

# Public Policy, Price Shocks, and Conflict: Price Shocks and Civil War in Developing Countries\*

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## Abstract

Those who study the role of agriculture in the political economy of development focus on government policy choices on the one hand and the impact of price shocks on the other. We argue that the two should be studied together. We find that civil unrest (Granger) causes government policies, pushing governments in poor and medium income countries to shift relative prices in favor of urban consumers. We also find that while civil wars are related to food price shocks, when government policy choices are taken into account, the relationship disappears. We thus learn two things: Policies that placate urban consumers may inflict economic costs on governments, but they confer political benefits. And when estimating the relationship between price shocks and political stability, equations that omit the policy response of governments are misspecified.

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Table 1: Food Riots, 2008

Bangladesh	Mozambique
Brazil	Pakistan
Burkina Faso	Myanmar
Cameroon	Panama
Cote d'Ivoire	Philippines
Egypt	Russia
Ethiopia	Senegal
Haiti	Somalia
India	Tajikistan
Indonesia	Yemen
Mexico	

## 1 Introduction

Particularly in the developing areas, governments treat food supplies as a security matter. This was certainly the case in the West, when countries that are now developed were themselves developing.<sup>1</sup> It remains true today. Thus Table 1, which lists countries that experienced food riots during the price rise of 2007-2008. Recent events in North Africa and the Middle East provide additional evidence of the political importance of food prices.

In this article, we seek to move beyond qualitative accounts and salient examples to provide statistical evidence of the link between food shortages and political security.

In section 2, we briefly review the literature. In section 3, we describe our sample and our measures and in section 4 our methods of estimation. A novel feature of the latter is the incorporation of the expected policy response of governments into equations that capture the political response to food price rises. In section 5 we present our findings, the most striking of which is that the relationship between price shocks and civil wars becomes insignificant when government policies distort markets in ways that favor the consumers of agricultural products.

## 2 Literature

Two literatures inform this article. The first addresses agricultural policy and explores the manner in which governments intervene in markets so as alter prices. The second explores the relationship between food price rises and political stability. In the sections that follow,

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<sup>1</sup>See, for example, Tilly (1971), Tilly (1990), and Kaplan (1976).

we demonstrate that, while commonly pursued separately, for reasons both of methodology and substance, the two themes should be addressed together.

## 2.1 Agricultural Policy

Writing in 1977, Michael Lipton highlighted the degree to which governments in the developing areas adopted policies biased in favor of the urban and industrial sector. While Lipton (1977) addressed a wide range of policies, others have focused more narrowly, concentrating on how governments intervene in agricultural markets. Some (Johnson (1973)) focus on international markets and trade policy; others, on domestic markets, both for agricultural products and farm inputs (Schultz (1976)). Still others probe the political foundations of agricultural policy. The literature on interest groups (Bates (1981); Olson (1985); see also Hayami (1957) and Hayami (1986)) stresses the ironic difference in the power of the farm lobby in developed and underdeveloped countries. In the former, producer interests dominate, despite their small numbers and the small size of agriculture in the national economy; in the latter, consumer interests dominate, even though the urban sector constitutes a small proportion of the total economy and industrial and manufacturing firms are few in number. Varshney (1993) notes, however, that the political advantage enjoyed by urban interests in the developing world erodes in democracies, where the size the rural population confers a political advantages (see also Bates and Block (2009)).

In the sections that follow, when we address public policy, we make use of the Relative Rate of Assistance (Anderson (2009)), which provides a measure of the degree to which governments intervene in favor of rural or urban producers. Using this measure, we explore the impact of differences in the economic structure and political institutions upon the policy choices of governments.

## 2.2 Commodity Price Shocks

Deaton and Miller (1995) number among the first systematically to explore the political impact of food price shocks. For each country in Africa, they constructed an index in which they weighted each of 21 commodities by its relative importance in the total value of that country's exports. To deal with the possible impact of endogeneity, they made use of instrumental variables. Applying vector auto-regression to data from 32 African countries, 1960-1990, Deaton and Miller (1995) find the impact of commodity price shocks largely favorable to Africa's economies. Total GDP increases. So too do each of its components:

consumption, investment, and government expenditure. The researchers then introduce a measure of “irregular exit”<sup>2</sup> as their index of political instability. Commodity price shocks affect this measure, they note, through their impact on national income. It is when prices turn negative and national incomes decline, they find, that the likelihood of irregular exits rises.

In contrast to Deaton and Miller (1995), Dell et al. (2008) report that food price rises lead to declines in income, reductions in the growth rate of the economy and increases in political instability and that these relationships prevail only among poor countries. The difference between two sets of findings can be attributed to the instrument which Dell et al. (2008) employ – increases in local temperatures – that would correlate with local crop loss rather than with movements in global markets. In Deaton and Miller’s world, were a country to produce rice, it would benefit economically from an increase in rice prices; the value of its the crop would rise. In the world of Dell et al. (2008), a weather shock signals the possibility of a crop failure, with losses of output and a rise in food prices, but a fall in the national product.

As did Deaton and Miller (1995), Dell et al. (2008) employ the probability of irregular exit as a measure of political instability. The probability of irregular exit rises with temperatures, they report, and thus with food prices. They also find temperature increases to be associated with political “interregnums” or periods in which no discernable government holds power.

Writing in 2008, Besley and Persson (2008) construct country specific Laspeyres indices for a global sample of roughly 125 countries for 45 commodities and for the period 1960 to 2000. They find a positive and significant relationship between their index and the occurrence of civil wars. Decomposing the bundle of commodities into agricultural goods, petroleum products, and minerals, they attribute this result largely to the impact of price rises for farm products. The relationship is stronger, they find, in poor countries and in nondemocracies.

The last contribution is that of Arezki and Bruckner (2011), who study the relationship between a food price index based upon international prices and export shares on the one hand and a series of political variables on the other: Polity’s measures of democracy and political restraint; Banks’ data on riots and anti-government demonstrations, and PRIO’s measure of civil unrest.

As do Dell et al. (2008), Arezki and Bruckner (2011) find that food price shocks impact measurably on poor but not on high income countries. Based on estimates drawn from a

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<sup>2</sup>Irregular exits include assassinations, coups, and the forced resignation of the head of state. See also Bienen and van de Walle (1991)

panel of data drawn from 61 low income countries, 1970-2007, they find food price shocks systematically related to declines in Polity scores, increases in riots and demonstrations, and increases in the likelihood of civil unrest. Their finding is robust to the exclusion of large food producers, which they list as China, Guatemala, India, Ivory Coast, Pakistan, Thailand, Uganda, Ukraine, and Vietnam. They make no effort, however, to control for movements in the prices of other commodities, such as petroleum products.

Portions of this literature also focus on particular countries, such as Colombia (as by Dube and Vargas (2006) and Angrist and Krueger (2008)), or on the role of climate (as by Miguel et al. (2004) and Hsiang et al. (2011)). Given the focus of this paper, we do not review their contributions here.

## **2.3 Discussion**

We build on the literature in several ways. Given that the prices of other goods – and especially that of petroleum – can also affect national incomes and political stability, we strive to isolate the impact of changes in food prices from that of changes in the prices of other commodities. Unlike many of the previous papers, we include measures of energy use and production in our estimates. It is particularly important to do so as the prices of different commodities may vary in concert, particularly when responding to monetary imbalances.

More significantly, perhaps, this paper departs from many of its predecessors in that it combines the two literatures. That is, while focusing on the impact of food price shocks, it takes into account the policy response of governments. Doing so, it finds and reports evidence that the impact of food price shocks is itself a function of the policy choices of governments.

We thus seek to contribute to two literatures, both by exploring the policy response of governments and the manner in which their responses shape the impact of price rises upon domestic stability.

## **3 Sample and Variables**

Our measure of government policies, calculated by Anderson (2009), exists only for a subset of lower income nations; moreover, we found – as did Dell et al. (2008) and Arezki and Bruckner (2011) – that food price shocks fail to affect political outcomes to a measurable degree in

higher income countries.<sup>3</sup> Our dataset therefore consists of roughly 1,100 observations, drawn from approximately 30 developing countries between 1961 and 2001.<sup>4</sup>

As our measure of price shocks, we created import and export Laspeyres indices, using FAO measures of food consumption and World Bank data on international reference prices<sup>5</sup>. These indices provide measures of food price imports and exports for each country and for each year. For country  $i$  and year  $t$ , the expression of the Laspeyres index reads

$$\text{Laspeyres}_{it} = \frac{\sum (p_{ct} \times q_{ci1980})}{\sum (p_{c1980} \times q_{ci1980})}$$

where  $p_{ct}$  gives the global market price of commodity  $c$  in year  $t$  and  $q_{cit}$  gives the quantity consumed (exported) of commodity  $c$  in country-year  $it$ 's consumption (export) basket.<sup>6</sup>

The data cover crops that account for nearly 70% of the calories consumed globally. We employ 1980 as the base year.<sup>7</sup>

Figure 1 employs data from 12 countries to illustrate changes in the value of our aggregated food price index over time and country. Clearly, the boom of the 1970s accounts for a major portion of the temporal variation. And since countries confront the same global food prices and choose relatively similar consumption baskets, the major portion of the total variation occurs cross-temporally. That this is the case facilitates causal inference. For since all countries receive roughly the same treatment, we can attribute country level variation in responses to price shocks to differences in their political institutions and socioeconomic structures.

As can be seen in Figure 1, despite occasional sharp upward movements, food prices have been steadily declining. When estimating the relationship between our price index and measures of political instability, we therefore experimented with a variety of corrections for trend. None improved the fit, however; indeed, they reduced it. While we shall report evidence of a relationship between the price index and measures of political instability, these measures failed to correlate with trend-filtered versions of the index.<sup>8</sup>

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<sup>3</sup>A finding that we, like they, attribute to Engel's law, by which poorer people spend a larger proportion of their incomes on food.

<sup>4</sup>Of the 94 low income countries in our dataset, we observe the outcome variable in the first stage of our model for only 32. Hence we are reluctant to employ imputational methods: This would entail imputing values of the first stage outcome variable to some 60 countries for which no observations were recorded.

<sup>5</sup>Anderson (2009)

<sup>6</sup>For more, see Deaton and Muellbauer (1980).

<sup>7</sup>For each year, we dropped countries whose production accounted for 20% or more of the major food crops. An important exception occurred when we dropped price setters in rice markets, strongly suggesting that domestic insecurity significantly affects food prices in rice markets.

<sup>8</sup>It is as if consumers were responding politically to food price rises, even when these increases represented

We employ two measures of political instability. The first is the Peace Research Institute’s (PRIO) measure of civil war, for which there are three variants: PRIO 25, which assumes a value of 1 if a civil war in a given year results in at least 25 battle deaths; PRIO 100, which assumes a value of 1 if a civil war results in at least 100 battle deaths; and PRIO 500, which assumes a value 1 if a civil war yields at least 500 battle deaths. Use of the three measures enables us to probe the impact of food price shocks not only upon the onset but also the intensity of civil wars. A second is Arthur Bank’s conflict index, which we draw from his Cross-National Time Series Data Base. For each country and each year, Banks records the occurrence of strikes, assassinations, revolutions, riots, and purges, which he then weights according to his assessment of their impact on political stability. We explore the relationship of food price shocks to the natural log of Banks’ variable, seeking thereby to reduce the impact of potentially influential outliers.

As a measure of government policy, we employ an index of the relative rate of assistance (RRA), as calculated by the World Bank.<sup>9</sup> The index reflects the relative magnitude of the shifts of the nominal rates of assistance (NRA) between agriculture and other sectors of the economy. More formally, for purposes of illustration, if the sole intervention by government is an *ad valorem* tariff, the NRA for a given commodity is then

$$\text{NRA}_{it} = \frac{E_{it} \times P_t (1 + \tau_{mit}) + E_{it} \times P_t}{E_{it} \times P_t}$$

where  $\tau_{mit}$  is the tariff rate applied by country  $i$  in year  $t$  on competing imports  $m$ ,  $E_{it}$  is the country-year specific domestic currency price of US dollars (exchange rate), and  $P_t$  is the dollar denominated global price of the commodity in year  $t$ . The measure thus captures the difference between global and domestic prices produced by the government’s tariff.

The measure provides a means for calculating the relative rate of assistance (RRA), which is the index we employ to characterize government policy.<sup>10</sup> For country  $i$  in year  $t$ , the RRA is

$$\text{RRA}_{it} = \frac{1 + \text{NRA}/\text{agriculture}_{it}}{1 + \text{NRA}/\text{nonagriculture}_{it}} - 1.$$

The RRA is thus a function of the relative extent to which the government separates domestic from international prices for agricultural and non-agricultural commodities. When

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but a return to a long-term equilibrium level.

<sup>9</sup>Anderson (2009)

<sup>10</sup>The measure can, and has been, adopted to incorporate additional forms of government intervention.

government policies favor agricultural producers to a greater degree than others, then this measure is positive; when they instead favor consumers, it is negative. Put another way, positive values suggest that the government favors farmers; negative, that it is biased in favor of urban interests.

As our measure of political institutions, we employ Political Competition, a variable taken from Polity IV. We do so because the first-best measure of political competition, that of Beck et al. (2002), is not available in sufficient historical depth. Fortunately, Political Competition correlates closely (0.80) with the latter measure, enabling us to employ it instead.<sup>11</sup>

Lastly, we introduce measures of the importance of petroleum in the national economy and of monetary instability, which serve as control variables. Price shocks in food markets can be the result of monetary forces as well as physical shortages; and when that is the case, food prices move in concert with those of other commodities. Of these commodities, it is perhaps only petroleum that is able to induce political shocks comparable in magnitude to those resulting from food. In our efforts to identify the impact of food prices, we therefore control for these confounding variables.

Table 3 provides a full list of the variables, describes them, and indicates the sources from which they were taken.

## 4 Specification

To estimate the impact of food price shocks, we employ a two-stage, simultaneous equations model. The first stage captures the policy response of the government; the second, the impact of price movements on political instability, conditional upon the government's response.

### 4.1 First Stage Equation

By imposing tariffs, levying export taxes, and issuing licenses and permits, governments can limit trade and so separate the level of prices in domestic and foreign markets. Using these measures, governments can also alter relative prices for rural producers and urban consumers. The purpose of the first stage equation is to account for the manner in which governments intervene, as captured by the RRA.

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<sup>11</sup>The measure, collected by Beck et al. (2002), was developed by the Africa Program at Harvard University, who demonstrated that it Guttman scaled. It is also invertible, i.e. given a number on the scale, an observer can know the structure of political competition precisely.



We view the government’s policy response as being shaped by the economic and political characteristics of the nations in our sample, which is drawn from the ranks of the low and low-medium income countries. We learn from the literature that in such economies rural dwellers are numerous; if the government must compete for votes in order to stay in office, it will therefore have to consider letting domestic food prices rise, thereby generating an increase in real income for rural producers. On the other hand, urban consumers are spatially concentrated; by comparison with their rural counterparts, they therefore face low costs when organizing. Because they staff key services, moreover, their power is disproportionate to their numbers. And not only do they spend a large portion of their incomes on food; but also, so do others. As food is a necessity, when its price rises, people spend less on other commodities, resulting in decreased purchases of non-essential items, recession in the manufacturing and retail sector, and rising unemployment.<sup>12</sup> Given these effects, we can expect urban consumers of food vigilantly to monitor food prices and vigorously to lobby for policies designed to keep them low. Indeed, in the absence of electoral competition, they can be expected to dominate the political process. Our choice of sample and our specification of the policy equation is therefore designed to take into account the structure of the economy and the nature of political institutions: factors that affect the policy response of governments.

$$\begin{aligned}
\text{Policy}_{it}|\text{Income Level} &= \alpha_C + \alpha_T + \alpha_1\text{Export Laspeyres}_{it} + \alpha_2\text{Import Laspeyres}_{it} \\
&+ \alpha_3\text{Political Competition}_{it} \\
&+ \alpha_4\text{Export Laspeyres}_{it} \times \text{Political Competition}_{it} \\
&+ \alpha_5\text{Import Laspeyres}_{it} \times \text{Political Competition}_{it} \\
&+ \alpha_6\text{Policy}_{it-1} + \alpha X
\end{aligned} \tag{1}$$

We estimate four variants of this equation. The results appear in Table 4. Models 1 and 2 are estimated with straightforward OLS, with the lagged RRA value and country and year fixed effects omitted. Model 2 includes robust and clustered standard errors, which correct for dependence within country observations. Models 3 and 4 add, respectively, country and year fixed effects and the lagged policy value.

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<sup>12</sup>See, for example, Sen (1983).

## 4.2 Second Stage Equation

The estimates of Equation 1 yield the expected policy responses of governments to food price shocks, conditional upon the political and economic environment within which they inhere and (in the case of model 4) previous policy commitments. Equation 2 introduces these responses into models that capture the political impact of food price shocks. The introduction of an instrumented variables in the first stage should purge the coefficient relating government policy and political outcomes in the second of endogeneity bias.

As Wooldridge (2002) demonstrates, 2SLS is equivalent mathematically to regression using instrumental variables; the second stage estimates will be consistent, therefore, if the instrument is highly correlated with the instrumented explanatory variable. Because model 4 in Table 4 incorporates a lagged value of the dependent variable, estimates derived from it should generate consistent estimates in the second stage equation. The problem of inconsistency arises once again, however, because of the need to cluster standard errors by country; clustering reduces the precision of the first stage estimates. When estimating the second stage, we therefore use the IV-Generalized Method of Moments (GMM) estimator developed by Hansen (1982) and extended in Baum et al. (2003) and Baum et al. (2007). The combination of country level clustering and IV-GMM ensures that our estimates correct for dependence among intra-country observations without sacrificing the precision afforded by a strong instrument.<sup>13</sup>

The system of equations is overidentified. In overidentified settings, standard IV techniques reduce the  $\ell$  available instruments to the  $k$  necessary for exact identification, sacrificing efficiency in the process. An additional advantage of the IV-GMM estimator is that it employs information from all available  $\ell$  instruments, thereby enhancing the efficiency of the second stage estimates.

The general form of the second stage equation can be written as:

$$y_{it}|\text{Income Level}_{it} = \beta_C + \beta_T + \beta_1\widehat{\text{Policy}}_{it} + \beta_2\text{Export Laspeyres}_{it} + \beta_3\text{Import Laspeyres}_{it} + \beta_4\text{Political Competition}_{it} + \beta Z \quad (2)$$

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<sup>13</sup>In the process, it also creates a weighting matrix such that covariance between the instrument and the second stage error term approaches 0 by definition, removing the remaining source of inconsistency in standard IV estimates.

## 5 Results

### 5.1 First Stage

Turning first to the coefficients on import prices (Table 4): they are positive in all models, thus suggesting that when the costs of imports rise, governments seek to stimulate local production. Initially beneficial to farmers, the intent is of course to restore prices by increasing food supplies. By contrast, the coefficient on the export price index is negative in all models. It suggests that when global prices shift such that local farmers can gain higher prices in foreign markets than they can at home, governments prevent them from doing so. By banning exports or imposing export taxes, they seek to prevent local prices from rising to the level of prices abroad.

Note the coefficient on political competition: it is positive and significant in most models. When the value of the coefficient is low, there is little or no electoral competition; political competition is suppressed or takes the form of rivalries between organized interests. As the value of the index rises, it points to the rising significance of party competition. As the sample is drawn from low and middle income countries, the change in political institutions thus signals an increase in the power of the rural majority and therefore – as the coefficients suggest – a shift toward pro-farmer policies.

Importantly for second stage estimation, model 4 attains an  $R^2$  of 0.76, implying that equation (1) explains nearly 80% of observed variation in government policy response. Our instruments for RRA are thus strong, and our estimates will therefore be consistent when we employ this equation in the second stage.

### 5.2 Second Stage

The first four panels of Table 5 contain two equations. Both yield coefficients measuring the relationship between the right hand side (RHS) variables – discussed above – and measures of political instability. The first equation (OLS) in each panel resembles those reported elsewhere in the literature: it relates price shocks and the properties of institutions to the likelihood of civil wars and political unrest. The second equation (GMM) provides estimates of the second stage equation of the 2SLS model, which contains an additional variable: the expected policy response of the government, given the structural characteristic of the economy and the nature of political institutions.

Panels 1-4 in Table 5 address the relationship between price shocks and civil war (see the

definition of PRIO in Table 2); panel 4 addresses the relationship between price shocks and political unrest (see the definition of Banks in Table 2). We begin with panel 4.

### 5.2.1 Political Unrest

In models 7 and 8, as the prices of imports rise, unrest increases.<sup>14</sup> While the magnitude of the estimates is the same, the loss of observations renders the coefficient in model 8 statistically insignificant. In keeping with Deaton and Miller's (1995) findings, rising prices for agricultural exports associate with lower rates of disorder – something they attribute to increased prosperity. Supportive of this interpretation are the coefficients on energy use and OPEC membership: Closely related to levels of income, they too bear negative signs and are significant in both models.

Note the coefficient on government policy: it is large, negative, and significant at the 1% level. Policy shifts in favor of the urban sector are associated with increases in urban unrest. Yet the direction of the causal relationship between the two variables remains unclear: Do policy shifts in favor of urban dwellers cause urban unrest, or does urban unrest cause governments to subsidize urban food costs? To address this question, we therefore conduct a Granger causality test (6), which establishes causality by asking whether one time series successfully forecasts another. As depicted in the right hand column, we find strong evidence that urban unrest is a strong predictor of government policy.

On the basis of this finding, we respecify equations (1) and (2) so that food price shocks condition urban unrest, which in turn induces governments to lower food prices. The first stage results appear in model 5 of Table 4; the second stage results in model 9 of Table 5. We find that urban unrest exerts a large effect on government policy: A standard deviation increase in  $\ln$  Banks generates a standard deviation shift in relative prices, rendering them more favorable to urban consumers.

### 5.2.2 Civil Wars

Turning to models 1-6, focus first on the OLS estimates, which, as noted above, resemble many of the equations previously reported in the literature. Negative and significant, the coefficients on the export price index suggest that when export prices fall, the likelihood of civil wars increases. A standard deviation reduction in the export Laspeyres index generates a 2% increase in the probability of civil war, or roughly two-thirds of a standard deviation.

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<sup>14</sup>The decline in the number of observations results from the dropping of those in which the raw scores were negative, rendering the log undefined.

Moreover, this effect grows slightly larger – and is more precisely estimated – as the PRIO battle death threshold increases. When food prices rise, these results suggest, the civil conflicts that ensue are likely to be particularly violent.

But now turn to the even numbered (GMM) equations. The coefficient on RRA suggests that governments that tend to respond to price shocks with measures that favor urban consumers are significantly less likely to face civil wars. Strikingly, the coefficients on export prices are now insignificant, suggesting that governments that adopt pro-consumer policies neutralize the destabilizing impact of price declines in export markets.

In interpreting these findings, it is useful to turn to the qualitative literature on “provisioning,” a term that refers to the feeding of public servants – including the armed forces – and urban centers – especially political capitals. The literature notes that the management of food supplies was critical to the keeping of peace in ancient Rome (Garnsey (1988)) and 18th Century Paris (Kaplan (1976)) and remains critical to the maintenance of order in contemporary Nairobi (Bates (1989)). According to these accounts, the delivery of grain at affordable prices enabled emperors, kings, and presidents to campaign for political support from urban populations. By providing heads of state the opportunity to consolidate their support, provisioning transformed food price shocks into political opportunities. In the hands of wily politicians, food price shocks can render civil wars less likely. While we find this interpretation appealing, we have yet to explore it systematically.

### 5.3 Robustness Checks

Were political instability to occur in a major producing country, it might affect global prices and introduce endogeneity bias: In response to this possibility, we reestimate equations (1) and (2), omitting countries that produce 20% or more of the world’s major staple crops: maize, wheat, and soybeans.<sup>15</sup> The results for our core IV-GMM model appear in Table 7, and closely resemble those in Table 5. They suggest that when governments respond to urban unrest by reducing RRA by a standard deviation, the probability of civil war declines by between 3% and 5%, depending on the number of battle deaths. And when governments pursue policies that favor urban consumers, food prices once again have no meaningful effect.

We next consider whether these relationships have evolved over time. Given the impact

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<sup>15</sup>Arezki and Bruckner (2011) represents the only other attempt to remove this form of endogeneity bias. They remove several large producers from their sample: China, Guatemala, India, Indonesia, Pakistan, Thailand, Uganda, Ukraine, and Vietnam. Since food production is relatively variable, however, we prefer our time variant approach.

of the Cold War on the levels and incidence of civil unrest,<sup>16</sup> we re-estimate the model before and after the end of the Cold War. To conserve degrees of freedom, we do so by interacting our export and import food price indices with a dichotomous variable that assumes value 1 from 1990 on. The results appear in Table 8, and again closely resemble our baseline results in Table 5. When governments adopt policies that shift RRA in favor of urban consumers by a standard deviation, these results suggest, the probability of civil war once again declines by between 3% and 5%, depending on the number of battle deaths.

Lastly, we test whether the dynamics we find in Table 5 are unique to low income countries. The results in Table 8 suggest that while policy shifts in favor of the urban sector appear to slightly reduce the probability of civil war, the effect is much smaller than in poor countries; it is also imprecisely estimated. Surprisingly, we find some evidence that increases in food export costs increase the probability of civil war, though the magnitude of this effect is quite small.

## 6 Conclusion

As noted in Table 1, the rapid rise in food prices between 2007 and 2008 triggered widespread political unrest. More recently, discontent over food prices exacerbated urban protests in North Africa and the Middle East and so contributed to the events now known as the “Arab Spring.” These events have rekindled interest in the relationship between subsistence crises and political disorder. In this paper, we have sought to contribute to the literature on this subject.

Those who study the politics of agriculture in development focus not only on the determinants of political order; they also study government policy. Most often, they find that governments in the developing world adopt policies that favor the interests of urban consumers and discriminate against those of farmers. In doing so, they emphasize the costs of these policies, both to farmers and to the economy. A major lesson of this paper is that the policy choice and political impact should be studied together. Doing so reveals that the economic costs of government policies must be weighed against their political benefits. It also reveals that by omitting the responses of governments, the specifications employed in previous studies of the impact of food price shocks have been misspecified. When governments mitigate the impact of price rises to urban consumers, contrary to previous findings, there is then *no* relationship between food price shocks and civil war.

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<sup>16</sup>See, for instance, Goldstone and Gurr (2003).

Our use of a two stage model suggests a mechanism that might account for this finding: political expectations. In countries where the structure of the economy, political institutions and the past behavior of the government are such that the government can be expected to placate urban consumers in the event of food price rises (thus the result of the first stage), then price shocks will not result in civil wars (thus those of the second). When the organized, powerful, and vulnerable urban sector can rationally expect a favorable response from its government, their protests do not prepare the ground for civil war.

We realize that we have yet to pin down the precise path running between price shocks and conflict; our analysis is thus incomplete. What we have established is that urban bias lowers the likelihood that food price shocks will trigger civil war. The policy choices of governments in the developing areas become more intelligible when viewed in the light of this finding.

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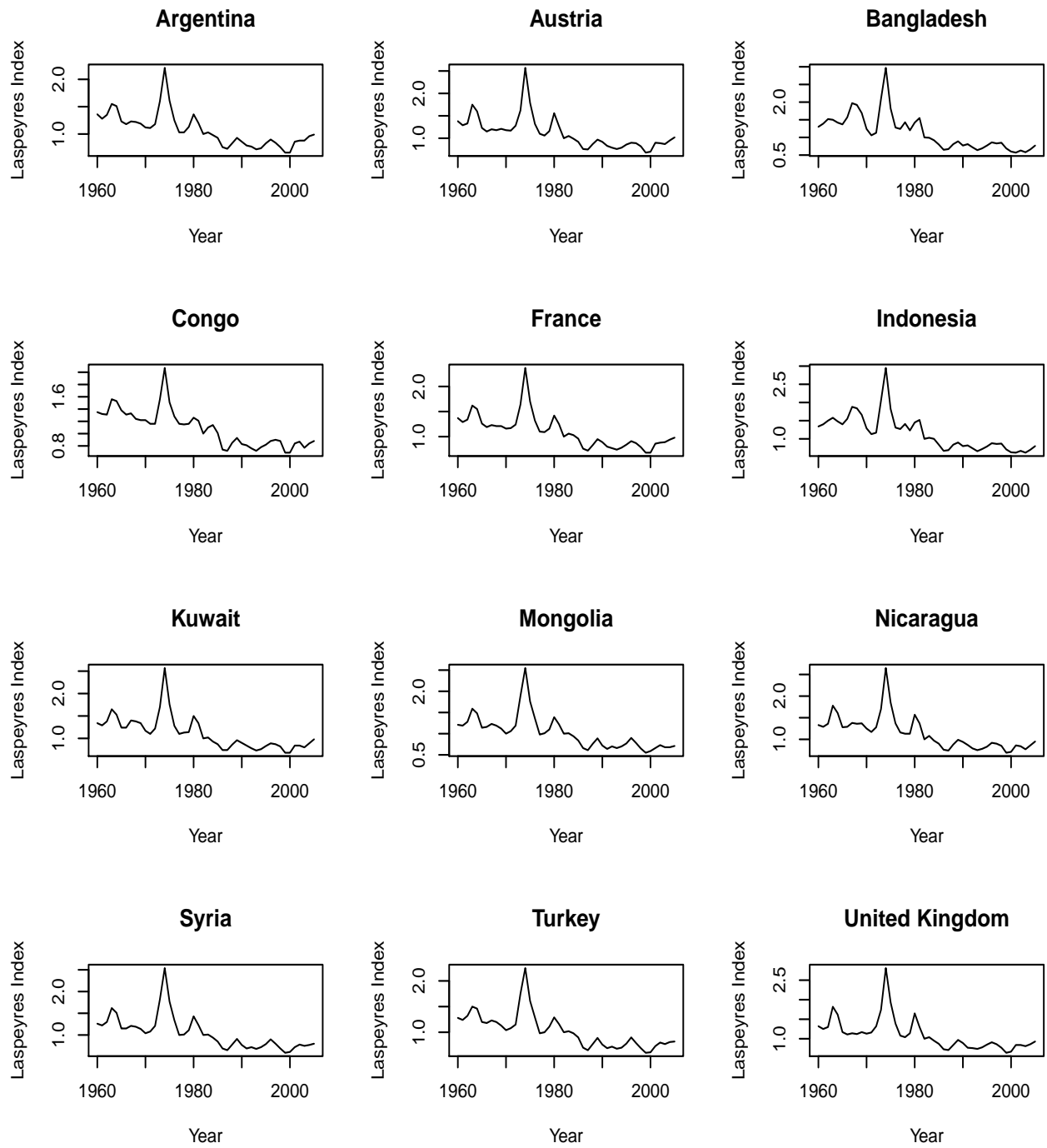


Figure 1: Laspeyres Time Series for a Random Country Sample

Table 2: Outcome Variable Definitions and Descriptive Statistics

Variable	Variable Type (Min/Max)	Mean	Median	Standard Deviation	Description/Source
RRR	[-0.95, 1.30]	-0.17	-0.08	0.26	A measure of the extent to which governments manipulate domestic prices in favor of the agricultural sector, developed by Kym Anderson and colleagues for the World Bank; see Anderson (2009).
PRIO 25	Dichotomous	0.14	0.00	0.35	This variable assumes value 1 if a country experienced a civil war with greater than 25 battle deaths in a given year; see <a href="http://www.prio.no/CSCW">www.prio.no/CSCW</a> .
PRIO 100	Dichotomous	0.13	0.00	0.34	This variable assumes value 1 if a country experienced a civil war with greater than 100 battle deaths in a given year; see <a href="http://www.prio.no/CSCW">www.prio.no/CSCW</a> .
PRIO 500	Dichotomous	0.11	0.00	0.31	This variable assumes value 1 if a country experienced a civil war with greater than 500 battle deaths in a given year; see <a href="http://www.prio.no/CSCW">www.prio.no/CSCW</a> .
Banks	[-0.62, 27.39]	-0.06	-0.62	1.80	This index aggregates all instances of political violence within a given country-year, with more serious episodes – revolutions, riots, purges – weighted more heavily than strikes and assassinations. It is taken from Arthur Banks' Cross-National Time Series database; see <a href="http://www.databanksinternational.com">www.databanksinternational.com</a> .

Table 3: Explanatory Variable Definitions and Descriptive Statistics

Variable	Variable Type (Min/Max)	Mean	Median	Standard Deviation	Description/Source
Export Laspeyres In- dex	[0.00, 18.65]	1.56	1.32	1.13	A country-year measure of food prices, benchmarked at the representative consumers' 1980 consumption basket. We draw global commodity prices from the World Bank and food consumption data from the FAO.
Import Laspeyres In- dex	[0.01, 116.30]	1.55	1.36	0.79	A country-year measure of food prices, benchmarked at the representative consumers' 1980 consumption basket. We draw global commodity prices from the World Bank and food consumption data from the FAO.
Political Competition	[1, 10]	3.51	2.00	2.91	This variable, drawn from the Polity IV dataset, measures "qualities of democratic and autocratic authority in governing institutions," with $-10$ representing a hereditary monarchy and $10$ a consolidated democracy; see Marshall and Jaggers (2005).
Energy Consumption	[0, 1312845]	19430	1710	93150	A measure of primary energy consumption, given in thousands of metric coal-ton equivalents. The variable is taken from the Correlates of War 2 Project; see <a href="http://www.correlatesofwar.org">www.correlatesofwar.org</a> .
OPEC Membership	Dichotomous	0.04	0.00	0.20	A time variant OPEC membership roster, as commissioned by the CIA's Political Instability Task Force.
Banking Crisis	Dichotomous	0.03	0.00	0.16	Records episodes of banking crises, as presented in Reinhart and Rogoff (2009).
Low Income Status	Dichotomous				Following Arezki and Bruckner (2011), we restrict attention to low and low-middle income countries, as defined by the World Development Indicators.
Post-Cold War	Dichotomous	0.33	0.00	0.47	This variable assumes value 1 from 1990 on.

Table 4: First Stage Results (Standard Errors in Parentheses)

	RRA Model 1	RRA Model 2	RRA Model 3	RRA Model 4	ln Banks Model 5
Export Laspeyres	-.050** (.016)	-0.050 (0.037)	-0.014 (0.027)	-0.020 (0.014)	-0.225†† (0.150)
Import Laspeyres	.057** (.015)	0.057 (0.037)	0.010 (0.029)	0.007 (0.013)	0.312 (0.263)
Political Competition	.035** (.007)	0.035* (0.013)	0.035* (0.016)	0.010 (0.008)	-0.119 (0.082)
Export Laspeyres × Political Competition	-.008† (.005)	-0.008 (0.009)	-0.010 (0.006)	-0.002 (0.004)	0.103 (0.050)
Import Laspeyres × Political Competition	-.008 (.003)	-0.008 (0.008)	-0.005 (0.006)	-0.002 (0.003)	-0.008 (0.035)*
Banking Crisis	-.004 (.043)	-0.004 (0.035)	-0.016 (0.037)	-0.015 (0.042)	-0.353 (0.329)
RRA $t - 1$				0.657** (0.075)	
Fixed Effects	No	No	Yes	Yes	Yes
Robust Clustered Standard Errors	No	Yes	Yes	Yes	Yes
$R^2$	0.0703	0.0703	0.5703	0.756	0.3675
N	1182	1182	1182	1182	508
Significance levels:	†† : 15%	† : 10%	* : 5%	** : 1%	

Table 5: Second Stage Results (Standard Errors in Parentheses)

	PRIO 25		PRIO 100		PRIO 500		Log Banks		RRA	
	OLS (1)	GMM (2)	OLS (3)	GMM (4)	OLS (5)	GMM (6)	OLS (7)	GMM (8)	OLS (8)	GMM (9)
$\widehat{RRA}$		0.261* (0.156)		0.199†† (0.141)		0.142 (0.136)		-1.854** (0.549)		-0.134** (0.049)
$\widehat{\ln Banks}$										
Export Laspeyres	-0.019†† (0.013)	0.011 (0.027)	-0.020†† (0.012)	-0.004 (0.024)	-0.022* (0.009)	0.009 (0.020)	-0.009 (0.129)	-0.344** (0.119)	0.006 (0.033)	-0.047†† (0.033)
Import Laspeyres	-0.005 (0.015)	-0.015 (0.016)	-0.011 (0.017)	-0.037† (0.144)	-0.018 (0.017)	-0.035† (0.021)	0.266† (0.134)	0.210 (0.160)	0.006 (0.035)	-0.018 (0.035)
Political Competition	-0.012† (0.006)	-0.026* (0.011)	-0.008 (0.006)	-0.024* (0.010)	-0.013 (0.006)	-0.012 (0.009)	-0.021 (0.035)	-0.034 (0.044)	0.006 (0.010)	0.006 (0.010)
Energy Consumption	-2.41e-07** (8.21e-08)	-2.59e-07* (1.17e-07)	-1.69e-07†† (1.11e-07)	-1.72e-07 (1.22e-07)	-1.23e-07 (1.13e-07)	-1.31e-09 (1.16e-07)	-3.80e-06** (8.06e-07)	-3.73e-06** (4.29e-07)	-5.43e-07** (1.68e-07)	-5.43e-07** (1.68e-07)
OPEC Membership	-0.303 (0.211)	-0.337 (0.191)	-0.263†† (0.174)††	-0.217 (0.163)	-0.271 (0.167)	-0.198†† (0.137)	-0.304†† (0.197)	-0.395† (0.235)	-0.088 (0.093)	-0.088 (0.093)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Robust Clustered SEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2427	1061	2427	1061	2427	1061	522	289	289	289

Significance levels: †† : 15% † : 10% \* : 5% \*\* : 1%

Table 6: Direct Granger Causality Test Results ( $p$  Values in Parentheses)

	$H_0$ : No Granger causality from RRA to $\ln$ (Banks)	$H_0$ : No Granger causality from $\ln$ (Banks) to RRA
$F$ Statistic	1.3467 (0.2526)	2.2985 <sup>†</sup> (0.0775)



Table 7: Second Stage Results, with Price Setters Dropped (Standard Errors in Parentheses)

	PRIO 25		PRIO 100		PRIO 500		Log Banks	
	OLS (1)	GMM (2)	OLS (3)	GMM (4)	OLS (5)	GMM (6)	OLS (7)	GMM (8)
RRA		0.214* (0.108)	0.211†† (0.145)		0.157 (0.140)			-1.808** (0.558)
Export Laspeyres	-0.022† (0.012)	-0.004 (0.025)	-0.020†† (0.012)	-0.003 (0.025)	-0.022* (0.009)	0.011 (0.021)	0.022 (0.135)	-0.364* (0.145)
Import Laspeyres	-0.008 (0.015)	-0.021 (0.016)	-0.011 (0.017)	-0.036† (0.020)	-0.018 (0.017)	-0.034† (0.020)	0.266* (0.134)	0.201 (0.157)
Political Competition	-0.010†† (0.006)	-0.021* (0.010)	-0.008 (0.006)	-0.024* (0.010)	-0.013* (0.006)	-0.013 (0.010)	-0.026 (0.035)	-0.047 (0.047)
Energy Consumption	-2.42e-07** (8.23e-08)	-2.55e-07* (1.18e-07)	-1.70e-07†† (1.11e-07)	-1.78e-07 (1.23e-07)	-1.24e-07 (1.13e-07)	-7.95e-09 (1.16e-07)	-3.79e-06** (7.81e-07)	-3.77e-06** (4.52e-07)
OPEC Membership	-0.299 (0.214)	-0.308†† (0.193)	-0.263†† (0.174)††	-0.223 (0.164)	-0.271 (0.168)	-0.202†† (0.137)	-0.300†† (0.202)	-0.358†† (0.222)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Robust Clustered Standard Errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2403	1037	2427	1037	2403	1037	509	276

Significance levels: †† : 15% † : 10% \* : 5% \*\* : 1%

Table 8: Second Stage Results, Post-Cold War (Standard Errors in Parentheses)

	PRIO 25		PRIO 100		PRIO 500		Log Banks	
	OLS (1)	GMM (2)	OLS (3)	GMM (4)	OLS (5)	GMM (6)	OLS (7)	GMM (8)
RRA		0.261* (0.118)		0.193 (0.137)		0.135 (0.135)		-1.930** (0.537)
Export Laspeyres	-0.018 (0.013)	0.008 (0.027)	-0.019†† (0.012)	-0.008 (0.025)	-0.021* (0.009)	0.008 (0.022)	-0.005 (0.140)	-0.398** (0.120)
Import Laspeyres	-0.003 (0.016)	-0.016 (0.017)	-0.008 (0.018)	-0.037† (0.021)	-0.014 (0.018)	-0.039† (0.021)	0.276* (0.132)	0.204 (0.159)
Export Laspeyres × Post-Cold War	-0.022 (0.048)	-0.043 (0.085)	-0.014 (0.045)	0.053 (0.077)	-0.028 (0.037)	-0.023 (0.067)	-0.014 (0.376)	0.648† (0.335)
Import Laspeyres × Post-Cold War	-0.018 (0.045)	0.009 (0.082)	-0.025 (0.044)	-0.001 (0.080)	-0.025 (0.039)	0.059 (0.050)	-0.422 (0.480)	-0.640† (0.381)
Political Competition	-0.011† (0.006)	-0.026* (0.011)	-0.007 (0.006)	-0.023* (0.010)	-0.012 (0.006)	-0.012 (0.009)	-0.022 (0.036)	-0.035 (0.042)
Energy Consumption	-2.36e-07** (8.11e-08)	-2.58e-07* (1.18e-07)	-1.63e-07†† (1.12e-07)	-1.67e-07 (1.23e-07)	-1.16e-07 (1.13e-07)	1.41e-09 (1.13e-07)	-3.71e-06** (6.83e-07)	-3.81e-06** (3.66e-07)
OPEC Membership	-0.304 (0.211)	-0.347* (0.190)	-0.265†† (0.173)††	-0.227 (0.164)	-0.273 (0.167)	-0.183 (0.139)	-0.318†† (0.200)	-0.348†† (0.241)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Robust Clustered Standard Errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2427	1061	2427	1061	2427	1061	522	289

Significance levels: †† : 15% † : 10% \* : 5% \*\* : 1%

Table 9: Second Stage Results, High Income Countries (Standard Errors in Parentheses)

	PRIO 25		PRIO 100		PRIO 500		Log Banks	
	OLS (1)	GMM (2)	OLS (3)	GMM (4)	OLS (5)	GMM (6)	OLS (7)	GMM (8)
RRA		0.115 (0.110)		0.049 (0.088)		0.014 (0.073)		-0.557 (0.475)
Export Laspeyres	0.035 <sup>†</sup> (0.021)	0.092** (0.032)	0.033 <sup>††</sup> (0.020)	0.060 <sup>†</sup> (0.035)	0.022 (0.020)	0.006 (0.035)	0.242 <sup>†</sup> (0.125)	0.112 (0.100)
Import Laspeyres	-0.010 (0.018)	0.014 (0.016)	-0.004 (0.015)	-0.005 (0.021)	-0.008 (0.014)	-0.020 (0.025)	0.084 (0.077)	-0.109 (0.208)
Political Competition	0.003 (0.005)	-0.000 (0.005)	-0.001 (0.005)	-0.002 (0.005)	-0.005 (0.006)	-0.006 (0.005)	-0.024 (0.036)	0.028 (0.034)
Energy Consumption	-1.55e-07 (2.12e-08)	-1.17e-07 (1.98e-07)	-1.72e-07 (2.17e-07)	1.05e-09 (1.81e-07)	-4.15e-07 (2.57e-07)	2.68e-07 <sup>††</sup> (1.82e-07)	-4.21e-06* (1.81e-06)	-4.36e-06 (1.48e-06)
OPEC Membership	-0.040 (0.021)		-0.037 <sup>†</sup> (0.021)		-0.023 (0.020)		-3.737 <sup>†</sup> (0.000)	
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Robust Clustered Standard Errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2222	1205	2222	1061	2222	1061	690	289

Significance levels: †† : 15% † : 10% \* : 5% \*\* : 1%