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Three Essays on the Economic Costs of Armed Conflict

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THREE ESSAYS ON THE ECONOMIC COSTS OF ARMED CONFLICT

by

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ABSTRACT

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Under the Supervision of Scott Adams, Ph.D.

This dissertation consists of three essays on the economic cost of armed conflict. The first essay focuses on the impact of an armed conflict on children's health. The exposure to violence in utero and early in life has adverse impacts on children's age-adjusted height. Using the experience of the Kashmir insurgency, I find that children more affected by the insurgency are 0.9 to 1.4 standard deviations shorter compared with children less affected by the insurgency. The effect is larger for children born during peaks in violence. Also, children affected by the insurgency are more likely to be sick in the two weeks prior to the survey.

The second essay analyzes the effect of an armed conflict on education of women. Armed conflicts tend to reduce educational outcomes of groups more affected by violence compared with groups less affected by violence. The Kashmir insurgency is different from previous examples that I find an insignificant effect of the insurgency on years of schooling. There are two reasons for this finding. First, improvements in the educational sector in the state of Jammu and Kashmir in the 1980s and 1990s continue to work during the insurgency. Second, the Indian government dealt with the insurgency by sending in tens of thousands security forces to break down any form of rebellion.

The third essay explores the relationship between (armed) conflict and trade. Modeling the world as n*n dyadic country relationships, I account for het-

erogeneity of conflict dyads over time using panel estimation techniques and estimate the relationship between trade and conflict. The simultaneity in the trade-peace relationships is solved by using an instrumental variable approach. I find in most setups that trade promotes peace. After accounting for endogeneity, however, the relationship between trade and conflict reverses in sign in some setups, but remains negative once focusing only on bilateral conflict with actual battle deaths.

This dissertation is dedicated to every first generation college student coming from a low-income and blue-collar household.

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Chapter 1

Armed Conflict and Children's Health: The case of Kashmir

1.1 Introduction

Children exposed to negative external shocks in utero, or early in life, have higher mortality rates, lower birth weights and are shorter for their age. These shocks can include recessions (Cutler et al. 2002), famines (Stein et al. 1975, Almond et al. 2008), droughts (Akresh and Verwimp 2006), pandemics (Almond 2006), wildfires (Jayachandran 2008), or radioactive fallout (Almond, Edlund and Palme 2009, Danzer and Danzer 2011)

A new dimension to these external shocks is armed conflict. The impacts of armed conflicts on human capital formation have been in the focus of empirical research since the mid 2000s. This includes education (Shemyakina 2011,

Akbulut-Yuksel 2009, Swee 2009), displacement (Deininger et al. 2004), labor force participation (Menon and van der Meulen 2010) and the two main predictors of health later in life: low birth weight (Camacho 2009) and height early in life (Bundervoet, Verwimp and Akresh 2009, Guerrero-Serdan 2009, Akresh, Lucchetti and Thirumurthy 2010, Akresh and Verwimp 2011). Through stresses experienced in utero and early in life because of an armed conflict, the height development of children is negatively affected. Children who experienced more violence early in life than other children are shorter for their age.

Most of this research explored the negative effects of civil wars and interstate wars on health. Here, I focus on a less violent form of an armed conflict: an insurgency. The Kashmir insurgency in the state of Jammu and Kashmir (J&K) is an ongoing conflict which started in 1990. The insurgency has three distinct phases, making it possible to identify treatment and control groups by their geographical as well as cohort exposure.

In this study, I utilize the National Family Health Survey for India (NFHS) to identify the effects of the insurgency on children's height for age z-scores (HAZ). To estimate the (local) average treatment effect on the height of children age 0 to 36 months, I combine event data on violence with the location of a household during the insurgency. The treated children experienced violence in utero and in their first years of life. In the districts and regions more affected by the insurgency, I find negative effects on height for age z-scores. Children more affected by the insurgency are 0.9 to 1.4 standard deviations shorter than children less affected by the insurgency.

The implications of lower height are well-known, with much evidence suggesting poorer education and labor market outcomes for those in developing and developed countries (Currie and Madrian 1999, Strauss and Thomas 2008, Victora et al. 2008). Examples for developing countries include delayed school

enrollment in Ghana (Glewwe and Jacoby 1995) or lower test results in rural India (Monk and Kingdon 2009).

In addition to height, I briefly explore whether conflict affects another important determinant of health in developing countries. Specifically, I test whether more conflict-exposed children are also more likely to have diarrhea in the two weeks prior to the survey interview. Children already shorter for their age are indeed more likely to show symptoms of diarrhea.

My research is novel as the Kashmir insurgency is embedded in the conflict between India and Pakistan over the territory of Jammu and Kashmir (J&K). Different geopolitical interests are the reason that research based on households living in this region is very limited. The overall picture drawn in official Census reports and health survey reports is a positive one about trends in the state of J&K. This may be true for the entire state of J&K, but focusing on different groups within the state reveal poorer health and education (Parlow 2012) associated with the armed conflict in J&K.

The paper is organized as follows. Section 2 introduces to the literature. Section 3 briefly describes the phases of the Kashmir insurgency and the identification strategy. Section 4 discusses the data and my empirical strategy. Results are discussed in section 5. In section 6, I present robustness checks and briefly explore some additional results on the long term impacts of conflict on children's health. The paper concludes in section 7.

1.2 Related Literature

1.2.1 Health and external shocks

Detailed literature reviews on the effects of external shocks on infant health can be found in Currie and Madrian (1999), Strauss and Thomas (2008), Victora et

al. (2008), and Almond and Currie (2010).[1]

Although the links between childhood health and external shocks are manifold,[2] the consensus is that fetal health and the environment in the first 36 (to 59) months of life determine future health outcomes. This paper is also related to the idea of in utero programming, which can be traced back to Barker (1998) and his focus on birth weight. Gluckman and Mark (2004) suggest a life-course model where the combination of in utero health and early life conditions work together. Thus, birth weight and height can be linked (Luo et al. 1998, Finken et al. 2006).

Conceptually, I consider health shocks in the context of a health production function. Health (H) is modeled as a function of mother characteristics (X), household characteristics (e.g. social economic status (SES), access to health services and external shocks). Rosenzweig and Schultz (1983) introduce the idea of estimating a health production function with H=f(X, SES, health services). In the context of life-course models, health will also be a function of previous health and of shocks.

Health production functions are widely estimated in the public health literature, but not as much in the development literature. Children's height is often the focus of the development economics literature because it directly relates to malnutrition, a persistent problem in developing countries (Akresh and Verwimp 2011). My goal is to estimate children's height as a function of the experience of violence early in life, mother's and household's characteristics, children's health at birth, and health service utilization during pregnancy.

[1] These shocks can include famines, droughts, recessions, pandemics, and smog.

[2] These links can include lack of micro nutrients, stress during pregnancy, infections early in life, mother's characteristics, household wealth and more.

1.2.2 Armed conflicts and health

The particular external shock studied in this paper is armed conflict. During such conflicts, the access to health services for pregnant women, including vaccinations, prenatal and antenatal care, and micro-nutrients needed for the fetus development, is limited. Camacho (2007) adds that stress during pregnancy is another channel limiting the development of the child in utero. Stress changes the production and distribution of hormones, including intrauterine growth hormones. Stress can reduce the gestation time of the fetus. In developing countries, armed conflict and its corresponding stresses make already existing challenges to fetal development more acute.

Armed conflict takes different forms depending on the level of violence and actors involved. They can range from insurgencies to civil wars to wars between two countries to world wars. Akbulut-Yuksel (2009) estimates the long-term effects of WW II on the German population. Individuals more affected by allied bombings during WW II earn less as adults and are also shorter and less satisfied with their health. Guerrero-Serdan (2009) estimates the regional variation in height for age z-scores for children in Iraq after the US invasion. Children in more war-affected regions are shorter. Akresh, Lucchetti and Thirumurthy (2010) examine the effect of the Eritrean-Ethiopian border war on height of children. Children close to border regions are shorter in both countries.

Akresh and Verwimp (2011) focus on the civil war in north Rwanda and the crop failure in south Rwanda. Children born between 1987 and 1991 are shorter because of these two external shocks. Bundervoet, Verwimp and Akresh (2009) find that children in rural Burundi are shorter because of the civil war. Camacho (2007) again highlights the role of stress, finding that land mine explosions in Colombia between 1998 and 2003 led to lower birth weights and more prematurely births.

An example for the impacts of an insurgency on human capital outcomes can be found in Galdo (2010). He estimates the long-run effects on adult earnings of the "Shining Path"-insurgency in Peru (1980 to 1995). He identifies groups who were in utero, infants or those of pre-school age during the insurgency. As adults, these individuals earn less in their jobs.

Literature on the effects of the Kashmir insurgency in particular, however, is limited. Moreover, official Census reports (Census of India 2001, 2011) and those based on the National Family Health Survey (NFHS) draw a positive picture for the entire state of Jammu and Kashmir in terms of mortality rates, fertility and vaccination programs. This positive picture potentially masks important district or regional variations, making the methodology and results presented in this paper helpful in understanding the impact of the insurgency on children's health.

1.3 The Kashmir insurgency and identification

1.3.1 The Kashmir insurgency

In December 1989, the daughter of the Indian home minister of Kashmir affairs, Rubaiya Sayeed, was kidnapped by the Jammu and Kashmir Liberation Front. India responded, sending in tens of thousands of security force personnel into the valley of Kashmir in January 1990. This marked the official beginning of the insurgency. Within a short period of time, India stationed a few hundred thousand security force personnel throughout the valley, with a focus on major cities. Violence committed against civilians by militants, as well as security forces inexperienced (and overwhelmed) in fighting militancy, were the norm early in the 1990s (Joshi 1999, Schofield 2001).[3] Furthermore, 75,000 to

[3] This includes murder, kidnapping, bomb explosions, sexual abuse, and torture by militants. The literature also cites many examples where civilians were shot during cross-fires,

100,000 Hindus migrated from the valley of Kashmir in 1990 to camps around Jammu and New Dehli leaving behind an almost exclusive Muslim population (Asia Watch 1993). By the mid 1990s, the insurgency became a pro-Pakistan movement with new militant groups organizing the uprising.[4] Violence died out slowly throughout the cities in the valley. In 2001-2002, there was another peak in violence as the groups behind the militancy changed again. Their agenda was fighting a "Jihad" against India by committing militant acts, not just in J&K (Meyerle 2008). The various phases of the insurgency and the regional variation in its intensity allow for an opportunity to identify the effects of the conflict on groups differently affected by the insurgency.

1.3.2 Identification strategy based on phases of violence

Based on a novel event-dataset constructed from an in-depth literature review of the insurgency and crime data (INSCR 2012), I identify districts more affected by violence, as well as three distinct phases of the insurgency. Table 1.1 presents the count of insurgency events by time and region. Figure 1.1 shows the districts of J&K. The state of Jammu and Kashmir has three regions: Jammu, Kashmir and the sparsely populated Laddakh region. The insurgency was concentrated in the Jammu and Kashmir region only. The Jammu region itself includes six districts (Jammu, Doda, Udhampur, Kathua, Rajouri and Poonch). The Kashmir region, also known as the valley of Kashmir, also includes six districts (Anantnag, Pulwama, Srinagar, Badgam, Baramula and Kupwara).[5] Given the harsh winters in J&K, the state has two capitals. Srinagar city is the summer capital, while Jammu city is the winter capital.

adopted and tortured, and in the case of women sexually abused, by security force personnel.

[4] I will not discuss the role of Pakistan's involvement in the Kashmir insurgency here. The reader should note that the insurgency is also embedded in the Indian-Pakistani conflict over the territory of Jammu and Kashmir resulting in three short wars (1947, 1965, and 1999).

[5] In 2011 Jammu and Kashmir was reorganized into 22 districts. The NFHS surveys and my analysis are based on the old district structure.

[Table 1.1 about here]

[Figures 1.1, 1.2, 1.3 and 1.4 about here]

Figures 1.2-1.4 illustrate the peaks of violence across regions that will underlie the identification strategy outlined in this section.[6]

The first phase of the insurgency can be marked from 1990 - 1996. Militancy focused on urban areas of Kashmir, especially the Srinagar district and the summer capital Srinagar city. To a lesser extent, the winter capital Jammu city in the Jammu region was also affected by violence (Table 1.1). Local government and its agencies, which are targets for militants (or terrorists) in general (Kalyvas 2006, Justino 2009), are present in the capitals.

The second phase was from 1996 to 2001 with a peak in violence around 2001. Militancy concentration moved away from Srinagar (city) to the smaller cities of Kashmir and to the districts of Jammu (Doda, Rajouri and Poonch) located closer to the Line of Control (LoC). This was because of the massive presence of security force personnel in the urban areas of Kashmir. The LoC also separates India from Pakistan and most militant infiltration originated there. During the 2001 peak in violence, Hindus were specifically targeted through multiple massacres (SATP 2012). Before these massacres, most civilian victims were Muslims.

The third phase started after the peak in violence in 2001 and can be described as a low-intensity conflict with no major incidences against civilians in Jammu and Kashmir. In some sense the population got used to the presence of a massive security force (up to 350,000) and the fear of violence. Most victims

[6] Peaks in violence can be clearly identified around 1995-1996 and 2001-2002. After 2001, violence died out slowly.

of the insurgency were actual militants during this period (see Figure 1.2).

1.4 Data and empirical strategy

1.4.1 Descriptive Statistics

In this section, I describe the data I use and general differences in height outcomes of children living in urban and rural areas of Kashmir.

I utilize the National Family Health Survey (NFHS) for India, a national and representative household survey, to analyze the effects of the Kashmir insurgency on children's height. The NFHS has three individual rounds: NFHS-1 (1993), NFHS-2 (1998-1999) and NFHS-3 (2005-2006). Women who were ever-married and aged 15 to 49 years were interviewed. Information on their demographic, household and health background (mainly utilization of health services) were collected. Their children, ages 59 months (NFHS-1, NFSH-3) and 36 months (NFHS-2), were measured in terms of height and weight. The three survey rounds for J&K cover different phases of the insurgency, with different districts covered in each because of security reasons. The NFHS-1 was only conducted in the Jammu region. The NFHS-2 covers the entire Kashmir valley and three out of six districts in Jammu. The NFHS-3 covers the entire J&K region. The coverage across survey rounds is sufficient to identify children exposed differently by the insurgency in utero and early in life.

Table 1.2 summarizes basic descriptive statistics for each NFHS survey round. Height for age z-scores for children is computed according to the WHO 2006 growth standards. The reference population is children in the same age group in the United States. Children in J&K are shorter on the average and close to being stunted.[7] The samples of children are n=666 (NFHS-1), n=962

[7] Stunted is defined as two standard deviations less than the reference population.

(NFHS-2) and n=1,226 (NFHS-3).

The urban-rural differential in children's height is typical for developing countries where health services are more available in urban areas. In rural areas mothers have less access to health services during and after pregnancy. These health services can include checkups, access to doctors and micro-nutrients needed for the development of the child. Access to health services deteriorated during the 1990s in rural Kashmir. Basic health services could not be delivered to rural areas because of the violence (Asia Watch 1993), which can explain the decrease in HAZ scores for the NFHS-2 round (Table 1.2).

[Table 1.2 about here]

Additionally, the developments in height scores described above can be visualized using kernel weighted local polynomial graphs. In developing countries younger children can have lower HAZ-scores than older children because of improvements in health services over time if the development process is not interrupted (WHO 2012).[8] To conserve space, I only show urban-rural differentials for the NFHS-1 and Kashmir-Jammu differentials for the NFHS-2 and 3 (Figure 1.5).

The NFHS-1 only includes the Jammu region. Children in urban areas have slightly lower HAZ-scores than children in rural areas, which could be attributed to the insurgency. Children in Kashmir are shorter than children in Jammu using the NFHS-2 sample. Furthermore, the older cohort has slightly better scores that fall sharply. The trend for the NFHS-3 is mixed. Younger children in Jammu (up to 24 months) are more affected by the insurgency than children in Kashmir. One reason could be that Hindus were targets of militants during 2001-2002. Hindus are concentrated in the Jammu region of the state.

[8] This means lower in absolute values because they average HAZ score is negative.

This is because almost the entire Hindu community left the valley after of the outbreak of the insurgency in 1990.

[Figure 1.5 about here]

1.4.2 Empirical Strategy

The goal of my paper is to quantify the actual effect of the insurgency on children's height. Thus, I will employ a difference in difference technique to estimate the (local) average treatment effect of the insurgency on the height of children more affected by violence compared with children less affected by violence. The Kashmir insurgency, because of its variation in intensity across regions over time, allows me to divide children into treatment and control groups in a natural experiment setup. I expect those in conflict-affected regions to experience violence in utero through stress experienced by the mother, to have less access to health services in general, and to be exposed to violence early in life.

My empirical specification is an approximation of a reduced-form health production function and is written as:

$$H_{ijt} = \alpha + \gamma \text{war}_{ijt} + \beta_1 X_{1ijt}^{child} + \beta_2 X_{2ijt}^{mother} + \beta_3 X_{3ijt}^{SES} + \rho_j + \theta_t + \delta_t + \epsilon_{ijt} \quad (1.1)$$

H_{ijt} is the HAZ score of child i living in district or region j and born in year t.[9] The average treatment effect is γ, where *war* is a binary variable indicating children born and living in a more conflict-affected region.

X_1 is a vector describing children's characteristics, including age in months,

[9]The dependent variable is a standardized height score which allows the interpretation of the war-coefficient directly as a reduction in standard deviations from the reference population. A one standard deviation difference is approximately 2 cm.

sex, birth order, and an indicator whether the child was small at birth.[10] Birth size (or birth weight in general) can be linked to height later in life (Luo et al. 1998, Finken et al. 2006). Although children small at birth can catch up in growth if the environment early in life is optimal, I expect that these children remain shorter because of the low level of development in J&K.[11]

The vector X_2 contains mother's characteristics, including age, education and height in cm. Furthermore, I use information on health service utilization. Previous research mostly ignored the link between mother's health and children's health at birth because of the lack of data. Akresh and Verwimp (2011) use current BMI of the mother to proxy for her health status during pregnancy and at birth. Although it is possible to assume that current BMI could also have been the BMI before the pregnancy, I use information on iron-deficiency anemia. Anemia is a chronic disease known to start during childhood because of the lack of iron in food (WHO 2012). Iron-deficient mothers have higher energy requirements during pregnancy which may not be met during an armed conflict. In addition, I use information on whether the mother ever experienced a still-birth or had an abortion in the past.[12]

X_3 is a vector describing the socioeconomic status (SES) of the household. This includes land- and livestock ownership controls, as well as whether one belongs to a scheduled caste.[13] The parameter ρ includes district fixed effects, and city size effects, common to every child in the district. The parameter θ includes quarter and year of birth fixed effects. Finally, the parameter δ includes

[10] The NFHS asks whether the child was smaller than the average at birth. The actual birth weight would be a more robust measurement, but is only available for a small group of children.

[11] J&K is one of the least developed states in India.

[12] Previous abortions can increase complications in the following pregnancy which in turn can affect the in utero development of the child. Similarly, a previous still-birth could indicate complications during pregnancy in general and affect the pregnancy following.

[13] I do not use information on father's occupation or education, because HAZ scores are usually only affected by mother's characteristics. Another reason is that almost all fathers work in low-skilled jobs. Note that Jammu and Kashmir is one of the least developed states in India. Almost everyone works in professions requiring little educational skills.

state fixed effects for children born at time t. This could help remove the confounding influence of factors such as the number of hospitals or community health centers in the region.

1.5 Results for the NFHS-1, 2 and 3

1.5.1 The effect of the insurgency on height

In this section I focus on the quantitative effect of the insurgency on children's height. I will discuss other control variables affecting height in the next section. I present regression results by survey round in Table 1.3 (NFHS-1), Table 1.4 (NFHS-2) and Table 1.5 (NFHS-3).[14] Each survey round covers a different phase of the insurgency and allows me to test if the experience of violence early in life has a negative impact on different treatment groups. Furthermore, I have two possible sets of treatment and control groups in mind. First, I compare the height outcomes of children of the same age group but living in more and less affected districts (or regions) of J&K. Second, I compare children living in the same district (or region) but belonging to a different age group (*cohort models*). In developing countries younger children can have better height outcomes than older children because of improvements in the health system over time. An armed conflict can interrupt this development. Thus, I expect children born at the beginning of the insurgency and around peaks in violence to be more affected compared to an older cohort born before these shocks. Figure 1.6 illustrates my treatment and control groups by phases of the insurgency and the corresponding survey rounds of the NFHS.

[14] The NFHS-1 differs from the NFHS-2 and 3 in one major point. It does not include anthropometric measurements for the mother or tests of hemoglobin levels. Height of the mother is one of the main predictors for children's height and could create an omitted variables bias.

[Figure 1.6 about here]

The NFHS-1 covers the first phase of the insurgency. During the first phase of the insurgency it was only safe to conduct a survey in the Jammu region of J&K. Most of the violent events in the Jammu region were actually committed in the Jammu district itself and the winter capital Jammu city. I find that children living in the Jammu district are up to one standard deviation shorter than children living in less affected districts of the Jammu region (Table 1.3). I also compare the height outcome of children born before the outbreak of the insurgency with children born after 1990. The two age cohorts live in the same district (*cohort models*). Children born after the outbreak of the insurgency loose up to 1.4 standard deviations compared to children born before the outbreak. Although the Jammu district is less affected by militancy compared to districts in Kashmir during the first phase of the insurgency (Table 1.1), children are significantly affected in their height. Joshi (1999) notes that during 1990 public services were interrupted by daily strikes of public servants, which can affect the delivery of health services. This can explain why I also find a negative, but smaller in magnitude, effect on height scores of children living in rural areas of the Jammu district, because health services were not delivered to rural areas. Furthermore, Schofield (2001) describes many examples where ambulances and medical delivery trucks were stopped by security forces at check points and had to return to the district hospital.

[Table 1.3 about here]

For the second phase of the insurgency I use the NFHS-2. My focus is on children living in urban Kashmir as the more conflict-affected region. I compare

their height outcomes with children living in urban Jammu. Given that the NFHS-2 contains only safe areas of Jammu, these children developed without being exposed to violence and make an ideal control group.[15] I find that children living in urban areas of Kashmir, excluding Srinagar, are affected the most by the experience of violence (Table 1.4).[16] These children are up to 2.5 standard deviations shorter because of the insurgency. Violence moved from the Srinagar district to other districts in Kashmir, namely Anantnag, Badgam and Kupwara, because of security force personnel stationed in Srinagar. Most of the violent events coded for 1996 to 1999 (Table 1.1) were actually committed in these three districts.

[Table 1.4 about here]

Finally, the NFHS-3 allows me to test if children who were in utero or born during the 2001 peak in violence are affected by the experience of violence. I have two treatment groups in mind. First, I want to know if children in Kashmir (and urban Kashmir) are negatively affected by the insurgency compared to children in Jammu.[17] Second, during the 2001 peak in violence Hindus were targets of violence. I test if Hindus are negatively affected in their height.

Children in Kashmir are indeed shorter compared to children in Jammu because of the insurgency (Table 1.5). They are up to 1.5 standard deviations shorter. After 15 years of insurgency the Kashmir region lags behind the Jammu

[15] I cannot break down my sample into an older cohort and younger cohort, because only children up to 36 months were measured in their height in this survey round. I would expect for instance, that a cohort born in after the end of the first phase the Srinagar district would have improved HAZ scores compared to an older cohort.

[16] I also compared HAZ scores for children in Srinagar with safer regions and find that these could catch up in their growth. Results can be requested.

[17] The NFHS-3 has no district identifiers. Instead, I will use language spoken to identify the Kashmir (Kashmiri) and the Jammu region. Kashmiri is almost exclusively spoken in Kashmir. That is why I cannot break down my sample into districts.

region in development permanently.[18] The insurgency has also a negative, but less pronounced, impact on Hindus in Jammu (*War*Hindu*). These children are up to 0.48 standard deviations shorter compared to Non-Hindus.

[Table 1.5 about here]

Overall, the experience of violence in utero and early in life reduces children height. For the Kashmir insurgency children are up to 1.4 standard deviations shorter.

1.5.2 Other Determinants of Height

The NFHS also allows me to test the effect of other variables on height, along with the external shock. Specifically of interest are children's health at birth, mother's health during pregnancy, and health service utilization. These variables are included in Tables 1.3-1.5 and warrant some additional discussion.

Health at birth is measured as a dummy variable being small at birth or not.[19] This link can be seen in the context of a life-course model, where birth size can be used to predict future height outcomes (Luo et al. 1998, Finken et al. 2006). Birth weight would be a more robust measurement to measure children's health at birth but birth weight is only available for a very small sample of children. Furthermore, birth weight is affected by the same in utero experience as height and could create an endogeneity problem. Though, I do not expect birth size to be affected by the same experience of violence, because birth size is typically linked to mother's birth size (Veena et al. 2004).[20] Children, who were

[18] Even children in rural areas of Kashmir remain shorter compared to children in rural areas of Jammu. The treatment effect is negative but not significant. Results are not reported here to conserve space.

[19] This is based on mother's recall.

[20] To limit this concern, I interacted birth size with my war variable and could not find a significant effect.

already small at birth, remain shorter for their age. Although children could catch up in growth during their first years of life if the environment is optimal in terms of nutrition and health care, here they remain shorter.

Mother's health during pregnancy can affect children's development in utero. Akresh and Verwimp (2011) use current BMI as a measurement for mother's health during pregnancy. It is possible to assume that in developing countries the BMI does not change significantly over time, so that the current BMI was the BMI before pregnancy started. But, I suggest a more robust measurement for mother's health during pregnancy: iron-deficiency anemia. I define women having anemia with hemoglobin levels of less than 10 grams per deciliter blood as a lower bound at the time of the interview. Anemia is chronic and starts early in life in developing countries (WHO 2012b). Therefore, I can safely assume that these women were also anemic during pregnancy. Anemic women have indeed shorter children because of higher energy requirements during pregnancy, which affects the in utero development of the child.

Utilization of health services during and after pregnancy can include vaccinations and checkups. Vaccinations and checkups during pregnancy and afterwards have no significant effect on HAZ scores, although a majority of mothers had access to these (and more) services. This finding contradicts the goal of health programs promoting checkups and vaccinations in developing countries.

Finally, there is one unexpected finding. Breastfeeding has a negative effect on children's height.[21] It is surprising because the standard assumption is that breastfeeding improves children's health (WHO 2012). In some cases, however, mothers relying exclusively on breastfeeding lack complementary nutrition, which can affect the development of the child (Fawzi et al. 1997). Streefkerk and Moulik (1991) note that health services are underutilized (e.g. micronutri-

[21] Breastfeeding is defined as currently breastfeeding or not. I find similar results for the NFHS-1 sample in using breastfeeding, but including breastfeeding reduces the sample size drastically. Results can be requested.

ents) in areas with less education in India. This can be particularly true in J&K where the average level of education is less compared to other states of India (Census of India 2001, 2011).

1.6 Robustness checks

I suggest two different sets of robustness checks. First, I focus on the effect of the insurgency on height scores of children and test if they remain qualitatively similar under different specifications and assumptions. Second, I explore briefly whether the experience of violence affects children in having symptoms of diarrhea, another important health outcome for developing countries.[22]

1.6.1 Robustness checks for effects on height

There are a number of potential concerns that might confound the interpretation of the results presented so far. I consider each in turn and offer some evidence to allay these concerns. I only report the coefficients for the average treatment effects of the insurgency on height (*war*) to conserve space.

The first issue of concern is migration. Mothers (and their young children) migrating to safer districts because of violence experienced at the origin site could bias the results upward. The process of migration is stressful and can affect children's height in addition to stresses caused by the exposure to violence. This concern is somewhat mitigated because most of the households in my sample have been living at their current residence for more than 10 years. Households in Jammu and Kashmir are poor on average, and moves tend to be limited to cases of marriage. Even then, most marriages remain local. To check for any lingering influences of migration, I exclude women living at their resi-

[22] I also test, but do not report, if they are more likely to be anemic or have a cough, but results are more conclusive for diarrhea as the health outcome. Results can be requested from the author.

dence for less than three (and five) years. The results for the NFHS-2 and 3 are robust and summarized in Table 1.7. The effects using the NFHS-1 change. At the beginning of the insurgency, households migrated from the valley because of the violence to the less-affected Jammu region resulting in different sample sizes for the NFHS-1, thus explaining this change (Table 1.7).

[Table 1.7 about here]

Birth cohorts may be differently affected by the insurgency. I expect cohorts born closer to peaks in violence to be shorter. I split the samples into 12 month intervals for children up to the age of 36 months and into an older cohort (37 to 59 months) to assess this issue. The treatment effects vary by age cohorts as expected (Table 1.7). For the NFHS-1, I find that children (age cohort 24 to 35 months) who were in utero during 1990, or born in 1990, are affected the most. These children are up to four standard deviations shorter. Similarly, I find for the NFHS-2 that children in utero or born around the 1996 peak in violence are affected the most for the urban Kashmir region. For the NFHS-3, I compare only the Kashmir with the Jammu region.[23] As above, I cannot find any significant effects of the insurgency for children living in the Kashmir region itself.

[Table 1.7 about here]

1.6.2 Other health outcome - Symptoms of Diarrhea

A known result in the health literature is that children shorter for their age, because of negative external shocks, have (slightly) worse health outcomes through-

[23] I do not present results for urban Kashmir because this would result in very small samples reducing the validity of any conclusions drawn from these results.

out their life and perform more poorly in school and in the labor market. Here, I test if the same children, who were earlier found to be shorter for their age because of the insurgency, are also more likely to be sick in the two weeks prior to the survey. The health outcome I focus on is diarrhea. Diarrhea can be caused by living conditions which can include access to clean water, food, or hygiene in general (Bhandari, Bhan and Sazawal 1992, Jalan and Ravallion 2003, Sitara et al. 2009, Kumar and Vollmer 2012, WHO 2012c).

I estimate a reduced form model for equation (1.1) with factors typically considered as determinants of diarrhea, focusing on living conditions and health service utilization early in life. To control for hygiene, I use information on the availability of any type of toilet facilities in the household, or if they are shared with others. Shared toilets are a source of bacteria (Kumar and Vollmer 2012). Furthermore, food can be contaminated through many channels (e.g. the water, the storage of food, or the food itself). I use access to water through a pipe leading to a house or not, and if the child gets unboiled water or not. Public water fountains can be contaminated with bacteria causing diarrhea (Jalan and Ravallion 2003, Sitara et al. 2009). Similarly, unboiled water is a source of contamination.

I also control for having a refrigerator in the household and for types of food given to children regularly. Certain types of food can spoil more easily (e.g. milk), especially if not stored properly. In addition, malnutrition can be another source of diarrhea because children lack in vitamins to build up an immune system (Lima and Guerrant 1992, Bhandari, Bhan, and Sazawal 1992). Most of these control variables are only available for the NFHS-2 and NFHS-3.

I find that children living in more conflict-affected areas are more likely to have diarrhea in the two weeks prior to the survey (Table 1.8). Children in the Jammu district (NFHS-1) and in rural Kashmir (NFHS-2) are indeed sicker on

the average. For the NFHS-3, I cannot find significant differences. Surprisingly, controls for hygiene and contamination of food are insignificant in most specifications, which could be explained by the insurgency. The insurgency causes children more affected by the experience of violence to be shorter. Through this channel, they are also likely to be sicker. This experience can outweigh the effects of typical factors causing diarrhea.

[Table 1.8 about here]

1.7 Conclusion

Health of children, defined as height for age z-scores (HAZ), is negatively affected by the insurgency in the state of Jammu and Kashmir (India). The Kashmir insurgency had three phases which allowed me to identify a series of treatment and control groups of children across space and time. Children who experienced violence in utero and early in their life, are 0.9 to 1.4 standard deviations shorter than children who experienced less or no violence early in their life. The magnitude is similar to results found in the literature for stronger forms of armed conflicts, such as wars.

The Kashmir insurgency differs from these stronger forms of conflict because fewer civilians were killed, less infrastructure was destroyed, and mass dislocation, which is typical for stronger forms of armed conflict, only took place in the beginning of the insurgency for Hindus. Most of the exposure of violence can be best described as a constant fear of militant acts and of harassment by security force personnel stationed across Kashmir. Nevertheless, this constant stress caused a similar impact on height of children as more violent forms of conflict.

The results of the paper suggest that it is possible to identify groups more

affected in their human capital development than others during armed conflicts. Development programs, including those administered through non-governmental organizations could be specifically designed to target these groups and help ameliorate the negative effect of an armed conflict on future human capital accumulation.

Finally, this paper is another in a line of recent work suggesting that armed conflicts interrupt development processes. A government that allocates resources to fight militancy and to restore order cannot also fund development projects (health and literacy programs) for the least developed states in their nation. The long-term consequences for the entire region are difficult to quantify. In the context of the Kashmir insurgency, future research could estimate these effects using the three survey rounds of the National Family Health Survey (NFHS) and compare health outcomes across rounds.

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Figures

Figure 1.1: Jammu and Kashmir district map

The districts most affected by violence are: Srinagar (40%), Baramula (17%), Kupwara (11%), Anantnag (10%), Pulwama (7%) and Badgam (3%). The ranking is based on own calculations in using the event data set I created. For the period 1990 to 2011 I have 1368 different events in total. 662 occurred in the period 1990 to 1996 only.

Figure 1.2: Number of victims for J&K - 1988 to 2007 - own calculations

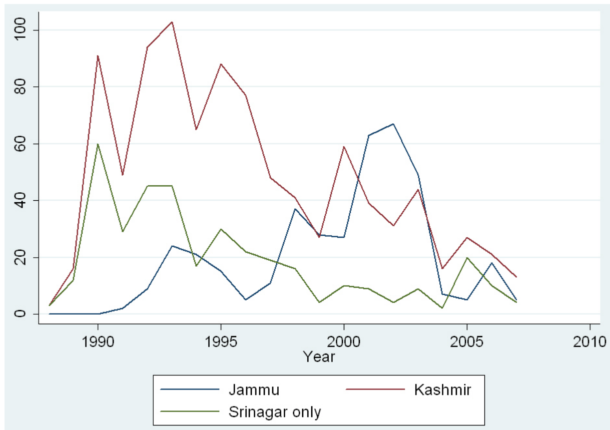


Figure 1.3: Number of victims for J&K - 1988 to 2011 - Source of raw data: SATP (2012)

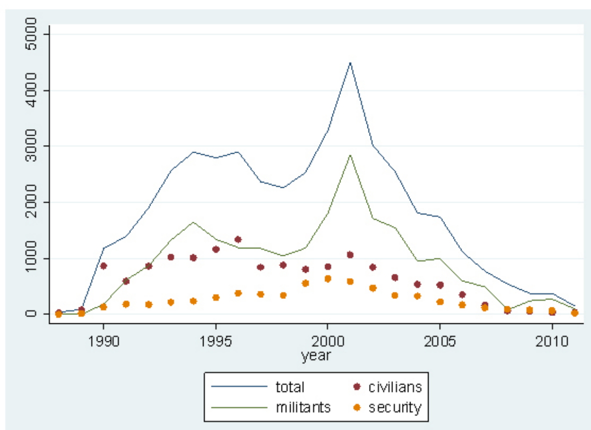


Figure 1.4: Number of murder victims for Srinagar, Jammu and Doda district 1990 to 2006 - Source of raw data: INSCR (2012)

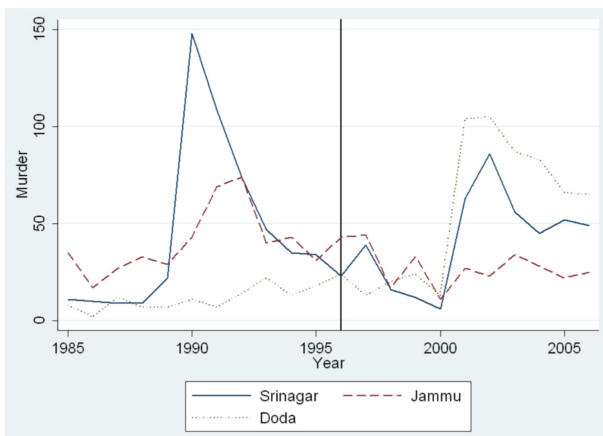
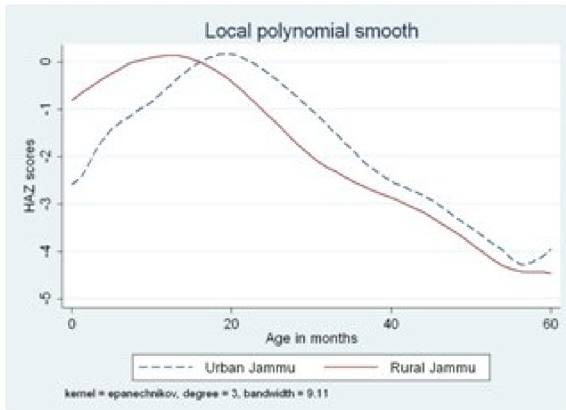
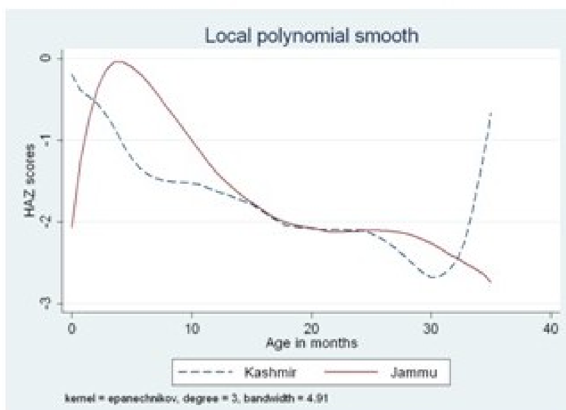


Figure 1.5: Local HAZ polynomials - own calculations

NFHS-1: Urban Jammu (dashed line) vs. Rural Jammu (solid line)



NFHS-2: Kashmir (dashed line) vs. Jammu (solid line)



NFHS-3: Kashmir (dashed line) vs. Jammu (solid line)

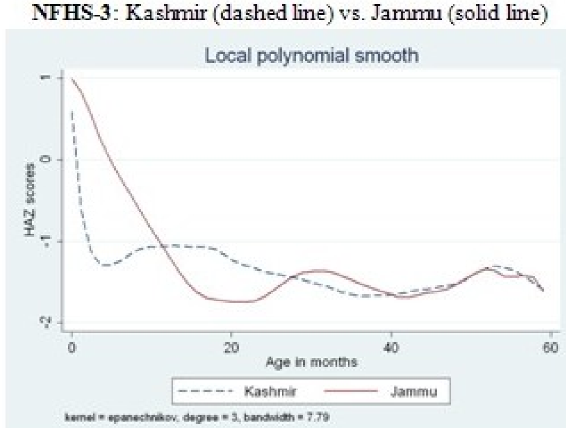
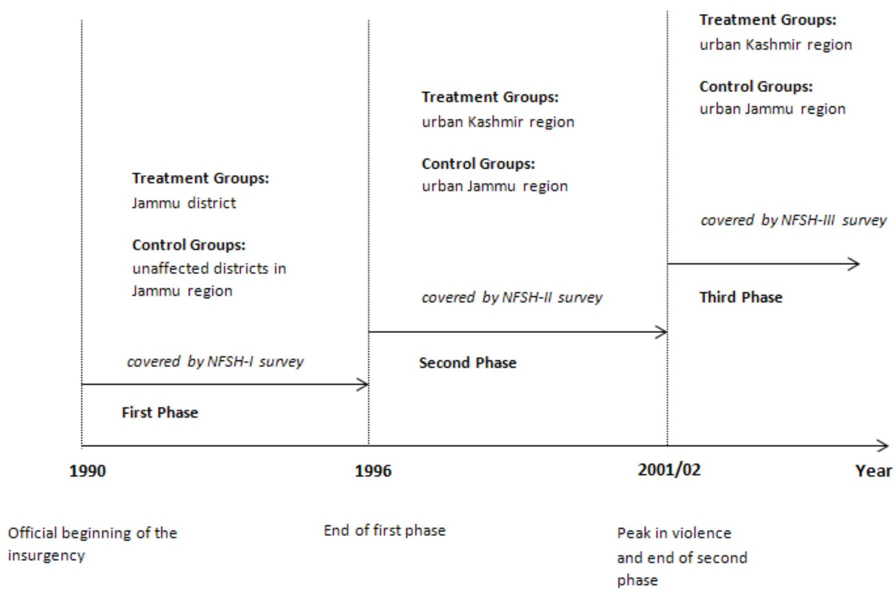


Figure 1.6: Phases of the insurgency and treatment / control groups



Tables

Table 1.1: Number of insurgency related incidences - 1988 to 2010 - own calculations

Year	**Jammu region**	District average	**Jammu district**	**Kashmir region**	District average	**Srinagar district**
1988	0	0	0	3	0.5	**3**
1989	0	0	0	16	2.66	**12**
1990	0	0	0	91	15.16	**60**
1991	2	0.3	**1**	49	8.16	**29**
1992	9	1.5	3	94	15.66	**45**
1993	24	4	5	103	17.16	**45**
1994	21	3.5	0	65	10.8	17
1995	15	2.5	8	88	14.66	30
1996	5	0.83	0	77	12.83	22
1997	11	1.83	0	48	8	19
1998	37	6.16	1	41	6.83	16
1999	28	4.66	0	27	4.5	4
2000	27	4.5	0	59	9.83	10
2001	63	10.5	3	39	6.5	9
2002	67	11.16	16	31	5.16	4
2003	49	8.16	2	44	7.33	9
2004	7	1.16	4	16	2.66	2
2005	5	0.83	0	27	4.5	20
2006	18	3	0	21	3.5	10
2007	5	0.83	0	13	2.16	4
2008	4	0.66	2	8	1.33	0
2009	2	0.33	0	3	0.5	1
2010	0	0	0	6	1	3

Notes: Bold numbers indicate that absolute number of incidents is close or more than 50% of all incidents in this particular year. I am using this event-data set in conjunction with findings in the literature. The reason is that it is not possible to collect all insurgency related events without access to local archives. Especially the amount of incidences in the Jammu district underestimates the effect of the insurgency. Given the amount of riots, murder rates and looting early in the 90's in the Jammu district (INSCR 2012), it is surprising that not more insurgency related incidences are reported. One reason could be that only incidences in Kashmir made it into the literature, because the Azaadi movement is mainly a Kashmiri one. Nonetheless, Jammu city is the winter capital of the state which many government agencies present which can be targets for militants.

Table 1.2: Descriptive Statistics based on NHS-1, 2 and 3 for all Jammu and Kashmir

	NFHS-1 (0 to 59 months) urban (n=233)	rural (n=463)	**NFSH-2** (0 to 36 months) urban (n=213)	rural (n=749)	**NFSH-3** (0 to 59 months) urban (n=277)	rural (n=949)
Children's characteristics						
HAZ	-1.536	-1.418	-1.338	-1.707	-1.144	-1.362
Age in months	25.89	26.03	18.42	16.72	30.18	29.56
Boys	57.94%	53.35%	54.01%	55.18%	52.71%	52.37%
Small at birth	25.00%	23.54%	28.27%	31.11%	25.36%	33.05%
Iron Supplement	91.85%	78.62%	83.05%	69.36%	79.17%	64.63%
Vitamin A	34.36%	21.74%	41.21%	25.27%	n.a.	n.a.
Complications at birth	32.19%	22.89%	34.21%	16.55%	31.05%	9.17%
Antenatal Checkup	98.28%	86.18%	97.05%	81.88%	94.44%	82.67%
Tetanus Vaccination	98.28%	85.10%	94.49%	86.11%	95.33%	84.10%
Diarrhea last two weeks	23.38%	19.35%	31.51%	32.62%	4.55%	11.50%
Mother's characteristics						
Age in years	25.48	23.76	26.95	26.84	28.98	27.81
Years of Schooling	8.59	3.77	6.22	2.56	7.41	3.39
Hindu	85.41%	76.24%	30.80%	40.41%	40.79%	29.08%
Muslim	4.29%	15.33%	58.23%	58.88%	54.15%	70.81%
Height (cm)	n.a.	n.a.	153.20	153.59	153.72	154.35
Children ever born	2.33	3.09	2.52	3.13	2.44	3.08
Household's characteristics						
Owns Land	18.45%	74.24%	2.53%	18.00%	30.69%	77.24%
Owns Livestock	18.45%	78.14%	n.a.	n.a.	24.19%	77.03%
Scheduled Tribe	0	1.74%	19.41	30.87%	21.30%	38.25%

Notes: For the NFHS-1 years of schooling, I assume missing values in years of schooling to be zero. Given that the sample barely includes any members of a scheduled tribe, years of schooling likely overstates the true years of schooling.

Table 1.3: DID regressions based on NFHS-1 children 0 to 36 months

Treatment group Control Group	Jammu district rest of Jammu	cohort model	rural Jammu district rest of Jammu	cohort model
War	-1.032**	-1.440**	-.528**	-1.342**
	(.317)	(.591)	(.140)	(.632)
Age child	-.212***	-.243**	-.254**	-.194***
	(.043)	(.052)	(.065)	(.074)
Male	-.240	.002	-.264	-.000
	(.144)	(.273)	(.211)	(.292)
Age mother	.097***	.131**	.085*	.065
	(.013)	(.055)	(.033)	(.061)
Education	.015	.032	.021	.038
	(.021)	(.037)	(.026)	(.035)
Muslim	.384*	.556	.263	-.734
	(.168)	(.583)	(.233)	(1.019)
Number of Children born	-.374	-.781	-.540	-1.443**
	(.457)	(.806)	(.540)	(.702)
Scheduled tribe	-.328	-.334	-.578	.724
	(.367)	(.836)	(.432)	(1.219)
Abortion ever	.055	.183	-.126	.349
	(.151)	(.387)	(.405)	(.441)
Small at Birth	-.807***	-.138	-.697	-.103
	(.172)	(.342)	(.356)	(.304)
Complications at Birth	.221	.483	.154	-.141
	(.315)	(.365)	(.364)	(.308)
Antenatal Care	1.292	.259	1.070	.503
	(.807)	(1.672)	(.800)	(1.059)
Tetanus vaccination	-.933	.544	-.767	-.207
	(.967)	(1.589)	(.944)	(1.087)
Home delivery	.086	.418	.215	.144
	(.073)	(.356)	(.174)	(.321)
R^2	0.61	0.80	0.63	0.76
N	337	159	225	159
Time trend	yes	yes	yes	yes
Birth F.E.	yes	yes	yes	yes
City F.E.	yes	yes	no	no
District F.E.	yes	no	yes	no
State F.E.	yes	yes	yes	yes
HH controls	yes	yes	yes	yes

Notes: Household controls include owning a TV (for urban areas), owning land and livestock (for rural areas), and birth order. The cohort model includes children living in the same district but compares outcomes of children age 0 to 35 months with an older cohort. The older cohort was in utero or born before the outbreak of the insurgency. Robust and clustered at the district level standard errors are shown in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 1.4: DID regressions based on NFHS-2 children 0 to 36 months

Treatment group Control group	urban Kashmir urban Jammu	other urban districts all urban districts
War	-2.553***	-1.523***
	(.371)	(.334)
Age child	-.166	-.150
	(.153)	(.167)
Male	-.136	-.216
	(.216)	(.206)
Age mother	-.012	-.009
	(.034)	(.029)
Education	.055*	.067*
	(.028)	(.033)
Height mother	.088**	.089**
	(.028)	(.029)
Anemia mother	-.756**	-.877***
	(.225)	(.231)
Muslim	1.784***	1.743**
	(.466)	(.563)
Number of children	-.041	.087
born	(.489)	(.661)
Wanted child	.163	.167
	(.287)	(.317)
Abortion ever	-.143	-.199
	(.295)	(.313)
Small at birth	-.488*	-.410*
	(.234)	(.182)
Tetanus vaccination	-.087	-.070
	(.300)	(.327)
Prenatal Care	-.560	-.309
	(.476)	(.581)
Doctor assistance	-.366	-.445
at birth	(.756)	(.787)
Antenatal Care	-.097*	-.097*
	(.043)	(.043)
Home delivery	-.495	-.404
	(.658)	(.726)
Currently	-.823**	-.721**
Breastfeeding	(.305)	(.284)
R^2	0.42	0.44
N	178	178
Time trend	yes	yes
Birth F.E.	yes	yes
City F.E.	yes	yes
District F.E.	yes	yes
State F.E.	yes	yes
HH controls:	yes	yes

Notes: Household controls include owning a TV, refridgerator and land. Furthermore, controls include if a household belongs to a scheduled class or not. I do not present cohort models because the NFHS-2 only includes children age 0 to 36 months. The model for "other urban districts" focuses on districts in Kashmir affected by violence the most. These districts (Anantnag, Badgam and Kupwara) are compared to districts less and not affected by violence. Robust and clustered at the district level standard errors are shown in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 1.5: DID regressions based on NFHS-3 children 0 to 36 months

Treatment group	Kashmir	urban Kashmir
Control group	Jammu	urban Jammu
War	-.251	-1.590**
	(.286)	(.738)
War*Hindu	-.478*	-.239
	(.261)	(.647)
Age child	-.214**	-.285
	(.102)	(.286)
Male	.056	-.030
	(.174)	(.265)
Age mother	.005	-.020
	(.021)	(.045)
Education	.019	-.046
	(.022)	(.038)
Height mother	.066***	.059**
	(.015)	(.028)
Anemia mother	-.321	.077
	(.205)	(.389)
Number of children	-.015	-.061
born	(.085)	(.177)
Wanted child	.035	-.357
	(.221)	(.420)
Abortion ever	.032	.314
	(.215)	(.426)
Small at birth	-.404**	-.972***
	(.184)	(.272)
Tetanus vaccination	-.387	
	(.372)	
Prenatal Care	.053	.906
	(.280)	(.556)
Doctor assistance	-.243	-.298
at birth	(.398)	(.596)
Antenatal Care	.095	-.858
	(.419)	(.946)
Home delivery	-.029	-.730
	(.424)	(.610)
Currently	-.026	-.210
Breastfeeding	(.205)	(.324)
R^2	0.22	0.63
N	475	102
Time trend	yes	yes
Birth F.E.	yes	yes
City F.E.	yes	yes
District F.E.	no	no
State F.E.	yes	yes
HH controls	yes	yes

Notes: Household controls include owning a tv, refridgerator, owning land, belonging to a scheduled cast, birth order and the altitude a household lives in. Robust and clustered at the district level standard errors are shown in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 1.6: Migration - Years living at current residence - NFHS-1, 2 and 3

	NFHS-1		**NFHS-2**		**NFHS-3**	
	Jammu	Jammu rural	Kashmir urban	Other	J&K	J&K urban
Years>3						
War	-1.562*	-.791	-3.919***	-.268**	-.366	-1.897*
	(.650)	(.194)	(.729)	(.081)	(.306)	(.982)
R^2	0.69	0.71	0.46	0.26	0.19	0.52
N	229	163	134	387	471	101
Years>5						
War	1.248	-1.758	-1.431	-.269**	-.254	-1.866
	(.945)	(.313)	(.777)	(.081)	(.333)	(1.215)
R^2	0.75	0.80	0.53	0.25	0.19	0.53
N	129	93	115	353	415	93

Notes: Models with high levels of multicollinearity, because of a too small sample sizes, are not reported here. Robust and clustered at the district level standard errors are shown in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 1.7: Exposure to violence by birth cohorts - NFHS-1, 2 and 3

	NFHS-1 Jammu	Jammu rural	**NFHS-2** Kashmir urban	others districts	**NFHS-3** Kashmir
36 to 59 months					
War	1.077	.233	n.a.	n.a.	.405
	(.760)	(.454)			(.413)
R^2	0.71	0.76			0.27
N	128	76			198
24 to 35 months					
War	-4.376*	-4.167***	-3.436***	-.754**	.309
	(1.918)	(.711)	(.239)	(.204)	(.630)
R^2	0.76	0.80	0.59	0.46	0.24
N	99	62	65	124	138
12 to 23 months					
War	-.728	-1.097	2.683**	.021	-.503
	(.395)	(.962)	(.845)	(.215)	(.409)
R^2	0.73	0.80	0.75	0.42	0.30
N	123	87	59	128	207
<12 months					
War	.729	1.714	n.a.	-.569**	-.746
	(1.442)	(0.78)		(.180)	(.548)
R^2	0.66	0.78		0.32	0.28
N	115	147		157	172

Notes: Models with high levels of multicollinearity, because of a too small sample sizes, are not reported here.
Robust and clustered at the district level standard errors are shown in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 1.8: Other dimension of health - symptoms of diarrhea two weeks prior to the survey

	NFHS-1	NFHS-2		NFHS-3
Treatment group	Jammu district	urban Kashmir	rural Kashmir	all Kashmir
Control group	other districts	urban Jammu	rural Jammu	all Jammu
War	.449***	-.029	.556**	.083
	(.146)	(.178)	(.193)	(.057)
Age child	.006	-.085	-.053	-.080***
	(.011)	(.048)	(.049)	(.019)
Male	-.012	.034	.016	-.004
	(.062)	(.066)	(.048)	(.030)
Age mother	-.026*	-.019	-.006	-.005
	(.010)	(.012)	(.006)	(.004)
Education	.010*	.010	.000	.007*
	(.004)	(.008)	(.003)	(.004)
Muslim	.055	-.196*	-.297***	-.040
	(.138)	(.082)	(.050)	(.046)
Currently	-.006	.185**	.092	-.023
Breastfeeding	(.004)	(.065)	(.056)	(.040)
No toilet in house	.179	.026	-.056	.052
	(.004)	(.131)	(.059)	(.047)
Birth order	-.053	.045	.003	.004
	(.137)	(.030)	(.017)	(.013)
Small at birth	.191**	-.061	-.001	.040
	(.048)	(.071)	(.045)	(.036)
Water pipe	n.a.	.154	-.026	-.041
		(.225)	(.043)	(.040)
Owns Refrigerator	n.a.	-.076	.140**	.039
		(.116)	(.048)	(.051)
Gave plain water	n.a.	.440***	.016	.013
		(.075)	(.096)	(.051)
Gave Fresh Milk	n.a.	.011	.080	-.009
		(.095)	(.044)	(.035)
Gave Fruits	n.a.	.100*	-.061	.007
		(.040)	(.047)	(.039)
R^2	0.31	0.22	0.09	0.10
N	154	165	589	510
Time trend	yes	yes	yes	yes
Birth F.E.	yes	yes	yes	yes
City F.E.	yes	yes	yes	yes
District F.E.	yes	yes	yes	no
State F.E.	yes	yes	yes	yes
HH controls	yes	yes	yes	yes

Notes: Models with high levels of multicollinearity, because of a too small sample sizes, are not reported here. Household controls include owning land and livestock, owning a TV, and belonging to a schedule tribe. Robust and clustered at the district level standard errors are shown in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Chapter 2

Education and Armed Conflict: The Kashmir Insurgency in the Nineties

2.1 Introduction

Armed conflicts change the supply of education (e.g. through occupied school buildings or migration of teachers) and the demand for education (lower returns to education). Thus, an armed conflict can reduce the education (e.g. years of schooling) of individuals.

Armed conflicts vary by the intensity of violence, and range from wars (or civil wars) to a possibly weaker form of an armed conflict insurgencies. Wars and civil wars can be intense. They destroy infrastructures and lives during the entire conflict period and have strong and long-lasting negative impacts on education (Akresh and de Walque 2008, Akbulut-Yuksel 2009, Swee 2009, Shemyakina 2011, and Chamarbagwala and Moran 2011). Insurgencies have phases with peaks in violence but also phases with low levels of violence. Thus, the experience of violence can be different during an insurgency.

In using the Kashmir experience, I add another variation of an armed conflict

to the discussion. The Kashmir insurgency is an ongoing conflict which started in 1990. I use the 2005/06 National Family Health Survey for India (NFHS-3) to estimate the impact of the insurgency on girls who were of school age during the first phase of the insurgency from 1990 to 1996. I compare educational outcomes of girls more affected by the experience of violence with girls less affected.

The underlying trend in the educational system of Jammu and Kashmir (J&K) is a positive one during the 1990s. Individuals have more years of schooling, enroll more into primary and secondary education, and drop out of schools less. This is true for the state overall, but once focusing on groups more affected by violence, I find that girls living in the major cities of Kashmir do not benefit from the underlying positive development. Overall, the average treatment effect of the insurgency on years of schooling shows a negative but not significant impact on schooling. The results remain qualitatively robust, once accounting for migration, different age cohorts, and a different identification of Kashmiri.

Previous research found strong and negative impacts of armed conflicts on years of schooling. Here, I find an insignificant impact on years of schooling because the Kashmir insurgency is less intense when compared with other armed conflicts. The goal of the Indian government was to suppress any form of rebellion, which resulted in sending in tens of thousands armed forces into the major cities of the valley of Kashmir. Another goal was, to keep daily routines running as "normal" as possible for civilians (Joshi 1999). Anecdotal evidence suggests that schools were occupied by armed forces and militants during the insurgency (Asia Watch 1993, Schofield 2001), but new schools and more teachers were hired in J&K (J&K Directorate of Statistics 2011). This development weakened the impact of an armed conflict on years of schooling.

I also test the impact of the insurgency on school completion and school enrollment as other channels to education. I find that dropout rates for primary

education increased. Surprisingly, enrollment into primary education increased in Kashmir.

The paper is organized as follows. Section 2 introduces to the relevant literature, while section 3 describes the Kashmir insurgency. In Section 4, I introduce to the data and explain my identification strategy. Results for years of schooling are discussed in section 5, followed by robustness checks in section 6. In section 7, I explore the effect of the insurgency on school completion and school enrollment. The paper concludes in section 8.

2.2 Literature Review

Armed conflicts can change the supply and demand for education (Shemyakina 2011, Chamarbagwala and Moran 2011). The supply of education is reduced because school buildings get destroyed or occupied by armed forces and militants. Another reason is that teachers migrate to safer regions. The demand for education can decrease because of the increased risk of going to school. This is especially true for girls because parents want to protect them from the risk of being exposed to violence (Shemyakina 2011). Furthermore, the schooling decision is affected by decreased returns to education during and after a conflict because of changing labor market opportunities.

Schooling outcomes are less for children in Germany who lived in high-intensity bombing areas during WW II (Akbulut-Yuksel 2009). These children have up to 1.2 fewer years of schooling and earn up to 6% less as adults, compared with children less affected by Allied bombings. Boys in Rwanda, who experienced and survived the 1994 genocide, have up to 1.5 years less schooling (Akresh and de Walque 2008). Given that average schooling in Rwanda is four years only, the genocide had a large impact on education. Swee (2009) finds for the civil war in Bosnia that children are up to 3% less likely to complete

secondary schooling. Shemyakina (2011) finds for the civil war in Tajikistan, that girls and boys of school-age are less likely to complete their mandatory schooling compared with children less affected by the civil war. Furthermore, the demand for education decreased in more conflict-affected regions. Finally, Chamarbagwala and Moran (2011) explore the long-term consequences of the 36-year long civil war in Guatemala. This civil war has short phases of high levels of violence and long phases of low levels of violence which is similar to the Kashmir insurgency. They find that rural households lose up to one year of education on average when compared with urban households.

Literature on the negative impacts of the Kashmir insurgency on human capital outcomes is limited. Educational outcomes, especially for Kashmir, are assumed to be negative (Asia Watch 1993, Joshi 1999, Schofield 2001, Kashmircorps 2008), but no quantitative support for the statement exists so far. Reports, based on various rounds of the NFHS, draw a positive picture for years of schooling for the entire state of Jammu and Kashmir (UNESCO 2010), but ignore the effects on individuals more affected by the conflict.

2.3 The Kashmir insurgency

Jammu and Kashmir (J&K) is one of the 28 states in India. It consists of three parts: Jammu, Kashmir, also known as the valley of Kashmir, and Ladakh. Those three parts are different from each other by composition of the population, historical background and the language. Ladakh is barely populated. The overall population of 12.5 Million is split between Jammu (43%) and Kashmir (55%). Kashmir has a Muslim majority of 97%, which speaks Kashmiri. Kashmiri is almost exclusively spoken in the valley.

The state of J&K has been the reason for three short wars between India and Pakistan over the territory (1947, 1965 and 1999). India and Pakistan claim

the region for themselves. This is known as the Kashmir conflict or sometimes as a "proxy war" between India and Pakistan with skirmishes around the Line of Control (LoC). The LoC is separating the Indian and Pakistani part of the Kashmir region.

Today, the insurgency itself is embedded in the dispute between these two powers, but started as a movement for independence of Kashmiri Muslims called: "Azaadi" (freedom). J&K experienced economic improvements during the late Seventies and Eighties but many in the valley felt left out (Habibullah 2008). The local government remained corrupt, most public jobs went to Hindus, and the Kashmiri did not feel represented in the state assembly and parliament (Habibullah 2008).

The official start of the insurgency is after the December 1989 kidnapping of Rubaiya Sayeed, the daughter of the Indian minister for Kashmir affairs. After her release, the Indian central government sent security forces into J&K to break down any form of rebellion.

The insurgency can be split up into three phases (Meyerle 2008, SATP 2011). The first phase was from 1990 to 1996, where militancy focused on urban areas of Kashmir. From the late 1990s to 2001/02, militancy moved to more rural areas of Kashmir and districts of Jammu. The third phase is from 2002 to today. This phase is a low intensity insurgency. My focus is on the first phase of the insurgency.

During the first phase of the insurgency most violent events took place in urban areas of Kashmir, especially the capital Srinagar city. Up to 100,000 Hindus left the valley in the first two years and left behind a Muslim majority (Asia Watch 1993). By the mid 1990s, Indian security forces controlled major cities, where militancy died out slowly. "Normalcy" (Joshi 1999, p.92) returned to the urban areas of Kashmir and elections could be held again in 1996.

Figure 2.1 shows the districts of Jammu and Kashmir. The districts mostly affected by the insurgency during the early 1990s were: Srinagar, especially Srinagar city, Baramula, Kupwara, Anantnag, Pulwama and Badgam. I ranked the districts according to own calculations based on a novel event-dataset I created using existing literature on the insurgency (Table 2.1).

Figure 2.2 shows overall numbers of victims of the insurgency from 1990 to 2011. As a lower bound, the insurgency cost the lives of 14,634 civilians, 6,007 security forces and 22,535 militants, as well the destruction of local infrastructure in the last two decades (SATP 2011). The first phase started 1990 with a large increase in victims and peaked in 1996. After 1996, the number of civilian victims is below the pre-1996 levels. The insurgency changed and cost more lives of militants and security forces.

[Figure 2.1: about here]

[Figure 2.2: about here]

[Table 2.1: about here]

2.4 Data and empirical strategy

2.4.1 Data and descriptive statistics

I utilize the 2005/06 National Family Health Survey for India (NFHS-3). It is a representative survey conducted at the state level focusing on health of women and children, but also offering demographic background questions. For the state of Jammu and Kashmir, I have information on 3,281 ever-married women (ages

15 - 49). The sample is representative in respect to composition of religion and language spoken. Household size is close to the national average (Census of India 2001, 2011).

Here, I discuss differentials and long-run trends in average years of schooling between regions in J&K, which aids identifying groups for the difference in difference analysis following. Table 2.2 summarizes descriptive statistics for urban and rural areas of J&K, as well as for the Jammu and the Kashmir region itself. There are differences in years of schooling between urban and rural areas. Women in rural areas of J&K, especially in the Kashmir region, work in activities (e.g. horticulture) requiring less education (Joshi 1999). A similar differential exists between the Jammu and the Kashmir region. A possible explanation is that most of the tourism and the horticulture in the state takes place in the Kashmir region itself (Joshi 1999, J&K Directorate of Statistics 2011, Sharma, Sharma and Wari 2012). Women working in these sectors typically do not require more than primary education.

Figure 2.3 and 2.4 illustrate long-run trends in years of schooling between urban and rural areas of J&K and between the Jammu and the Kashmir region itself. One of the long-term development goals of the Indian government is to increase literacy rates of the population (Fifth All India Education Survey 1985). Thus, the trends show that younger cohorts of women have more education than older cohorts of women besides women who started their primary education during the insurgency (ages 15 - 21).

[Figure 2.3 and 2.4 about here]

[Table 2.2 about here]

2.4.2 Identification and empirical strategy

To employ a difference in difference analysis (DID), I need to identify girls more affected by the insurgency than others to be able to compare their educational outcomes. The actual treatment is the insurgency. The treatment group consists of girls who were of school age during the first phase of the insurgency (1990 to 1996) and who lived in Kashmir. There are two possible control groups. First, girls who finished their schooling before the insurgency broke out, and second girls of school age during the first phase of the insurgency but living in less affected regions of J&K.

In India compulsory primary schooling covers ages 6 - 14. From age 15 onwards, children can enroll in secondary schools. By the age of 15, children should have completed primary education. The treatment group is the age cohort 15 - 29 in 2005. Everyone older than 29 should have completed primary education by 1990. Furthermore, most of the violence took place in the urban areas of Kashmir during the first phase of the insurgency, especially in major cities.

One drawback of the NFHS-3 is that I cannot identify the exact location (district or valley) of the household. I use language spoken as the identifier. Jammu and Kashmir has distinct languages spoken in some parts but not others. Kashmiri is almost exclusively spoken in the valley. In my sample 55% speak Kashmiri while 45% speak the remaining languages. This reflects the composition of the J&K population with around 55% in Kashmir and 45% in Jammu.

My empirical model is the following:

$$Y_{ijt} = \alpha + \gamma(\text{war}) + \beta X_i + \delta_j + \omega_t + \tau + \epsilon_{ijt} \tag{2.1}$$

where Y_{ijt} is years of schooling for individual i, living in j, and belonging to age

cohort t. The parameter γ is the average treatment effect of the insurgency on girls more affected by the insurgency compared with girls less affected by the insurgency. The parameter X_i is a vector, including demographic controls. The parameter δ_j reflects regional fixed effects. The parameter ω_t controls for cohort fixed effects and the parameter τ controls for time fixed effects. The parameter ϵ_{ijt} is the usual error-term.

2.5 Results

I use difference in difference regressions. Results are presented in Table 2.3. I compare years of schooling of a younger cohort (age 15 - 29) to outcomes of an older cohort (age $>$ 29) and to girls of the same age but living in less affected areas. The younger cohort went to school during the first phase of the insurgency, while the older cohort finished schooling before the outbreak of the insurgency in 1990.

Most of the violence during the 1990s took place in the urban areas of Kashmir, especially in larger cities, like Srinagar city. I have no information on the district a household lives in. Thus, I split the treatment group into girls living in urban areas and girls living in cities. The difference between these two treatment groups is that I exclude towns from the former.[1] The older control groups live in the same region or in rural areas. I expect girls in urban (and cities) areas to have better school outcomes compared with older cohorts living in urban and rural areas.

The average treatment effect (*war*) for girls living in urban areas is negative but not significant. I find a similar effect of the insurgency for girls living in cities (column 2). One explanation for the insignificant effect of the insurgency on years of schooling is the amount of security forces deployed throughout cities

[1] Towns have a population of less than 10,000, which has rural characteristics.

in the valley which made going to school relatively safe. Another explanation is that the supply of schooling itself did not deteriorate as much as in other armed conflicts (Swee 2009, Shemyakina 2011). Dabla (2010) notes that especially in Srinagar city private schools opened to counteract the negative effects of public schools occupied by the military and the militants. These two developments can weaken the negative effect of an armed conflict on years of schooling.

Confounding variables like age have the expected negative effect on years of schooling, because older individuals should have less education compared to younger individuals. Furthermore, Muslims have less education compared to Hindus. Muslim women work mainly in handicraft or at home, which requires less education in general (J&K Directorate of Statistics 2011).

[Table 2.3 about here]

The trend in J&K is towards more education. Girls more affected by the insurgency are left out from the overall positive development in the educational sector. Overall, the insurgency did not affect years of schooling negatively. The reason is that "normalcy" came back to the valley after 1992 (Joshi 1999). Despite the outbreak of the insurgency, the goal of the local government was to keep daily routines running as normal as possible.

2.6 Robustness checks

The above results could be influenced by potential migration of households because of the insurgency, the chosen age cohort for girls more affected by the insurgency, and my identification of the Kashmir region.

First, considering migration, households migrate to safer regions if the experience of violence becomes too intense. While up to 100,000 Hindus left the

valley in the beginning of the insurgency, migration of Kashmiri is not reported in various NGO reports. Furthermore, given that women marry early in India, girls who were of school age during the 1990s do not necessarily have to live in the same locality in 2005 when the survey was undertaken. Overall, households live for more than ten years on the average at their current residence.[2] I restrict my samples to women who have lived more than ten (or 15) years at their current residence. I find similar effects of the insurgency on years of schooling as before (Table 2.4).

Another concern is that different age groups are differently affected by the experience of violence. Girls who went to school in the beginning of the insurgency experienced more violence than girls who went to school at the end of the first phase of the insurgency. Here, I split the treatment groups into three age groups. Ages 27 - 29 finished primary schooling at the beginning of the insurgency. Ages 22 - 26 experienced violence during the insurgency. The youngest age group, ages 15 - 21, began their schooling at the end of the of the first phase, where "normalcy" returned to the cities of Kashmir (Joshi 1999). I find similar effects as before, but smaller in magnitude for the oldest cohort (Table 2.4). Given that these girls completed most of their schooling around the outbreak of the insurgency, this finding is not unexpected.

Finally, one can argue that using only language spoken to identify the Kashmir region could also include individuals speaking Kashmiri in districts of Jammu which are close to the valley. Districts in Jammu with a Kashmiri minority include Doda, Rajouri and Poonch. To overcome this issue, I use information on primary sampling units (PSU) and language spoken. I assume that every PSU with a majority of Kashmiri speaking women is within Kashmir. In my sample, I get a small change in composition. I have some non-Kashmiri speaking women in the sample for Kashmir, and around 40 Kashmiri speaking

[2] Years lived at the current residence refers to the locality a households lives in.

women in the sample for Jammu. I do not expect the results to be affected significantly. The effect of the insurgency on years of schooling remains qualitatively similar compared to only using language spoken to identify Kashmir (Table 2.4).

[Table 2.4 about here]

2.7 Channels to differentiated educational attainment

An armed conflict does not only affect years of schooling of individuals, but also the decision to drop out of school and the decision to enroll in schools during a conflict. My focus is on girls of primary school age (ages 15 - 29 in 2005) and of secondary school age (ages 25 - 34 in 2005). Their outcomes are compared with girls less affected by the insurgency.

2.7.1 School completion

Children enrolled in schools during an armed conflict are more likely to drop out for safety reasons. Furthermore, the reduced supply of education can increase dropout rates.

My dependent variable takes the value '1', if someone completed primary (or secondary) schooling and zero otherwise. Controls for quality of education (teacher-student ratios, school-student ratios) are added to my previous specifications. Data for the quality of education are from the J&K Directorate of Statistics (2011), and available for the pre-insurgency period and for the school year 1990/91. I assign different values for different age cohorts who went to school before 1990. For the affected age cohort, I take the 1990/91 values for

the entire first phase of the insurgency.[3] I present the results for school completion in Table 2.5.

Girls enrolled in primary education and living in the cities of Kashmir are less likely to complete primary schooling because of the insurgency. Compared to years of schooling, the average treatment effect is significant. As expected, more teachers and schools per students have a positive effect on completing primary schooling, but only school ratios are significant. In the second part of Table 5, I show results for girls completing secondary education. The insurgency did not affect girls living in cities negatively. Given that fewer girls enroll in secondary education, these girls select themselves into secondary education. They are more willing to finish secondary education, even in the situation of an armed conflict.[4] Surprisingly, higher teacher and school ratios have negative impacts on completing secondary education. Smaller classes can reduce the ability of working with other students, which could be a disadvantage in situations where resources are less available in general.

[Table 2.5 about here]

2.7.2 School enrollment

School enrollment can be affected by an armed conflict in various ways. School buildings get destroyed, or occupied, and teachers can migrate to safer regions. Through the reduced supply of schooling the demand cannot be met. Furthermore, the demand for education can decrease, because parents decide to keep their children at home for safety reasons.

School enrollment is a binary variable and takes the value '1' if somebody is enrolled in primary (or secondary) education and zero otherwise. I use schools

[3] These ratios are higher compared to the pre 1990 values.

[4] I cannot control for this selection bias in my models because of the lack of data (e.g. parents and household information when girls were of school age).

per capita and teachers per capita to proxy for the supply of education. To proxy for the demand for education, I use altitude. Jammu and Kashmir is a very mountainous area. Households living in higher areas have less access to schooling, especially to secondary education (Raza, Ahmad and Sheel 1990). My results are presented in Table 2.6.

I find that school enrollment in primary education increased for girls living in the cities of Kashmir. This can be interpreted in two ways. First, the experience of violence did not deter girls from enrolling in primary education. Second, the insurgency changed local labor markets. One of the main sources of income before the insurgency broke out was tourism (Joshi 1999, J&K Directorate of Statistics 2011). Tourism sharply declined after 1990 (J&K Directorate of Statistics 2011) which could explain why girls enrolled more in primary education. Most jobs in tourism require less education (e.g. service jobs). These girls enrolled more in primary education to improve their labor market prospects.

However, the demand for secondary education did not increase. This can be explained by the deteriorated safety situation. If fewer girls enroll into secondary education in general, then these girls are likely the first who are deterred by an armed conflict.

More teachers and schools per capita have the expected positive effect on school enrollment, but only schools per capita have a significant effect. The role of altitude is different for secondary schooling compared with primary schooling. Altitude has a positive effect on secondary school enrollment. As argued above, these girls are different in selecting themselves into secondary schooling, and take commuting to less mountainous areas into account in their decision to enroll in secondary education.

[Table 2.6 about here]

2.8 Conclusion

The experience of the Kashmir insurgency is different from other armed conflicts in the literature. Armed conflicts, like WW II or the Rwandian genocide, reduced years of schooling of children more affected by the conflict compared with children less affected. Here, the Kashmir insurgency did not reduce years of schooling of girls more affected by the insurgency. This finding can be explained by the coping strategy of the Indian central government. India sent in tens of thousands security forces to fight any form of militancy at the beginning of the insurgency. By the mid 1990s, a few hundred thousand security forces were deployed in Kashmir, which weakened any form of militancy, and therefore civilians were possibly less exposed to violence. The goal of the local (and central) government was to keep daily routines running as "normal" as possible, given the armed conflict (Joshi 1999). Furthermore, during the 1990s more schools were opened, and more teachers were hired, not just in safe regions of the state (Dabla 2010). Both developments can attribute to a weak effect of the insurgency on years of schooling, which remained qualitatively similar in a series of robustness checks. These checks include accounting for possible migration by Kashmiri households to safer regions, different age cohorts and a different identification of the Kashmir region.

While the insurgency has an insignificant negative effect on years of schooling, girls of primary school age and living in cities of Kashmir were more likely to drop out from primary education when compared with girls less affected by the insurgency. A surprising finding is that these girls are more likely to enroll into primary education. Given that employment opportunities vanished during the 1990s, girls enrolled in more education to increase their chances in the labor market. The increase in school enrollment and the opposing force of increased school dropout rates can additionally explain why the effect of the insurgency

on years of schooling is limited.

The experience of the Kashmir insurgency in the 1990s shows that if the local government can deal with an armed conflict, years of schooling does not decrease. Though, it should be kept in mind that during the 1990s, a human rights crisis took place in the valley of Kashmir. Security forces unfamiliar with the territory, and overwhelmed in dealing with militancy, committed countless examples of human right violations against the civilian population, including kidnapping, torture and rape of girls and women (Asia Watch 1993, Schofield 2001) which has a negative and long-lasting impact on a different human capital outcome: height of children (Parlow 2012).

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Figures

Figure 2.1: Jammu and Kashmir district map

The districts most affected by violence are: Srinargar (40%), Baramula (17%), Kupwara (11%), Anantnag (10%), Pulwama (7%) and Badgam (3%). The ranking is based on own calculations in using the event data set I created. For the period 1990 to 2011, I have 1368 different events in total. 662 occured in the period 1990 to 1996 only.

Figure 2.2: Number of victims for J&K - 1988 to 2011 - Source of raw data: SATP (2011)

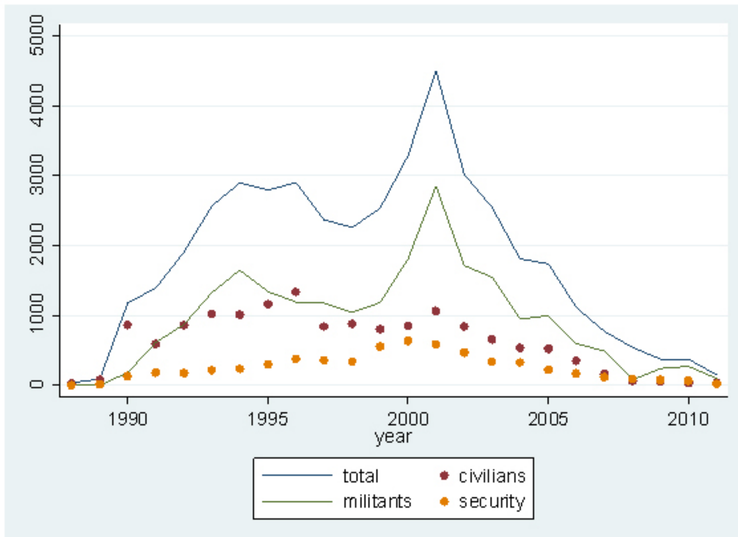
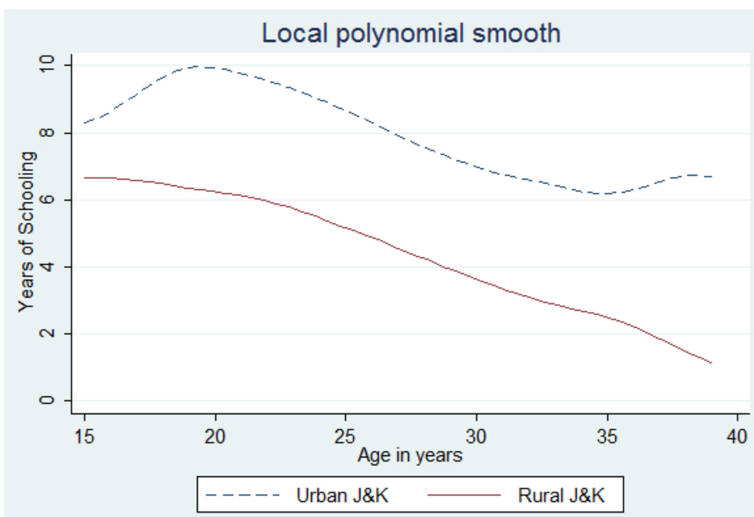
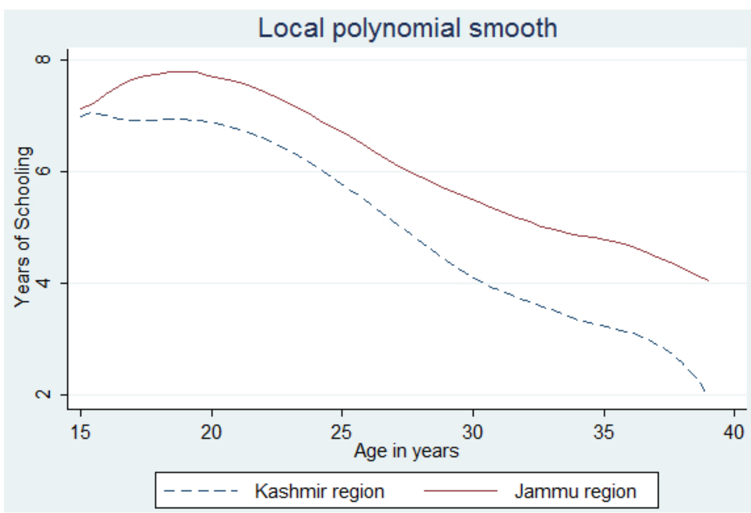


Figure 2.3: Average years of schooling - Urban vs. rural Jammu & Kashmir



Notes: Years of schooling is presented by age. Younger cohorts (especially age 15 to 21) obtained most of their primary education during the insurgency.

Figure 2.4: Average years of schooling - Kashmir region vs. Jammu region



Notes: Years of schooling is presented by age. Younger cohorts (especially age 15 to 21) obtained most of their primary education during the insurgency.

Tables

Table 2.1: Number of insurgency related incidences - 1988 to 2007 - own calculations

Year	**Jammu**	**Kashmir**	**Srinagar only**
1988	0	3	3
1989	0	16	12
1990	0	91	60
1991	2	49	29
1992	9	94	45
1993	24	103	45
1994	21	65	17
1995	15	88	30
1996	5	77	22
1997	11	48	19
1998	37	41	16
1999	28	27	4
2000	27	59	10
2001	63	39	9
2002	67	31	4
2003	49	44	9
2004	7	16	2
2005	5	27	20
2006	18	21	10
2007	5	13	4

Table 2.2: Descriptive Statistics based on NHS-III for all Jammu and Kashmir

	Urban (n=1081)	**Rural** (n=2200)	**Jammu** (n=1492)	**Kashmir** (n=1789)
Age	30.10	28.15	28.81	28.77
Years of Schooling	8.14	4.48	6.52	4.99
Age 15 to 29	9.43 (n=551)	5.93 (n=1311)	7.55 (n=852)	6.47 (n=1010)
Age $>$ 29	6.80 (n=530)	2.35 (n=889)	5.14 (n=640)	3.08 (n=779)
No Schooling	25.44 %	47.59%	33.38%	46.06%
Years lived at residence	11.78	12.99	12.54	12.74
Married	61.79%	62.55%	74.00%	66.00%
Household size	6.13	7.35	6.23	7.55
Children age $<$ 5	0.45	0.79	0.66	0.68
Hindu	35.25 %	33.27%	72.39%	1.84%
Muslim	60.50%	65.55%	23.53%	97.54%
Working	28.49%	39.73%	19.50%	49.80%

Table 2.3: Years of schooling for women

	Kashmir only (urban)	capital and cities
	Model 1	Model 2
War	-.512	-.747
	(.449)	(.604)
Age	-.115***	-.113***
	(.026)	(.026)
Muslim	-2.863	-3.072***
	(1.043)	(1.172)
Capital	1.395***	3.654***
	(.390)	(.484)
City	4.057***	6.044***
	(1.238)	(1.319)
Cohort	.777	.532
	(.690)	(.705)
Constant	yes	yes
Year fixed effects	yes	yes
N	1766	1766
R^2	0.26	0.23

Notes: Robust standard errros are reported in brackets. * p<0.10, ** p<0.05, *** p<0.01

Table 2.4: Robustness checks - Years of schooling - Average Treatment Effects

	Kashmir urban	capital and cities
Living > 10 years	-.031	-.521
	(.469)	(.642)
N	1534	1534
R^2	0.30	0.27
Living > 15 years	.069	-.338
	(.480)	(.665)
N	1466	1466
R^2	0.30	0.27
Age 15 to 21	-.426	-1.076
	(.498)	(.664)
N	1298	1298
R^2	0.30	0.31
Age 22 to 26	-.651	-1.075
	(.675)	(.836)
N	1071	1071
R^2	0.26	0.26
Age 27 to 29	-.327	.405
	(.952)	(1.271)
N	933	933
R^2	0.21	0.21
Kashmir	-.270	-.434
(PSU-based)	(.455)	(.632)
N	1727	1727
R^2	0.24	0.21

Notes: Robust standard errros are reported in brackets. * p<0.10, ** p<0.05, *** p<0.01

Table 2.5: School completion rates for primary and secondary schooling

Primary Education	Kashmir only	Secondary Education	Kashmir only
	Model 1		Model 2
War	-.149***	War	.079
	(.047)		(.054)
Age	-.006*	Age	-.022***
	(.003)		(.005)
Muslim	-.028	Muslim	.029
	(.070)		(.073)
Capital	-.037***	Capital	-.197**
	(.072)		(.091)
Cohort	-.021	Cohort	.085**
	(.071)		(.037)
Teacher ratios	.005	Teacher ratios	-.115***
	(.006)		(.013)
School ratios	.003*	School ratios	-.002***
	(.002)		(.000)
Constant	yes	Constant	Yes
Year fixed effects	yes	Year fixed effects	Yes
N	929	N	322
R^2	0.05	R^2	0.73

Notes: Robust standard erros are reported in brackets. * p<0.10, ** p<0.05, *** p<0.01

Table 2.6: School enrollment in primary and secondary schooling

Primary Education	Kashmir only	Secondary Education	Kashmir only
	Model 1		Model 2
War	.200***	War	-.051
	(.091)		(.061)
Age	.003	Age	-.007
	(.002)		(.008)
Muslim	-.448**	Muslim	-.088**
	(.183)		(.043)
Capital	-.037***	Capital	-.017
	(.072)		(.049)
Cohort	.107	Cohort	-.099
	(.083)		(.121)
Altitude	-.095*	Altitude	.098***
	(.056)		(.030)
Teachers	.015	Teacher	.089
per capita	(.024)	per capita	(.064)
Schools	.906***	School ratios	-
per capita	(.336)		
Constant	yes	Constant	Yes
Year fixed effects	yes	Year fixed effects	Yes
N	932	N	299
R^2	0.04	R^2	0.08

Notes: I dropped the variable schools per capita in the secondary schooling models because of multicollinearity.
Robust standard erros are reported in brackets. * p<0.10, ** p<0.05, *** p<0.01

Chapter 3

Does Trade promote Peace? - Using a gravity equation in a n*n dyadic relationships world

3.1 Introduction

Whether trade reduces the probability of interstate conflict has been the focus of empirical research for the last 30 years. Although a conclusion has not been reached, many find that trade indeed reduces conflict (Barbieri 1996, 2003, Polachek 1980, 1997, 2007, Pollins 1989). Only a few researchers asked if conflict reduces trade (Long 2008), or explored both directions of the relationship (Keshk, Pollins and Reveuny 2004, Martin, Mayer and Thoenig 2008). The simultaneity bias inherent in the conflict-trade relationship was ignored by most researchers or at most dealt with incompletely. My innovation in this paper is to use the gravity equation to explore the conflict-trade relationship. The gravity equation is flexible enough to model any dyadic relationship between a country i and j with regard to trade. It can also be used to model interstate conflict between two countries (Pollins 1989).

Within this approach, I deal with three possible limitations in previous work: the structure of the world, the pooling of data, and endogeneity in the trade peace nexus. First, the world is modeled as a rectangle to account for the ordering introduced in the Correlates of War (COW) country structure.[1] In this world every trade relationship enters the model only once. This ordering includes more developed countries than less developed countries. More developed countries tend to be more democratic and more democratic countries tend to be less likely involved in international conflict. This should be kept in mind when interpreting the results. When modeling the world as a rectangle, more country pairs can be used.[2] Specifically, my approach covers almost all countries of the world from 1948 to 2001.

Previous research uses multiple years of data but assumes that dyadic trade relationships do not change over time. Thus, the data are pooled and treated much like a cross section of trade dyads. This introduces an omitted variable bias by ignoring fixed effects common to all country pairs.

The final and arguably most important empirical issue is the simultaneity bias created by the relationship between trade and conflict. If trade reduces conflict and countries in conflict tend not to trade with each other, then naïve estimations could overstate the true reciprocal relationship between trade and conflict. To correct for this, an instrumental variable approach is needed. Martin, Mayer and Thoenig (2008) apply an instrumental variable technique to explain bilateral trade in their conflict model. They use preferential trade agreements (PTA) to instrument for bilateral trade. Given that PTAs follow peaceful relationships between two countries, a weak instrument problem arises.[3] My goal is to provide a stronger instrument to deal with endogeneity. Specifically, I will

[1] Long (2008) also uses a rectangular world but limits his analysis to a few countries and years only. Furthermore, he explains trade with conflict.

[2] Instead of only having n*((n-1)/2) conflict dyads I make use of n*n conflict dyads.

[3] Another argument is that PTAs could create envy because certain countries are excluded from them.

use annual rainfall as an instrument for trade in the conflict model.

The results of the paper suggest that trade and interstate conflicts are reciprocal in most specifications, with the results remaining robust in the fixed effect panel regressions. In using past values of trade in my models, I find that only last period's trade values explain current conflict. The trade history between states has no long-lasting impact on conflict. However, the relationship between current trade and conflict tends to change direction in using instrumental variable techniques. Trade has a positive effect on conflict. Many international disputes are actually over trade issues, one example is the dispute over NAFTA between the USA and Canada in the 1990s. But once focusing only on conflicts with actual battle deaths, the reciprocal relationship between trade and conflict prevails even in an instrumental variable model. Overall, trade indeed promotes peace, which is in favor of the liberal peace hypothesis (Barbieri 1996, 2003).

The paper is organized as follows. Section 2 discusses the relevant literature briefly and presents some arguments why trade and conflict affect each other. Section 3 describes the data and the models. Section 4 focuses on the effects of trade on conflict. Section 5 covers the robustness checks, while the paper concludes in section 6.

3.2 The Conflict Trade Nexus

For my purpose, I define conflict as a militarized interstate dispute (MID). A MID can include threats, the display of force, and battles having fewer than 1,000 deaths (Jones, Bremer and Singer 1996).[4] Analysis of the conflict trade nexus originated in the international relations literature.[5] In this field there are two main schools of thought with different implications for the conflict-trade

[4]This definition does not include wars, due to their rare and idiosyncratic nature.

[5]International relations is a field in political science explaining how states interact.

relationship: the liberal view focusing on cooperation and the neorealist view focusing on power (Barbieri 2003).[6]

The liberal school assumes that countries seek ways to create peace, which benefits everyone. The creation of international institutions is one way to achieve peace by cooperation; an early example is the League of Nations, the predecessor of the United Nations. In this view, trade can create peace because countries have to communicate and cooperate to reduce trade barriers, as with GATT or the WTO. Polachek (1980) formalizes the notion that trade reduces conflict in a welfare maximization model. In this model, conflict creates welfare cost because of trade benefits foregone. Governments compare the welfare costs with possible gains of conflict. Assuming that these welfare costs are higher than potential conflict gains in the long run, trade reduces conflict and benefits countries more. This idea has been labeled as the "liberal peace hypothesis" by Barbieri (1996, 2003).

The neorealist school assumes that the international system is in anarchy (Waltz 1979). Countries feel constantly threatened by each other and want to secure their own power (position), for instance by formal alliances. As long as power is equally distributed across countries (balance of power), conflict is minimized because the international system is stabilized. The neorealist view mainly explains why the Cold War period was more peaceful compared with previous periods.[7] Trade is another way to create stability in the international system, as long as trade benefits are equally distributed. Once trade benefits are asymmetrically distributed, conflict arises (Barbieri 1996, 2003). One reason is that trade gains can be used for national defense which threatens other states

[6]See Barbieri (2003) for a more detailed discussion of the literature.

[7]It can also explain why the number of MIDs increased substantially after the end of the Cold War in 1991 (COW 2010) because there is no balance of power in the international system anymore.

(Gowa 1994).[8] Another reason is envy (Barbieri 2003).[9]

These two explanations have each been subject to empirical investigations. The liberal peace hypothesis is tested by Polachek (1980, 1997, 2007) and Pollins (1989). Polachek uses trade, defined as exports or imports, as a determinant of conflict, and finds that trade reduces conflict. Pollins focuses on how international cooperation, defined as diplomatic interactions, increases trade. Barbieri (1996, 2003) and Russet and Oneal (1997, 1999, 2001) test the implications of the neorealist view. In this light, trade dependencies can increase conflict if one state depends more on trade than the other. Barbieri defines trade dependency as interdependency and finds that conflicts increase as a result.[11] Russet and Oneal also find that trade dependency increases conflict.[12]

Previous researchers have largely focused only on one direction of the conflict-trade relationship in their work at a time, thereby ignoring endogeneity. Once both directions are explored in one research design, the issue of simultaneity becomes salient. Trade reduces conflict, but countries having a history of conflict, or currently in conflict, are also less likely to trade. Keshk, Pollins and Revenue (2004) and Martin, Mayer and Thoenig (2008) explore both directions of the conflict-trade relationship in their work separately, and recognize endogeneity issues between conflict and trade. Keshk, Pollins and Revenue (2004) apply a two-stage regression to both models without choosing valid instruments distinguishing their models properly.[13] Martin, Mayer and Thoenig (2008) use

[8] Gowa (1994) uses the term "security externalities" to describe how trade can create conflict.

[9] In addition to these two schools, Morrow (1999) offers a different explanation that focuses on firm behavior. He assumes that firms are trading, and the role of countries is, to set up the framework within which firms can operate effectively.[10] A conflict increases transaction cost by creating trade barriers. For example shipments could be delayed at customs or never make it to the buyer. A profit maximizing firm will form expectations of the future using past conflict outcomes. This is because cross-border trade contracts are set in advance. By the time a conflict occurs, it has no effect on current trade.

[11] Trade interdependency is defined as the share of a country's trade on overall trade between two countries.

[12] Trade dependency is defined as trade over GDP.

[13] They leave out the entire discussion about choosing instruments, as well presenting first

preferential trade agreements (PTA) as an instrument for trade in their conflict model, and find that the negative relationship between trade and conflict prevails in an IV model. PTA is likely to be a weak instrument because PTAs follow peaceful relationships between countries. Furthermore, countries excluded from a PTA can increase their tensions with the excluding country.

3.3 Empirical Strategy and Data

The gravity equation is based on the "potential concept" from physics (Isard 1954), and first applied empirically to explain trade by Tinbergen (1964).[14] Within this framework two objects (e.g. two countries i and j) attract each other because of their size (measured as GDP) and their distance.[15]

The baseline trade gravity equation is :

$$trade_{ij} = \beta_0 GDP_i^{\beta_1} GDP_j^{\beta_2} Distance_{ij}^{\beta_3} \tag{3.1}$$

After taking the log of equation (1), and adding a vector of country attributes (at_i,at_j) the empirical gravity equation over time t is:

$$\begin{aligned} \ln(\text{trade})_{ijt} = \beta_0 + \beta_1 \ln(\text{GDP})_{it} + \beta_2 \ln(\text{GDP})_{jt} + \beta_3 \text{distance}_{ij} + \sum_{i=1}^{n} \gamma_i \text{at}_{it} \\ + \sum_{j=1}^{n} \gamma_{jt} \text{at}_{jt} + \epsilon_{ijt} \end{aligned} \tag{3.2}$$

stage results, and estimate reduced forms of the endogenous equation in the first stage to use predicted values in the second stage.

[14] The gravity equation became the standard empirical model in the economics trade literature, or as Feenstra et al. (2001, p.431) note this model is one of the "greater success stories in empirical economics".

[15] The same argument can be made for a conflict gravity equation.

Although the attraction between two countries can be used to describe why two objects (countries) with similar mass (GDP) trading with each other, it can also explain why two countries having similar country attributes (e.g. the level of democracy) are more likely to trade with each other. County attributes enter the model separately. Furthermore, the gravity equation is flexible enough to model conflict relationships as well (Pollins 1989) and is used here to explain (bilateral) conflict as a function of (bilateral) trade. Thus, the conflict gravity equation takes following empirical form:

$$\begin{aligned} \text{conflict}_{ijt} = \beta_0 + \beta_1 \ln(\text{trade})_{ijt} + \beta_2 \ln(\text{GDP})_{it} + \beta_3 \ln(\text{GDP})_{jt} + \beta_4 \text{distance}_{ij} \\ + \sum_{i=1}^{n} \gamma_i \text{at}_{it} + \sum_{j=1}^{n} \gamma_{jt} \text{at}_{jt} + \epsilon_{ijt} \end{aligned} \tag{3.3}$$

In my paper, I follow Head, Mayer and Ries (2010) in modeling the world as a "square". Compared to previous work, I have n*n conflict-trade relationships, instead of n*((n-1)/2). The latter setup follows the work of Barbieri (1996), who created a large dataset, covering most countries of the world, based on the Correlates of War country structure.[16] In creating a square world, I account for a few limitations in this standard setup. First, every trade relationship enters the model only once, but countries report their trade flows to the IMF. Quite often, exports reported from one country to another are not the same, if reported as imports. These discrepancies are the reason why trade relationships show up twice in a square world.[17] Second, the COW-structure (Barbieri 1996) uses a descending ordering of the world, and includes more dyadic relationships with developed countries than developing, especially underdeveloped countries.

[16] This dataset has been widely applied by researchers following her.
[17] This is the reason why the n*n (-square) world is standard in the trade literature.

More developed countries are more democratic on the average. Given that more democratic countries have a tendency to avoid bilateral conflict (Henderson 2002), this structure can bias results. Finally, Barbieri's dataset misses a few hundred dyadic relationships for the 1990s. This can add up to a few ten thousand missing conflict-trade relationships as in Martin, Mayer and Thoenig (2008).[18]

I use the dyadic dataset provided by Head, Mayer and Ries (2010) as my starting point.[19] The dataset includes relevant gravity equation variables like GDP, per capita income (PCI), distance measured as actual distance and contiguity (whether countries share a border). Also included are variables describing similarities between countries (e.g. official language, colonial ties and others). I add IMF trade data for the period 1948 to 2001 from the historical and current Direction of Trade Statistics.

My conflict variable is defined as a Militarized Interstate Dispute (MID). MID equals one if a dyad is in an interstate dispute and zero otherwise. Information on MID occurrences are from the MID dataset V3.1 (COW 2010) and the dyadic MID dataset V2 (Maoz 2005). The COW-project also offers information on formal military alliances, military expenditures and a national military capability index (CINC), which can explain interstate conflict. To measure the level of democracy, I use the Unified Democracy Score (UDS) provided by Pemstein, Meserve and Melton (2010). UDS offers more observations for the time period covered than the standard Polity IV variable. Furthermore, UDS is a continuous variable, which allows the interpretation of the regression coefficient as an elasticity.[20]

[18] In another version of this paper, I used Barbieri's dataset and noticed these discrepancies, which resulted in modeling the world as a rectangle. Note that Barbieri released an updated version of her dataset in 2012.

[19] The dataset is available through the CEPII project website: `http://www.cepii.fr/anglaisgraph/bdd/gravity.htm`, last accessed 02/20/2012

[20] Both measurements for democracy behave similarly in my regressions, but I do not report the Polity IV results here. Results for models using Polity IV can be requested from the

My complete dataset consists of 50,176 country pairs (or conflict-trade dyads), which were observed from 1948 to 2001. This results in 2,659,381 observations and covers 224 countries of the world. Given missing trade data, however, only around 640,000 observations are used in my typical regressions. I check whether omitting dyads with no trading relationship affects my results in a robustness check.[21]

In observing the same trade dyad over time, I need to account for the panel structure to avoid an omitted variable bias by ignoring unobserved fixed effects common to every dyad. Here, I apply fixed effects panel models, and compare them to the underlying pooled models. Green, Kim and Yoon (2001) apply a fixed effects logit model to a smaller subset of countries and years, and find no relationship between trade and conflict. Similarly, Martin, Mayer and Thoenig (2008) apply fixed effects logit regressions and linear probability fixed effects regressions to explain conflict, and find a tendency that the reciprocal relationship between conflict and trade prevails. To be consistent with previous work, I show results for population-average based GEE models as well.

Lastly, I deal with endogeneity in the conflict-trade relationship by using an instrumental variable approach, which is described in more detail below.

3.4 Does trade affect conflict?

Naïve Regressions

My results for the baseline conflict gravity equation are summarized in Table 3.1. Because of the binary nature of the bilateral conflict variable, I use non-linear estimation techniques. I present results for a logit model, a fixed effects

author.

[21] Another issue with trade data is taking the log of zero. I use total trade in millions of dollars and add one dollar to each observation. Finally, trade (exports plus imports), GDP and PCI are measured in 2005 constant USD.

(also known as conditional) logit model (FE logit) and a population average logit model (PA logit) to be consistent with the existing literature.

The coefficients in the pooled logit and population average model behave similar in sign and significance. In both setups trade has a strong and highly significant negative effect on bilateral conflict. Trade indeed promotes peace, which is in favor of the liberal peace hypothesis.

Collier and Hoeffler (1998) stress the importance of economic variables, like GDP (or GDP growth) in explaining conflict. Here, GDP and per capita income (PCI) have significant effects on bilateral conflict. Countries bigger in size (measured as GDP) are more likely to be involved in conflict.[22] Wealthier countries (PCI) are less likely to be involved in conflict.

The distance measurements have the expected signs. Countries further away from each other are less likely to be in conflict, while countries sharing a border are more likely to be in conflict. Given that MIDs are defined as bilateral conflict, this result is not unexpected, because most (armed) conflicts are indeed between neighbors.

Measurements describing similarities between countries include sharing an official language or a common history (as a former colony and colonizer). These measurements increase the potential for conflict. Many countries having an interstate conflict also share a common language; examples include China and Taiwan. Furthermore, Africa has many examples where former colonies fought for their independence from their mother countries. Another measurement of similarity is sharing the same legal system. Sharing the same legal system decreases conflict potentials, which can be explained by having similar institutional systems and systems in place to solve disputes (e.g. WTO or EU dispute settlement procedures).

[22]Part of GDP are military expenditures, which tend to rise with GDP (Payne and Sahu 1993). I tested, but do not report, the role of military expenditures on conflict and find, that once included, GDP becomes insignificant and changes sign.

Surprisingly, being in a formal military alliance or being more military capable (CINC) have no explanatory power. Collier and Hoeffler (1998) find that economic variables are in some cases more important in explaining conflict (in general) than standard international relations measurements. Though, once I focus on MIDs including actual battle deaths in a robustness check, CINC deters conflict. Countries with more military capabilities can do more harm in a dispute escalating to skirmishes or battles. However, the standard international relations variable to explain conflict is the level of democracy. Democracy has the expected negative impact on MID. Countries more democratic are less likely to be involved in bilateral conflict. Countries more democratic tend to be less involved in conflict and find other (and likely better) channels to solve disputes.[23]

The fixed effects logit model is different from the underlying pooled logit models. Changes in conflict outcomes are explained; for instance if two countries were in conflict last year, but not this year, they enter the model, while country pairs having the same conflict outcomes in two consecutive periods do not enter the model.[24] The negative effect of trade on conflict remains significant in a fixed effects model. The liberal peace hypothesis holds after accounting for unobserved heterogeneity over time of conflict dyads. Finally, gravity variables like GDP and PCI have the same explanatory power as before. Combined with democracy and trade, these variables explain changes in conflict outcomes significantly. This confirms the finding of Green, Kim and Yoon (2001) that economic and international relations variables keep their explanatory power in fixed effects setups.[25]

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[23] For instance the "Dispute Settlement Understanding" of the WTO is a well established mechanism.

[24] This explains why the sample size reduces substantially, because only dyads with observed changes in conflict are included in the regression.

[25] They apply their fixed effects models to the Barbieri country structure.

[Table 3.1 about here]

Dynamics - Lags of Trade

Here, I can answer the question whether the trade history between countries matters in explaining bilateral conflict.[26] I use ten lags of trade, but only report the first five lags in Table 3.2 to conserve space.

Only last period's trade levels explain current conflict. Governments act short-sighted when an interstate conflict occurs and do not account for (positive) past trade relationships. A similar example can be found in Head et al. (2010). They find that former colonies, after breaking away from their motherlands, start trading again with each other only a few years later. Given that movements for independence initiated decolonization, the conflict is soon forgotten.

Overall, the models behave similar compared to above. Recognizing that current trade is endogenous in the naïve regressions, most variables remain similar in sign and significance once current trade is excluded from the model. Only the military capability index (CINC) changes from being insignificant to significant. CINC can deter bilateral conflict in this setup.

[Table 3.2 about here]

Instrumental Variable Models

If trade reduces conflict (liberal peace hypothesis) and countries in conflict never (or barely) trade with each other, then current trade is endogenous in my models.[27] My above results are likely to overstate the negative relationship between

[26] Another question could be if countries (or their governments) form expectations of future trade levels in using leads. Using leads in my models does not give a consistent picture. Basically, the significance of leads is cumbersome to explain, e.g. why should the third or seventh period ahead matter, but not the first or second.

[27] Barbieri and Levy (1999) find that if the conflict (even war) is short (less than a year) trade levels between countries do not decrease necessarily.

trade and conflict. Here, I suggest rainfall as an instrument for trade. Rainfall matters for many countries in affecting economic outcomes (Miguel, Satyanath and Sergenti Ernest 2004). If a country experiences a drought, it needs to import agricultural goods. Similarly, if a country has adequate amounts of rain, it can export agricultural goods (or goods related to primary goods). Aldaya et al. (2012) show for the US that rainfall shocks change patterns in international crop trade. Moreover, water in general is used for production and not only needed in agriculture. I use annual rainfall data from the Tyndall Centre for Climate Change Research. These data is available from 1960 to 2000 only.

In Table 3.3, I present results for a pooled instrumental variable model (IV-Probit) and a linear probability model (IV-LPM). The first stage results are expected for standard trade gravity equations. GDP, PCI and countries sharing a common language trade more with each other. The instrumental variable rainfall performs well in the first stage with an F(2,547195)=419.01, which is above the suggested value of 10 (Staiger and Stock 1997, Stock and Yogo 2005). Furthermore, with two instruments available to explain one endogenous regressor the model is overidentified. Rainfall increases trade between countries and is highly significant in the first stage. However, a weak instrumental variable can still arise in large samples which should be kept in mind while interpreting the results (Staiger and Stock 1997).

The second stage results are mixed. Trade still decreases conflict in the probit setup, but reverses in sign in the linear probability model. Many MIDs are over trade issues (or economic issues in general), which can explain the positive effect of trade in the LPM setup. Once focusing on conflicts with actual battle deaths in a robustness check, the negative relationship prevails even in the LPM setup. The economic costs of conflict (e.g. trade benefits foregone and human lives lost) are too high compared to the benefits from just trading with

each other.

In the instrumental variable models, most explanatory variables remain similar in sign and significance compared to the naïve regressions. A noteworthy exemption is alliance, which was insignificant before. Here, military alliances have the expected negative effect in reducing conflict.

Overall, trade can have a positive effect on conflict, but also a negative effect, which remains (mostly) negative in a series of robustness checks.

[Table 3.3 about here]

3.5 Robustness checks

I perform four robustness checks. First, I test whether focusing on MIDs having actual battle deaths changes the results. The economic costs are high if skirmishes or battles occur. Thus, I expect the relationship between trade and conflict to be stronger in this setup. Second, researchers argue that the democratic peace hypothesis is an artifact of the Cold War (Barbieri 1996, Henderson 2002). I limit the sample to the Post-Cold War period. Third, I deal with missing values differently by assuming them to be zero. Including these trade relationships increases the sample size substantially. Finally, I split up the sample by regions to see if country pairs in certain regions of the world are more or less likely to be involved in conflict.

The results are summarized in Table 3.4, 3.5 and 3.6. I limit my analysis to current variables. To conserve space, I only report coefficients of the trade variable for my last three robustness checks (Table 3.5 and 3.6).[28]

Changing the conflict variable to only MIDs having actual battle deaths shows a stronger negative relationship between trade and conflict (Table 3.4).

[28] Results for other control variables can be requested from the author.

This is expected, because the costs of escalating conflicts to battles are higher compared to regular disputes. The negative relationship also holds in the instrumental variable setup. Most control variables have the same sign and significances as before. Two exemptions are alliance and CINC. Both were insignificant in the broader definition of conflict. Here, they have the expected negative impact on conflict in the pooled setup. Alliances are mostly non-aggression treaties (type 3), which do deter violent conflicts. Furthermore, countries with more military capabilities can also do more harm. In this light, CINC deters MIDs from escalating to battles.[29]

Barbieri (1996, 2003) argues that the liberal peace hypothesis is an artifact of the Cold War period. After 1991, globalization increased and countries opened up to more trade (e.g. NAFTA and the expansion of the EU), which can change the effect of trade on conflict because trade benefits can outweigh potential gains from conflict. I find that the positive relationship between trade and conflict is stronger in the IV models (Table 3.5) compared to above. Trade increased bilateral conflict during the Post-Cold War period, as found by Barbieri (2003) in a different setup.

The IMF trade statistics include many missing values for trade relationships which are unlikely to have any significant amount of trade. Although it is reported as missing or not available, trade is likely to be zero; for instance Israel does not trade with its neighboring countries for obvious political reasons, but trade is not coded as zero. I treat missing values as zero, which increases the sample size by more than 200,000 observations. In Table 3.5, I find similar results as in my naïve and IV-models above. The relationship between trade and conflict is stronger in this setup compared to my results above.

[Table 3.4 and 3.5 about here]

[29] Recall, that the definition of an MID includes the display of power as well.

Finally, I divide my sample into regions and focus only on conflict relationships within a certain region (Table 3.6). I find similar results as above. The negative relationship between trade and peace holds for most regions of the world. Only for highly integrated regions like Europe, I find that trade can increase conflict potentials. Given that MIDs can also be on trade issues this finding is not unexpected when countries heavily trade with each other. The more countries trade the more likely it is that trade issues occur.

[Table 3.6 about here]

3.6 Conclusion

The discussion how (and if) trade and interstate conflict are related has produced countless research over the last 30 years (Barbieri 1996, 2003, Polachek 1980, 1997, 2007, Pollins 1989, Keshk, Pollins and Reveuny 2004, Long 2008, Martin, Mayer and Thoenig 2008). The overall tendency is that trade reduces conflict (known as the liberal peace hypothesis). Barbieri (1996, 2003) contests this idea in her work and finds that trade can actually increase bilateral conflict.

I find that the negative relationship between trade and conflict holds in most of my setups in changing the structure of the world to the standard structure in international economics. Trade indeed promotes peace. Thus, welfare gains from trade do outweigh potential gains from bilateral conflict (Polachek 1980). This includes pooled models and models accounting for the panel structure of the data. After accounting for endogeneity between trade and conflict, I find that trade can increase conflict, mainly because of disputes based on trade-related issues. However, once I focus on conflicts having fatalities, the reciprocal relationship between trade and conflict even holds in an instrumental variable

model. The cost of escalating a conflict to skirmishes or battles are too high, in terms of trade benefits foregone.

Overall, the reciprocal relationship between trade and conflict holds in a square world. Trade does indeed promote peace because potential gains from trade outweigh potential gains from conflict.

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Tables

Table 3.1: Conflict gravity equation - 1948 to 2001

	Logit	FE-Logit	PA-Logit
$Trade_{ij}$	-.019***	-.031***	-.014***
	(.007)	(.004)	(.005)
GDP_i	.457***	.363***	.415***
	(.042)	(.129)	(.023)
GDP_j	.516***	.231*	.500***
	(.041)	(.128)	(.021)
PCI_i	-.289***	-.544***	-.311***
	(.046)	(.133)	(.033)
PCI_j	-.440***	-.442***	-.600***
	(.053)	(.133)	(.033)
$Dist_{ij}$	-.854***	-	-.957***
	(.070)		(.040)
$Contig_{ij}$	1.806***	-	1.619***
	(.164)		(.098)
$Language_{ij}$	.388***	-	.320***
	(.137)		(.082)
$Alliance_{ij}$	-.159	-.195	.084
	(.151)	(.131)	(.085)
$Colony_{ij}$	.951***	-	.958***
	(.215)		(.108)
$Legal_{ij}$	-.223*	-	-.204***
	(.116)		(.074)
$Coldwar_{ij}$	.500***	.031	.352***
	(.160)	(.076)	(.076)
$Democ_i$	-.748***	-.847***	-.160
	(.165)	(.150)	(.120)
$Democ_j$	-1.076***	-.620***	-1.083***
	(.177)	(.149)	(.115)
$Cinc_i$	-.015	.515	-.043
	(.057)	(.773)	(.066)
$Cinc_j$	.004	.083	.012
	(.056)	(.132)	(.075)
Time fixed effects:	yes	no	no
n	617218	27191	490169
Pseudo R^2	0.27	n.a.	n.a.

Notes: I use clustered standard errors where available (reported in brackets). The FE-Logit explains only dyads with observed changes in conflict outcomes between two periods. This is why the sample reduces significantly. The population average model assume an AR-(1) link within groups. All continous measurements are in log-form.
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table 3.2: Conflict gravity equation - 1948 to 2001 - Lags of Trade

	Logit	FE-Logit	PA-Logit
$L1.Trade_{ij}$	-.037***	-.027***	-.025***
	(.008)	(.009)	(.009)
$L2.Trade_{ij}$	.005	.009	.007
	(.007)	(.010)	(.009)
$L3.Trade_{ij}$	-.001	.001	-.000
	(.009)	(.010)	(.009)
$L4.Trade_{ij}$	.011	.017	.008
	(.008)	(.010)	(.009)
$L5.Trade_{ij}$	-.000	.000	-.004
	(.007)	(.010)	(.009)
GDP_i	.442***	.099	.428***
	(.052)	(.198)	(.027)
GDP_j	.484***	.739***	.493***
	(.049)	(.192)	(.025)
PCI_i	-.308***	-.424**	-.331***
	(.052)	(.193)	(.036)
PCI_j	-.461***	-.765***	-.512***
	(.057)	(.191)	(.036)
$Dist_{ij}$	-.847***	-	-.895***
	(.081)		(.044)
$Contig_{ij}$	1.796***	-	1.711***
	(.180)		(.110)
$Language_{ij}$	.320**	-	.319***
	(.155)		(.094)
$Alliance_{ij}$	-.072	-.352**	-.064
	(.165)	(.171)	(.097)
$Colony_{ij}$	.970***	-	.949***
	(.254)		(.125)
$Legal_{ij}$	-.170	-	-.278***
	(.130)		(.084)
$Coldwar_{ij}$	.460***	-.001	.081
	(.167)	(.091)	(.079)
$Democ_i$	-.785***	-1.020***	-.473***
	(.180)	(.185)	(.130)
$Democ_j$	-1.216***	-.571***	-.962***
	(.194)	(.184)	(.124)
$Cinc_i$	-.085**	11.118**	-.073
	(.039)	(5.534)	(.097)
$Cinc_j$	-.063*	.598	-.064
	(.037)	(1.138)	(.152)
Time fixed effects:	yes	no	no
n	438715	17695	401586
R^2	0.27	n.a.	n.a.

Notes: Clustered standard errors are reported in brackets. The FE-Logit explains only dyads with observed changes in conflict outcomes between two periods. This is why the sample reduces significantly. This can introduce problems of multicollinearity (e.g. with CINC). The population average model assume an AR-(1) link within groups. All continous measurements are in log-form.
* p<0.10, ** p<0.05, *** p<0.01

Table 3.3: Dealing with Endogeneity - 1960 to 2000 - IV regressions

First Stage	IV-Probit	IV-LPM
GPD_i	1.537***	1.537***
	(.004)	(.004)
GDP_j	1.625***	1.625***
	(.004)	(.004)
PCI_i	.272***	.272***
	(.007)	(.007)
PCI_j	.230***	.230***
	(.008)	(.008)
$Dist_{ij}$	-2.413***	-2.413***
	(.012)	(.012)
$Contig_{ij}$	.397***	.397***
	(.054)	(.054)
$Language_{ij}$	1.484***	1.484***
	(.023)	(.023)
$Alliance_{ij}$	-.312***	-.312***
	(.031)	(.031)
$Colony_{ij}$	1.883***	1.883***
	(.058)	(.058)
$Legal_{ij}$	.101***	.101***
	(.017)	(.017)
$Coldwar_{ij}$	-.902***	-.335***
	(.063)	(.066)
$Democ_i$	3.257***	3.257***
	(.031)	(.031)
$Democ_j$	1.914	1.914***
	(.031)	(.031)
$Cinc_i$	.065***	.065***
	(.021)	(.021)
$Cinc_j$	.021	.021
	(.022)	(.022)
$Rain_i$	.153***	.153***
	(.010)	(.010)
$Rain_j$	.258***	.258***
	(.010)	(.010)
F-Stat	419.01	419.01
Second Stage		
$Trade_{ij}$	-.074**	.0012***
	(.035)	(.00039)
GPD_i	.287***	-.0004
	(.055)	(.00060)
GDP_j	.312***	-.0003
	(.058)	(.00064)
PCI_i	-.096***	-.0010***
	(.011)	(.00012)
PCI_j	-.146***	-.0013***
	(.010)	(.00010)
$Dist_{ij}$	-.514***	-.0012
	(.086)	(.00093)
$Contig_{ij}$	.810***	.0693***
	(.030)	(.00065)
$Language_{ij}$	.241***	-.0013**
	(.056)	(.00064)
$Alliance_{ij}$	-.110***	-.0043***
	(.026)	(.00036)
$Colony_{ij}$	.531***	.0097***
	(.074)	(.0010)
$Legal_{ij}$	-.093***	-.0015***
	(.020)	(.00020)
$Coldwar_{ij}$	.126	.0026***
	(.078)	(.00077)
$Democ_i$	-.061	-.0059***
	(.128)	(.00141)
$Democ_j$	-.248***	-.0059***
	(.086)	(.00096)
$Cinc_i$	-.009	-.0001***
	(.033)	(.00024)
$Cinc_j$	-.004	-.0000
	(.031)	(.00025)
Time fixed effects:	yes	yes
n	547263	547263
R^2	0.49	0.02

Notes: For the IV-Probit, I get a Wald χ^2_1=3.65 with p=0.056 for the exogeneity of the instruments. For the IV-LPM model, I get an Anderson χ^2=837.49 with p=0.00 and a Sargan statistic of χ^2_1=12.904 with p=0.0003.
* p<0.10, ** p<0.05, *** p<0.01

Table 3.4: Robustness check I - Fatal MIDs - 1948 to 2001

	Logit	FE-Logit	PA-Logit	IV-Probit	IV-LPM
$Trade_{ij}$	-.047***	-.037***	-.042***	-.346***	-.00059***
	(.011)	(.007)	(.007)	(.063)	(.00020)
GDP_i	.411***	.289	.380***	.665***	.0012***
	(.067)	(.284)	(.036)	(.098)	(.00032)
GDP_j	.552***	-.492*	.551***	.746***	.0014***
	(.068)	(.294)	(.033)	(.103)	(.00033)
PCI_i	-.291***	-.727***	-.405***	-.042**	-.0002***
	(.101)	(.291)	(.053)	(.021)	(.00006)
PCI_j	-.703***	.182	-.958***	-.199***	-.00055***
	(.117)	(.305)	(.057)	(.018)	(.00005)
$Dist_{ij}$	-.821***	-	-.937***	-1.104***	-.0024***
	(.110)		(.058)	(.154)	(.00049)
$Contig_{ij}$	2.391***	-	1.887***	.996***	.0246***
	(.276)		(.158)	(.055)	(.00034)
$Language_{ij}$	.568**	-	.551***	.738***	.0015***
	(.253)		(.127)	(.099)	(.0003)
$Alliance_{ij}$	-.501**	-.443	-.220	-.284***	-.0030***
	(.232)	(.276)	(.151)	(.050)	(.00019)
$Colony_{ij}$	.997**	-	1.367***	1.089***	.0042***
	(.335)		(.166)	(.132)	(.00053)
$Legal_{ij}$	-.474**	-	-.566***	-.159***	-.0006***
	(.220)		(.121)	(.036)	(.00010)
$Coldwar_{ij}$	.654*	.334**	.999***	-.005	.00503***
	(.377)	(.170)	(.144)	(.146)	(.00075)
$Democ_i$	-.336	-.428	.790***	1.039***	.0022***
	(.283)	(.300)	(.216)	(.228)	(.00074)
$Democ_j$	-.772**	-.721**	-.503**	.446***	.0008*
	(.337)	(.307)	(.202)	(.152)	(.00050)
$CINC_i$	-.179**	33.650***	-.249	-.030	-.0000
	(.091)	(7.555)	(.244)	(.087)	(.00012)
$CINC_j$	-.140*	-1.506	-.083	-.022	-.0000
	(.074)	(7.990)	(.228)	(.078)	(.00013)
IV:$Rain_i$				.153***	.153***
				(.010)	(.010)
IV:$Rain_j$				.258***	.258***
				(.010)	(.010)
F-Stat				419.01	419.01
Time fixed effects:	yes	no	no	yes	yes
n	617218	9192	490169	547263	547263
R^2	0.32	n.a	n.a.	0.48	0.48

Notes: These models only includes MIDs with at least one battle death. Clustered standard errors are reported in brackets.
* p<0.10, ** p<0.05, *** p<0.01

Table 3.5: Robustness checks II - Post-Cold War period and Missing Trade Values

	Pooled Logit	FE-Logit	PA-Logit	IV-Probit	IV-LPM
Post-Cold War period					
$Trade_{ij}$	-.028**	.003	-.004	.194***	.0030***
	(.014)	(.018)	(.012)	(.050)	(.0004)
n	189200	2256	183512	145934	145934
R^2	0.31	n.a.	n.a.	n.a.	0.03
using missing values					
$Trade_{ij}$	-.035***	-.046***	-.023***	-.138***	.0024***
	(.005)	(.076)	(.003)	(.045)	(.0005)
n	918450	38913	844523	782086	782086
R^2	0.28	n.a.	n.a.	n.a.	0.02

Notes: The models using rainfall cover the period 1960 to 2000. Clustered standard errors are reported in brackets.
* p<0.10, ** p<0.05, *** p<0.01

Table 3.6: Robustness checks III - Different regions

	Pooled Logit	FE-Logit	PA-Logit	IV-Probit	IV-LPM
East Asia / Pacific					
$Trade_{ij}$	-.035**	-.042**	-.038***	-.127***	-.0097***
	(.015)	(.019)	(.014)	(.039)	(.0018)
n	8411	1600	6442	8411	8606
R^2	0.37	n.a.	n.a.	n.a.	0.11
Central Asia					
$Trade_{ij}$	-.081***	-.029	-.115***	-.382	-.00022
	(.031)	(.028)	(.016)	(.270)	(.00064)
n	19071	1117	28591	9819	27866
R^2	0.41	n.a.	n.a.	n.a.	0.03
Latin America / Caribbean					
$Trade_{ij}$	-.039*	-.027*	-.027*	-.073	-.0017
	(.022)	(.015)	(.014)	(.090)	(.0015)
n	48718	3751	38986	38345	38345
R^2	0.34	n.a.	n.a.	n.a.	0.08
Middle East / North Africa					
$Trade_{ij}$	-.084***	-.067***	-.063***	-.056	.0071***
	(.013)	(.012)	(.015)	(.108)	(.0013)
n	54580	3501	43176	49104	50698
R^2	0.38	n.a.	n.a.	n.a.	0.27
North America					
$Trade_{ij}$	.002	-.022	-.024	-.045	-.0012**
	(.018)	(.021)	(.141)	(.0005)	(.00058)
n	60994	2592	50073	50073	59498
R^2	0.44	n.a.	n.a.	0.02	0.03
South Asia					
$Trade_{ij}$	-.014	-.030	.063*	-.214	-.0079***
	(.033)	(.028)	(.0005)	(.172)	(.0024)
n	32544	3102	30542	30542	31704
R^2	0.43	n.a.	n.a.	0.02	0.04
Africa					
$Trade_{ij}$	-.004	-.0029	.0032	-.038	-.0015
	(.016)	(.012)	(.014)	(.122)	(.0017)
n	47101	3171	36245	45104	46462
R^2	0.34	n.a.	n.a.	n.a.	0.04
Europe					
$Trade_{ij}$	.364**	-1.578	.301	-1.501***	-.013***
	(.174)	(1.156)	(.283)	(.633)	(.0045)
n	10605	748	10794	10356	11820
R^2	0.07	n.a.	n.a.	n.a.	0.13

Notes: Clustered standard errors are reported in brackets. Regions follow the World Bank definition and are for trade between countries in the same region.
* p<0.10, ** p<0.05, *** p<0.01

Curriculum Vitae

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Education

Ph.D. Economics, University of Wisconsin-Milwaukee, USA, August 2013

M.A. (Diplom) in Economics (major), Sociology (minor) and Political Science (minor), University of Potsdam, Germany, 2008

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Fields of Interest

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Teaching Experience

Milwaukee Area Technical College, Department of Liberal Arts and Science, Milwaukee, WI

Instructor, Principles of Macroeconomics, Summer 2013 and Fall 2012

Instructor, Introduction to Economics, Spring 2013

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Instructor, Labor Economics, Spring 2012 and Fall 2010

Instructor, Principles of Microeconomics, Fall 2011, Spring 2011, Fall 2010, Summer 2010, and Fall 2009

Instructor, Principles of Economics, Spring 2010

Teaching Assistant, Graduate Econometrics, Fall 2009 to Spring 2012

Teaching Assistant, Principles of Microeconomics, Fall 2008 and Spring 2009.

Tutor for Panther Academic Support Service (undergraduate tutoring center), Spring 2012, Fall 2012, and Spring 2013

Tutor for graduate level Macroeconomics for Pakistani exchange students, Spring 2010

University of Potsdam, Faculty for Economics, Business and Social Science, Potsdam, Germany

Teaching Assistant, Graduate Microeconomics, Fall 2006 to Spring 2008

Presentations

"Armed Conflict and Children's Health: The Case of Kashmir", workshop on the "Economic Analysis of Conflict" organized by SIPRI, New Delhi, India, March 2013

"Does Trade promote peace?", conference on "The Economic Costs of Conflict", German Institute for Economic Research (DIW), Germany, January 2011

Professional Experience

German Institute for Economic Research (DIW), Department of International Economics, Berlin, Germany

Research Assistant, Ukrainian household survey project, June 2007 to October 2007

Honors and Fellowships

UWM Graduate School Travel Award - for the Conference on "The Economic Cost of Conflict", German Institute for Economic Research (DIW), Germany, 2011

Scholarship from the German Academic Exchange Service (DAAD) - Awarded to fund M.A. studies in Economics at the University of Wisconsin-Milwaukee, 2006

Miscellaneous

Organizer of a workshop on "Introduction to Latex for Economists", University of Wisconsin-Milwaukee, September 2010

Computer Skills Blackboard (Collaborate), D2L, Smart Board Technology, Stata, Eviews, SPSS, Maple, MS-Office and $\LaTeX$