimate the following regressions

$Y_i = \alpha + \beta G_i$

$Y_i = \alpha + \beta G_i + \emptyset O G_i$

$Y_i = \alpha + \beta G_i + \emptyset N G_i + \delta D G_i$

$Y_i = \alpha + \beta Z_i$

We hypothesis the $\beta > \emptyset > \delta$, as the effect of the terrorist incident i on it is own governorate

will be larger than all other governorate or the neighbor governorate or the distance governate as

it defined above. Moreover, we hypothesize the coefficient estimated using the weighted distance

measure as a regressor would be negative[2].

7.3. Robustness Check

To assess the robustness of our results, we replace the main regressor the log of the sum of terrorist

incident with the number of civilian fatalities. In addition, the empirical analysis uses four different

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[2] At this point we did not report any of the results of these estimation as we may need to
reconsider the way we constructed the data span this analysis.

regressor sets (i.e., models), which vary based on the inclusion of control factors. The first regressor set is the parsimonious model (Model 1), which excludes all control factors. The second set adds gender, age and Marital status (Model 2). The third set adds socioeconomic variables (Model 3). The full set includes all the control factors (Model 4).

8. Econometrics Results

8.2. Cross-sectional results

a. Hours Per Week

Table (2.1) present the results of OLS estimations of the terrorist attacks effects on hours worked per week. Across all the different specifications (model (1) the parsimonious model to model (4) the full model) the results show strong significance indicates evidence in favor of the hypothesis. It worth to mentioned that we log the dependent variable, hours worked per week, because the distribution is heavily skewed to a tail. All significant results indicate a negative relationship between terrorist activity and the logged number of hours worked per week, supporting our hypothesis that endangerment costs would cause households to work fewer hours.

Table (2.1)

OLS Estimation, Logged Number of Terrorist Incidents 2007 and Hours Worked

per Week 2007

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log Terrorist Incidents, 2007	-0.947***	-0.0428	-0.325***	-0.437***
	(0.000)	(0.160)	(0.000)	(0.000)
Governorate		0.0247***	0.104***	0.0774***
		(0.005)	(0.000)	(0.002)
Household Size		-0.0854***	0.115***	0.188***
		(0.000)	(0.003)	(0.000)
Gender		21.29***	17.30***	15.94***
		(0.000)	(0.000)	(0.000)
Age		0.107***	-0.119***	-0.133***
		(0.000)	(0.000)	(0.000)
Born here (governorate i)		0.0912	0.953*	1.033*
		(0.689)	(0.078)	(0.065)
Marital status		-3.065***	-1.045***	-1.124***
		(0.000)	(0.000)	(0.000)
Economic Sector			-0.480***	-0.828***
			(0.000)	(0.000)
Highest diploma attained				-1.222***
				(0.000)
Total expenditure				0.0151***
				(0.000)
Voter turnout				-0.0739***
				(0.000)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.090	0.115

Robust P-value in parentheses: *** p<0.01, ** p<0.05, * p<0.1

In order to check the results, we devise a robustness test to verify the impact of terrorism on the

dependent variables. In addition to the number of terrorist incidents, we also look at the max

number of civilian fatalities. The same results as shown in table (2.2) hold cross the different

specifications.

Table (2.2)

OLS Estimation, Civilian Fatalities and Hours Worked per Week 2007

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log Civilian Fatalities, 2007	-0.867*** (0.000)	0.00189 (0.951)	0.00158 (0.982)	-0.142* (0.069)
Governorate		0.0264*** (0.003)	0.123*** (0.000)	0.0762*** (0.003)
Household Size		-0.0866*** (0.000)	0.106*** (0.006)	0.169*** (0.000)
Gender		21.29*** (0.000)	17.26*** (0.000)	15.96*** (0.000)
Age		0.108*** (0.000)	-0.116*** (0.000)	-0.130*** (0.000)
Born here (governorate i)		0.0802 (0.725)	0.820 (0.129)	0.880 (0.116)
Marital status		-3.066*** (0.000)	-1.022*** (0.000)	-1.067*** (0.000)
Economic Sector			-0.458*** (0.000)	-0.793*** (0.000)
Highest diploma attained				-1.163*** (0.000)
Total expenditure				0.0135*** (0.000)
Voter turnout				-0.0915*** (0.000)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.089	0.113

Robust P-value in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

b. Compensation

In a measure related to the number of hours worked each week, we are able to look at the level of compensation respondents of the survey received on their last paycheck. Here, we have evidence that terrorism, measured by the log of terrorist incidents 2007, negatively impacts the level of wages. This is shown in Table (3.1.).

Again, using the robustness check to verify that terrorism does indeed negatively impact the

amount of the last paycheck, we estimate the impact of civilian fatalities. This does show that the

log of the civilian fatalities in terrorist incidents is negatively correlated with compensation.

Table (3.1)

OLS Estimation of the effects of terrorist attacks 2007 on the amount of last paycheck

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log Terrorist Incidents in 2007	-0.0206***	-0.0180***	-0.0225***	-0.0150***
	(0.000)	(0.000)	(0.000)	(0.001)
Governorate		0.00768***	0.0244***	0.0113***
		(0.000)	(0.000)	(0.000)
Household Size		0.000682	0.00608***	-0.0203***
		(0.264)	(0.010)	(0.000)
Gender		0.360***	0.226***	-0.101***
		(0.000)	(0.000)	(0.000)
Age		-0.00344***	-0.0255***	-0.0234***
		(0.000)	(0.000)	(0.000)
Born here (governorate i)		0.0202**	0.0144	0.0555*
		(0.037)	(0.641)	(0.068)
Marital status		0.00405*	0.117***	0.0794***
		(0.051)	(0.000)	(0.000)
Economic Sector			0.556***	0.500***
			(0.000)	(0.000)
Highest diploma attained				-0.113***
				(0.000)
Total expenditure				-0.00229***
				(0.000)
Voter turnout				-0.0145***
				(0.002)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.089	0.113

Robust P-value in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table (3.2)

OLS Estimation, Number of Civilian Fatalities 2007 and Last Paycheck 2007

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log Civilian Fatalities, 2007	-0.0206*** (0.000)	-0.0180*** (0.000)	-0.0225*** (0.000)	-0.0150*** (0.001)
Governorate		0.00768*** (0.000)	0.0244*** (0.000)	0.0113*** (0.000)
Household Size		0.000682 (0.264)	0.00608*** (0.010)	-0.0203*** (0.000)
Gender		0.360*** (0.000)	0.226*** (0.000)	-0.101*** (0.000)
Age		-0.00344*** (0.000)	-0.0255*** (0.000)	-0.0234*** (0.000)
Born here (governorate i)		0.0202** (0.037)	0.0144 (0.641)	0.0555* (0.068)
Marital status		0.00405* (0.051)	0.117*** (0.000)	0.0794*** (0.000)
Economic Sector			0.556*** (0.000)	0.500*** (0.000)
Highest diploma attained				-0.113*** (0.000)
Total expenditure				-0.00229*** (0.000)
Voter turnout				-0.0145*** (0.000)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.089	0.113

Robust P-value in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

a. Job Permanence

For the measure of job permanence, as discussed above, we construct an indicator that determines

whether a survey respondent has a more stable employment position or a more transient one. In

these results, correlation between the permanence of a job and terrorist activity is statistically zero.

Our results remain insignificant for this measure during the robustness check as well. One of

the reasons for the lack of significant results may be in the construction of the dependent

variable. Even when we run a Probit estimation the result hold the same .

Table (4.1)

Linear Probability Estimation, Number of Terrorist Incidents 2007, Job Permanence 2007

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log, Terrorist Incidents, 2007	-0.00486 (0.414)	-0.00423 (0.495)	-0.00587 (0.350)	-0.00363 (0.512)
Governorate		-0.000271 (0.855)	-0.000726 (0.629)	0.000352 (0.841)
Household Size		-0.00217 (0.279)	-0.00201 (0.309)	0.00103 (0.683)
Gender		-0.109*** (0.000)	-0.0465*** (0.003)	-0.00848 (0.508)
Age		0.00343*** (0.000)	0.00201*** (0.000)	0.00156*** (0.000)
Born here (governorate i)		0.0177 (0.169)	0.0213* (0.079)	0.0112 (0.428)
Marital status		-0.0217*** (0.000)	-0.0120** (0.017)	-0.00548 (0.308)
Economic Sector			-0.0668*** (0.000)	-0.0545*** (0.000)
Highest diploma attained				0.0155*** (0.000)
Total expenditure				0.000310*** (0.009)
Voter turnout				0.000565 (0.530)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.089	0.113

Robust P-value in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table (4.2)

Linear Probability Estimation, Number of Civilian Fatalities 2007, Job Permanence 2007.

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log number civilian fatalities, 2007	-0.00318 (0.623)	-0.00221 (0.728)	-0.00435 (0.509)	-0.00142 (0.809)
Governorate		-0.000112 (0.940)	-0.000553 (0.714)	0.000347 (0.844)
Household Size		-0.00221 (0.261)	-0.00203 (0.295)	0.000897 (0.718)
Gender		-0.109*** (0.000)	-0.0466*** (0.003)	-0.00832 (0.513)
Age		0.00345*** (0.000)	0.00202*** (0.000)	0.00158*** (0.000)
Born here (governorate i)		0.0165 (0.201)	0.0199 (0.101)	0.0100 (0.478)
Marital status		-0.0215*** (0.000)	-0.0119** (0.018)	-0.00504 (0.350)
Economic Sector			-0.0668*** (0.000)	-0.0542*** (0.000)
Highest diploma attained				0.0160*** (0.000)
Total expenditure				0.000298** (0.011)
Voter turnout				0.000430 (0.657)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.089	0.113

Robust P-value in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

8.3.Panel Results

In our panel dataset, we only have one dependent variable: whether a survey respondent was working in each month of 2007. The result of table (5.1) show a strong support hypothesis H1 , as the results show a negative significance correlation between the employment status the survey respondent and the terrorist incidents across all diff of specification.

Table (5.1)

Linear Probability Estimation, Number of Terrorist Incidents 2007, Working 2007

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log Terrorist Incidents, 2007	-0.00427*** (0.000)	-0.00184*** (0.003)	-0.00685*** (0.000)	-0.00518*** (0.000)
Governorate		0.000457*** (0.009)	0.000894*** (0.000)	0.000503** (0.015)
Household Size		-0.00452*** (0.000)	0.000483 (0.175)	0.000607 (0.127)
Gender		-0.450*** (0.000)	-0.0201*** (0.000)	-0.0234*** (0.000)
Age		0.00347*** (0.000)	0.00175*** (0.000)	0.00148*** (0.000)
Born here (governorate i)		-0.0121** (0.011)	-0.00770 (0.146)	-0.00961* (0.073)
Marital status		-0.0751*** (0.000)	-0.00820*** (0.000)	-0.00444* (0.063)
Economic Sector			-0.0136*** (0.000)	-0.0112*** (0.000)
Highest diploma attained				0.00101 (0.159)
Total expenditure				2.01e-05 (0.305)
Voter turnout				-0.000799*** (0.000)
Observations	127,307	84,906	19,538	17,474
R-squared	0.004	0.275	0.089	0.113

Robust P-value in parentheses: *** p<0.01, ** p<0.05, * p<0.1

9. Discussion

The results presented above all use robust standard errors. We tried clustering on the governorate level, but this caused a loss of significance across all dependent variables and most levels of specification. In the Econometrics literature there is a discussion about the use of clustering when the number of clustered variables is small. We cluster on 18 governorates, so this approach may not be appropriate for our paper. Additionally, clustering is meant to be used when there is heteroskedasticity in the error terms. Yet, when we conduct a White test, it does not appear

that we have such heteroskedasticity. With this in mind, it may be the case that reporting robust standard errors suffices.

Our results, using robust standard errors, show significant and negative results. This is true across the dependent variables that we use in the cross-sectional and panel data, with the exception of Job Permanence in the cross-sectional data. Thus, if we reconsider our four hypotheses, we believe we find evidence in favor of three of them.

H1: As endangerment costs increase, the marginal benefit of working decreases, so households choose to supply less labor.

H2: The number of hours worked is inversely correlated with endangerment costs.

H3: Household wages will decrease as endangerment costs increase.

H4: Job permanence will decline as endangerment costs increase.

The first three hypotheses are consistent with the results that we have presented here in this paper. However, the fourth hypothesis was not supported by the results that we have, both presented in this paper, and in other constructions of the job permanence variable.

10. Conclusion

Given the results discussed above, it is clear that terrorism increases endangerment costs for those participating in the labor force, and these elevated endangerment costs impact individual decision-making. As endangerment costs rise, proxied by the number of terrorist incidents and the maximum number of civilian fatalities, labor supply distortions result. There is evidence that individuals choose to not work when the endangerment costs reach a certain threshold. We also see that the number of hours worked per week decreases as endangerment costs increase, and that the amount of the household's last paycheck declines.

We believe that the approach presented here has significant implications for policymakers in two contexts. First, for policymakers in Iraq, these results should lead to specific types of interventions in areas particularly impacted by terrorism. We see that as endangerment costs rise, households choose not to work. However, the willingness to work increases, so there is a productivity gap. Technology could help bridge this gap by allowing people to work remotely or increasing security for transportation routes to business sectors in city neighborhoods.

The second set of policymakers that should find these results interesting are countries like the United States who face an influx of refugees from countries with high levels of conflict and violence. As endangerment costs in countries rise, an inevitable result is an influx of outward migration, often refugees seeking asylum in destination countries. Building on the results here, it would be interesting to understand both mitigation policies on endangerment costs, and the role of destination countries in establishing national security policies to deal with the economic and political upheaval of these costs.

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