

TECHNICAL BRIEF

# (RE)ASSESSING THE RELATIONSHIP BETWEEN FOOD AID AND ARMED CONFLICT

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**A recent, widely-publicized study by Nunn & Qian (2014) links U.S. food aid to lengthier intra-state conflicts, but this result does not hold up under closer scrutiny.** According to their statistical analysis, variation in provision of wheat aid is associated with the duration of intra-state conflict. That finding supports the authors’ conclusion that recipients of larger amounts of food aid tend to have longer armed conflicts. An underlying argument is that amid degraded security due to conditions of conflict, aid is subject to theft by rebels, boosting the capability to sustain fighting. The finding is not supported, however, when unreliable data from the early 1970s are excluded from the analysis and well-established influences on rebel capacity are included. Additional empirical research is warranted to explore this topic at a more disaggregated level, with respect to individual aid programs and conflicts, as well as the dynamics of state-rebel interactions. Nunn & Qian found no evidence that food aid was related to the onset of intra-state war and the analyses conducted here reaffirm that finding.

## I. Introduction

Does food aid provided by the United States government affect the onset or duration of conflict in recipient countries? Such aid could be hijacked by a rebel group en route or stolen at the point of delivery. The aid can then feed rebels directly or be exchanged on the open market and become an indirect source of military supply. Under these scenarios, increases in aid are expected to be related to a higher probability of a conflict being initiated and a lower probability of a conflict ending. Anecdotal evidence exists to support this argument, but it has not been subjected to systematic cross-national study.

In their recent article, “U.S. Food Aid and Civil Conflict,” Nunn & Qian (2014) seek to evaluate this argument by examining the relationship between U.S. wheat aid and the onset, incidence, and duration of conflict in 126 non-OECD countries between 1971 and 2006.<sup>1</sup> The text box in the opposite column offers detail about these three aspects of conflict and how quantitative models attempt to grapple with each of them. The results of Nunn & Qian’s statistical analysis indicate that although variation in U.S. wheat aid is not associated with the onset of intra-state conflict, it is associated with the incidence and the duration. These findings are consistent with the notion that U.S. wheat aid is not consistently susceptible to being captured prior to the start of hostilities, thereby fueling their initiation, but once a conflict commences and general security degrades, the provision of aid tends to boost rebel capability and sustain fighting.

Of course, a conclusion of this nature is of serious concern to the United States Government, including agencies like the U.S. Agency for International Development that are involved in the provision of food aid. Not surprisingly, the findings attracted significant attention in major media outlets.<sup>2</sup> It is critical to ensure that the relationship to conflict is properly assessed and any appropriate measures are taken based on the accumulation of evidence.

### Onset, Incidence, and Duration of Conflict

**Onset:** According to conventional academic standards, the onset of low-level armed conflict occurs when at least 25 battle-related deaths are observed in a year, while the threshold for full-scale civil war is a total of 1000 battle-related deaths.

**Incidence:** Conflict incidence is any year after the onset year that exhibits at least 25 battle-related deaths. This is the primary focus of the analysis for Nunn and Qian. By focusing on conflict incidence, their study examined whether food aid had a measurable effect on increasing the likelihood of sustained civil conflict in the years after it had begun.

**Duration:** Refers to the number of years that elapse starting with the onset year and extending for each subsequent incidence year until a year when the number of battle-related deaths falls below 25.

<sup>1</sup> Nunn and Qian report findings for both inter-state conflict and intra-state conflict. This technical brief limits its discussion to the findings pertaining to intra-state conflict because these are typically of greater interest to audiences within USAID.

<sup>2</sup> Both the *Wall Street Journal* (Lahart 2012) and the *New York Times* (Rampell 2012) reported on the preliminary findings from Nunn & Qian’s research.

With those considerations in mind, the aim of this technical brief is to carefully examine Nunn & Qian's study. A central goal is to determine whether the association between U.S. wheat aid and conflict remains after notable influences on rebel capacity (i.e., the direct provision of external assistance by foreign states), and other variables demonstrated in the existing literature to affect the duration of intra-state conflict, are taken into account in the analysis. As will be discussed below, once these additional factors are included, U.S. wheat aid does not hold up as a significant predictor of the duration of intra-state conflict. The basic argument—that the material resources rebel groups can acquire enhance their ability to fight the state—is confirmed, but increased flows of U.S. wheat aid do not appear to play a significant role in bolstering those capabilities. External assistance provided directly to rebels, rather than food aid that is distributed for humanitarian purposes, lengthens the duration of intra-state conflict.

Section II describes the Nunn & Qian study, focusing on how they construct their model to account for the challenges inherent in studying a topic such as the link between aid and conflict. Section III isolates several shortcomings in their analysis and outlines ways to address these issues. In particular, the revised approach largely takes their theory, data, and methodology at face value, but incorporates omitted variables that are known to correlate with the duration of intra-state conflict. Section IV shows that Nunn & Qian's findings on conflict incidence are highly sensitive to shortening the time period of analysis: The findings on conflict incidence disappear when four years of data are removed from the earliest part of the period under study. Meanwhile, their findings on conflict duration shift significantly when new variables that are critical for understanding the duration of internal conflict are included. The primary implication of the results in this segment of the analysis is that external direct assistance to rebels far outweighs wheat aid as a key driver of conflict duration.

Section V concludes by discussing concerns about conducting this sort of study using the country-year as the unit of analysis and by recommending methodology that is better suited to evaluating the link – or lack thereof – between food aid and conflict.

## II. The Nunn & Qian Study

A main complication in assessing the relationship is the difficulty of establishing the direction of causation. Conflict, by generating substantial internal displacement and other humanitarian crises, could plausibly induce the U.S. to provide more wheat aid as a humanitarian response, i.e., reverse causality. Another possibility is that food aid affects conflict and simultaneously conflict affects food aid, i.e., joint determination. The potential of reverse causality and joint determination presents statistical problems known in the social sciences as the problem of *endogeneity* that must be resolved if the independent causal impact of food aid on conflict is to be determined rigorously.

Nunn & Qian do tackle these concerns by employing *instrumental variables* in their analysis. In simple terms, an instrumental variable is correlated with the key explanatory variable (here, wheat aid), but not with the outcome variable (here, the incidence or duration of

conflict). The instrumental variable in their analysis is total U.S. wheat production in the previous year multiplied by the average amount of wheat aid provided to a particular country. Changes in total production are expected to be correlated with the amount of aid provided (e.g., when more wheat is available, more tends to be distributed in the form of aid), but not associated with conflict. Nunn & Qian take steps to confirm this is true, such as accounting for temperature and precipitation. In turn, they use U.S. wheat production in the previous year to predict the amount of wheat aid that would be provided to a particular country in the absence of conflict. Via this methodology, they separate changes in wheat aid into (1) an endogenous component that is due to country-specific characteristics such as the occurrence of a humanitarian crisis and (2) an exogenous component that is unrelated to country-specific characteristics. They are thereby able to isolate the impact of just the latter component—after also controlling for variation in region and time—on the onset and duration of conflict.

Their analysis reveals that variation in U.S. provision of wheat aid does not have a consistent relationship with the onset of intra-state conflict, but it is associated with the duration of low- and high-level intra-state conflict—the more aid, the longer these types of conflicts last. They interpret these results as indicating that food aid is prone to sustain intra-state conflict by supplying a resource that is subject to theft and can thereby increase rebel capability.

## III. Revising the Model on Food Aid and Conflict

The general logic of Nunn & Qian's analysis is that external support boosts—albeit unwittingly, in the case of food aid—the ability of a rebel group to wage war against the state. This logic is intuitive and consistent with a large body of political science research. Assistance is vital because rebels tend to be small, weak and at a disadvantage when confronting a state with a standing army and other resources (Mack 1975; Arreguin-Toft 2005; Record 2009; Hendrix 2011).

Within this context, however, the argument that food aid plays an important role is less convincing. To markedly affect conflict onset or duration, such aid must increase the ability of rebel groups to undertake attacks against the state, survive the violence and continue fighting. Food aid might contribute on the margin in all these respects. Yet one can reasonably hypothesize that the impact is likely to be small relative to more direct sources of support for armaments and military operations, which are already established empirically as being significant drivers of conflict onset and duration. Therefore, a rigorous analysis ought to incorporate these other factors as well. Doing so will provide an essential test of whether the influence of food aid on the duration of intra-state conflicts that Nunn & Qian observe is a robust finding, or instead an artifact of relevant variables they omit from their analytical model. In the process, the magnitude of the impact of the explanatory variables can also be compared.

Drawing on the list of factors that previous literature has shown to be correlated with the onset and duration of intra-state conflict, the revised analysis adds the following omitted variables:

- Direct material assistance to rebel groups and the state;
- Domestic sources of funding;

- Ethnic grievances;
- Spillover effects; and
- Conflict management interventions.<sup>3</sup>

The most reliable and widely-cited source for academic data on direct material assistance to conflict actors is the Uppsala Data Conflict Program (UCDP), from which Nunn & Qian obtain all of their information concerning conflict onset and offset.<sup>4</sup> The UCDP dataset on external assistance reports whether or not access to foreign bases, military support (guns, ammunition, etc.), and economic aid was provided in a given country-year. Each of these variables is recorded for the rebels, while military support is also recorded for the state (Stina, et al. 2011).<sup>5</sup>

In addition, rebels can capitalize on domestic sources of funding. Gems (mainly diamonds), oil, and drugs stand out because they are valuable and relatively easy to obtain and exchange for money or goods, which makes them an excellent basis of material support (Collier & Hoeffler 2004; Collier, et al. 2008). Data on the presence for a given country-year of each of these types of so-called “lootable” natural resources is acquired from Lujala (2008), who has done extensive research on their location and availability.

People subjected to persistent, severe inequality can develop grievances, which become motivation to mobilize and demand recognition, inclusion and rights. With some regularity, those engaging in these actions may resort to violence, contributing to both the incidence and duration of conflict. For those reasons, ethnic discrimination has been a long-standing topic in research on civil war (Gurr 1970; Fearon, et al. 2007; Cederman, et al. 2007). Information on the existence of any politically relevant ethnic groups that are facing discrimination in a given country-year can be derived from the Ethnic Power Relations dataset (Cederman 2010).

A civil war in a country often has spillover effects, including the export of violence and the migration of refugees, which can precipitate conflict in a neighboring country and decrease the likelihood that a conflict in a neighboring country can be resolved (Salehyan 2009; Beardsley 2011). A variable that reflects the existence of a neighboring civil war is developed using data from the Correlates of War (COW) project about the contiguity of states, cross-referenced against the UCDP dataset on intra-state conflict.

Peacekeeping has been shown to play a strong role in fostering the conditions that allow warring intra-state actors to come to terms (Fortna 2004, 2009; Beardsley 2012). From these existing studies, data can be obtained on whether or not peacekeepers were present in each country in each year.

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<sup>3</sup> The number of rebel actors who can veto a peace agreement is also crucial to the duration of a conflict (Cunningham 2006). Because the available data on veto players is organized by conflict, this variable is not included in the revised analysis, which is organized by country. The drawbacks to the country-year format are discussed in Section V of this brief.

<sup>4</sup> Nunn & Qian use outdated data on conflict onset and offset, released by UCDP in 2010. The newer data, from 2012, more accurately records the onset and offset of intra-state conflict.

<sup>5</sup> Bases and economic assistance are likely to make a bigger difference for rebels than for states.

Data for certain of these omitted variables is available starting only in 1975. Thus, an initial task is to replicate Nunn & Qian’s analyses concerning the incidence and duration of intra-state conflict for this shorter time period, to determine whether their findings still hold and establish a proper baseline for subsequent comparisons of results. The next task is to introduce the omitted variables into the analysis, once again to see the repercussions for the significance of wheat aid as a predictor of conflict.<sup>6</sup>

## IV. Results

### *The Relationship between U.S. Food Aid and the Incidence of Intra-State Conflict is Sensitive to the Time Period*

Nunn & Qian’s findings about U.S. food aid and civil conflict depend heavily on a small set of observations from the early 1970s. When these years (1971-1974) are excluded from the analysis, the results show no significant relationship between food aid and conflict.

To elaborate, for the entire time period 1971-2005, Nunn & Qian find a positive relationship between the provision of U.S. wheat aid and the incidence of intra-state conflict: the greater the value of such assistance in a recipient country in any given year, the higher the likelihood of conflict. Yet they acknowledge that the quality of the data on wheat aid for 1971-1973 is poor. With that concern in mind, they also run the analysis with the observations from 1971-1973 dropped; the results are substantially similar.

The relationship persists if the sample is narrowed to 1974-2005. When the starting year of the range is shifted to 1975, however, the relationship is no longer statistically significant. Thus, based on the evidence from 1975-2005, no confident conclusion can be made that a systematic relationship exists between the amount of wheat aid provided by the U.S. and the incidence of civil conflict. In other words, the observations from 1971-1974—encompassing several years with questionable data on the main explanatory variable of interest—appear to sway the results.

### *Direct External Support for Rebel Groups – not U.S. Food Aid – Influences the Incidence of Intra-State Conflict*

When the omitted explanatory variables are included in the analysis for 1975-2005, external support to both the rebels and the state and external base support to the rebels are significant predictors of conflict incidence. Meanwhile, no other variable is a significant predictor of incidence. Most notably, the wheat aid variable, which fell just short of statistical significance in the 1975-2005 baseline model, is pushed to complete insignificance in the extended model that includes the omitted explanatory variables. These results indicate that since 1975, countries with high levels of U.S. wheat aid are not consistently more prone to intra-state conflict than those with low levels of wheat aid. By contrast, countries in which rebels

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<sup>6</sup> In addition, the data on discrimination against ethnic groups is not available for every case covered by Nunn & Qian. To check whether or not the smaller sample size affects the results, another task is to run the analysis with and without this variable. The findings do not affect the conclusions that are reached and therefore have not been reported.

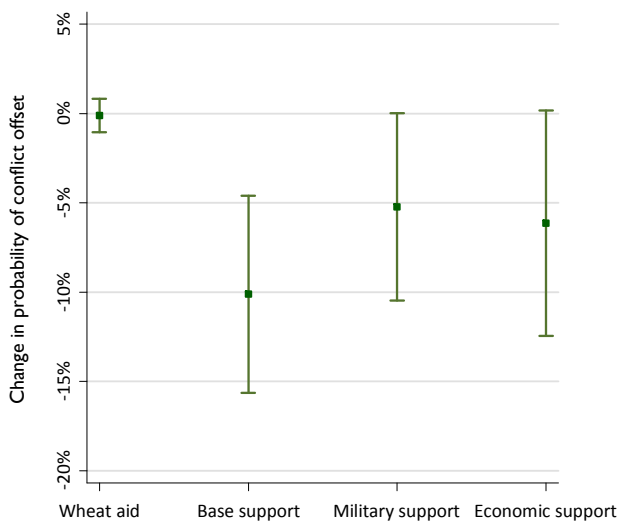
and/or the state receive other types of external direct support are much more likely to be characterized by sustained intra-state conflict than those without such assistance.<sup>7</sup> To reiterate, this finding is consistent with the existing literature.

**U.S. Food Aid has a Negligible Effect on Sustaining Intra-State Conflict, Unlike Direct External Support for Rebel Groups**

Nunn & Qian also show that the significant impact of U.S. wheat aid on the incidence of intra-state conflict is attributable primarily to prolonging existing armed conflict, rather than causing the onset of such conflicts. Naturally, the analysis of duration focuses on country-years with ongoing conflicts. The dependent variable is conflict offset, which arises when the level of violence drops below a minimum threshold of 25 battle-related deaths in a given year.

Unlike with the analysis of incidence, U.S. wheat aid remains a significant predictor of longer conflicts in the 1975-2005 baseline model. When the omitted explanatory variables are added, however, the wheat aid variable becomes highly insignificant. Once again, the only variables that emerge as statistically significant are various other types of external direct assistance—military and economic support and access to foreign bases for rebel groups. The results indicate that when this assistance is provided, an ongoing conflict is considerably more likely to continue, relative to what tends to happen in the absence of assistance.

**Figure 1 – Comparing the Marginal Effects of Select Variables on the Offset of Intra-State Conflict**



To elaborate the findings, Figure 1 displays the substantive impact on the probability of conflict offset for select variables in the analysis. The bar on the far left of the graph shows the estimated impact of increasing wheat aid by 25,000 MT for a country that already receives the average level of aid for all countries in the dataset (27,610 MT). Under those circumstances, the estimated change in the likelihood of a conflict offset falls within a 95% confidence

<sup>7</sup> Since rebels cannot receive military aid when not fighting, the significance of external support is probably inflated in the incidence analysis.

interval of 0.7% to -1.5%. The interpretation of these results is that even when the amount of food aid doubles for a recipient country, the estimated change on the likelihood of armed conflict coming to an end is negligible (and statistically insignificant). By contrast, the confidence interval associated with having access to external bases, relative to no such access, ranges from -7% to -18%, a very large and statistically significant reduction in conflict offset (i.e., greater probability of continuing). The corresponding interval for military support ranges from 0% to -9.5%, while the interval for economic support ranges from 0.6% to -12.3%. Both effects are statistically significant at the 90% level and substantially larger in size than what is observed for wheat aid.

**An Alternative Statistical Analysis Confirms that the Impact of Direct External Support for Rebels Far Outweighs the Impact of U.S. Food Aid in Prolonging Intra-State Conflict**

The last part of the analysis involves examining influences on the duration of intra-state conflict using a different statistical methodology called the Cox proportional hazards model. The previous duration analysis follows Nunn & Qian by employing a logit methodology to estimate the probability of offset in a given year. A main shortcoming of this methodology is that it has difficulty relating the introduction of a key variable—like a change in wheat aid or access to external support—to the time until conflict offset. When both the outcome of an event and the time to that event are of interest, social scientists commonly use a proportional hazards model. The analysis here follows suit.

Again, the goal is to assess the relationship between the amount of wheat aid provided by the U.S. and the duration of a conflict, taking other factors into account. In the 1975-2005 baseline model, the wheat aid variable is significant and associated with longer conflicts. This is no longer true once the omitted variables are included in the analysis. As before, wheat aid becomes highly insignificant and is effectively supplanted by various types of external direct assistance to rebels, namely the provision of access to foreign bases and of military and economic support.<sup>8</sup> In particular, intra-state conflicts last much longer when rebel groups have access to foreign bases, which reduces the likelihood of termination by about 75 percent per year, compared to a scenario where that material assistance is lacking. This finding is consistent with an emerging literature, which demonstrates the significance of allowing rebels to hide and amass strength in locations that are typically off limits to the incumbent state they are opposing.

<sup>8</sup> Another variable is also significant in the duration analysis: discrimination against ethno-political groups. The results indicate that if a discriminated group is present, a conflict is about half as likely to terminate at any point, compared to the circumstance without one of these groups.

**Figure 2 – Comparing the Effects of Select Variables on the Survival Rate of Intra-State Conflict**

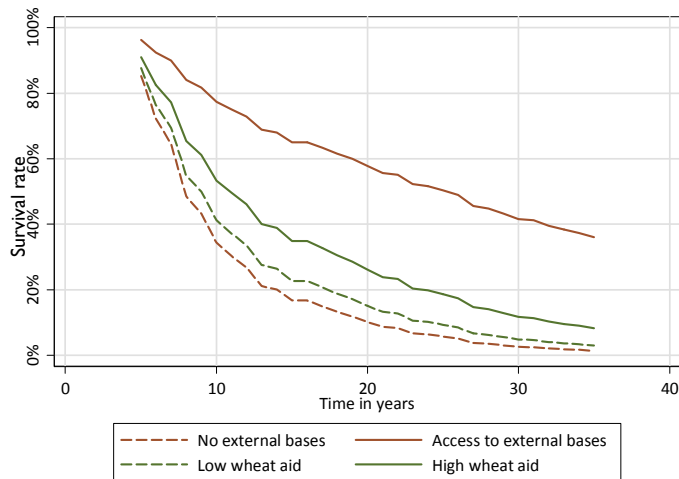


Figure 2 illustrates key results of this duration analysis. The curves are comprised of estimates of the survival rate, i.e., the share of intra-state conflicts that remain ongoing at each point in time, based on the values of select explanatory variables. The comparison is limited to examining the effects of wheat aid and of access to bases; the results revealed that the latter variable has the largest impact on conflict duration. When rebel groups have access to foreign bases, conflict is about 35-45 percentage points more likely to remain ongoing at any point, relative to the situation without that external assistance. By contrast, in cases exhibiting high levels of wheat aid (set equal to the 75th percentile for all country-years with positive values), conflicts are only about 5-10 percentage points more likely to remain ongoing at any point, relative to cases with low wheat aid (set equal to the 25th percentile).

### V. Recommendations for Further Analysis

Nunn & Qian link the provision of food aid by the U.S. government to lengthier durations of intra-state conflict. This brief focuses on assessing and revising their theoretical models and empirical analysis. The results demonstrate that the impact of food aid is sensitive to

the time period and typically marginalized once omitted variables, which capture external direct support and other factors known to influence conflict duration, are added to the analysis.

A prominent weakness throughout this work relates to the basic unit of analysis. Each case in the dataset is a ‘country-year.’ That is, each case is an annual observation of a country with national-level statistics. Those statistics include the amount of wheat aid received and whether rebels in that country received external support. Those national-level statistics also record whether there was an incidence of armed conflict at any point in that year in any location within the country. Information at the ‘country-year’ level can contribute to aggregation bias—a distortion in the analysis caused by combining information from lower levels of analysis. For instance, the approach taken in the analyses discussed in this brief cannot distinguish precisely where and when individual conflicts start or end and thus offers a relatively crude measure of the impact of wheat aid on the onset or offset of a particular conflict. Moreover, the approaches described here can yield spurious conclusions by ignoring the fact that aid may be delivered in a portion of the country where rebel groups do not operate. A better approach would be to move to data that tracks the ability of specific rebel groups to continue fighting against a state and allows the type, amount and delivery process of different sources of support to be matched to the location and behavior of these groups. These requirements point to the need for data on aid and conflict that is spatially and temporally disaggregated down to the local level and for individual actors and events. In this regard, important initiatives are already underway and generating valuable information that enables more micro-level analysis of conflict dynamics and contributing factors, such as the UCDP’s Georeferenced Event Dataset (Sundberg, et al. 2010) and the Armed Conflict Location and Event Dataset (Raleigh, et al. 2010). Finally, more systematic (as opposed to anecdotal) qualitative evidence could be essential to document instances of rebels capturing aid and bolster quantitative studies of how long these rebels fight, compared to those who do not seek to exploit this potential resource (Berman, et al. 2012).

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