

# Civil Conflicts and Food Price Spikes

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May 25, 2014

*Rough draft. Please do not cite.*

## Abstract

In this paper, we investigate the relation between food prices and civil conflicts by using a panel data set of 82 developing and emerging countries spanning from 1995 to 2009. Our results reveal that a rise in domestic food prices increases the likelihood of civil conflicts. The size of the estimated impact of domestic food prices on conflicts is higher in South-East Asia. Finally, we compare the estimated impact of international and domestic food prices on the occurrence of conflicts. Due to the imperfect pass-through, the effect of international food prices on the occurrence of civil war is significantly lower and even close to zero in most of our estimations.

*Keywords: Civil Conflicts, Food Prices, Political Instability, Natural Resources*

*JEL Codes: Q24, Q34, O13*

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# 1. Introduction

Shortly before the French Revolution of 1789, the queen, Marie Antoinette, upon being told that the poor people of Paris had no bread, reputedly replied: "Then let them eat cake". Throughout history, food prices spikes are frequently thought to cause food riots and conflicts like the French Revolution (1789), the fall of the British Raj in India (1789).<sup>1</sup> Since 2000, food prices have experienced rapid increase. Corn and wheat prices nearly triples and price for rice doubles. High prices for these stapled grains impact negatively households purchasing power and may raise poverty.<sup>2</sup> The decrease in purchasing power lowers *the opportunity cost*, thus, causing food riots as in Mexico in 2007 or in Jordan in February 2008.<sup>3</sup> However, many other factors like political instability, inequality underpinned food riots.

The objective of this paper is to investigate the relation between food prices and conflicts among a large panel of developing countries. This paper focuses on two research questions. The first challenge is to deal with the reverse causality between food prices and conflicts. Second this paper examine the relation between international food prices, domestic food prices and conflicts. Studies analyzing the relation between food prices and conflicts (Arezki and Bruckner (2011) and Bellemare (2012)) used data on international food prices. However, the transmission between domestic food prices and international food prices is not perfect.<sup>4</sup> In response to international food price spikes, governments can intervene by reducing their import protection or by increasing export restraints. Thus, domestic food prices rise less than international food prices (Anderson et al., 2013). By considering international food prices instead of domestic food prices, previous studies introduce a bias in the analysis (Arezki and Bruckner (2011) and Bellemare (2012)). We measure this bias by estimating a system of two equation: the first equation estimates the impact of international food price on the domestic food price; the second equation estimates the impact of domestic food price on the occurrence of civil conflicts.

Using a panel data base of 82 countries spanning from 1995 to 2009, our empirical results indicate that a rise in food prices increase the likelihood of conflicts. Cereal import dependent countries are more sensitive to a rise in food prices. Our results also reveal that

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<sup>1</sup>Introduire en appel de note un rappel de note historique sur ces deux points

<sup>2</sup>Several studies analyzed the impact of food price increase by using the methodology developed by (Deaton, 1989). By using household survey data from Guatemala, (De Janvry and Sadoulet, 2010) results reveal that the effects of food price spike on households pruchasing power is very limited due to the imperfect transmission between international and domestic food prices. (Chakravorty et al., 2012) show that the food price increase due the U.S energy policy should increase the number of poors in India.

<sup>3</sup>See (Schneider, 2008) and (Bush, 2010) for a complete description of food riots after the 2008 food crisis.

<sup>4</sup>(Chakravorty et al., 2012) estimate the price pass-through in India for four food commodities, e-g, rice, wheat, sugar and meat. They found no significant transmission between the international and domestic price for wheat and meat. The pass-through elasticity was 0.18 for rice and 0.38 for wheat.

South-East Asia is the most sensitive region to a rise in food prices.

The paper is organized as follows. Section 2 provides a review of the literature on the links between income shocks and conflicts. In section 3, data and descriptive statistics are presented, then, empirical strategy is explained. Section 4 discusses the results, along with the results of several robustness checks. Section 6 concludes.

## 2. Income shocks and conflicts

Many factors underpinne civil wars and conflicts like weak institutions, ethnic diversity, inequality.<sup>5</sup> However, income shocks are among the strongest and most robust correlate of civil wars and conflicts. Traditionnally, two theoretical models are used to explain the relation between economic shocks and civil conflicts ([Blattman and Miguel \(2010\)](#)). Early studies suggest that higher prices leads to higher revenues, which decreases the incentives to fight ([Grossman \(1991\)](#)). This theory named *opportunity cost theory* has been investigated by many empirical studies. The empirical paper by [Miguel et al. \(2004\)](#) examines the impact of economic growth on the occurence of conflicts. To tackle the endogeneity issue between economic growth and conflicts, they use the rainfall variation as an instrument. They also control for other channels that can impact conflicts like democracy level, the terms of trade, the level of population, the religious fractionnalization, the ethnolinguistic fractionalization, geographical characteristics like the proportion of a country that is montainous (time invaraint geographic conditions), a dummy variable which takes the value "1" if oil constitutes more than one third of exports revenues. The results reveal that the lagged growth has an impact on the occurence of conflicts while the contemporaneous economic shocks have no impact on conflicts. The results reveal that negative rainfall growth affect postively conflicts, in other words, since most of sub-saharian countries lies within the semiarid tropics, a negative shock on rainfall affects negatively agricultural production or equivalently, higher levels of rainfall are associated with significantly less conflicts. Another study tests the causal effect of overpopulation on the incidence of conflicts. [Brückner \(2010\)](#) test the existence of a significant impact of population size on the civil conflicts conditional per capita GDP of a panel of 37 Sub-Saharan countries over the period 1981-2004. To estimate the impact of population size on the probability of occurence of civil conflicts, the author uses randomly occuring drought as an instrumental variable.<sup>6</sup> In addition, to account for endogeneity issue

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<sup>5</sup>Some papers have analyzed the relation between ethnic diversity and conflicts([Montalvo and Reynal-Querol \(2005\)](#); ? and [Esteban et al. \(2012\)](#)).

<sup>6</sup>Droughts are indentified by an indicator function that is one for the 5% largest negative drops in the level of rainfall over two consecutives years.

of per capita income to both population and civil conflict, the authors use two instrument variables: smooth variations in rainfall and international commodity prices.<sup>7</sup> The author finds a significant and positive effect of population size on the probability of occurrence of conflict. The impact of GDP per capita on the probability of conflict is significant only when the country fixed effects and the year fixed effects are both included in the model.<sup>8</sup>

Another strand of the literature argues that the abundance of natural resources like fossil fuels or minerals, a source of income for States, causes more violence by raising gains from appropriation. This theory named *State Prize* has been tested empirically. Before the paper by (Dal Bó and Dal Bó, 2011), the literature focuses on this theory without discussing an element of paradox: in some cases, a positive income shock increases the occurrence of conflicts while others decrease it. By developing a general equilibrium model of appropriation in a small open economy, (Dal Bó and Dal Bó, 2011) solve this paradox by distinguishing the income shocks affecting labor- and capital-intensive sectors. In labor-intensive sectors like agriculture a rise in food prices may increase the opportunity of conflicts and decrease the incidence of conflicts. Alternatively, in the capital sector a rise in contestable income may increase conflict by raising gains from appropriation. (Bazzi and Blattman, 2011) test the evidence of these theories. Their data set covers all countries in Africa, the Middle East, Latin America, and Asia over the period 1957-2007.<sup>9</sup> They use different measures of conflicts. UCP/PRIO mainly captures the variation in intensity, while the others like ((Fearon et al., 2007), (Sambanis, 2004) and the Correlates of War or SOW (Sarkees and Wayman, 2010)) are suited to more decisive changes in violence. The authors argue that the most common measure of conflicts, which is coded "1" for a year of new conflict and a year of ongoing conflict raise conceptual and empirical issues. Conceptually, price shocks effects on onset conflicts and ongoing conflicts are not symmetric. Since initiating a conflict has a fixed cost, price shocks may have a larger effect on ongoing conflicts. Empirically, it is crucial to take into account the dynamics since conflicts are highly persistent. Omitting lagged variables may introduce a bias between the error term, the dependent variable, and the shocks. The authors estimate independently the impact of price shock on the onset of conflicts and on the end of conflicts (*point précis. Les auteurs en ne prenant en compte que le début du conflit supposent implicitement que un choc de prix déclenche un conflit et qu'un choc de prix favorise l'arrêt du conflit. Par conséquent, la relation teste est réductrice. De plus, d'une*

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<sup>7</sup>The index of international commodity prices is calculated from the price of 19 commodities weighted by a fixed export share. IL FAUDRAIT RETROUVER PAR LA SUITE LA LISTE DE CES 19 BIENS.

<sup>8</sup>the results are robust the onset of conflict is the endogenous variable. The author uses the onset of conflicts as an explanatory variable to deal with the issue of recurrent conflicts and the length of conflicts.

<sup>9</sup>They exclude countries with population under 1 million.

*quation l'autre les effets sont opposés.*). The authors find weak evidence in favor of either theory. By using district level data, (Dube and Vargas, 2013) also test simultaneously the two theories in Columbia. They use data at the municipalities level. Their results corroborate the existence of both theories. A fall in coffee prices induces a decline in wages, lowering the opportunity cost of fighting. In contrast, a rise in oil price generate greater rents to fight over via a rapacity effect.

The opportunity cost theory explains the causal effect of food price spike on the occurrence of conflicts. Some papers test the empirical evidence between food prices and civil conflicts. Sub-Saharan countries appear to be very fragile to any price shock since their degree of dependence upon primary commodity exports is high (Deaton (1999)). (Brückner and Ciccone, 2010) examine whether civil wars are more likely to start following downturns in the international price of countries' main exports commodities. This paper explains the relation between war outbreak and commodity price shocks. Their results show that a drop export commodity prices increase the incidence of civil conflicts in Sub-Saharan Africa. In a more general case, Sub-Saharan countries are said to be more sensitive to climate change. Many studies converge to show that climate change should affect negatively food production in this region, thus, may increase conflicts (Burke et al. (2009)). (Couttenier and Soubeyran, 2013) test the effect of climate change through a drought index in hydrology. Their results reveal that drought has a strong effect on the incidence of civil war and on democracy. (Arezki and Bruckner, 2011) test the relation between international food prices shocks and civil wars in Low and High Income Countries over the period 1970-2007. Their results show in period of high food prices political institutions deteriorate significantly and the likelihood of conflicts increase. (Bellemare, 2011) uses monthly data at the international level, their results reveal that rising food prices leads to increased political unrest, while food price volatility induces a decreases in political unrest.

### 3. Data

Our data cover 1995 to 2009 for most of the countries in Africa, the Middle-East, Latin America and Asia (see Figure 1).<sup>10</sup>

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<sup>10</sup> Some countries are excluded from the data set since data were missing for the domestic food price index. In Latin and Central America, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama were excluded. In Sub-Saharan Africa, Democratic Republic of the Congo, Djibouti, Eritrea, Guinea-Bissau, Liberia, Sudan are excluded from the data set. In Asia (except South East-Asia), Tajikistan, Turkmenistan, Uzbekistan Democratic People's Republic of Korea and Afghanistan are excluded. Finally in South-East Asia, Myannar is excluded.

Data on civil conflicts are obtained from the Armed Conflict Dataset of the Uppsala Conflict Data Programme (UCPD) and the Centre for the Study of Civil War at the International Peace Research Data Programme (ICPAD). According to the UCDP/PRIO Armed Conflicts database, civil conflicts are defined as "a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-deaths related" (UCDP/PRIO (2011a), page 1). The complete set represents 98 different civil conflicts over the period 1995-2009, among them 34 conflicts last one year and 7 during all the period covered <sup>11</sup>. The UCDP/PRIO distinguishes four types of conflicts: 1) the extrasystemic armed conflicts which occurs between a state and a non-state group outside its own territory; 2) the interstate armed conflict between two or more states; 3) internal armed conflicts between the government of a state and one or more opposition group(s) without intervention of another states; 4) internationalized armed conflicts between the government of a state and one or more opposition group(s) with intervention from other states (secondary parties) for one or both sides. Over 1995 to 2009, there are no extrasystemic conflict, 6 interstate conflicts (e.g. india and Pakistan about the Kashmir region), 86 internal conflicts, some of them can also be classified some years as internationalized conflicts and thus 22 different conflicts are classified as internationalized conflicts (among them 12 conflicts are located in Sub Saharan countries). In our paper, we limit our analysis to internal armed conflicts since we analyse the relationship between food prices and conflicts<sup>12</sup>. In this set, 55 countries are concerned by civil conflicts, 32 conflicts last 1 year and the 4 countries always in conflicts are Colombia, Philippines, Turkey and India.

We consider the incidence of conflicts, this variable is coded as "1" in year of a new or ongoing conflict and it is coded to "0" if the numbers of yearly drop under 25 deaths<sup>13</sup>. The only countries that experiment more than 1 conflict over the same year are Ethiopia, India, Israel, Myanmar and Russia <sup>14</sup>. However, the measure (or definition) of conflicts as defined by PRIO/Uppsalla has some limitations. It does not capture many types of riots or organizations of violence. Figure ?? maps the conflicts for the different regions.

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<sup>11</sup>The 7 countries that are in civil conflict over 1990 to 2009 are Colombia, Philippines, Sudan, Uganda, Turkey, Algeria and India in the kashmir region and in the Assam State

<sup>12</sup>If we analyse the relationship between resource price and conflicts we may need to include internationalized conflict. In this type of conflict, a foreign state can be involved in the conflict, e.g. conflicts between Uganda and the Democratic republic of the Congo for oil resources

<sup>13</sup>In the literature, different measures of internal war exist. Most of them uses the arbitrary 1,000 deaths threshold to identify an internal conflict or civil war (Fearon and Laitin (2003); Sambanis (2004) and the Correlates of War or COW (Sarkees and Wayman, 2010)). The danger of this definition is to exclude conflicts of small intensity or riots.

<sup>14</sup>JUSTIFIER POURQUOI NOUS AVONS DECIDER DE METTRE 1 POUR CES PAYS)

In terms of our "main" independent variables, we use two different measures for food prices. First, as most of previous work, we focus on international food prices (Miguel et al. (2004); (Arezki and Bruckner, 2011); Bazzi and Blattman (2011); Bellemare (2012)). We use the international food price index as defined by the World Bank (Bank, 2013a).<sup>15</sup> However, the pass-through between international and domestic food prices is imperfect. In response to spikes in international food prices, many governments adjust their agricultural trade barriers (reduction in imports protection or increase in exports restrains) in an attempt to partially insulate their domestic food markets from the prices increases. For instance, India rises its exports bans on rice to insulate domestic market (Anderson et al., 2013). Thus, we use the Domestic Food Price Level index built by FAO (FAO, 2013). This index is calculated by dividing the Food Purchasing Power Parity (FPPP) by the General Purchasing Power Parity, thus providing an index of the food price in the country relative to the price of generic consumption basket.

We introduce a set of economic variables as control variables. Per capita Gross Domestic Product (GDP) are from Penn World Table (Heston et al., 2012). Per capita GDP is deflated by country into real year 2005 US dollars and is calculated in Purchasing Power Parity (PPP). We also take into account the growth in per capita GDP to take into account economic shock. Food prices affect differently the occurrence of conflicts depending on whether if the country is a net exporter or net importer of food. In order to take into account this point, we introduce the cereal imports dependence ratio as defined by (FAO, 2013). It is calculated as the ratio of cereal imports and the production of cereal plus the cereal imports minus the cereal exports. Since this ratio is calculated on 3-years averages, it reduces concerns that food imports and exports are endogenous year-to-year changes in countries socio-political environment (REVOIR L'ARGUMENT). The openness at 2005 constant prices defined as the ratio between the sum of imports and exports and GDP is from Penn World Table (Heston et al., 2012).

Autocracy is measured by the autocracy score of the Polity IV database. (Marshall et al., 2002) This score ranges from 0 to 10; a value of 10 indicates a high level of autocracy while a value of 0 indicates the lowest value of autocracy.<sup>16</sup> The authors define the term autocracy operationally in terms of the presence of a distinctive set of political characteristics.<sup>17</sup> The

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<sup>15</sup>The Food Price weighs exports price of a variety of food commodities (grains, fat and oils, other food) around the world in nominal U.S. dollar prices, 2005 = 100.

<sup>16</sup>;

<sup>17</sup>The four indicators for measuring the degree of autocracy are: 1) the competitiveness of political participation, the regulation of participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive.



authors define the autocracy as follows: *In mature form, autocracies sharply restrict or suppress competitive political participation. Their chief executives are chosen in regularized process of selection within the political elite, and one in office they exercise power with few institutional constraint. Most modern autocracies also exercise a high degree of directiveness over social and economic activity, but we regard this as a function of political ideology and choice, not a defining property of autocracy.* (Marshall et al. (2002), pages 15-16). As in Bazzi and Blattman (2011), we code the variable conflict duration as follows: the number of years of conflicts over the last 5 years.

We also introduce the mortality rate under five years (Bank, 2013b). We build a measure of the country vulnerability to natural disasters by using data from (CRED, 2013). This database has been used by to analyze the relation between natural disasters and development (Strömberg, 2007). The database identifies different types of natural disasters like droughts, earthquake, extreme temperature.<sup>18</sup> In the dataset, the variable "natural disaster" is coded as "1" the year of natural disaster and "0" otherwise. We build a variable as the proportion of years during which a natural disaster occurs for each country. For instance, if during the period 1995-2009, a natural disaster occurred during 7 years. Our variable takes the value 50%.

## 4. Empirical strategy

To take into account the effects of food prices level on the occurrence of conflicts, we estimate the following equation:

$$C_{it} = \alpha_i + \beta_i \log P_{it-1} + \theta_i X_{it} + \epsilon_{it} \quad (1)$$

where  $C_{it}$  is an indicator for conflicts events which takes the value "1" if a conflicts is observed or "0" otherwise,  $\alpha_i$  is the country fixed-effects,  $P_{it-1}$  is the lagged food price index,  $X_{it}$  is the vector of control variables.<sup>19</sup> To measure the impact of food prices on the occurrence of conflicts, we use two different measures of food prices. As it is commonly used in the literature on conflicts, we first use the international food price index ((Miguel et al., 2004), Bazzi and Blattman (2011) and Bazzi and Blattman (2011)). Then, to account for imperfect pass-through between international prices and domestic food prices, we use the domestic food price index. The coefficient  $\beta_i$  can be interpreted as the elasticity of conflicts with respect to food prices. In other words, it measure the percentage change in the the probability of

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<sup>18</sup>The complete list of natural disaster is: droughts, earthquake, epidemic, insect infection, mass movement dry, mass movement wet, wildfire, extreme temperature, flood, storm, vulcano.

<sup>19</sup>The control variables are expressed in log except if they are expressed in percentage.



conflicts in response to a one percent change in the food price. If  $\beta_i$  is positive, it means that any increase in food prices reduces wages (or purchasing power) and thereby increasing conflicts. If  $\beta_i$  is negative, it means that any increase in food prices increases wages (or purchasing power) and thereby reducing conflicts.

We estimate 1 with a fixed effect linear model as in Miguel et al. (2004). It is crucial in this study to implement country fixed-effects to take into account cross-sectional differences like institutional quality, economic performances. A reverse causality exists between conflicts and food prices. To tackle with this issue, we take into account the lagged food price index.

In a second step, we estimate the following system to capture the indirect effect of international food prices on the occurrence of conflicts:

## 5. Results

Table 6 reports the effect of domestic food price index on the occurrence of civil conflicts. Column (2) shows that the domestic food price is significant at 10% level. A rise of 1% of domestic food price increases the likelihood of civil conflicts by 0.19%. All else being equal, the occurrence of conflict is higher in countries already in conflict. Conflicts are less likely to be observed in countries where the open rate is higher. In column (3), we examine the regional impact of the effect domestic food price index on the occurrence of civil conflicts. The effect of domestic food price index is significantly positive in two regions: South-East Asia and Latin America while it is not significant in Asia and Sub-Saharan Africa. In Table 7, we examine if domestic food price has a differential impact in countries with a higher cereal import dependency ratio. Finally, our results reveal that there is significant difference among the different regions. The likelihood of conflicts after a rise in domestic food price is higher in South-East Asia and in Latin America.

Finally, the indirect effect of international food prices on the likelihood of civil conflict is shown in Table 8. Column (1) indicates that the pass-through between the international and the domestic food prices is significant at 1%. A rise of one percent of international food prices induces a rise in domestic food price of around 0.15%. Surprisingly, the occurrence of a disaster has no contemporaneous effect on the domestic food price. Then, we examine if the size of the impact of domestic food prices on the likelihood is different across the different regions. The impact is higher in South-East Asia and in Latin America.

## 6. Conclusion

The objective of this paper is to estimate the effect of food price spikes on the occurrence of conflicts. To estimate this relation, we build a data set of 82 developing countries from 1995 to 1979. Our results reveal that there exist a significant and positive relation between food price spikes and civil conflicts. Most likely, a civil conflict will occur in South-East Asia and Latin America after a food price spike. Due to the imperfect pass-through, the effect of international food prices on the occurrence of civil war is significantly lower and even close to zero in most of our estimations. The implications of this research are potentially important from a public perspective. The recent food price spikes observed since 2000 can increase poverty and cause civil conflicts. Civil conflicts may slow down economic development in some regions.

## References

- Anderson, K., M. Ivanic, and W. Martin (2013). Food price spikes, price insulation and poverty. Technical report, National Bureau of Economic Research.
- Arezki, R. and M. Bruckner (2011). *Food prices and political instability*. International Monetary Fund.
- Bank, W. (2013a). Global food price index. Technical report. last accessed July 2013.
- Bank, W. (2013b). World development indicators. Technical report. last accessed July 2013.
- Bazzi, S. and C. Blattman (2011). Economic shocks and conflict: the (absence of?) evidence from commodity prices. Center for Global Development, WP, 274.
- Bellemare, M. F. (2011). Rising food prices, food price volatility, and political unrest.
- Bellemare, M. F. (2012). Rising food prices, food price volatility, and social unrest. In *APSA 2012 Annual Meeting Paper*, pp. 1–66.
- Blattman, C. and E. Miguel (2010). Civil war. *Journal of Economic Literature*, 3–57.
- Brückner, M. (2010). Population size and civil conflict risk: Is there a causal link?\*. *The Economic Journal* 120(544), 535–550.
- Brückner, M. and A. Ciccone (2010). International commodity prices, growth and the outbreak of civil war in sub-saharan africa\*. *The Economic Journal* 120(544), 519–534.
- Burke, M. B., E. Miguel, S. Satyanath, J. A. Dykema, and D. B. Lobell (2009). Warming increases the risk of civil war in africa. *Proceedings of the National Academy of Sciences* 106(49), 20670–20674.
- Bush, R. (2010). Food riots: Poverty, power and protest1. *Journal of Agrarian Change* 10(1), 119–129.
- Chakravorty, U., M. Hubert, and B. Marchand (2012). Does the us biofuel mandate increase poverty in india? association of resource and environmental economics 2nd annual summer conference, june 3-5, 2012, asheville, nc.
- Couttenier, M. and R. Soubeyran (2013). Drought and civil war in sub-saharan africa. *The Economic Journal*.

- CRED (2013). World development indicators. Technical report, Center for Research on Epidemiology of Disasters. last accessed July 2013.
- Dal Bó, E. and P. Dal Bó (2011). Workers, warriors, and criminals: social conflict in general equilibrium. *Journal of the European Economic Association* 9(4), 646–677.
- De Janvry, A. and E. Sadoulet (2010). The global food crisis and guatemala: what crisis and for whom? *World Development* 38(9), 1328–1339.
- Deaton, A. (1989). Household survey data and pricing policies in developing countries. *The World Bank Economic Review* 3(2), 183–210.
- Deaton, A. (1999). Commodity prices and growth in africa. *The Journal of Economic Perspectives*, 23–40.
- Dube, O. and J. F. Vargas (2013). Commodity price shocks and civil conflict: Evidence from colombia. *The Review of Economic Studies* 80(4), 1384–1421.
- Esteban, J., L. Mayoral, and D. Ray (2012). Ethnicity and conflict: An empirical study. *The American Economic Review* 102(4), 1310–1342.
- FAO (2013). Food security indicators. last accessed July 2013.
- Fearon, J. D., K. Kasara, and D. D. Laitin (2007). Ethnic minority rule and civil war onset. *American Political Science Review* 101(01), 187–193.
- Fearon, J. D. and D. D. Laitin (2003). Ethnicity, insurgency, and civil war. *American political science review* 97(01), 75–90.
- Gleditsch, N. P., P. Wallensteen, M. Eriksson, M. Sollenberg, and H. Strand (2002). Armed conflict 1946-2001: A new dataset. *Journal of peace research* 39(5), 615–637.
- Grossman, H. I. (1991). A general equilibrium model of insurrections. *American Economic Review* 81(4), 912–21.
- Heston, A., R. Summers, and B. Aten (2012). Penn world table.
- Marshall, M. G., K. Jaggers, and T. R. Gur (2002). Polity iv project: Political regime characteristics and transitions, 1800-2010, dataset user’s manual. *Center for Systematic Peace*.
- Miguel, E., S. Satyanath, and E. Sergenti (2004). Economic shocks and civil conflict: An instrumental variables approach. *Journal of political Economy* 112(4), 725–753.

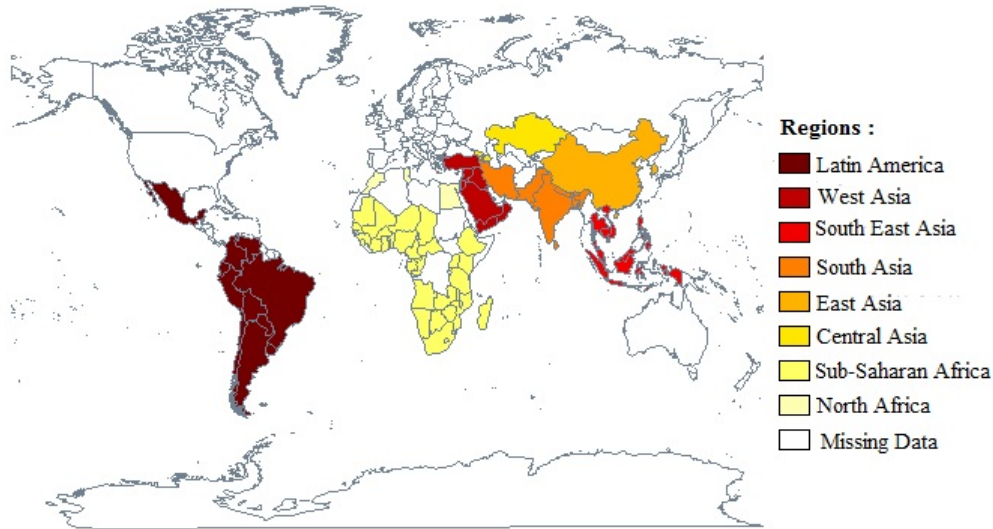
- Montalvo, J. G. and M. Reynal-Querol (2005). Ethnic polarization, potential conflict, and civil wars. *American economic review*, 796–816.
- Sambanis, N. (2004). What is civil war? conceptual and empirical complexities of an operational definition. *Journal of conflict resolution* 48(6), 814–858.
- Sarkees, M. R. and F. Wayman (2010). Resort to war.
- Schneider, M. (2008). We are hungry! *A Summary Report of Food Riots, Government Responses, and States of Democracy in 2008*.
- Strömberg, D. (2007). Natural disasters, economic development, and humanitarian aid. *The Journal of Economic Perspectives*, 199–222.
- Themnér, L. and P. Wallensteen (2012). Armed conflicts, 1946–2011. *Journal of Peace Research* 49(4), 565–575.
- UCDP/PRIO (2011a). Armed conflict dataset codebook.
- UCDP/PRIO (2011b). Armed conflict dataset version 4-2011. accessed July 2013.

## **7. Appendice A: Maps, Figures and Tables**

### **7.1. Maps**

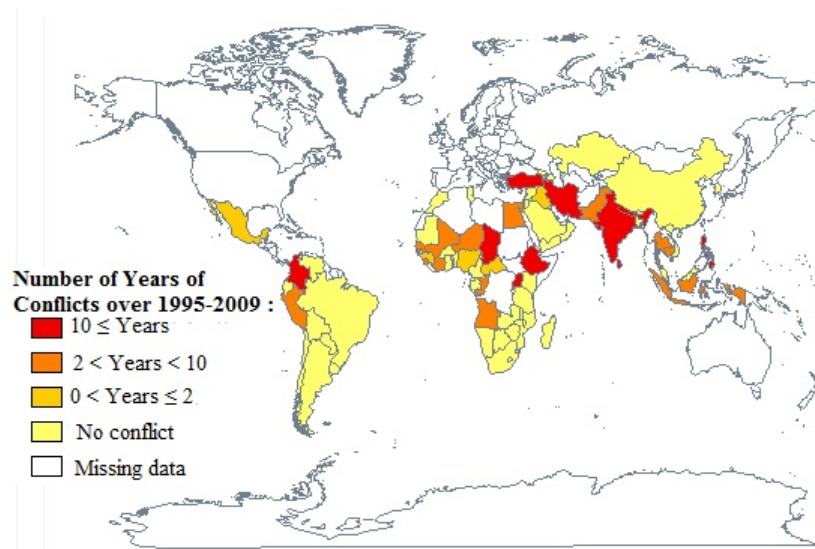
### **7.2. Tables**

**Figure 1: Different regions**



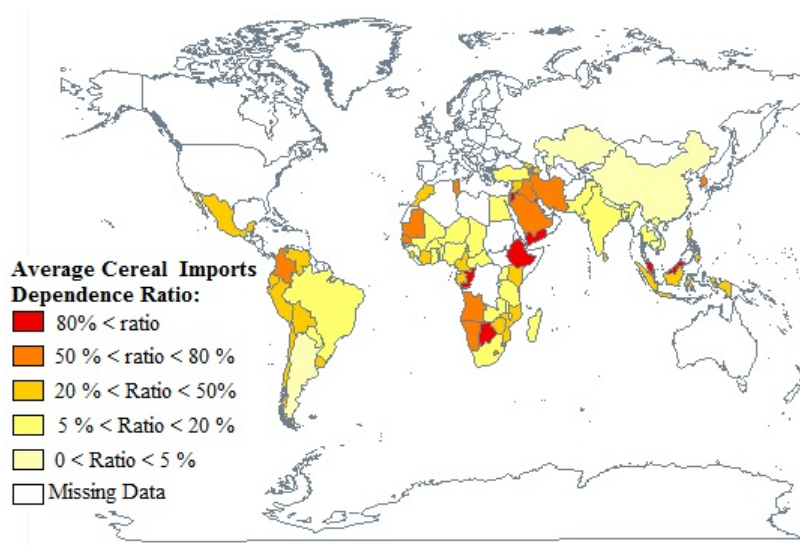
*Notes:* Some countries are excluded from the data set since data were missing for the domestic food price index. In Latin and Central America, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama were excluded. In Sub-Saharan Africa, Democratic Republic of the Congo, Djibouti, Eritrea, Guinea-Bissau, Liberia, Sudan are excluded from the data set. In Asia (except South East-Asia), Tajikistan, Turkmenistan, Uzbekistan Democratic People's Republic of Korea and Afghanistan are excluded. Finally in South-East Asia, Myanmar is excluded.

**Figure 2: Duration of conflicts (1995-2009)**



*Source:* Gleditsch et al. (2002); Themnér and Wallensteen (2012). *Notes:* We use UCDP/PRIO Armed Conflicts Dataset Version4-2011 ((UCDP/PRIO, 2011b)).

**Figure 3:** Cereal Import Dependency Ratio



Source: [FAO \(2013\)](#).

**Table 1:** Summary statistics

Variable	All countries				
	Mean	Std. Dev.	Min.	Max.	N
Conflicts	0.18	0.38	0	1	1230
World Food Price Index	109	19	86	159	1230
Domestic Food Price Index	174	41	53	433	1221
Autocracy	2.74	3.06	0	10	1172
Duration (Years)	0.94	1.74	0	5	1230
GDP (2005 US dollars)	6,545	11,521	276	118,770	1230
GDP growth (%)	2.05	1.54	-2.66	18.59	1229
Open Rate (%)	78.52	50.09	14.26	433	1230
Cereal Import Dependency Ratio (%)	38.40	31.46	0	127.5	1001

Notes: World Food Price Index is from [Bank, 2013a](#)



**Table 2: Summary Statistics Asia**

Asia except South-East Asia						
Variable	Mean	Std. Dev.	Min.	Max.	N	
Conflicts	0.21	0.41	0	1	360	
World Food Price Index (Base 100 = 2005)	109	29	86	159	360	
Domestic Food Price Index (Base 100 = 2005)	145	36	76	260	358	
Autocracy	4.61	3.64	0	10	338	
Duration (years)	1.05	1.86	0	5	360	
GDP (2005 US dollars)	10,768	16,390	780	118,770	360	
GDP growth (%)	2.16	2.33	-2.06	18.59	359	
Open Rate (%)	80	41	21	224	360	
Cereal Import Dependency Ratio (%)	43	35	0.70	110	260	

**Table 3: Summary statistics**

South-East Asia						
Variable	Mean	Std. Dev.	Min.	Max.	N	
Conflicts	0.29	0.46	0	1	120	
World Food Price Index (Base 100 = 2005)	109	19	86	159	120	
Domestic Food Price Index (Base 100 = 2005)	158	16	53	191	120	
Autocracy	2.31	2.62	0	7	105	
Duration (years)	1.5	2.13	0	5	120	
GDP (2005 US dollars)	14,105	17,789	813	54,282	120	
GDP growth (%)		1.77	0.81	-1.48	5.32	
120						
Open Rate (%)	147	94	44	433	120	
Cereal Import Dependency Ratio (%)	36	36	1.4	100	91	

**Table 4: Summary statistics**

Latin-America						
Variable	Mean	Std. Dev.	Min.	Max.	N	
Conflicts	0.14	0.35	0	1	165	
World Food Price Index (Base 100 = 2005)	109	19	86	159	165	
Domestic Food Price Index (Base 100 = 2005)	146	20	115	204	165	
Autocracy	0.1	0.47	0	4	164	
Duration (years)	0.79	1.70	0	5	165	
GDP (2005 US dollars)	7,177	2,682	2,947	12,429	165	
GDP growth (%)	1.47	0.65	-0.15	2.83	165	
Open Rate (%)	54	24	20	163	165	
Cereal Import Dependency Ratio (%)	31	17	0.3	61	143	

**Table 5:** Summary statistics

	Sub-Saharan Africa					
<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>	<b>N</b>	
Conflicts	0.15	0.36	0	1	540	
World Food Price Index (Base 100 = 2005)	109	19	86	156	540	
Domestic Food Price Index (Base 100 = 2005)	202	37	79	433	534	
Autocracy	2.22	2.38	0	9	520	
Duration (years)	0.82	1.55	0	5	540	
GDP (2005 US dollars)	2,067	2,487	276	12,757	540	
GDP growth (%)	2.27	1.14	-2.66	9.77	540	
Open Rate (%)	70.62	34.08	14.27	191.97	540	
Cereal Import Dependency Ratio (%)	38.56	32.10	0	127.5	468	

**Table 6:** Domestic Price

Dependent variable: Conflicts			
	(1)	(2)	(3)
<i>Log Price<sub>t</sub></i>	0.112 (1.53)	0.186 <sup>+</sup> (1.74)	
<i>Duration<sub>t</sub></i>	0.0644** (3.24)	0.0470* (2.02)	0.0604** (3.06)
<i>Duration<sub>t</sub> * Autocracy<sub>t</sub></i>	0.00896* (2.27)	0.00852* (1.97)	0.00944* (2.45)
<i>Log GDP<sub>t-1</sub></i>	-0.250 <sup>+</sup> (-1.83)	-0.229 (-1.54)	-0.230 <sup>+</sup> (-1.67)
<i>OpenRate<sub>t</sub> (%)</i>	-0.0768* (-2.02)	-0.111* (-2.04)	-0.0793* (-2.06)
<i>Log MortalityRate, under5years<sub>t</sub></i>	0.00849 (0.23)	0.0423 (0.78)	0.0168 (0.43)
<i>CerealDep.Ratio<sub>t</sub> (%)</i>		0.00209 (1.43)	
<i>Log Price<sub>t-1</sub> *Sub-Saha Afri.</i>			0.00252 (0.03)
<i>Log Price<sub>t-1</sub> *S-E Asia</i>			0.240* (2.50)
<i>Log Price<sub>t-1</sub> *Asia</i>			1.132 (1.63)
<i>Log Price<sub>t-1</sub> *Latin America</i>			0.202 <sup>+</sup> (1.95)
cons	0.0800 (0.49)	-0.139 (-0.60)	0.0199 (0.12)
( <i>N</i> )	1182	959	1182
adj. ( <i>R</i> <sup>2</sup> )	0.656	0.660	0.657

Notes: Regression results of equation (1) are displayed. *T* statistics are in parentheses. <sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 7:** Domestic price and Creal Import Dependency Ratio

Dependent variable: Conflicts			
	(1)	(2)	(3)
<i>Log Price</i> <sub><i>t</i>-1</sub> * <i>CerealDep.Ratio</i> <sub><i>t</i>-1</sub>	0.477*** (3.70)		
<i>Duration</i> <sub><i>t</i>-1</sub>	0.0516* (2.44)	0.0501* (2.35)	0.0509* (2.42)
<i>Duration</i> <sub><i>t</i>-1</sub> * <i>Autocracy</i> <sub><i>t</i>-1</sub>	0.00993* (2.41)	0.00988* (2.42)	0.00998* (2.43)
<i>Log GDP</i> <sub><i>t</i>-1</sub>	-0.265+ (-1.83)	-0.238+ (-1.65)	-0.250+ (-1.73)
<i>Openrate</i> <sub><i>t</i>-1</sub>	-0.118* (-2.29)	-0.109* (-2.20)	-0.120* (-2.52)
<i>Log Population</i> <sub><i>t</i>-1</sub>	0.0145 (0.14)		
<i>Log Price</i> <sub><i>t</i>-1</sub> * <i>CerealDep.Ratio</i> <sub><i>t</i>-1</sub> * <i>Sub-Saha Afri.</i>		0.274+ (1.87)	0.279+ (1.88)
<i>Log Price</i> <sub><i>t</i>-1</sub> * <i>CerealDep.Ratio</i> <sub><i>t</i>-1</sub> * <i>Asia</i>		0.863* (2.37)	0.806* (2.31)
<i>Log Price</i> <sub><i>t</i>-1</sub> * <i>CerealDep.Ratio</i> <sub><i>t</i>-1</sub> * <i>S-E Asia</i>		2.473* (2.15)	2.444* (2.12)
<i>Log Price</i> <sub><i>t</i>-1</sub> * <i>CerealDep.Ratio</i> <sub><i>t</i>-1</sub> * <i>Lat. Ame.</i>		1.245* (2.06)	1.335* (2.19)
<i>Log MortalityRate</i> <sub><i>t</i>-1</sub> , under 5 years		0.0405 (0.81)	
cons	-0.0169 (-0.02)	-0.0831 (-0.38)	0.0897+ (1.92)
( <i>N</i> )	1033	1033	1033
<i>adj.(R</i> <sup>2</sup> )	0.659	0.661	0.661

Notes: Regression results of equation (1) are displayed. *T* statistics are in parentheses. +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ;

**Table 8:** Indirect Effect of International Food Price on the Occurrence of Civil Conflicts

	(1)		(2)		(3)	
	lprix_food		lprix_food		lprix_food	
	<i>Log Dom. Px</i>	<i>Conflicts</i>	<i>Log Dom. Px</i>	<i>Conflicts</i>	<i>Log Dom. Px</i>	<i>Conflicts</i>
<i>Conflicts</i>	0.164*** (4.79)		0.140*** (4.21)		0.138*** (4.58)	
<i>Log InterP<sub>t</sub></i>	0.133*** (6.42)		0.0906*** (6.46)		0.101*** (7.51)	
<i>Log InterP<sub>t</sub>*Cer.Dep</i>	-0.000131 (-1.43)					
<i>Disaster<sub>t</sub></i>	-0.00819 (-1.57)					
<i>Inflation<sub>t</sub></i>	0.000592* (2.35)		0.000609* (2.23)			
<i>Disasterperiod</i>			-0.000953 (-1.06)		-0.00155+ (-1.77)	
<i>Duration<sub>t</sub></i>		0.0220* (2.03)		0.0365*** (3.34)		0.0407*** (4.06)
<i>Duration<sub>t</sub> * Autocracy<sub>t</sub></i>		0.00636** (3.10)		0.00784*** (3.71)		0.00818*** (4.13)
<i>OpenRate<sub>t</sub></i>		-0.118* (-2.41)		-0.136** (-2.76)		-0.146** (-3.13)
<i>Log GDP<sub>t-1</sub></i>		-0.115 (-1.11)				
<i>Log DomP<sub>t-1</sub> * CerD<sub>t-1</sub>*SubAfr</i>		1.321*** (6.95)		0.877*** (5.88)		0.908*** (6.51)
<i>Log DomP<sub>t-1</sub> * CerD<sub>t-1</sub>*Asia</i>		1.686*** (5.53)		1.491*** (5.21)		1.454*** (5.60)
<i>Log DomP<sub>t-1</sub> * CerD<sub>t-1</sub>*S-E Asia</i>		3.870*** (5.10)		3.554*** (4.51)		3.577*** (4.62)
<i>Log DomP<sub>t-1</sub> * CerD<sub>t-1</sub>*LatAm</i>		3.357*** (4.75)		2.915*** (4.30)		2.678*** (4.22)
( <i>N</i> )	888		959		1033	
( <i>R</i> <sup>2</sup> )	0.985	0.753	0.985	0.748	0.984	0.740

*Notes:* Regression results of equation (1) are displayed. *T* statistics are in parentheses. +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; *DomP* is the domestic price index as defined by the FAO and *InterP* represents the international price index; *disaster* is a dummy variable which takes the value "1" if a natural disaster occurs in period *t*; *disasterperiod* measures the sensitivity of a country to natural disaster.