

Development and Security



REPORT by Valeria Groppo and Kati Krähnert

The Impact of Extreme Weather Events on Children's Height: Evidence from Mongolia

3

INTERVIEW with Kati Krähnert

»Extreme Winters Affect Children's Height«

10

REPORT by Nina Wald

Forced Displacement Detrimental to the Health of Children in Colombia

11

REPORT by Nina Wald

Impact of Education Programs in Colombian Conflict Areas: Children Attend School More Frequently But Performance Has Barely Improved

18

REPORT by Johannes Rieckmann

Violent Conflicts Increase the Risk of Domestic Violence in Colombia

23

REPORT by Ghassan Baliki and Florian Szücs

Education as a Tool for Democratization

27

**DIW Berlin—Deutsches Institut
für Wirtschaftsforschung e. V.**
Mohrenstraße 58, 10117 Berlin
T +49 30 897 89 -0
F +49 30 897 89 -200

Volume 4, No 12
6 March, 2015
ISSN 2192-7219

Publishers

Prof. Dr. Pio Baake
Prof. Dr. Tomaso Duso
Dr. Ferdinand Fichtner
Prof. Marcel Fratzscher, Ph. D.
Prof. Dr. Peter Haan
Prof. Dr. Claudia Kemfert
Karsten Neuhoff, Ph. D.
Prof. Dr. Jürgen Schupp
Prof. Dr. C. Katharina Spieß
Prof. Dr. Gert G. Wagner

Editors in chief

Sabine Fiedler
Dr. Kurt Geppert

Editorial staff

Renate Bogdanovic
Sebastian Kollmann
Dr. Richard Ochmann
Dr. Wolf-Peter Schill

Editorial manager

Alfred Gutzler

Translation

HLTW Übersetzungen GbR
team@hltw.de

Press office

Renate Bogdanovic
Tel. +49-30-89789-249
presse@diw.de

Sales and distribution

DIW Berlin

Reprint and further distribution—including extracts—with complete reference and consignment of a specimen copy to DIW Berlin's Communications Department (kundenservice@diw.berlin) only.
Printed on 100% recycled paper.

The Impact of Extreme Weather Events on Children's Height: Evidence from Mongolia

By Valeria Groppo and Kati Krähnert

Shocks experienced during early childhood can harm the long term growth of children. We examine the potential impact of extreme weather events on children's height, taking the example of Mongolia, which is frequently plagued by extreme winters. Our focus is on the unusually harsh winter of 2009/10, which caused the deaths of over 10 million animals, approximately 23.9 percent of the country's entire stock. We identify causal effects by exploiting exogenous variation in the intensity of the shock across time and space. We find that the extreme winter of 2009/10 considerably impaired the growth of exposed children from herding households. Exposed children are small for their age, even three years after the event. It can be expected that the cohorts of exposed children will be smaller, poorer, and less healthy, even as adults.

External shocks, such as natural disasters, wars, and economic crises, can severely affect the lives of people. The children in developing and transition countries are particularly vulnerable to these events. In these economies, the availability of public safety nets and formal insurance schemes is often limited. Therefore, it is largely up to individual households to protect themselves against such shocks using informal strategies and to cope with the effects of shocks that have occurred. In these circumstances, households frequently prefer activities that generate a low but secure income. In the worst cases, this can lead to a vicious circle of poverty, shocks, and underdevelopment.¹

A relatively new area within development economics examines the impact of such shocks on children. The motivation for this research can largely be traced back to the British physician and epidemiologist David Barker, who formulated the fetal origins hypothesis in the early 1990s.² This hypothesis posits that fetuses adapt to malnutrition during pregnancy. According to Barker, this adaptation -a survival strategy for the unborn child- leads to permanent changes in physiology and metabolism in adulthood. The fetal origins hypothesis also states that children born underweight have a higher probability of suffering from coronary heart disease, diabetes, and high blood pressure as adults. Empirical studies testing Barker's hypothesis frequently find results consistent with the hypothesis. The empirical literature also provides evidence of a negative impact of shocks during pregnancy and in early childhood on human capital in the broad sense, including education, cognitive skills, and stature in children and adults.³

¹ For example, see S. Dercon and L. Christiaensen, "Consumption risk, technology adoption and poverty traps: Evidence from Ethiopia," *Journal of Development Economics* 96 (2011): 159-173.

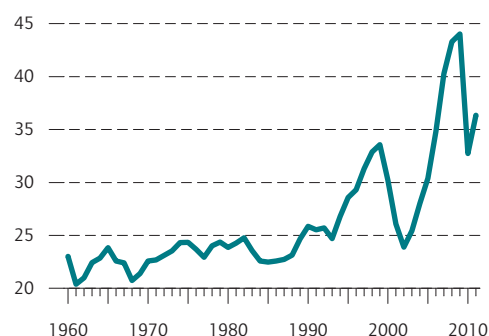
² C. N. Hales and D. J. P. Barker, "Type 2 (non-insulin-dependent) diabetes mellitus: The thrifty phenotype hypothesis," *Diabetologia* 35 (1992): 595-601.

³ For an overview of the literature, see J. Currie, "Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development," *Journal of Economic Literature* 47. (2009): 87-122; and R.

Figure 1

Livestock in Mongolia

In millions



Source: Mongolia Livestock Census; calculations by DIW Berlin.

© DIW Berlin

The *dzud* in the winter of 2009/10 caused the deaths of over 10.3 million animals.

The research presented here considers a shock in the form of an extreme weather event, an unusually harsh winter. Using data from Mongolia, we examined whether the winter of 2009/10 had a causal effect on the height of Mongolian children.⁴ Our research expands on the current state of knowledge by focusing on a shock in the form of a cold wave, while existing studies deal mostly with droughts and rainfall in tropical countries. Moreover, we provide evidence on the role of socio-economic characteristics and aid distribution in alleviating the effects of the shock.

Mongolia Is Prone to Extreme Weather Events

For various reasons, Mongolia provides an interesting context for studying this issue. First, the majority of the rural population lives from herding, a sector directly dependent on weather conditions.⁵ In 2011, 29.6 percent of Mongolian households owned livestock; for approximately 21.7 percent of households, herding represents

the main economic activity.⁶ People live mainly nomadic or semi-nomadic lives, moving to different pastures with their herds each season. In 2013, Mongolian farmers owned an average of 213 animals (sheep, goats, cows, horses, and camels)⁷ providing meat, milk, milk products, and dung for heating as well as income from the sale of wool, fur, meat, and milk.

Second, Mongolia is persistently plagued by extreme weather events that cause widespread livestock deaths. The unusually harsh winters, known as *dzud* in Mongolian, are caused by a long-lasting combination of various unfavorable climatic factors. These include extremely low temperatures over a period of several days or weeks, too little or too much snow, and significant temperature fluctuations that melt the snow and then freeze the runoff. *Dzuds* were, and still are today, a major risk factor for Mongolian herders. Because *dzuds* are very local phenomena, it is difficult to predict when and where the next *dzud* will occur.

Since weather records began in Mongolia in 1950, *dzuds* have occurred, on average, every eight years. Climatologists argue that both the frequency and the intensity of *dzuds* have increased since the late 1990s and associate this trend with global warming and climate change.⁸

Figure 1 illustrates the development of national herd stocks from 1960 to 2011. Two particularly strong declines have occurred since the 1990s: three successive extreme winters in the years 1999 to 2002 were responsible for the deaths of 11.1 million livestock; the *dzud* in the winter of 2009/10 caused the deaths of over 10.3 million animals, approximately 23.9 percent of the national stock. These are the highest ever documented livestock losses in Mongolia triggered by an extreme weather event. In January 2010, the Mongolian government declared a national disaster and appealed to the international community for emergency assistance.⁹

The high livestock losses in the winter of 2009/10 had serious socio-economic consequences. For instance, as reported by the International Red Cross, the shock threatened the food security of severely affected fami-

Martorell, "Undernutrition During Pregnancy and Early Childhood: Consequences for Cognitive and Behavioral Development," in *Early Child Development: Investing in our Children's Future*, ed. M. E. Young (Amsterdam: 1997): 39-83.

⁴ For a detailed description, see V. Groppo and K. Schindler, "Extreme Weather Events and Child Height: Evidence from Mongolia," DIW Discussion Papers 1403 (2014).

⁵ Agriculture is only possible in some areas of Mongolia due to the extreme continental climate.

⁶ National Statistical Office of Mongolia, *Monthly Bulletin of Statistics: December 2013* (Ulan Bator: 2013); National Statistical Office of Mongolia, "Mongolia has launched the main findings of its 2010 Population and Housing Census" (2011), en.nso.mn/content/49, last accessed on March 13, 2014.

⁷ National Statistical Office of Mongolia, *Monthly Bulletin of Statistics: December 2013* (Ulan Bator: 2013).

⁸ P. Batima, L. Natsagdorj, et al., "Observed Climate Change in Mongolia," AIACC Working Papers 12 (2005); D. Dagvadorj, L. Natsagdorj, et al, *Mongolia Assessment Report on Climate Change 2009* (Ulan Bator: 2009).

⁹ United Nations Mongolia Country Team, *Mongolia: Zud Appeal*, (Ulan Bator: 2010).

lies during winter months.¹⁰ Other studies indicate that herders limited their consumption of dairy and meat products in summer 2010.¹¹ Approximately six percent of all herding households lost their entire livestock and thus their livelihoods; a further 19.3 percent lost half of their herd.¹² The dzud also triggered a wave of distress migration by impoverished herders to the capital, Ulan Bator, with a consequent growth of informal settlements in the suburbs.

The Database

Our research is based on the Coping with Shocks in Mongolia Household Survey (see box).

Our outcome variable is a standardized measure of children's height, known as the height-for-age z-score (HAZ). The HAZ value is calculated for each of the 802 children aged 0 to 6 years included in our sample. Here, the actual measured height of each surveyed child is compared to the median height of children of the same sex and age. This median value is recorded in the World Health Organization's international reference dataset, which provides a worldwide representation of a child's height under optimal environmental conditions.¹³ A HAZ value of zero indicates that a child has the expected height for a healthy child of his or her age and sex. A HAZ value below zero indicates that a child is shorter than expected under optimal environmental conditions.

Furthermore, we use historic livestock census data to map the spatial intensity of the 2009/10 winter. A typical feature of dzuds is that they do not occur uniformly throughout Mongolia but are rather a very local phenomenon. Since the 1950s, the National Statistical Office of Mongolia has conducted an annual livestock census of all Mongolian herders every December. Data on the total number of livestock mortality per year and district are recorded in digital form since 1970. On the basis of

these data, we define the intensity of dzud as the difference between a district's livestock mortality in 2010 and its average livestock mortality from 1970 to 2008, divided by the standard deviation of long-term livestock mortality, in the same district. This standardized measure of the intensity of the dzud takes into account that different ecological zones have different long-term risks of being hit by a dzud.

Figure 2 maps the intensity of the dzud from 2009/10 for each of the 49 districts in western Mongolia where the Coping with Shocks in Mongolia Household Survey is conducted. The intensity level varies from 1.7 to 13.2. It is worth noting that the measure is above zero for each of the 49 districts, indicating that mortality in 2010 is above the long-term average in all sample districts. This again illustrates the severity of the 2009/10 shock. However, the distribution of dzud intensity varies significantly: some districts were particularly badly affected by the dzud, while other districts were far less affected. To account for this heterogeneity, we transform the dzud intensity measure into an indicator variable that takes the value one if a district has a dzud intensity value above the 85th percentile of the distribution.¹⁴ This variable is then merged with data on children.

The Winter of 2009/10 Affected The Height of Children from Herding Households

Descriptive findings indicate a relatively high occurrence of malnutrition in western Mongolia. The average HAZ value for the sample of Mongolian children is -1.07. For about 14 percent of sample children, the HAZ value ranged from -2 to -3; these children are moderately stunted or small for their age by international standards. Ten percent of sample children have an HAZ value of -3 and their growth is therefore considered to be severely impaired.

We use a difference-in-differences approach to explore the causal effect of the 2009/10 shock on children's height. We exploit the spatial variation in the intensity of the dzud, by distinguishing between children who, during the shock, lived in a severely affected district and those who lived in less affected districts. We also exploit variation in children's dzud exposure based on their date of birth. We define the cohort of children who experienced the dzud in utero or as infants as the co-

¹⁰ International Federation of Red Cross and Red Crescent Societies, Mongolian Red Cross Society, Rapid Assessment of Zud Situation in Mongolia (January 18 – January 26, 2010) (Ulan Bator: 2010) (summary report).

¹¹ See for example, M. E. Fernández-Gimenez, B. Batjav, et al, Lessons from the Zud: Adaptation and Resilience in Mongolian Pastoral Social-Ecological Systems (Fort Collins: 2012).

¹² United Nations Mongolia Country Team (2010); National Statistical Office of Mongolia, Monthly Bulletin of Statistics: December 2010 (Ulan Bator: 2010).

¹³ The WHO Child Growth Standards dataset is based on a sample of healthy children from Brazil, Ghana, India, Norway, Oman, and the US, whose mothers followed general recommendations for childcare and nutrition. One finding from this international dataset (and other datasets) is that the height-for-age of healthy children from different countries and ethnic backgrounds is very similar. Therefore, it is a common practice in research to express the height of children in relation to an international reference value. WHO Multicentre Growth Reference Study Group, "WHO Child Growth Standards based on length/height, weight and age," *Acta Paediatrica*. Suppl. no. 450 (2006): 76–85.

¹⁴ Similar results are obtained if a different percentile, for example, the 80th percentile—or the continuous intensity measure is used. A detailed description of the performed robustness tests can be found in Groppo and Schindler, "Extreme Weather Events."

Box

Household Survey in Mongolia

The longitudinal survey Coping with Shocks in Mongolia is conducted by DIW Berlin in cooperation with a local partner, the National Statistical Office of Mongolia, and is funded by the German Federal Ministry of Education and Research.¹ The sample includes 1,768 households in the three aimags (provinces) of Uvs, Zavkhan, and Govi-Altai, all in western Mongolia (see figure). A multi-stage sampling design is used so that the sample is representative of the population in western Mongolia. Each household in the sample will be surveyed three times

from 2012 to 2015. The questionnaire collects demographic characteristics of all household members (e.g., age, gender, education, and health), dzud experience (e.g., retrospective questions about the dzud of 2009/10, expectations of future climate shocks), risk management strategies (e.g., migration, formal and informal insurance schemes), welfare (e.g., consumption, income, wealth, and food security) and policy-relevant information (such as transfer payments, participation in government education and health programs). The household survey also collects anthropometric data (height, weight, and arm circumference) of children aged 0 to 6.

¹ For more detailed information, see www.diw.de/mongolei.

Figure

Mongolei

¹ Die Erhebungsregion der Coping with Shocks in Mongolia-Haushaltsbefragung ist grau markiert.

Quelle: Darstellung des DIW Berlin.

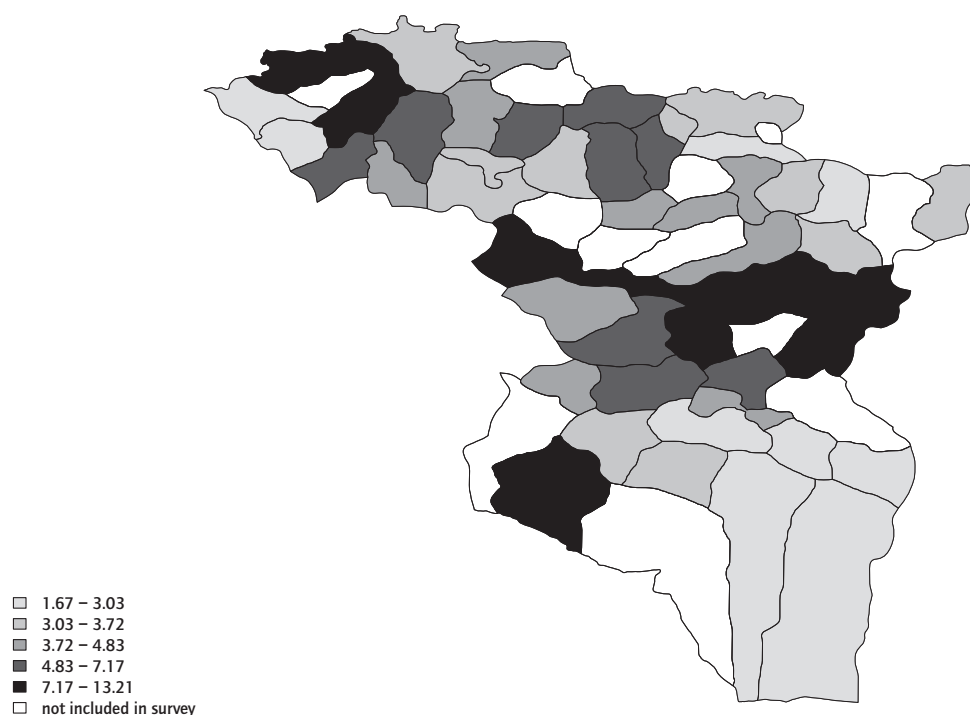
© DIW Berlin

hort affected by the shock. The control group consists of children born nine months after the dzud or later (after March 2011).

In order to make causal statements about the impact of the shocks, additional factors must be taken into account in a multivariate regression. For example, it is possible that differences in height are not only due to the dzud but also to the relatively strong economic growth in recent

years, which might have benefited in particular younger children. Equally, it may be that the more severely affected districts coincidentally also have poorer health infrastructures. It is also possible that households with a low level of education were more significantly affected by the shock than other households and were already experiencing a relatively less favorable food situation.

Figure 2

Intensity of 2009/2010 Dzud in Western Mongolian Districts

Source: Mongolia Livestock Census; calculations by DIW Berlin.

© DIW Berlin

The intensity of the 2009/10 dzud varied greatly across districts in the study area.

The table shows the findings of a multivariate OLS regression where the dependent variable is the standardized measure of children's height (HAZ). The regression controls for characteristics of the child, the mother, the household, as well as for district fixed effects and time. For children from herding households exposed to the dzud as unborn babies or in infancy and who live in a severely affected district, the HAZ decreased by 1.67 standard deviations compared to same-age-children living in less affected districts.¹⁵ In contrast, children from other households (that did not own any livestock) were not affected by the dzud- the interaction term is not statistically significant. This suggests that the impact of the dzud is not only caused by the extreme weather condi-

tions per se (which all children are exposed to) but is specifically due to the loss of livestock.¹⁶

Girls Are Affected by the Shock to a Lesser Extent than Boys

In the next step of the analysis, we highlight what socio-economic factors mitigate the negative consequences of shocks.¹⁷ An unexpected finding is obtained when considering gender differences. Both boys and girls are negatively affected by the dzud in terms of physical growth. However, this negative effect is significantly less

¹⁵ The measured effect is relatively large, as the following example shows. A boy who was 37 months old at the time of data collection and lived in a severely affected district during the dzud is around 5.25 cm smaller than a boy of the same age (with an otherwise identical socio-economic background) who lived in less affected districts.

¹⁶ To check the robustness of the findings, we constructed two alternative indicators of the intensity of the dzud. First, we use the amount of snowfall in winter 2009/10 per district. Second, we use the subjective assessment of the intensity of the 2009/10 shock from the perspective of the surveyed households (on a scale of 0 to 10). Both cases confirm the findings presented in the text: the dzud has significant negative effects on the height of children from herding households.

¹⁷ The findings described below refer to Tables 4 and 5 in V. Groppo and K. Schindler, "Extreme Weather Events."

Table

Effects of the 2009/10 Dzud on Children's Height

Estimated coefficients from OLS regressions

	Children from herding households	Children from non-herding households
Experienced the dzud as an unborn child/infant and lived in a severely affected district ¹	-1.668**	0.355
Experienced the dzud as an unborn child/infant	-0.024	-0.312
Observations	465	337
R ²	0.444	0.385

***, **, and * indicate statistical significance at the 1, 5 and 10 percent. Dependent variable: height-for-age z-score. Regressions also include characteristics of the child, mother, and household, as well as district, fixed effects, and time effects.

¹ Severely affected districts are districts in which the intensity of the dzud is above the 85th percentile of the intensity distribution.

Sources: Coping with Shocks in Mongolia Household Survey; Mongolia Livestock Census; calculations by DIW Berlin.

© DIW Berlin

Children from herding households exposed to the dzud as unborn children or infants and who live in a severely affected district are significantly smaller than children of the same age living in less affected districts.

pronounced in girls. One possible explanation for this is that girls are not disadvantaged in the Mongolian culture or are even given slightly preferential treatment in terms of nutrition compared to boys of the same age.¹⁸ Most existing studies of other countries, however, find either no significant gender effects or a significantly adverse effect for girls.

We also find clear evidence that wealth reduces the negative effects of the dzud. Children from herding households that owned relatively larger herds before the winter of 2009/10 suffer significantly less in terms of height than children from households with smaller herds.¹⁹ A possible interpretation of these findings is that relatively wealthier households can afford to keep their consumption stable, even during a shock. In contrast, relatively poorer households seem to limit their consumption during shock months in order to maintain their livestock base and thus their livelihoods in the medium term.

¹⁸ Our finding could also be related to genderspecific mortality. For example, there is evidence that male embryos are more vulnerable to shocks than female embryos. See S. Kraemer, "The fragile male," *British Medical Journal* 321 (2000): 1609-1612; and J. E. Lawn, H. Blencowe, et al. "Beyond newborn survival: the world you are born into determines your risk of disability-free survival," *Pediatric Research* 74 (2013): 1-3.

¹⁹ A comparison was made of between herding households in the richest tercile and those in the poorest tercile of the distribution of livestock owned in 2009.

Furthermore, our results suggest that access to external aid alleviates the effects of the dzud. The Mongolian government, international organizations, and local non-governmental organizations provided emergency aid in the form of food parcels and animal feed to households during the shock. On average, aid supplies amounted to 25.9 tons per district in the surveyed region. Regression findings show that emergency aid is significantly associated to higher height of children living in a severely affected district as unborn babies or infants. However, we cannot interpret this finding as a causal effect of emergency aid, but only as a correlation. This is because the criteria used to select households and districts for emergency relief distribution are not fully known.²⁰

Conclusion

Our results show that the unusually harsh winter of 2009/10 impaired the physical growth of children in Mongolia. However, the negative effects of the shock are not uniform across children in the sample but vary according to their socio-economic background. For example, only children from herding households recorded a decline in physical growth. There is a statistically significant difference between girls and boys, and between children from poorer and wealthier households.

According to the current state of knowledge in nutritional science, at least to some extent, it is possible to compensate for the negative effects of malnutrition in early childhood, through nutrition programs. However, the time frame in which such programs are effective is limited. Frequently, an age limit of three years is assumed.²¹ In Mongolia, the negative effects of the 2009/10 dzud are still evident three years after the shock. Therefore, it is likely that these effects will persist. Studies based on long-term data from other empirical contexts have shown that malnutrition during early childhood is associated with a lower level of education, smaller stature and poorer health as adults, and lower lifetime earnings.²²

²⁰ For example, the data from the Coping with Shocks in Mongolia Household Survey indicates that poorer households, households with a large number of children and households experiencing high livestock losses during the dzud were more likely to receive emergency aid. On the other hand, the worst affected districts did not necessarily receive more emergency aid, but aid was mainly distributed in districts with relatively less snowfall. Logistical costs seem to have played a role in selecting districts.

²¹ Martorell, "Undernutrition During Pregnancy."

²² H. Alderman and J. Hoddinott, "Long Term Consequences of Early Childhood Malnutrition," *Oxford Economic Papers* 58 (2006): 450-474; S. Dercon and C. Porter, "Live Aid Revisited: Long-Term Impacts of the 1984 Ethiopian Famine on Children," *Journal of the European Economic Association* 12 (2014): 927-948; S. Maccini and D. Yang, "Under the Weather: Health, Schooling, and Economic Consequences of Early-Life Rainfall," *American*

The same patterns are to be expected for the cohort of Mongolian children affected by the dzud.

Our findings lead to the conclusion that households' strategies alone are not sufficient to protect children from the negative consequences of such extreme weather events. However, our results on the positive correlation between food aid during the dzud and children's height are encouraging. It would therefore be advisable to set up support programs that can help households in case of future extreme weather events. Such programs should be primarily directed at herding households with young children and pregnant women, as well as households with small herds.

Valeria Groppo is Research Associate in the Development and Security Department at DIW Berlin | vgroppo@diw.de

Kati Krähnert is Acting Head of the Development and Security Department at DIW Berlin | kkraehnert@diw.de

JEL: I15, J13, O12

Keywords: anthropometrics, children, health, Mongolia, weather shocks



Dr. Kati Krähnert, Acting Head of the Department of Development and Security at DIW Berlin

SIX QUESTIONS TO KATI KRÄHNERT

»Extreme Winters Affect Children's Height«

1. Dr. Krähnert, you have examined the effects of extreme weather events on children's height. Why did you choose Mongolia as an example? We chose Mongolia as a case study for two reasons. First, a large proportion of the Mongolian population is directly dependent on weather and weather conditions. Second, Mongolia is a typical example of a relatively poor country repeatedly plagued by extreme climatic shocks.
2. How did you proceed with your analysis? In cooperation with the National Statistical Office of Mongolia, we interviewed 1,770 representative households in three regions of Mongolia. We visited these households three times over three years gathering information on quantitative aspects of their lives. These included, among other things, the weight and height of all children six years old or younger in these households.
3. What is the link between extreme weather events and children's height? We compared children who lived in areas severely affected by extreme weather events with those that lived in less affected districts. We also compared children who had experienced the shock – either in utero or as infants – with those conceived and born after the shock. We found that extreme weather events adversely affected children's height: children living in a severely affected district were small for their age.
4. How can this link between harsh winters and smaller body size be explained? The strong negative effect on body size is only apparent among children living in herding households. Children living in other households are not affected. From this we conclude that it is not

extreme weather conditions per se that lead to this negative effect but that the impact of the shock actually occurs due to the loss of livestock. We also found that boys are much more affected than girls. This is a very unusual finding. Girls seem not to be disadvantaged and in such extreme situations may even receive more food than the boys.

5. Is there anything that might mitigate the negative impact of these shocks? In January 2010, as the consequences of the extreme winter became clear, the Mongolian government appealed to the international community to provide emergency assistance. As a result, each Mongolian district received an average of 25 tons of food aid and animal fodder. We find evidence that this emergency aid had positive effects, such that each additional ton of emergency aid actually positively affected children's growth. However, these are only correlations and no causal relationship can be established.
6. To what extent can your findings also be applied to other countries? It is typical of many developing and transitional countries that many households must protect themselves against extreme shocks using their own resources. In Mongolia, we assume it will be more likely that there will be a group of children with poorer health in the long-term. This leads to high macroeconomic costs for the Mongolian society as a whole. A similar situation can also be expected in other developing countries where the impact of similar shocks is too severe for households to cope by themselves. This raises the question to what extent the state or development cooperation can intervene to prevent these macroeconomic impacts.

Interview by Eric Wittenberg

Forced Displacement Detrimental to the Health of Children in Colombia

By Nina Wald

Colombia has the highest number of internally displaced refugees in the world after Syria. The decade-long ongoing armed conflict between the Colombian police and the armed forces, paramilitaries, and guerilla groups has caused 5.7 million people—more than ten percent of the population—to flee their homelands. Many of them are women and children, driven off their lands, in most cases, to the misery of precarious living conditions and poor hygiene in destitute urban districts. A study by DIW Berlin shows that this forced displacement is detrimental to the health of children in Colombia, with displaced infants and toddlers, for example, suffering from malnourishment more frequently than non-displaced children of the same age group. Parents from displaced households also perceived their children's state of health to be considerably worse. In addition, their probable lack of health insurance hampers access to health services and medicine.

Numerous studies conducted in industrialized countries have examined the alleged influence of exogenous shocks—such as environmental pollution or parents' job loss—on children's health. Similar studies dealing with, for example, the impact of natural disasters on children's health, also exist for developing countries. Up until now, however, a further exogenous shock caused by war and displacement was found to impact children's health in a number of countries in Africa and Asia only, where infants and toddlers were found to be particularly prone to malnourishment and low birth weight.¹ To date, very few such studies exist for Latin America, in particular Colombia.²

One of the main contributory factors assigned to normal age-appropriate development is good health. Indeed, a child's health has a long-term and marked effect on cognitive skills, influencing, for example, educational success and socio-economic factors such as income, labor market participation, and health in adulthood.³ For this reason, the present study by DIW Berlin looks at

1 See, for example, R. Akresh, P. Verwimp, and T. Bundervoet, "Civil War, Crop Failure, and Child Stunting in Rwanda," *Economic Development and Cultural Change*, 59(4) (2011): 777-810; T. Bundervoet, P. Verwimp, and R. Akresh, "Health and Civil War in Rural Burundi," *Journal of Human Resources*, 44(2) (2009): 536-563; H. Mansour and D. Rees, "Armed Conflict and Birth Weight: Evidence from the Al-Aqsa Intifada," *Journal of Development Economics*, 99(1) (2012): 190-199.

2 A study on Colombia by Camacho (2008) shows that landmine explosions during pregnancy result in lower birth weights of affected children. See A. Camacho, "Stress and Birth Weight: Evidence from Terrorist Attacks," *American Economic Review* 98(2) (2008): 511-515.

3 An abundance of literature exists on this, for example: D. Almond and J. Currie, "Killing Me Softly: The Fetal Origins Hypothesis," *Journal of Economic Perspectives* 25(3) (2011): 153-172; A. Case, A. Fertig, and C. Paxson, "The Lasting Impact of Childhood Health and Circumstance," *Journal of Health Economics* 24 (2005): 365-389; P. Glewwe, H. Jacoby, and E. King, "Early Childhood Nutrition and Academic Achievement: a Longitudinal Analysis," *Journal of Public Economics* 81(3) (2001): 45-368; . Maurer, "Height, Education and Later-Life Cognition in Latin America and the Caribbean," *Economics & Human Biology* 8(2) (2010): 168-176; G. Van den Berg, M. Lindeboom, and F. Portrait, "Economic Conditions Early in Life and Individual Mortality," *American Economic Review* 96(1) (2006): 290-302.

Box 1

Displacement in Colombia

There are two causes of displacement: the conflicts between paramilitary and guerilla groups and the military, on the one hand, and the fact that these armed groups threaten individuals and entire communities, on the other hand. Afro-Colombians and indigenous peoples are disproportionately affected to a greater extent by displacement.¹

The majority of internally displaced people leave their home communities as small groups or families; mass flight is not particularly common in Colombia. In most cases, people flee from the country to the cities, although movement from one city to another has also been observed recently. In addition, unlike in many other refugee regions worldwide, there are no refugee camps in Colombia. Instead, the displaced people take to the slums on the outskirts of the cities, where the living conditions are usually very poor, without adequate living space and with limited opportunities to earn a living. Here, too, they are frequently threatened by armed groups. Although access to aid programs for refugees has been improved in recent years, only very few have actually received financial aid to date. Often the relevant authorities are unable to cope with the organization involved.²

¹ Internal Displacement Monitoring Centre (2013), "Colombia: Internal Displacement in brief," accessed October 21, 2014, <http://www.internal-displacement.org/americas/colombia/summary/>.

² Internal Displacement Monitoring Centre, "Colombia: Internal displacement."

how flight and forced displacement affect the health and health insurance status of children in Colombia.⁴

Statistical Indicators Show...

In Colombia, the displacement of people by paramilitary and guerilla groups is a major social problem (see Box 1), which is why this issue is often covered in surveys. The data used in this analysis were taken from the De-

⁴ This study is based on the discussion paper by N. Wald, "The Impact of Displacement on Child Health: Evidence from Colombia's DHS 2010," *DIW Discussion Papers* 1420 (2014).

mographic and Health Survey 2010 (see Box 2). Owing to the considerable developmental disparities between children in different age groups, as well as the varying degrees of influence that displacement has on a child's health, a distinction was drawn between three groups: infants and toddlers (0-4 years), elementary school children (5-12 years), and adolescents (13-18 years).

...Displaced Children Suffer from Poorer Health

The analysis of the health-related variables shows that displaced children of any age group fare far worse than their counterparts in the control groups (see table). Children from displaced families, for example, suffer far more frequently from malnutrition, as seen in the lower height-for-age z-score, a standardized index which puts height in relation to age and gender. In addition, parents of displaced families perceived their children's state of health to be far worse. Besides malnourishment or illness, one of the main reasons for this may be the fact that children are traumatized by war and displacement. Displaced children are also less likely to have health insurance than other children, making access to medical care in the event of illness difficult.

...Children from Displaced Families are More Likely to Grow Up in Precarious Conditions

Significant differences in socio-economic background can also be found between displaced and other families. More often than not, displaced children come from larger and poorer households; the mothers are often less educated than those of the non-displaced families. With regard to education, even as early as elementary school age, displaced children will already lag behind their non-displaced counterparts (measured in years of schooling); this gap will worsen between the ages of 13 and 18. The analysis also shows that displaced children more frequently take part in welfare programs such as Familias en Acción, which would seem to be a further indication of their predicament.

Displaced children in older age groups are more likely to live in a household with a single mother. Displacement often results in a shift in roles within the family: men, the main breadwinners prior to displacement, find it more difficult to obtain work in the cities, a typical destination for displaced families. Women, on the other hand, typically find employment there, either as child-minders or home-helps, which explains why women contribute more to household income. More often than not, this will cause the males in the household to become frustrated and often lead to domestic abuse

Box 2

Dataset

The data used for the present study by DIW Berlin originate from the Demographic and Health Survey (DHS) 2010, a detailed and representative household survey conducted in emerging and developing countries every five years which deals with aspects relating to health, reproduction, demography, and nutrition. One focal point in the data collection is women aged 13 to 49, and children under five years. In addition to health-related data, household and individual data were also collected.

Three different health-related variables were used in this analysis. First, the height-for-age z-score: this common indicator provides information on a child's nutritional status. A value lower than -2 denotes moderate malnutrition, while lower than -3 indicates severe malnutrition.

For the second health indicator, parents were asked to rate their child's health on a scale of 1 (excellent) to 5 (poor). The advantage here is that this indicator also factors in health aspects which are impossible to measure in the short interview time, for example, psychological problems or a child's social and cognitive development. In addition, parents can be assumed to know their child best, making them the best judges of their state of health.

The third variable used looks at whether the child has health insurance or not. This question is particularly relevant in Colombia, where the state-funded insurance scheme depends directly on the relevant home municipality, which changes after displacement, very often leading to the loss of insurance cover.

Together, these three variables provide an ideal picture of the state of health of displaced children, who suffer from poor hygiene in particular. Often displaced families will live in extreme poverty and will not be able afford to buy enough food for their children. The war and violence that displaced families experience in their home towns and communities, combined with the adverse living conditions they face as internal refugees in their new places of residence, foster psychological problems such as fear, depression, or aggressive behavior. Around 67 percent of displaced households specified that they suffered from psychosocial problems. While 24 percent of these sought help, as few as 15 percent actually received support. This is due to many internally displaced persons not having any health insurance and not being able to afford medical care.¹

¹ A. Carrillo, "Internal Displacement in Colombia: Humanitarian, Economic and Social Consequences in Urban Settings and Current Challenges," *International Review of the Red Cross* 91(875) (2013): 527-546.

Table

Differences between Displaced and Non-Displaced Children

	Age group: 0 to 4 years			Age group: 5 to 12 years			Age group: 13 to 18 years		
	Non-displaced	Displaced	Difference	Non-displaced	Displaced	Difference	Non-displaced	Displaced	Difference
Height-for-age z-score	-0.862	-1.129	0.267***	-0.716	-0.892	0.176***	-0.464	-0.713	0.249***
Subjective state of health ¹	2.709	2.881	-0.173***	2.735	2.916	-0.181***	2.801	2.976	-0.175***
Has Health insurance	0.83	0.685	0.145***	0.9	0.767	0.133***	0.895	0.747	0.148***
Household size	5.478	6.41	-0.932***	5.448	6.164	-0.715***	5.424	6.16	-0.736***
Female-headed household	0.27	0.268	0.003	0.286	0.329	-0.043***	0.319	0.423	-0.104***
Poor family	0.637	0.695	-0.058**	0.604	0.709	-0.106***	0.553	0.691	-0.138***
Participation in <i>Familias en Acción</i>	0.166	0.214	-0.047**	0.292	0.356	-0.064***	0.194	0.274	-0.080***
Mother: number of years in education	4.021	3.59	0.430***						
Child: number of years in education				2.129	1.821	0.309***	7.564	6.432	1.132***
Afro-Colombians	0.11	0.149	-0.040**	0.104	0.129	-0.025**	0.099	0.122	-0.023
Indigenous minority	0.135	0.125	0.009	0.122	0.145	-0.023*	0.103	0.197	-0.093***
Observations	15,679	295		25,885	691		16,200	376	

Statistical significance of the differences observed: *** = one-percent mark. ** = five-percent mark and * = ten-percent mark

¹ Higher values correspond to a poorer state of health.

Source: Demographic and Health Survey 2010; calculations by DIW Berlin.

Statistical indicators show that displaced children differ starkly from non-displaced children.

Box 3

Study Method

There are many ways to ascertain whether forced displacement has a causal effect on a child's health, in other words, whether it is the direct cause of the health impairments observed. All the strategies are based on a comparison of the state of health of displaced children with that of non-displaced children. For this reason, the children were divided up into two groups: displaced children and a control group of non-displaced children.

It must be pointed out, however, that the children in both groups differ with regard to other characteristics that also have an impact on their health. Ignoring these aspects will produce distorted findings. To isolate the effect of displacement, other variables which also affect children's health and membership in a health care scheme, are also included in the calculation. The results shown here are based on the following linear regression model:

$$\Delta \text{Reg}_{\text{ATT}} = E(Y_1 - Y_0 | X, D=1) = X(\beta_1 - \beta_0) + E(U_1 - U_0 | X, D=1)$$

where Y_1 represents the results for the group of displaced children and Y_0 denotes the results of the control

group. X refers to the remaining independent variables; U_1 and U_0 are the error terms for the displaced children and the control group, respectively. D is a dichotomous variable which assumes the value 1 for displaced persons. This equation shows that the displacement effect is calculated as the difference between displaced and non-displaced children, taking into account as many other independent variables that also affect health as possible. In addition, this effect is calculated using propensity score matching.¹

Here, Y stands for the three health-related variables height-for-age z-score, subjective state of health, and health insurance membership. X controls for individual and household characteristics such as age, gender, education, participation in welfare programs, household size, and access to infrastructure.

¹ These results are described in detail in N. Wald, "The Impact of Displacement on Child Health: Evidence from Colombia's DHS 2010," *DIW Discussion Papers* 1420 (2013).

towards the wife and children.⁵ In the long run, men will abandon their families or the families will leave them, which accounts for the larger percentage of women among the internally displaced.

Over and above this, displaced children more often come from ethnic minority groups such as Afro-Colombians or indigenous peoples. This is probably due to the regions where ethnic minorities live being affected by armed conflict to a disproportionate degree, meaning they are the ones most affected by displacement.⁶

Regression Analyses Confirm...

It still remains unclear as to whether war and displacement really are the cause of the poor health of displaced

children or whether we are dealing with mere statistical correlations here and the aforementioned socio-economic factors are in fact the main determinant. One possible explanation for the poorer health of displaced children is, for example, the mother's level of education or the family's financial means. A causal assessment based on regression analysis must be conducted in order to examine the actual influence of forced displacement. In this case, among others, propensity score matching is used (see Box 3), which involves finding statistical twins for displaced children, i.e., non-displaced children with virtually identical socio-economic characteristics (see Table). The children in the sample are therefore otherwise identical, the sole difference being whether they are from displaced or non-displaced families.

...Displacement Causes Malnutrition among Toddlers

Under consideration of other factors such as poverty, household size, mother's education, age, or gender, the regression analyses confirm that displacement has a negative impact on the nutritional status of toddlers (see Fig-

⁵ V. Calderón, M. Gáfaró, and A. Ibáñez, "Forced Migration, Female Labor Force Participation, and Intra-household Bargaining: Does Conflict Empower Women?" *MICROCON Research Working Paper* 56 (2011).

⁶ Internal Displacement Monitoring Centre, *Colombia: Internal Displacement in brief* ((2013), accessed October 21, 2014, <http://www.internal-displacement.org/americas/colombia/summary/>).

ure 1). Studies give a number of reasons for this.⁷ First, harvests are often destroyed in conflict regions, causing many families to leave their homelands and flee to the cities. Second, displaced families often suffer from food shortages or available food has low nutritional value.

Conversely, for older children between five and 18 years, displacement no longer affects their nutritional status significantly. These children appear to be less prone to malnutrition and draw on stored body reserves.

...Parents of Displaced Children Perceive Their Children's Health To Be Far Worse

In families that are subjected to flight and forced displacement, parents often regard their children's state of health to be worse than that of children whose families have not been displaced (see Figure 2). This effect remains unchanged even if other factors affecting health are also taken into account. There are many possible reasons for this: first, parents will consider their children's general state of health to be poorer if they suffer from illness or are malnourished, which is more frequently the case with displaced children. Second, psychological problems, cognitive and social developmental deficiencies, as well as trauma in the children can all cause parents to see their children's state of health as poor. Displaced children in Colombia are known to suffer from psychological problems more often than their counterparts in the control group. Once again, this is directly related to the armed conflict.⁸

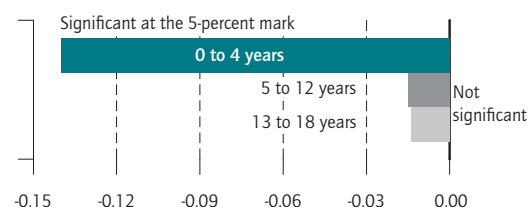
...Displaced Children Less Often Have Health Insurance

Children who have been victims of forced displacement have health insurance far less often: the probability of having health insurance decreases by 12-15 percentage points across all age groups (see Figure 3). This effect can be attributed to the nature of the health insurance system in Colombia (see Box 4). Health insurance provision is linked to the relevant municipality which supports the poor financially. If families choose or are forced to leave their municipality, they lose their health insurance cover and have to apply for this again in the new municipality. The problem here, however, is that in each

Figure 1

Effect of Displacement on Nutritional Status

Marginal effect on nutritional status (height-for-age z-score)¹



1 The regressions include additional explanatory variables not shown here. Each bar represents a regression equation.

Sources: Demographic and Health Survey 2010; calculations by DIW Berlin.

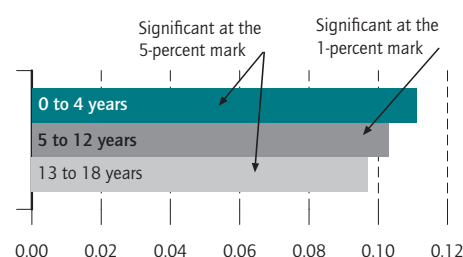
© DIW Berlin

Displacement worsens the nutritional status of infants and toddlers by 14 percent from the standard deviation.

Figure 2

Effect of Displacement on the Subjective State of Health¹

Marginal effect²



1 Higher values correspond to a poorer state of health.

2 The regressions include additional explanatory variables not shown here. Each bar represents a regression equation.

Sources: Demographic and Health Survey 2010; calculations by DIW Berlin.

© DIW Berlin

In displaced families, parents perceived their children's health as far poorer.

municipality health insurance is available to a limited number of people only. In addition, displaced persons fear for their lives so much that they would often rather do without health insurance than disclose their new address to their old municipality. Displaced children consequently lose their insurance cover despite needing it all the more due to health-related problems and their financial situation.

⁷ See, for example, Bundervoet et al., "Health and Civil War".

⁸ See, for example, I. Flink, M. Restrepo, D. Blanco, M. Ortega, C. Enriquez, T. Beirens, and H. Raat, "Mental health of internally displaced preschool children: a cross-sectional study conducted in Bogotá, Colombia," *Social Psychiatry and Psychiatric Epidemiology* 48(6) (2013): 917-926.

Box 4

Health Insurance Scheme in Colombia

Officially, every Colombian has access to basic health care. Three different systems are in place. The first is what is called the contribution scheme, which is mandatory for employed and self-employed persons who earn at least twice the minimum wage. The second is a subsidized scheme that was introduced to give poor households access to basic health care which they would not otherwise be able to afford. To be registered for state-funded health insurance, Colombians have to apply to their local authority, which then determines whether the applicant meets the requirements, i.e., whether they qualify as poor. If this is the case and the municipality has free capacity in their health insurance system, the applicant is issued a health insurance card providing him or her with access to medical care and assistance in that municipality. However, since the subsidized scheme only has limited capacity, there is also another scheme: the *vinculados* model, which is intended for those temporarily not insured under the other two schemes.¹ Here, people have access to treatment in emergencies but have to bear 30 percent of the treatment costs themselves, which is a huge burden for poor households.²

¹ E. Cabrera, "The Subsidized Health-care Scheme in the Social Protection System – Colombia," in *UNDP: Sharing Innovative Experiences. Successful Social Protection Floor Experiences*, vol. 18, (New York: 2011): 211-238.

² Human Rights Watch, "Colombia: Displaced and Discarded. The Plight of Internally Displaced Persons in Bogotá and Cartagena,"

The design of the health care system brings about challenges for the internally displaced: the majority of the displaced are so poor before they take flight that they are insured in either the subsidized or the *vinculados* scheme. If a person who is a member of a subsidized health insurance scheme flees, leaving their hometown behind, they have to apply for membership in a subsidized health care insurance system in their new municipality. This results in a number of difficulties. First, the displaced are not insured for a transitional period—at least while they are on the move. Second, the former municipality has to release the health records of the insured which, unfortunately, does not always happen.³ Third, the subsidized health care scheme may have no free capacity, leaving the displaced with no other choice but to sign up for the *vinculados* scheme. In addition, many people who have been displaced refrain from applying for health insurance in their new municipality, since this would mean disclosing a previous one in their application, revealing their new place of residence to their old municipality, which might put their lives in danger.⁴

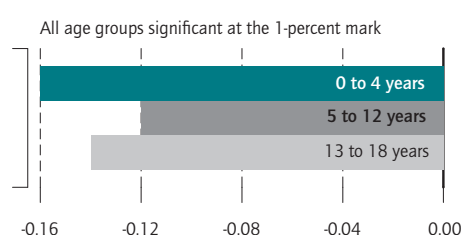
Human Rights Watch Report 17 4(B) (New York: 2005).

³ P. Webster, "Treating the Displaced," *Canadian Medical Association Journal* 184(6) (2012): 291-292.

⁴ Human Rights Watch, "Colombia: Displaced."

Figure 3

Effect of Flight on Insurance Status
Marginal effect on health insurance status¹



¹ The regressions include additional explanatory variables not shown here. Each bar represents a regression equation.

Sources: Demographic and Health Survey 2010; calculations by DIW Berlin.

© DIW Berlin

Children from displaced families are far less likely to have health insurance.

Conclusion

Flight and displacement in Colombia significantly impair children's health. The study by DIW Berlin shows that this applies in particular to infants and toddlers. In fact, this group is found to suffer from malnutrition more often than their peers from non-displaced families. Negative health impacts can also be seen in other age groups—among all children from birth up to the age of 18. This finding can be attributed to both somatic and psychological illness, often a direct consequence of war and displacement experiences. The study findings further show that flight will frequently result in a discontinuation of health insurance cover and that displaced children will very often continue to be uninsured either due to a lack of capacity in the state-funded health insurance system or because their parents do

not wish to divulge their new place of residence to their former municipality.

Healthcare policy-makers and organizations that look after the displaced urgently need to find out through what channels displacement affects children's health in order to take the necessary action to combat the problems. In Colombia, one possible starting point might be, for example, providing food parcels designed specifically to meet the nutritional needs of young children and psychological support for displaced families, as well as facilitating registration in the new insurance system without the former municipality being disclosed. This would give displaced children the chance to grow up healthier and make better use of their potential for later life.

Nina Wald is a Ph.D. Student at the Department Development and Security at DIW Berlin | nwald@diw.de

JEL: C21, D19, I13, O54

Keywords: children's health, armed conflict, displacement, Colombia

Impact of Education Programs in Colombian Conflict Areas: Children Attend School More Frequently But Performance Has Barely Improved

By Nina Wald

Policy programs in developing countries aimed at supporting certain sectors of the population in individual areas play a crucial role in development cooperation. Examples include programs to improve access to education. But what impact do such programs really have? The present study by DIW Berlin examines the impact of a welfare program on the learning success and participation of children in Colombian conflict zones. It shows that although the program does increase the school enrollment rate, learning success has barely improved at all. One possible explanation for this could be that school attendance is one prerequisite for learning success but is not sufficient in isolation. Since children in conflict areas often need to help secure a livelihood for their families, they have little time left at the end of the day for homework and for school-related activities as a whole.

A common form of welfare program in developing countries, particularly in Latin America, is the Conditional Cash Transfer Program (CCT) for poor families in which, for example, they receive money when their children go to school or participate in health programs. At the same time, the mothers attend classes in nutrition, hygiene, and other health- and family-related subjects. Analyses are then conducted to determine whether the programs have led to higher attendance rates, better school performance, lower levels of malnutrition, and increasing immunization rates in children. The results of the programs vary considerably according to the country and design of the study.¹

There is also a CCT program in Colombia called *Familias en Acción* which focuses on, among other things, improving education. An initial evaluation suggests a positive impact on school attendance, particularly among children and adolescents from urban areas. The program has certainly improved school performance, at least for elementary school children.² However, the evaluation made no distinction as to whether or not the children came from conflict areas. Therefore, the present study by DIW Berlin looks at whether the CCT program is

¹ For more literature on this topic, see, J. Baez and A. Camacho, "Assessing the Long-term Effects of Conditional Cash Transfers on Human Capital. Evidence from Colombia," *Policy Research Working Paper 5681* (Washington DC: The World Bank, 2011). T. Barham and J. Maluccio, "Eradicating Diseases: The Effect of Conditional Cash Transfers on Vaccination Coverage in Rural Nicaragua," *Journal of Health Economics* 28(3) (2009): 611-621. P. Gertler, "Do Conditional Cash Transfers Improve Child Health? Evidence from PROGRESA's Control Randomized Experiment," *American Economic Review* 94 (2) (2004): 336-41.

² O. Attanasio, E. Fitzsimons, A. Gomez, M. Gutiérrez, C. Meghir, and A. Mesnard, "Children's Schooling and Work in the Presence of a Conditional Cash Transfer Program in Rural Colombia," *Economic Development and Cultural Change* 58(2) (2010): 181-210. S. Garcia and J. Hill, "Impact of conditional cash transfers on children's school achievement: evidence from Colombia," *The Journal of Development Effectiveness* 2(1) (2010): 117-137.

Box 1

Datasets

The present study is based on three datasets. First, a household dataset from the policy support program Familias en Acción and, second, on a dataset specifically collected in conflict areas and broken down at the community level and, third, a dataset that describes the economic situation of communities through the development of trade income tax.

The data for the household dataset were collected for the Conditional Cash Transfer Program (CCT) Familias en Acción to measure the impact of the program on education, health, and nutrition in children. The program was introduced in particular for poor households in rural areas by the Colombian government, the World Bank, and the Inter-American Development Bank. After the first survey in 2002, further surveys followed in 2003, 2005 or 2006. More than 11,000 households in 122 communities were interviewed.

The communities were subdivided into treatment and control communities. The CCT program was made available in the treatment community but not in the control community. To exclude effects other than the policy program on the findings, the two groups selected are as similar as possible. There are 65 control communities and 57 treatment communities. Of the latter, 26 communities began the program before the first survey; these are referred to as early treatment communities. The other treatment communities had access to the program after the first survey and so are referred to as late treatment communities.

Any family considered poor with at least one child aged 0 to 17 years was allowed to draw benefits from

the program. The mothers of the participating families received 14,000 Colombian pesos (roughly equivalent to six US dollars) per child for elementary school attendance and 28,000 Colombian pesos (roughly equivalent to 12 US dollars) per child for attendance at a secondary school. To get the money, the children have to attend at least 80 percent of class hours. In addition, the mothers receive 46,500 Colombian pesos (about 20 US dollars) if they regularly bring their young children along for preventive health care and participate in training courses. Compared to the Colombian minimum wage of 309,000 Colombian pesos (approximately 135 US dollars) in 2002, these transfers represent a significant proportion of family income, particularly in families with a large number of children.

The second dataset was compiled by the Center of Economic Development Studies of the Universidad de los Andes (Bogotá, Colombia). It contains information about the conflict (extent of forced migration, attacks by armed groups, cultivation of cocaine, etc.) and about the communities (size, proportion of rural and urban population). The present study measures the intensity of conflict at the community level based on attacks by armed groups per year. To prevent the inflated influence of extreme values, the attacks were logarithmized for the econometric analysis.

The third dataset contains revenues from trade income tax and was compiled by Colombia's National Planning Department. These data are included in the econometric analysis because the economic situation of a community can certainly have an effect on educational participation and educational success.

as effective in the conflict areas of Colombia as it is in peaceful regions.³

Armed Conflict Has a Negative Impact on Education in Colombia

Several studies have unanimously confirmed that an armed conflict has a fundamentally negative impact on

educational outcomes and participation of children.⁴ En-

³ The study is based on C. Bozzoli and N. Wald, "Bullet Proof? Program Evaluation in Conflict Areas: Evidence from Rural Colombia," (unpublished working paper).

⁴ See, for example, F. Barrera and A. Ibáñez, "Does Violence Reduce Investment In Education? A Theoretical And Empirical Approach," *Documentos CEDE*, no. 2004-27 (Bogotá: Universidad de los Andes, 2004).

L. Dueñas and F. Sánchez, "Does Armed Conflict Affect the Poorest? The Case of School Dropout in Eastern Colombia," (working paper, Bogotá: Universidad de los Andes, 2007).

C. Rodríguez and F. Sánchez, "Armed Conflict Exposure, Human Capital Investments and Child Labor: Evidence from Colombia," *Documentos CEDE*, no. 2009-05 (Bogotá: Universidad de los Andes, 2009).

C. Rodríguez and F. Sánchez, "Books and Guns. The Quality of Schools in Conflict Zones," *Documentos CEDE*, no. 2010-38 (Bogotá: Universidad de los Andes, 2010).

Box 2

Method

The study used panel data on school enrollment rates and educational success. These data are available for three points in time: $t=0$, $t=1$, and $t=2$. Some of the 57 treatment communities already had access to the welfare program at time $t=1$, which is why they are considered early treatment communities. The remaining, late treatment communities were not able to take part in the program until time $t=2$.

How the effect of the program on education participation and success changed with the intensity of the conflict can be calculated using the following equation:

$$Y_{it} = \alpha_0 + \sum_{j=1}^2 \alpha_{1j} I(t=j) + \alpha_2 P + \alpha_3 A + \alpha_4 T + \alpha_5 P \times X + \alpha_6 A \times X + \alpha_7 T \times X + \theta Z_{it} + u_{it},$$

where Y_{it} represents the school attendance rate of individual i at time t , i.e., education participation and/or educational success. P is a dummy variable for participation in the CCT program and T indicates whether an individual is participating in the current CCT program. A is a dummy variable for the late treatment communities in order to take account of anticipation effects. These include possible changes in behavior before the introduction of the program

occurring solely because future program participants were already aware that they would participate in this program. For example, school enrollment rates may change in the late treatment communities before the introduction of the program because families know that school attendance is a condition of successful participation. Z_{it} is a vector (of person i at time t) of individual, household, and community characteristics such as age, gender, access to infrastructure, type of home, education and employment of parents, population of the community, the amount of trade income tax, and the number of pharmacies, hospitals, and schools. X denotes conflict intensity which is measured, in this case, as the logarithmic number of armed attacks in a community per year, while α measures the program effect.

In the present study, the following term is particularly interesting since it measures the effect of the program for a given conflict intensity:

$$\alpha_4 + \alpha_7 \times X$$

Furthermore, this study also examines whether non-linear relationships exist. To calculate the impact of the program in a non-linear model, the effect of various plausible values of X was simulated.

rollment rates are lower in war zones than in peaceful regions. There are several reasons for this: due to the destruction and growing uncertainty, priorities are shifted; given the daily struggle for survival, education takes a back seat. In addition, from the victims' perspective, future prospects worsen to the extent that education is less worthwhile in the long term. Alongside declining enrollment rates, another finding indicates that an increasing number of young people from conflict areas leave school without qualifications, either because they are recruited by armed groups or because they no longer go to school for fear of reprisals. Another factor is that the quality of the schools, and particularly of the teachers, often suffers during an armed conflict. This also means that attending school is considered less worthwhile. Instead, both children and adolescents start work earlier in war

zones—this appears to be more beneficial in the short term and contributes to the family's household income.

Can CCT Programs Offset the Negative Impact of Civil War on Education?

Against this background, it is crucial for policy-makers and other program managers to know the extent to which welfare and education programs in conflict areas can mitigate or even offset the negative impact of military action on education. In the case of Colombia, the analysis uses data from the CCT program Familias en Acción (see Box 1). The treatment effects are then calculated based on these data (see Box 2).

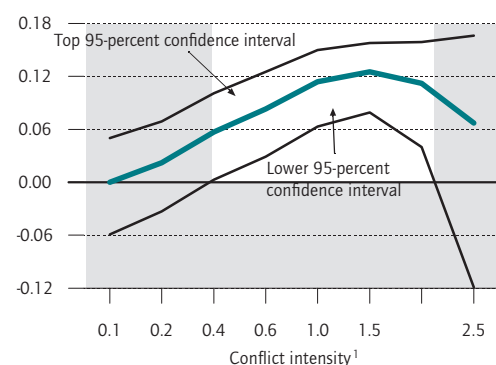
In terms of participation in education, the analysis shows that the CCT program is successful, particularly in conflict areas with medium intensity conflict (see Figure 1). However, higher enrollment rates alone are not a reliable indicator of accumulated human capital. A better

F. Sánchez and A. Díaz, "Los Efectos Del Conflicto Armado En El Desarrollo Social Colombiano, 1990-2002," *Documentos CEDE*, no. 2005-58 (Bogotá: Universidad de los Andes, 2005).

Figure 1

Effect of CCT Program on School Attendance Rates in Conflict Areas

Differences in school attendance rates



All values in the gray area are not significant.

1 Measured as \ln (number of attacks).

Sources: Familias en Acción; CEDE; calculations by DIW Berlin.

© DIW Berlin

The positive impact on the school attendance rate is greatest in areas with moderate-intensity conflict.

indicator of the effects of the CCT program is educational success, meaning, in this context, being moved up to the next class at the end of each school year. It indicates that the positive effects of the program on school attendance do not apply equally to the educational success of children from conflict areas (see Figure 2). While the CCT program does help children from war zones with low-intensity conflict, the effect decreases as the intensity of conflict increases.

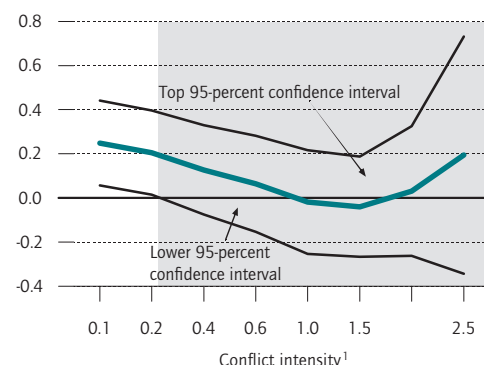
Children From Conflict Areas Spend Less Time on Homework

The first question to be addressed is why this is the case. Differences in the number of hours per week children from conflict areas spend at school thanks to the education program compared to children from peaceful areas are not statistically significant (see Table). However, children from conflict regions participating in the program have to spend significantly more time on household tasks at the expense of schoolwork. This might explain the lack of educational success among children from areas with high-intensity conflict.

Figure 2

Effect of CCT Program on Educational Success in Conflict Areas

Differences in Educational Success



All values in the gray area are not significant.

1 Measured as \ln (number of attacks).

Sources: Familias en Acción; CEDE; calculations by DIW Berlin.

© DIW Berlin

The program can only increase educational success in areas with low-intensity conflict.

Conclusion

The Familias en Acción policy support program aimed at increasing educational participation and success in Colombia also has a positive influence on school enrollment rates in conflict areas—and indeed is most effective when the conflict is of medium intensity. Nevertheless, this impact is not associated with greater educational success in these areas. A positive impact on educational success is only detected when the intensity

Table

Changes in Use of Time by Program Participants

	School hours	Schoolwork	Helping out at home
Program participation (all children)	0.288	0.121 ***	-0.198 ***
Program participation in conflict areas (participation * conflict intensity ¹)	-0.086	-0.216 **	0.502 ***
Observations	18,132	18,125	18,124

Statistical significance: *** = one-percent level, ** = five-percent level and * = ten-percent level

1 Measured as \ln (number of attacks).

Sources: Familias en Acción; CEDE; calculations by DIW Berlin.

© DIW Berlin

Program participants from conflict areas spend less time on homework and help more in the household.

of the conflict is low. The reason for the lack of increased educational success in regions with medium or high conflict intensity despite the policy support program is likely to be that children in conflict areas are not able to spend more time on homework. Instead, they often need to help out with household tasks or take up paid employment to earn a living. This largely offsets the positive effect of higher school attendance rates.

The present study by DIW Berlin therefore shows that welfare programs in conflict areas certainly do work but must be adapted to the specific conditions of each region so as not to neutralize the potentially positive effects. In the Colombian example, CCT programs in conflict areas and measures aimed at improving education and health help households tap into new income opportunities. The children could then focus more on scholastic activities and would no longer have to contribute to household income, leading to increased educational success among program participants.

Nina Wald is a Ph.D. Student at the Department Development and Security at DIW Berlin | nwald@diw.de

JEL: C23, D74, I21, I38, O54

Keywords (english): Conditional Cash Transfer Program, education, conflict, Colombia, panel data, treatment effects

Violent Conflicts Increase the Risk of Domestic Violence in Colombia

By Johannes Rieckmann

Over the past 50 years, Colombian society has experienced a violent conflict between government forces and right-wing paramilitary groups on the one hand, and left-wing guerrilla groups on the other. Moreover, a high proportion of women in Colombia are victims of domestic violence. The present study examines whether there is a correlation between the conflict and violence against women. The findings indicate that the more intense the conflict, the greater the risk of women falling prey to domestic violence.

Not only does war leave emotional scars in its wake, but it also changes the value systems of society at large and the behavioral patterns of individuals. This applies to violent cross-border conflicts as well as to civil war, traditional conflicts, and “low-intensity” asymmetric conflicts. The longer a conflict lasts, the more intense it becomes, and the closer it is to people’s homes, the more these effects can be seen.

Domestic Violence Is a Sign of Psychological Effects

Beliefs, attitudes, and social norms—in other words, the culture within a society—are affected by the experiences people have in their day-to-day lives. Since changes here are difficult to quantify, changes in behavioral patterns were examined instead. These allow us, at least to a certain extent, to draw conclusions on changes in individual attitudes and social norms.

When selecting behavior-related aspects for analysis, there are two important points: the behavior-related aspect must not be a direct consequence of conflict or fighting, and the cause of changes in behavior must be transparent. These two conditions apply to both the infliction and the endurance of domestic violence.¹

Theoretically, the causal relationship between these two factors may be inverse. In other words, domestic violence can create a violent climate, increasing the probability and intensity of fighting and conflict. In Colombia, however, this is highly unlikely. The Colombian guerrilla groups *Fuerzas Armadas Revolucionarias de Colombia* (Revolutionary Armed Forces of Colombia,

¹ The investigation into the underlying association between conflicts and domestic violence is described in the following paper by D. Noe and J. P. Rieckmann, “Violent Behaviour: The effect of civil conflict on domestic violence in Colombia,” Courant Research Centre “Poverty, Equity and Growth in Developing and Transition Countries: Statistical Methods and Empirical Analysis,” Discussion Paper (Universität Göttingen, 2013): 136.

FARC) and *Ejército de Liberación Nacional* (National Liberation Army, ELN) are excellently organized paramilitary groups who are generally highly strategic in their choice of conflict setting. This means the fighting does not take place primarily in areas where domestic violence might produce a good breeding ground for recruits into these groups.² Recruits on all sides of the conflict are often deployed far away from their homes. Whatever the location, the intensity of a conflict is essentially determined by military strategy considerations, which is why domestic violence cannot be assumed to affect conflict intensity.

Domestic violence can be expected to occur more often in connection with conflict for two main reasons. First, the more intense a conflict becomes, the greater the acceptance of violence within the society. Second, domestic violence is often a means of venting stress.

Here, it is not only about the survivors among those directly involved in fighting.³ Moreover, repeated observations of violence and even indirect contact with it—for instance, hearing or reading news about violent conflicts in your home town or village—can lead to psychological effects.

Consequently, violence as a means of resolving private and social problems is tolerated all the more, silently accepted.⁴ The force of habit and negative role models make it worse over time.⁵ How domestic violence is perceived and viewed within a society has a huge effect on how frequently it occurs⁶ as well as on the consequences for victims.⁷ Financial dependence, which is more marked in times of conflict, can lead to greater accep-

tance of domestic violence.⁸ Disassociation on the part of both those directly involved in and those on the sidelines of conflict can break down the psychological barriers that would normally stop people from resorting to or tolerating violence within the family. Violence becomes more “normal.” Under these circumstances, for the perpetrator, domestic violence can take on an instrumental function.⁹ Violence then serves to influence the behavior of the victim and “discipline” them.

Violence can also have an expressive¹⁰ function. In this case, the perpetrator uses violence as a release from emotional pressure to some extent as if venting stress. In a world that is dangerous and uncontrollable, violence gives the perpetrators reassurance of their ability to control their immediate environment as they see fit.

To show that violence experienced in the outside world can affect people psychologically, two data sources were used. We statistically exploit local differences in the intensity of fighting and differences in behavioral patterns with regard to domestic violence.

The data on conflict intensity were taken from Programa Presidencial de Derechos Humanos y Derecho Internacional Humanitario (DDHH and DIH) for the years 2003 and 2004, inter alia. The number of armed encounters between government forces and paramilitary groups per year and district was taken as a measure of conflict intensity.

In addition, survey data from the Colombian Demographic and Health Survey (DHS) for late 2004 and early 2005 was used. The DHS is conducted among more than 41,000 women aged between 13 and 49 from 230 Colombian administrative districts. In each district, up to 20 percent of women living in partnerships stated that they had been victims of domestic violence within the previous twelve months. These data allow both the time and place of domestic violence incidents to be determined, making it possible to measure the degree of association between the occurrence of domestic violence and the intensity of the fighting in the relevant district.

² E. A. Brett, “Participation and accountability in development management,” *Journal of Development Studies* 40 (2) (2003): 1–29.

³ Veterans with post-traumatic stress symptoms are more likely to be perpetrators of domestic violence than average members of the public; see M. D. Sherman, F. Sautter, M. H. Jackson, J. A. Lyons, and X. Han, “Domestic violence in veterans with posttraumatic stress disorder who seek couples therapy,” *Journal of Marital and Family Therapy* 32 (4) (2006): 479–490.

⁴ P. Waldmann, “Is there a Culture of Violence in Colombia?” *Terrorism and Political Violence* 19 (4) (2007): 593–609.

⁵ Social processes are subject to change as a result of conflict. See E. J. Wood, “The social processes of civil war: The wartime transformation of social networks,” *Annual Review of Political Science* 11 (2008): 539–561.

⁶ M. A. Koenig, R. Stephenson, S. Ahmed, S. J. Jejeebhoy, and J. Campbell, “Individual and contextual determinants of domestic violence in North India,” *American Journal of Public Health* 96 (1) (2006): 132–138.

⁷ The majority of victims are female, while the perpetrators are predominantly male. See A. Aizer, “The gender wage gap and domestic violence,” *American Economic Review* 100 (4) (2010): 1847–1859. One conceivable consequence that is influenced by social norms is divorce. See also R. A. Pollak, “An intergenerational model of domestic violence,” *Journal of Population Economics* 17 (2) (2004): 311–329.

⁸ See E. Karnofsky, “Familiäre Gewalt und Kindesmißbrauch in Kolumbien,” *Brennpunkt Lateinamerika* (4) (2005): 37–44; see also A. Farmer and J. Tiefenthaler, “An economic analysis of domestic violence,” *Review of Social Economy* 55 (3) (1997): 337–358.

⁹ S. Long, H. Tauchen, and W.A. Dryden, “Domestic Violence: a Non-Random Affair,” National Bureau of Economic Research, NBER Working Paper Series (1991): 1665.

¹⁰ F. W. Winkel, “Post traumatic anger. Missing link in the wheel of misfortune,” (Nijmegen: WLP, 2007).

Box

Correlation Not Commensurate with Causality

The statements made on the degree of association are based on statistical correlation. A statistically significant correlation coefficient means that there is a high probability of a correlation between two variables A (in this case, the conflict intensity, the explanatory variable) and B (in this case, the probability of being a victim of domestic violence, the dependent variable). This ideally remain true even if other important factors such as age, education, or income are taken into consideration. The data do not, however, provide enough information for a definitive statement as to the existence of a causal relationship, whatever the direction—A influences B, or B influences A. Besides the aforementioned inverse causality or indeed circular reciprocal causality (chicken or egg dilemma), other factors that may not have been included in the analysis may distort the results. To account for this, spatial identification and econometric methods are used here. To investigate the correlation between conflict intensity and the probability of becoming a victim of domestic violence, probit regressions and two-stage instrument variables methods based on least-squares and negative binomial probit were employed,¹ producing robust results. A causal correlation, while not verifiably proven to exist, was found to be very probable.

¹ Noe and Rieckmann, "The effect of civil conflict": 31–34.

Fighting Increases Risk of Domestic Violence

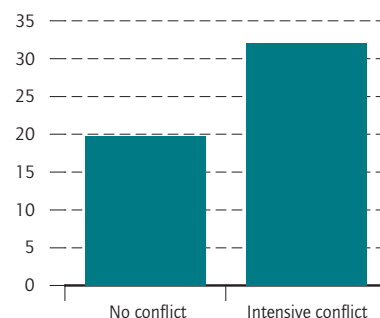
The results speak for themselves. The data used do not confirm that specific influence mechanisms are at play here but merely indicate the high probability of certain correlations (see Box). If a causal relationship is assumed, however, a one- to seven-percent higher risk of women falling prey to domestic violence can be seen between the most peaceful and conflict-ridden districts, depending on the given sample.¹¹ If the sample is lim-

¹¹ The analysis was conducted for women who were living in partnerships at the time of the survey (enabling data on the partner to be factored in) as well as for those who were not, meaning cases where women were separated from their partners for reasons of domestic violence could also be included.

Figure

Conflict Intensity and Domestic Violence Victimization

In percentage points¹



¹ Women in partnerships in districts that are smaller than 2500 km². If women from peaceful districts were to live in the district with the highest level of conflict (33 incidents in two years) where other conditions remain constant, the risk of them becoming victims of domestic violence is 12.3 percentage points higher.

Source: Noe and Rieckmann, "The effect of civil conflict".

© DIW Berlin

In districts with high conflict intensity, the probability of becoming a victim of domestic violence is far greater than in districts where there is no conflict.

ited to districts that are smaller than 2,500 square kilometers in size and the fighting observed takes place in close proximity to the households in question, the risk increases by even more than 12 percentage points (see Figure). Even under consideration of control variables representing the individual characteristics of the persons and households under observation (e.g. age, education, number of children, place of residence), the results remain statistically significant.

In very small districts (some are smaller than 40 square kilometers in area) where there is no direct conflict within the district but rather beyond its borders, the correlation between conflict and domestic violence may be underestimated. If fighting and acts of warfare in neighboring districts are factored in, the statistical results are very similar. Looking at domestic violence in a broader sense, i.e., including threats, changes virtually nothing.

This analysis therefore paints a similar picture to a study on the same matter conducted for Colombia's southern neighbor, Peru.¹² The authors of this study reported that those who were exposed to fighting and conflict in their late childhood and adolescence were more likely to be victims of domestic violence in later life.

¹² J. Gallegos and I. Gutierrez, "The Effect of Civil Conflict on Domestic Violence: the Case of Peru," SSRN Working Paper Series (2011).

Conclusion

The findings of the present study do not constitute a basis for straightforward policy recommendations. What this study can do, however, is provide a better understanding of the medium- and long-term consequences of violent conflicts. A comprehensive study¹³ on civil war by Blattman and Miguel (2010) has shown that the question of how civil war affects the fundamental factors of long-term economic prosperity—institutions, technology, and culture—has barely been touched upon, either theoretically or empirically. Yet this information is crucial, since these three factors are indicative of whether a society will recover from civil war or whether it will stagnate or fall back into war and conflict.

Domestic violence is not only a direct problem for the victims, but also endangers long-term safety and security, as well as social cohesion. Where domestic violence is a widespread phenomenon, many children who witness or are victims of domestic violence have no example of peaceful conflict resolution to follow. Their ability to form relationships is dysfunctional. This increases the probability of them being violent themselves in later life.¹⁴ Often the development of their personality is impaired.¹⁵ Under unfavorable conditions, these deficits might result in a cycle of violence, where the tendency to be violent is passed from one generation to the next.¹⁶ In the long-term, this will have ramifications for the economy—a problem that will ultimately affect each and every one in the given society.¹⁷

Johannes Rieckmann is a Research Associate at the Department of Development and Security at DIW Berlin | jriekmann@diw.de

JEL: H56, J12

Keywords: Domestic violence, conflict, Colombia, crime

¹³ C. Blattman and E. Miguel, “Civil war,” *Journal of Economic Literature* 48 (1) (2010): 3–57.

¹⁴ E. Karnofsky, “Familiäre Gewalt und Kindesmißbrauch” (2005)

¹⁵ P. Fonagy, “Male perpetrators of violence against women: An attachment theory perspective,” *Journal of Applied Psychoanalytic Studies* 1 (1) (1999): 7–27.

¹⁶ R.A. Pollak, “An intergenerational model” (2004)

¹⁷ V. Calderón, M. Gáfaró, and A.M. Ibáñez, “Forced Migration, Female Labor Force Participation, and Intra-household Bargaining: Does Conflict Empower Women,” MICROCON, Research Working Paper 56 (2011).

Education as a Tool for Democratization

By Ghassan Baliki and Florian Szücs

Calls for democratization have been a new landmark of the current decade. Protestations and revolutions demanding political change and democratic reforms have spread across most of the Middle East and North Africa. Yet, the origins and the determinants of success of these movements remain unclear to researchers and policy makers. Historically higher educational attainment has undeniably been associated with high levels of democracy, but the channels and the direction through which this effect is pronounced are not yet fully determined. Using cross-country panel data, results show that education is more effective in fueling democratization when average incomes are low.

In spite of all the political changes during the past century, one piece of received wisdom still seems to hold true: Advanced economies with high levels of education and income growth are democratic, while developing countries with lower education levels remain non-democratic (see Figure 1). In recent decades most developing countries have witnessed a growth spurt in secondary and tertiary education, yet the lack of political freedoms and the persistence of autocratic rules remain resilient. For example, the People's Republic of China had a sharp decrease in the share of the population with no education and a notable increase in secondary schooling, but the democratization level remains low and unchanged since the 1980s. This raises the questions such as: How do rising levels of education (see Figure 2) affect democratization? And why do some countries move into democracy while others do not?

This brief overview aims to present the results from an on-going research project to study the effects of education on democratization levels when returns to human capital are low. Using a cross-country panel analysis from 1950-2010, secondary education is found to affect democratization positively. Moreover, democratization is more likely to occur when secondary education is not appropriately remunerated. These results shed light on the role of possible channels through which educational attainment influences democracy. Naturally, more micro-evidence is needed in order to confirm the specific channels driving democratization. For example, the opportunity cost theorem of engagement into political activism - which states that educated individuals are more likely to engage in political activity if productive activities are not available - is one of the most prominent theoretic reasons behind such channels. However, there is little to no empirical data that capture the incentives of individuals (educated or not) to engage in political activity and democratization movements. Still, cross-country results serve as a reasonable starting point for future research and provide some first insight to understand the factors at play behind the education-democracy nexus.

Figure 1

Education and Democracy 2010



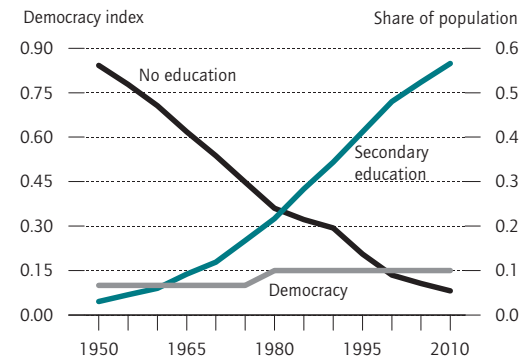
Source: calculations by DIW Berlin.

© DIW Berlin

Countries with a large share of population with secondary education have higher democratization values.

Figure 2

Education and Democracy: China 2010



Source: calculations by DIW Berlin.

© DIW Berlin

In China the level of education significantly increased, while the level of democratization remained nearly constant.

An inconclusive debate

Modernization theorists argue that rising education and income are uncontested pillars for the development and consolidation of democratic institutions.¹ However, recent empirical evidence has not yet found a consensus on the direction of the causal relationship between democratization and education. On the one hand, there is strong empirical indication in support of modernization theory. Using cross-country data, several studies have found that higher education levels are a prerequisite to a sustainable democracy.² Some argue that rising levels of education increase civic participation, including voting and political organization, and thus promote support to democratic broad-based regimes vis-à-vis narrow-based dictatorships.³ On the other hand, more recent empirical evidence shows that the relationship disappears when unobservable heterogeneous effects and within country

variation are controlled for.⁴ Moreover, recent micro-level data shows that the more education individuals gain, the more submissive to authority they become.⁵

In order to interpret the underpinning factors behind the democracy-education relationship, more evidence on the channels and mechanisms is necessary. A new strand of literature claims that the most potent channel through which higher educational attainment influences democratization levels is political participation and protestation. Educated individuals will only participate in political activity if the opportunity cost of not engaging in productive activity is low.⁶ In order to better comprehend this nexus, a better understanding of collective action is required, and a strong theoretical foundation is needed. This brief builds on the latter part of the literature and proposes that democratic change is more likely to take place when the average income is low compared to the average education.

In the literature on economic development, human capital accumulation contributes positively to income growth, and the population will invest in higher education if and only if the expected returns to the invest-

¹ S. M. Lipset, "Some social requisites of democracy: economic development and political legitimacy," *American Political Science Review* 53 (1) (1959): 69-105.

² F. R. Campante and D. Chor, "Schooling, Political Participation, and the Economy," *Review of Economics and Statistics* 94 (4) (2012): 841-859.

³ E. L. Glaeser, et al. "Why does democracy need education?," *Journal of Economic Growth* 12 (2) (2007): 77-99.

⁴ D. Acemoglu, et al. "From education to democracy?," *American Economic Review* 95 (2) (2005): 44-49.

⁵ W. Friedman, et al. "Education as Liberation?," NBER Working Paper Series 16939 (2011).

⁶ F. R. Campante and D. Chor, "Schooling, Political Participation, and the Economy," *Review of Economics and Statistics* 94 (4) (2012): 841-859.

ment are higher than its costs. Yet if the actual income is lower than the expected income, individuals are more prone to invest their efforts in pursuing political activities. The move into democratization is expected to reduce the rate of exploitation and consequently provide a more equal distribution of incomes. Democratization will either take place when dictators provide concessions (lower exploitation for example) or when ousted through a revolution.

While higher education plays an important role in expanding an individual's political capacities, it will only lead to democratization if citizens devote more time to political activity. This becomes more likely when the returns to economic activities are low.

The empirical evidence

To empirically examine the nexus of education, income and democracy, we employ a cross-country panel dataset constructed from multiple sources. First, the Penn World Tables (version 6.0 – 8.0) are used to obtain measures of income per capita.⁷ Second, scores of educational attainment are measured by years of schooling at the secondary and tertiary levels, as well as the share of population with formal education. Both measures are taken from the Barro and Lee educational attainment dataset.⁸ Lastly, the Polity2 index⁹ and the Vanhanen index¹⁰ are used for measuring democratization (see Box).

With these data, we test the effect of the 5-year lagged values of income, education, and their interaction effect on the current levels of democracy. The results (see Table) show that the current level of democracy is significantly related to previous democracy levels; that secondary (columns 1 and 3) and in particular tertiary (columns 2 and 4) education significantly raise the level of democracy; and past that income raises the level of democracy as measured by the Vanhanen index, but not by the Polity2 index. The interaction term of income and education is significantly negative in all specifications and reflects a measure of returns to education at the national level. In other words, the determinants of democratization become more apparent when income is controlled for. The negative coefficient of the inter-

Table

Results of regressions of democracy measures

	Vanhanen		Polity2	
	secondary education	tertiary education	tertiary education	Höhere Bildung
dem(t-1)	0.394***	0.387***	0.532***	0.534***
edu(t-1)	0.0902*	0.644***	0.181**	0.657**
inc(t-1)	0.0425***	0.0341**	0.0319	0.0165
inc(t-1)*educ(t-1)	-0.0101**	-0.0635***	-0.0221***	-0.0837***
N	1210	1210	1145	1145
r ²	0.457	0.457	0.528	0.527

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In all specification country and year fixed effects are used.

© DIW Berlin

The table shows the correlation of income and education with the respective index separated for secondary and tertiary education.

action term shows that democratization is less likely to take place when average incomes are high. The results are robust with either index of democratization and under different econometric specifications.

The regressions also reflect the importance of the level of education in increasing the likelihood of the occurrence of democratic change. In results not reported here, we find no significant effect of primary education on democracy indices. While secondary education has a significant impact, the coefficient of tertiary education is much larger, both for the lagged education level and for the interaction with income.

To illustrate the results, consider the following example: of the 187 countries with democracy data in the sample in 2010, the Vanhanen index classifies 154 as democracies, while 33 are not democratic, that is, they have a score lower than 5. The above regression coefficients suggest that an increase of one year in average secondary education across all countries—while holding income constant—would push 13 nations across the threshold value, such that they would be considered democracies.

While the results do not directly measure the channels through which education positively influences democratic change, yet they provide a strong basis for future research to consider studying the role of returns to education on political participation.

⁷ R. C. Feenstra, et al. "The Next Generation of the Penn World Table" (2013), accessed October 30, 2014, www.ggdc.net/pwt.

⁸ R. Barro and J.W. Lee, "A New Data Set of Educational Attainment in the World, 1950-2010," *Journal of Development Economics* 104 (2013): 184-198.

⁹ M.G. Marshall, et al. "Polity IV Project: Dataset Users' Manual," Arlington, Polity IV Project (2011).

¹⁰ T. Vanhanen, "Measures of Democracy 1810-2012," FSD1289, version 6.0 (2014-01-31), Tampere, Finnish Social Science Data Archive (2014).

Box

Measures of Democracy

The literature on Political Economy relies on two main measures of democracy: the Polity2 index, and the Vanhanen index of democratization. Despite the high correlation between the two indices (about 0.8), they measure different structural qualities.

The Polity2 index is probably the most used index and it mainly captures the characteristics of political regimes, including but not limited to: political competition, political freedoms, constraints on the exercise of power by the executive, and warranty of civil liberties. Each country is assigned a democracy and an autocracy value, both ranging from 0 to 10. The value of the Polity2 index is calculated as the difference between the two and rescaled to the unity interval, such that 0 indicates a strong autocracy and 1 a strong democracy.

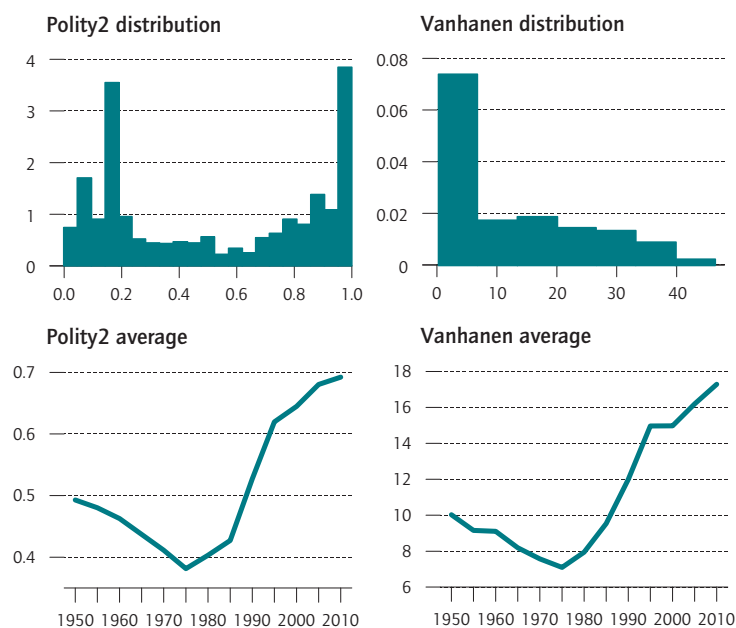
The Vanhanen Index is calculated by taking into account two variables, ranging between zero and one: intensity of election contestation (share of votes for the opposition party/parties), and voter participation rates. Both sub-indices are based on election data. The overall index is calculated by multiplying those two sub-indices by 100, where the minimum criteria for a country to be classified as democratic are participation rates of at least 10%, opposition vote shares of at least 30% and an overall score of more than 5. Thus, deficiencies in one of the democracy values have a strong effect on the overall performance of the countries regime type. The scale ranges from 0 to 100, where a value above 5 already qualifies for a democracy, while 100 is a purely theoretical value. For the regressions, the Vanhanen index is also rescaled to the unity interval.

As exhibited in figure 1, the Polity2 index, unlike the Vanhanen index, is censored on the right hand side, such that a substantial part of the distribution is clustered there. Still, as shown in the lower part of the figure, the measures exhibit considerable correlation in measuring democracy over time. Both indices vary substantially across countries, as shown for the Polity2 index in figure 2. While European, North- and South-American nations mostly fall in the third and fourth quartiles of the distribution, most Asian and African nations are found in the first and second quartiles.

Figure 1

Measure of democratization

Worldwide distributions and averages 1950-2010



Source: calculations by DIW Berlin.

© DIW Berlin

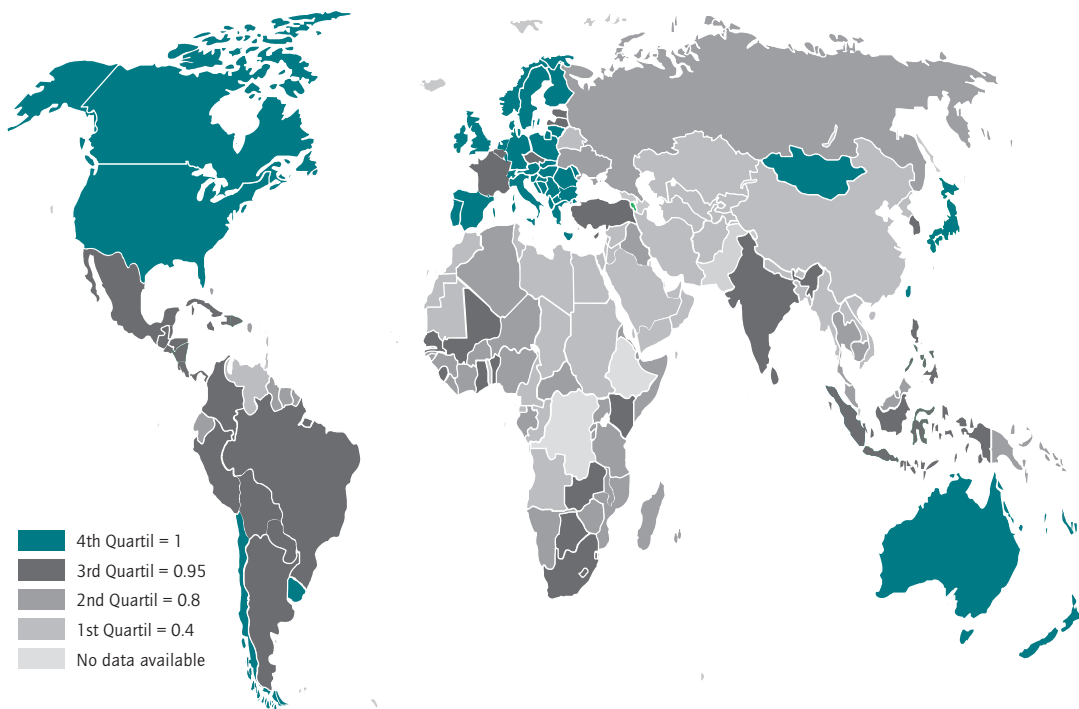
Conclusion

In the last 5 years, a new wave of protests and revolutions demanding more political freedom and democracy has erupted in the Middle East and North Africa. There have been numerous studies that aim to examine the drivers behind these revolutions, yet none has provided definite answers and clear-cut conclusions. Education has been on a steady rise in the last three decades, and the share

of the educated population, especially in the developing world, is increasing. Education is found to play a major role in influencing the transition of a country into democracy, and it grows more evident with higher levels of schooling. Yet, not in all cases does increasing education lead to democratization. This motivates the search for additional factors affecting the relationship of education and democratic regimes.

Figure 2

Global Distribution of the Polity2 Index Quartils in 2010



Source: calculations by DIW Berlin.

© DIW Berlin

For example, the level of income might be an important mitigating factor between education and democracy. As found in the current study, the role of education becomes more prominent when the returns to human capital investment are low, which may reflect the lower opportunity cost of political participation. This suggests that political unrest is more likely to manifest, when increases in education are not adequately remunerated by wage increases. While this appears plausible, more mi-

cro-evidence is needed to confirm the channel and direction of the effects.

Ghassan Baliki is a Research Associate in the Department of Development and Security at DIW Berlin | gbaliki@diw.de

Florian Szücs Assistant Professor at WU Vienna and has been Research Associate in the Department Firms and Markets at DIW Berlin | fszuecs@diw.de

Keywords: Democratization, Education, Political Change