If They Only Had Cake: The Effect of Food Supply on Civil War Onset, 1960-1999*

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Abstract

Poor states are more likely to experience civil conflict, but what about poverty places their states in such risk? We argue that it is not the lack of money that guides citizens to rebellion; rather, it us the lack of adequate supplies of food. Food is a basic human need that when in short supply undermines the legitimacy of governments. Our study builds on existing data and we examine the effect of food supply on civil war onset. Our results show that states lacking adequate supplies of food are at risk for civil war, even if they have relatively high levels of wealth. In addition, food deprivation exacerbates the risk of civil war in states that export large amounts of lootable resources. (122 words)

"Finally I remembered the way out suggested by a great princess when told that the peasants had no bread: 'Well, let them eat cake.'" -Jean-Jacques Rousseau, *The Confessions of Jean-Jacques Rousseau* (1782)

How large do grievances need to grow in a society before it devolves into a civil war? Disenchanted citizens exist in every state, but mass violence does not occur in the majority of these cases. This stylized view has led Paul Collier and Anke Hoeffler (1998, 2002, and 2004) to argue against grievances as a motivating cause of civil conflict and instead concentrate on greed. This shift in focus, however, does not mean that grievances do not matter or that they are constant across time and states. Dissatisfaction within a state varies and as it grows, it makes mobilization of political factions easier, which increases the viability of disloyal opposition. What sorts of grievances vary enough to generate such a dramatic change in the ability to mobilize consistent, violent opposition?

Previous research has often turned to wealth and its distribution across society as a source of discontent. Past scholarship has repeatedly argued that poor individuals crave change, especially in societies that contain vastly unequal distributions of wealth. Yet money is an instrument. People do not value the possession of the paper; rather, they value what it represents, what it can purchase. This implies that simply looking at wealth, or its distribution, may mask a deeper, underlying causal mechanism. Perhaps a

¹ Here we are referencing fiat and fiduciary money, which are used by most states in the world. This is not the case in states that rely primarily on commodity money or have an economic system based on barter.

more useful theoretical undertaking would be to look at what people fundamentally value, i.e. what they purchase with their income. Research on famines shows that people prioritize their purchases, so when wealth decreases, they first cut the least important (or valued) items (Sen 1982). From this perspective, purchases that maintain life (food and water) are the last items cut. If grievance really matters, then looking at changes in the availability of food would offer a useful way to capture its effect.

The search for, and security of, adequate amounts of food embodies a critical psychological drive. Maslow (1970), and other psychologists, have argued that individuals possess a hierarchy of needs with the basic needs of survival (physiological needs) at the base and self-actualization at the pinnacle. Given this basic set of universal human priorities, it seems reasonable to believe that threats to basic human needs would generate grievances acute enough to stimulate civil strife. States with an inadequately fed population should be at risk for the onset of civil war.

We place our theory of food deprivation and civil war in the context of the greed versus grievance debate that has sprung from the work of Collier and Hoeffler (1998, 2002, 2004), who contend that greed is the most important source of civil war. Using daily per capita caloric consumption, our study shows that the provision of adequate supplies of food decreases the probability of civil war onset, which lends support for the 'grievance' hypothesis. Still, despite the effects of basic needs, the result of greed, as argued by Collier and Hoeffler, does not disappear. In fact, we find an interaction effect in which states with lootable resources and a lack of adequate food supplies are at an extreme risk of falling into a civil war. Grievances appear to catalyze greed.

Greed, Grievance, and Civil War

Ron (1995) notes that Collier and Hoeffler's 2002 article, rooted in their research at the World Bank, carries an economist's perspective. Although their work has spawned much interest, they have partially ignored past work in political science, anthropology, sociology, psychology, and even economics. Even today, the debate over the origins of civil war remains a bit divorced from past scholarship on civil strife, and we suspect this has clouded, or even conflated, the concepts of greed and grievance. In this section, we briefly summarize the recent "greed and grievance" literature and contextualize it with past work that has typically highlighted political crisis against a backdrop of economic distress, resource scarcity, and social mobilization.

Collier and Hoeffler (1998, 2002, and 2004) have shown that greed and the opportunity to rebel are more important than social grievance in causing civil war. They compare a model of rebellion "opportunity," or greed, relative to a "grievance" model. At the heart of their argument is the proposition that rebellion occurs where it is profitable and that this is a stronger motivation than grievance. Rebel movements require resources and lootable assets appear significant either as a means to funding rebel organizations or as an end objective. This work has generated further investigation by others, although at this point we would like to add that we are not convinced that their primary concepts of greed and grievance are empirically distinct.

It would appear that some variables could represent both greed and grievance. Economic growth appears in their work (Collier and Hoefller 2004) as a proxy for greed, yet the bulk of the existing literature would argue that lower rates of growth are a source of grievance. This is not to say that their research may not tie in well with other studies

seeking to explain the micro-foundations of rebellion (Ginkel and Smith 1999; Gates 2002; Azam 2002; Mehlum, Moene, and Torvik 2002; Weinstein 2005). Indeed, we agree that looting and other resources should be important either as a means of funding rebel groups or as booty. Our point is that although Collier and Hoeffler recognize that they must rely on proxies to capture greed, their measures and results may bias their interpretations toward greed whereas we still see much explanatory power for grievance.

There is a long tradition linking economic crisis, especially concerning social and economic change, to political strife. The literature on revolutions and economic deprivation dates back to at least the nineteenth century with the writings of Marx and other socialists. A common theme in the literature is that civil strife stems from industrialization and its transformation of socioeconomic systems. For Barrington Moore (1966), revolutions and democracy are contingent upon the rise of a bourgeoisie class through industrialization. The rise of both the bourgeoisie and proletariat involve a fundamental restructuring of society and economies that purportedly increase civil conflict, and possibly even deprivation (Skocpol 1979). Mancur Olson (1963) points out that even the supposed *gainers* from economic change may become sources of instability as urbanization and social transformation breed resentment and social movements.

Parvin (1973) and Rodrik (1999) offer evidence for the proposition that economic growth creates expectations that can then lead to violence during times of economic deprivation.

Deprivation and dislocation are most often the focal points of this theme. Ted Gurr (1970), among others, has found that men rebel because of economic deprivation, typically associated with industrialization and rapid changes in society (Kuznets 1955, 1968; Sorokin 1957; Olson 1963; Huntington 1968). Social and economic

transformations unleash both material and psychological changes. Zartman et al. (1971) link evidence of this in the Middle East and Africa to fluctuations in balance of payments and drops in per capita income. Economic deprivation alone, however, is not a deterministic explanation for civil war and revolution since many of the poorest countries are stable (Huntington 1968). According to Huntington, it is not *modernization* itself that causes grievance but instead the efforts to achieve it, where social disorder is rooted in rising expectations and the frustrations that arise with growing differentials between social income groups. "Economic development increases economic inequality at the same time that social mobilization decreases the legitimacy of the inequality (p. 59)." Moreover, relating development to institutional effectiveness, these same states may lack the ability to govern effectively through such times of strife (Kuznets 1966). It is in this manner then that the intermediate levels of development, where industrialization begins to take off, are most often associated with intrastate violence, and Russett et al. (1964), Hibbs (1973) and Hegre et al. (2001) support this proposition empirically.

What is notable about this earlier literature is that it may not necessarily explain rebellion where states lack an urban proletariat. Collier and Hoeffler's theory could be an explanation for a new type of civil war, which implies fundamental differences in social movements and motivations to engage in violence. Is greed really the prime motivator in the poorest states today, such as those African countries where rebel groups loot resources? The face validity of this claim seems odd given that the cases that may best support the greed proposition also tend to be from Africa, where there should be no shortage of grievance. Is it just mere coincidence that African civil wars have seemingly grown more vicious as food production has decreased in the past thirty years (Sen 1999)?

Extant literature speaks to a problem not well highlighted by Collier and Hoeffler, offering a link between civil strife in poor countries and socio-economic problems. The key concepts appear to be resource scarcity and state capacity. This is an area where Collier and Hoeffler have not fully considered grievance.

Collier and Hoeffler (1998, 2002, and 2004) have attempted to differentiate greed from grievance in their explanation of civil war. Instead of focusing directly on environmental scarcity, or food deprivation, they more generally examine economic growth, development, and the role of commodities in an economy. They find that countries at certain levels of commodity dependence, which is their main proxy for greed, are susceptible to civil war, apparently, because such industries are lootable. Indra de Soysa (2002) finds some evidence to support the 'greed proposition' but also that creed, need, and poor governance contribute as well, although the commodity that seems most important is oil. Indeed, oil exporters appear to be prone to civil war (Fearon and Laitin 2003; Ross 2004a, 2004b; Fearon 2005). Fearon (2005) also notes that the Collier and Hoeffler's measure of commodities omits gems and other lootable resources of relevance. Ross (2004a) studied thirteen recent civil war cases to examine causal mechanisms and found support for links between oil, narcotics, and other non-fuel minerals but not for the looting proposition. Regan and Norton (2005) do not find evidence linking diamonds to civil war, although Lujala et al. (2005) note that secondary, but not primary, sources of diamonds are related to civil war. Certain resources, however, may prolong civil wars, even if unrelated to onset, which does support part of the greed story regarding rebel group funding.

The role of resources, especially scarcities, should play some role in grievances that result in political violence in poor states. Of interest to us are past studies on resource scarcity and food supply. Food supplies may decrease due to either man-made or natural disasters. Additionally, economic hardship may make food unaffordable. Homer-Dixon (1999) shows that environmental scarcity can lead to civil war in those societies that are either too poor or lack the ingenuity to overcome environmental challenges. North (1977) discussed many of these same variables, profiling states by their access to resources, population, and level of technology. Low resources could result in gaps between demands and supplies, leading to conflict. Research on this theme from anthropology, sociology, and other disciplines now appears in more popularized books as the issues of resource depletion and environmental pollution are becoming more recognized (Diamond 2005).

Famine poses a clear political problem, although not one that necessarily leads to violence. Disruptions in food supplies may arise for various reasons but malnutrition could even dampen the likelihood of rebellion. Dirks (1980) surveyed several famines and found that civil disorder is most likely to occur in the early stages of a famine, whereas in the later stages, malnutrition reduces activity to mostly the search for food and social interactions become restricted to families. Brass (1986) documented how the Bahir famine in India of 1966-67 did not lead to rebellion when institutions prevented mass violence. A missing key factor would appear to be the lack of instigation by leaders combined with some state capacity. Weak states that lack substantial infrastructure and governing capacity should be especially prone to civil violence in the face of

environmental scarcities (Fearon and Laitin 2003, Fearon 2005; Humphreys 2005).² In addition, shortages may not necessarily be entropic but a result of policy or internal politics. There were often food shortages in eighteenth and nineteenth century France and Great Britain due either to bad policies or fractious rent-seeking behaviors, resulting in food becoming a source of conflict in entitlement shifts (Tilly 1983). Sen (1982, 1999) also shows that famines rarely occur throughout an entire country and food may be available but simply unaffordable.

To summarize, we argue that the failure of Collier and Hoeffler to fully survey past work on economics and civil strife has led to a misreading of the role of greed relative to grievance. In fact, in their 2004 study, which is most similar to our study here, they cite almost none of the studies we cite in our paper, and many of these are classics in political science.³ We argue that grievance, particularly food deprivation, is a stronger cause of civil war than greed. In the next section, we present our theory.

The Psychological Drive for Survival

We predicate our theory of civil war onset on a few important assumptions. The first is that people pursue basic needs that exist in a hierarchy (Maslow 1970). The first set of needs is biological and includes, among others, access to food and potable water.

² See also Levi (1988), Jackman (1993), and Kugler et al. (1997) for conceptual and empirical discussions of state capacity.

³ Collier and Hoeffler naturally do not cite work not published after 2004, although they even omit a few articles before 2004 that responded to their earlier papers, such as de Soysa (2002), or related work such as Fearon and Laitin (2003). Collier and Hoeffler also exclude prominent economists, such as Olson or Kuznets, who have written on this topic.

Once the biological needs are satisfied, individuals then seek security, such as protection from the elements and physical security. The Maslow hierarchy continues with its enunciation of needs to include belongingness, love, esteem, and self-actualization, but these are outside our immediate purview. Our second assumption is that government exists to help provide some of these most basic needs (Bay 1968), or, at the very least, citizens believe that the government should help provide the most basic life-sustaining needs. As explained by Thomas Hobbes, Niccólo Machiavelli and other great thinkers of the past, security from constant threat is the primary goal of political organization.

Rampant crime or armed insurgencies reduce faith, and eventually, the legitimacy of governments. Another basic need related to the efficacy of government is the capacity to protect food and water supplies. Violent riots broke out, for example, when the Moroccan and Tunisian governments cut food subsidies to abide by IMF conditionality in 1984 and only ended when such policies were reversed (Seddon 1984). Our final assumption is that extended periods of civil strive are not random, but take some

⁴ Couching our argument within the context of Maslow's hierarchy serves two purposes. First, it demonstrates the importance of food supply. Second, and perhaps more important, it shows that the needs are cross-cultural and are not specific to a given society, religion, and so on.

⁵ Bay (1968) tends to link other aspects of regime characteristics to achieving these higher needs that are less relevant to our immediate discussion. We agree most with him that food and security are essential basic human needs and key purposes for government. Some literature criticizes whether **all** of Maslow's needs are instinctive or a function of culture (Gibson and Teasley 1973) or that there are conflicts between lower and higher needs (Wilcox 1969; White and Pierce 2000), although it would not seem controversial that food is important as a motivator of human behavior and necessary for personal development.

provocation by political agents. In other words, pure greed is more criminal in nature, but when combined in an atmosphere of extreme grievance it becomes wrapped into mass civil strife. Civil war is indicative of deep grievances that have both material and psychological dimensions, upon which political entrepreneurs capitalize or manipulate.

It is important to point out here that we seek to explain the onset of civil war, which is of a more severe form of civil conflict than riots or other lesser events. We are not arguing that hungry people spontaneously rebel but instead that food deprivation is a key factor that leads civil strife to escalate to civil war. Prior to a full-blown civil war, we expect that political agents/entrepreneurs have already been plotting against the government. In states where there is food deprivation, the citizens may come to view the government as failed or illegitimate. This alone is not often enough for civil war to occur; however, where people face food shortages and there already exists an alternative to the government, civil war may arise. This would be especially true when resistance groups can sustain their forces by looting commodities. In these cases, grievances from food deprivation provide the manpower to sustain civil war.

Food deprivation is a material condition that has psychological and political ramifications. In fact, Sen argues that hunger is the "irreducible absolutist core in the idea of poverty" (Sen, 1983: 159). Not only do people personally feel malnutrition, but it also affects their perception of society and government. While poverty does not necessarily lead to mass civil violence, the reduced ability to obtain food is surely indicative of political problems that citizens are unlikely to ignore. Disruptions or reductions in affordable, or obtainable, food should motivate mass rebellion if such crises

become prolonged.⁶ This is not to say that greed is unimportant, but that it may find opportunity once grievance has mobilized people to fight against authority.

The previous section reviewed several aspects of the literature that only partially seem to connect, and we aim to bridge this gap. We are not directly interested in specific commodities, although we do not deny that such factors may be important. What directly interests us is a source of mass grievance strong enough to motivate civil war, and we believe that food deprivation is not only this grievance but that it also offers a superior explanation than simply greed alone. Our theory is parsimonious in the sense that where there is some severe economic crisis or disruption, there is the chance that food may become unobtainable. Whatever the source of domestic strife, our particular interest is to explain why certain states cross the threshold into civil war.

A number of factors can affect food supply and entitlements.⁷ Food may become unaffordable due to harsh economic conditions and thus a source of grievance in industrialized or industrializing states. Food may also become sparse in more rural states through either natural disaster, drought, or because of inefficient or wasteful state policies. In all these cases, the outcome is generally the same: food consumption drops

⁶ Since our immediate objective is to study the onset of civil war, we do not make a claim here regarding the length of food deprivation and civil strife. We are pursuing that in other research.

⁷ Theories of food entitlements explain that the source of famine is not just natural or even cultural (see English views of the Irish potato famine) but most often rooted in the inability to purchase food for various reasons, including market dislocations and changes in exchange rates between certain services and goods. A barber, for example, may become famished during an economic down-turn when people make choices to delay hair-cuts or if those who produce expensive food commodities incur drops in their produce (Sen 1982, 1999).

and people face shortfalls in nutrition strong enough to motivate anger that can then be directed at a government that is either unwilling or unable to solve the crisis at hand.⁸

Often it takes political entrepreneurs to magnify discontent. An example of this occurred in Iran in 1925 after a bad harvest greatly reduced food supplies. A protest erupted on September 23, where citizens demanded more bread from the government. During the course of the protest, which was "a simple demonstration on the part of people who were acutely anxious about their winter supplies of food," a number of speakers attempted to rally the crowd with a "wider political objective." (Cronin, 2005: 194) In fact, a number of the new speakers argued, "the government would make bread abundant only if they would proclaim that they did not wish for the present shah to be their ruler anymore" (Cronin, 2005:194). These political entrepreneurs put both a voice to, and guided, the grievances of the population.

Our three assumptions are critical in explaining the pre-conditions to civil war.

Considering that food is an essential human need, when it is in short supply people become distressed. People may or may not blame their government. When they do blame the government, civil war becomes possible when political agents provide an opportunity to sustain an organization capable of rebellion. We assume that political agents exist in most every society but are typically few in number and often containable or deterred. Such agents could be motivated by greed, but can more easily sustain a rebellion when they have access to both lootable resources and hungry recruits. In other words, the opportunity for rebellion grows stronger when grievances potentially enlarge

⁸ Sen (1999) discusses how cultural alienation can result from famine or other imbalances or inequities in food supplies, although he does not develop this more fully to discuss civil violence.

anti-government forces, which even allows for a higher capability to seize the finances necessary to sustain rebellion. True, armed rebels often appear better fed than others in society do, although they were not necessarily so before they took up arms. Famished people do not a strong army make, at least for long. Grievances arising from food deprivation catalyze rebellion where political agents have access to the necessary resources. Since we are measuring civil war, which is a measure of civil strife where conflicts were already underway, our theory explains how food and lootable resources interact to push such conflicts across the more violent civil war threshold.

The lack of an adequate supply of food obviously generates grievances. This discontent often leads to some form of political action short of outright civil war, but on some occasions, political entrepreneurs capture the movement and push it towards civil war. Our theory provides a straightforward prediction about the relationship between food supply and civil war onset. In particular, states that cannot provide their citizens adequate supplies of food are at a higher risk of civil war. This leads to our main hypothesis.

Hypothesis 1: The fewer calories the average citizens in a state consumes per day, the greater the risk of civil war onset.

It is important to note that some of the previous literature points to an interesting aspect of food supply and civil discontent. In particular, Dirks (1980) found that violence occurred only in the early parts of a famine, where individuals still had the energy and time to dedicate to political action. At extremely low levels of food consumption, individuals spend the bulk of their time seeking food or they risk starvation. As such, we believe that there is a point in daily per capita caloric consumption at which individuals

solely look after their survival and politics becomes secondary. Populations at, or below, this point will not respond to the guidance of, or rally to, political entrepreneurs. This implies that at the lowest levels of daily per capita caloric consumption, the risk of civil war is actually low.

Hypothesis 2: The fewer calories the average citizens in a state consumes per day, the greater the risk of civil war onset, but at extremely low levels of per capita caloric consumption, the risk of civil war is low.

Our theory does not eliminate the role of greed as argued by Collier and Hoeffler but instead explains how grievance helps to catalyze the greed, or opportunity, for rebellion. The presence of lootable resources **and** a minimal supply of food may present an exceptionally dangerous situation for a government. Not only would the political entrepreneurs have a willing audience, but they would also have an ample source of material resources to fund their ongoing rebel insurgencies. This leads to our final hypothesis.

Hypothesis 3: The presence of lootable resources in a state with low levels of per capita caloric consumption greatly increases the risk of civil war.

Research Design and Data

To best show that grievance, especially food deprivation, catalyzes civil war, we nest our research with existing data. We use Fearon's (2005) data set, which he based on

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⁹ Providing a single threshold of nutritional requirements is difficult given differences in body size and age among people. What is most interesting though is that teenagers require higher levels of food than average, which also coincides with being at an age more prone to physical fighting and soldiering than older age groups.

Collier and Hoeffler's (2002) five-year data set. This data set contains information from 161 countries during the period from 1960 to 1999, although not all states are in the sample for the entire time span. Our empirical analysis is thus cumulative with recent literature, especially the research that examines the effect of greed in spurring civil wars. Like Fearon (2005), the unit of analysis is the state-year, which differs from Collier and Hoeffler's work that usually examine states over five-year periods.

Dependent Variable

Our dependent variable is not the onset of civil strife. We instead seek to explain why states cross the threshold into civil war. We hence seek to explain the most severe civil conflicts. We base the dependent variable of *Civil war onset* on the Correlates of War (COW) list of civil wars. The definition of civil war according to COW includes situations where there is armed military action against the regime of a state of the international system (defined by COW), where the government is actively involved and active resistance is offered, and at least 1,000 battle deaths occur during the course of the conflagration (Sarkees, 2000). We coded as one those years in which a new civil war onset occurred, and all other years as zero. Since the dependent variable is dichotomous, we use logit regression for our analyses. The models also use robust standard errors and cluster on states, which is an important empirical advance in comparison to the work of Fearon (2005). Additionally, *Peace years* is included as an independent variable to capture any temporal effects. Peace years equals the number of months a state has been at peace (no civil war). The value can start at 172 if a state did not experience a civil war between the beginning date of our analysis and the end of World War II.

¹⁰ Fearon's (2005) data set is available online at http://www.stanford.edu/~jfearon/.

Daily Per Capita Caloric Intake

To capture the ability of states to provide the basic needs of their citizens, we utilize the daily per capita caloric intake as measured by the Food and Agriculture Association of the United Nations (FAO). To generate the daily per capita caloric supply, the FAO measures the total production of food products, adds the imports of such goods, and subtracts the exports. This represents the total amount of food available to the population. The different types of food are transformed into calories to create the total amount of available calories. The total calories are then divided by the total population and days of the year to arrive at the daily per capita caloric consumption. For the measure, the FAO assumes that all available calories are consumed, but clearly a portion is lost.

This paper uses the natural log of the daily per capita caloric intake in the analyses. The natural log transformation takes into account decreasing relative effect. In other words, moving from 1800 to 2200 calories per day will have a larger effect than moving from 3200 to 3600. In addition, we interpolated missing values to minimize the influence of list-wise deletion. The amount of interpolated values is small compared to the size of the data set. We have raw data on 5246 country-years and the interpolation generated an additional 589 values (about 10% of our food values).

The non-transformed food variable (daily per capita caloric consumption) has a mean value of 2545 with a minimum of 1483 and maximum of 3768. Given that the human body needs roughly 2000 calories on average per day to survive, a fair number of

states in our sample do not have the capacity to feed their total population. ¹¹ In fact, about 14 percent of the state-years fall below the 2000 level. We can see the full distribution of the variable in Figure 1, which is a histogram of the food variable with a normal curve superimposed. In this figure, the y-axis represents the fraction (percent of total) of state-years within each bin. The bins represent a set of values for per capita caloric consumption, i.e. between 1500 and 1575.

The distribution of the food variable approximates a normal distribution, but two peaks exist at roughly 2200 and 3200 daily per capita calories. One could argue that the two peaks represent the difference between less and more developed states. Obviously wealthy states will be systematically more able to feed their citizens. To examine this possibility, we split the data set into less and more developed states based on the natural log of the GDP. States that had below average values of the GDP we coded as less developed and those with above average GDPs we considered more developed.

Figure 2 presents the distribution of the food variable within the less and more developed (wealthy) samples. As one would expect, the less developed states have a more difficult time providing food to their citizens. The two peaks seen in Figure 1 do seem to correspond to the difference between less and more developed states. Even though this is the case, note that a significant portion of less developed states have high levels of daily per capita caloric consumption. In addition, a number of the wealthy states fall below the 2000 daily caloric consumption subsistence level.

¹¹ The subsistence level can vary across states, but generally ranges from 1800 to 2000 calories per day. For a discussion of how to determine the subsistence level see http://www.fao.org/es/ess/faostat/foodsecurity/Files/undernourishment methodology.pdf.

As noted earlier, the models use the natural log of the daily per capita caloric consumption (denoted as *Caloric Consumption (logged)* in the tables) as our measure of basic needs satisfaction. Some of the models also include the squared value (denoted as *Logged Caloric Consumption Squared* in the table) to capture the hypothesized nonlinear dynamics. Given the distribution of these variables, the predicted inverted U-shaped relationship (hypothesis 2) would generate a positive coefficient on caloric consumption (logged) and a negative coefficient on logged caloric consumption squared.

Lootable Resources

One of the most common, and perhaps controversial, correlates of civil war onset is the presence of lootable resources, which Collier and Hoeffler (2004) claim makes the onset of civil war viable. The greed perspective argues that these resources allow potential rebels to generate a monetary benefit from the civil war. The potential for a "civil war as business", the greed proposition, increases the probability of civil war onset. Collier and Hoeffler measure lootable resources with a World Bank measure of primary commodity exports as a portion of gross domestic product.¹²

As Fearon (2005) noted, the World Bank measures are only available for fiveyear periods. To use state-years, Fearon interpolated the missing values of primary commodity exports as well as all other independent variables. In addition, to avoid improbable extrapolations, he extended the first and last measured values as appropriate.

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¹² The lootable resource measure incorporates six World Bank components: (1) food and live animals, (2) beverages and tobacco, (3) crude materials, inedible, except fuels, (4) mineral, fuels, lubricants, and related materials, (5) animal and vegetable oil, fats, and waxes, and (6) nonferrous metals (see Fearon (2005) for a description).

The models utilize the primary commodity data in two ways. First, the variable *Primary Commodities* is simply the value of the primary commodity measure. Second, the variable *Primary Commodities Squared* is the squared value of primary commodities.

Wealth

The models control for state wealth. The variable *Log of Income* is the natural log of the gross domestic product per capita lagged one year. Fearon (2005) used the Penn World Tables to supplement Collier and Hoeffler's data. We use the mean value of log income to split the sample based on the level of development: state-years above the mean are considered developed and those below are undeveloped. The models also include the variable *Economic Growth*, which is the change in the per capita GDP over the previous five-year period. Earlier research has generally found that high levels of economic growth decrease the probability of civil war onset.

Demography

We include in our models a series of control variables meant to capture demographic effects. The variable *Fractionalization* was constructed by Collier and Hoeffler (2002) by multiplying two scales (each with ranges from 0 to 100) of ethnic and religious heterogeneity. After the multiplication, they then added the maximum of the two scales. *Ethnic Dominance* is dichotomous, coded as one in those state-years where the largest ethnic group is between 45 to 90 percent of the total population and zero otherwise. The variable *Log population* is simply the natural log of the population of the state lagged one year. *Geographic Concentration* is a zero to one variable coded by Collier and Hoeffler (2002) that measures the dispersion of a population within a state.

Results

Table 1 presents the results from the complete data set of all states from 1960 to 1999. As a point of reference, model 1 is a replication of Fearon (2005, Table 2 model 6). The coefficients are virtually identical to his estimates, but the levels of significance partly differ. In particular, the coefficient on primary commodities is statistically significant in our model. This lends more support for the greed proposition than did the results reported by Fearon (2005). The reason for this difference derives from our estimation technique. While we both use logistic regression in our analyses, Fearon (2005) does not cluster on the state when adjusting the standard errors. The greater efficiency of our estimation technique is enough to generate significant effects for primary commodities.¹³

The second model simply adds our measure of caloric consumption. Two key points need to be made. First, hypothesis 1 is confirmed; the effect of caloric consumption is negative and statistically significant, which means that states with higher levels of food consumption are less likely to experience the onset of a civil war. Second, the log of income becomes statistically insignificant. Given the relatively high correlation (0.78) between log of income and logged caloric consumption, it is not surprising that log of income becomes insignificant. Model 3, for instance, provides

¹³ Clustering is important if one believes that the errors are correlated within panels. Therefore, for instance, the errors can become correlated if some of the states in the sample are more (or less) prone to civil war even when controlling for the effects of the independent variables. In this case, the regression will systematically under-predict civil war onset for the war-prone states and over-predict it in the peace-prone states. This will cause a correlation of the errors within these panels, which violates the assumption of regression models. Clustering corrects the standard errors for this violation by accounting for the within panel correlation of the errors.

similar results for the caloric consumption, but the log of income is statistically significant. The change in the statistical significance is most likely the result of the correlation and not the inclusion of the additional grievance variables. So is the support for hypothesis 1 spurious?

We conducted a series of additional analyses to gain a better grasp of the relationship between income and food consumption. In particular, we modeled logged caloric consumption as a function of log of income. This model showed a strong relationship between log of income and logged caloric consumption (coefficient was 0.14, p-value was 0.00, and r-squared was 0.59). While this model was a good fit, there was still some unexplained variance in logged caloric consumption (41% of the variance was unexplained). The residuals from this model represent the variance in logged caloric consumption not explained by the log of income. When we used these residuals in models 2 and 3, we found that the coefficients on the residuals were negative and significant. Thus, the higher the logged caloric consumption not explained by the log of income, the lower the probability of a civil war onset. This once again confirms hypothesis 1. In addition, when we used the residuals, the log of income was negative and significant in both models, which implies that income still has an independent effect. In sum, while there is clearly a relationship between income and food consumption, it does not generate spurious support for hypothesis 1.14

¹⁴ The results described in the above paragraph are available upon request. In addition, we ran another set of analyses where logged caloric consumption was a function of the log of income and economic growth. We then used the residuals from this model and still found support for hypothesis 1.

Model 4 tests the argument that the effect of caloric consumption is non-linear. The coefficient on logged caloric consumption is positive and significant and the coefficient on the squared term is negative and significant, producing the inverted U-shape effect. This shows a decreased risk of civil war onset in both the lowest and the highest caloric consumption states, which supports hypothesis 2. Also, note that wealth no longer has a significant effect, but ethnic dominance does. To present a more intuitive view of these results, Figure 3 plots the predicted effect of caloric consumption on the probability of dispute onset. To calculate the predicted probabilities, we set all other variables to their means (dichotomous variables at their mode) and the level of caloric consumption is varied from its minimum to maximum. As the results imply, there is a general inverted-U shaped relationship, although extremely high levels of caloric consumption have a lower probability of civil war onset than extremely low levels.

We can further understand the relation between caloric consumption, wealth, and civil war onset by looking at differing samples of the data set. In particular, Table 2 splits the data set between low and highly developed states (divided at the mean value of log income). In each of these samples, the correlation between the logged caloric consumption and log of income decreases from 0.77 level in the entire sample to 0.51 in the less developed states and 0.45 in the more developed states. These models are slightly different in that they do not contain the log of income because splitting the sample is already taking into account wealth. In fact, splitting the sample is equivalent to interacting each coefficient with a level of development dummy variable.

The models of Table 2 provide a number of interesting results. Models 1 and 2, which use a specification similar to that of model 4 in table 1, provide modest support for

hypothesis 2. While the coefficients for logged caloric consumption and logged caloric consumption squared are not individually significant, they are jointly significant at the 0.10 level. This drop in the level of significance may relate to the smaller samples used in Table 2. Aside form the effect of caloric consumption, models 1 and 2 have other statistically significant effects. Economic growth decreases the risk of civil war in both samples just as large populations increase the risk. In addition, both ethnic dominance and primary commodities have an effect in the more developed sample.

Models 3 and 4 drop the logged caloric consumption squared to more specifically test hypothesis 1 in the two samples. In both the more and less developed samples, states with higher levels of logged caloric consumption are less likely to experience the onset of a civil war, which once again supports hypothesis 1. As with models 1 and 2, economic growth and population have significant effects in both samples and primary commodities and ethnic dominance only have statistically significant effects in the more developed sample. In general, all four models in Table 2 provide continued support for the proposition that the provision of adequate supplies of affordable food decrease a state's risk of civil war.

While the results seem to have consistently shown that grievances (measured as low per capita caloric consumption) matter, do political entrepreneurs truly take advantage of these grievances? What happens in those states that have major grievances, such as a lack of adequate supplies of affordable food, and greedy political entrepreneurs? Table 3 addresses these questions (hypothesis 3) by including an interaction term (logged caloric consumption times primary commodities). We would

expect that those states with low caloric consumption and high primary commodities will be at exceptionally high risk for the onset of civil war.

The results in Table 3 confirm hypothesis 3 in that states with low caloric consumption and high levels of primary commodities are significantly more likely to experience the onset of a civil war. This result is not easily discerned from Table 3 so we graphed the relationship in Figure 4. In this figure, all variables are set to their means, while caloric consumption and primary commodities exports are varied. Figure 4 has two lines that represent states with low caloric consumption (one standard deviation below the mean) and those with high caloric consumption (one standard deviation above the mean). For each state, we vary the level of primary commodities export from its minimum to maximum value.

Figure 4 shows a non-linear relationship for both the low caloric consumption and high caloric consumption states, where the predicted probability of civil war onset peaks when primary commodities hit about 0.3 (low food consumption states) and 0.1 (high food consumption states). For the low caloric consumption states, however, the peak predicted probability of civil war onset is dramatically higher (2.4% compared to 0.4%). This increase is even more remarkable given that these states are only one standard deviation below the mean. It seems that those states with both lootable resources (greed) and low daily per capita caloric consumption (grievance) have a significantly higher chance of developing a civil war, which supports hypothesis 3. Aside from supporting

¹⁵ It is important to note that we maintained mathematical relationships between primary commodities, caloric consumption, the squared terms, and the interaction term when generating all the predicted probabilities.

hypothesis 3, Figure 4 provides additional evidence for hypothesis 1, in that at all values of primary commodities, the predicted probability of civil war onset is higher for the low caloric consumptions states as opposed to those with high caloric consumption. Thus, grievances arising from food deprivation appear to catalyze civil war, particularly when rebel movements possess a greater opportunity to finance their endeavors through looting commodities.

Given such striking results, it may be useful to look at those states that would be most at risk for civil war based on their late 1990's values. In 1997, the Democratic Republic of Congo had, according to the model in Table 3, a 28% chance of a civil war onset. In 1999, the 10 states most at risk for a civil war were the Democratic Republic of Congo (7.6%), Russia (6.7%), India (5.6%), Philippines (5.2%), Ethiopia (5.1%), Peru (4.9%), Nicaragua (4.7%), Zimbabwe (4.7%), Pakistan (4.4%), and Chad (3.8%). The highest predicted probabilities generated in the data set were Algeria in 1962 (56%), Nigeria in 1986 and 1987 (33% and 38%, respectively), and Iran in 1981 (28%). In general, the predicted values of civil war onset indicate a good fit of the model with reality. In fact, years that contained a new civil war onset averaged a predicted probability of 5.9% compared to 1.5% for those years without an onset.

Conclusions

Our theory calls on research from several fields to explain civil war onset and, in doing so, we speak to a large literature neglected by the more recent studies that feature the greed proposition. Our empirical results are cumulative and nested in existing data and hence offer a reevaluation of greeds predominance over grievance as a source of civil strife. The results of our analyses reinforce an intuitive idea: grievances matter. In fact,

our results indicate that grievances help catalyze civil war where political agents already have some opportunity to rebel. This finding stands having used the same data as Fearon (2005), improving estimation, and controlling for alternative theories.

While certainly important in terms of the academic debate on the origins of civil wars, the effect of basic needs satisfaction has critical policy implications. The policy advantage of examining daily per capita caloric consumption is that state decision-makers could lower the risk of civil war by becoming more attuned to the effects of food deprivation in the early stages of famine or other crises, especially if political agents seek to discredit the government by exploiting such fundamental grievances. Leaders in undeveloped states with limited resources, especially those facing potential rebellion, can lower their risk of civil war by shifting some of their revenue into providing food to stave off civil war. If the state cannot afford such a move, it could spend time applying to outside donors or humanitarian organizations. The basic point here is that the results indicate that state policies can greatly affect the risk of civil war onset and these policies can be more easily altered than some of the other risk factors, i.e. poverty, ethnic dominance, regime type, and so on.

The results also suggest that international organizations and outside actors can play a critical role in lowering the risk of civil war. Rather than dedicating resources to long term development projects, it may be more important to ensure adequate supplies of food first. Once the risk of civil conflict is low, foreign direct investment and aid may more easily spur long-term economic growth. Unfortunately, however, the results also seem to indicate that actors wishing for regime change can starve a state into submission, i.e. limit supplies of food until a revolt occurs. Concurrently, the use of starvation as a

tool to suppress or repress against political groups within a country would seem more likely to backfire, especially during the earlier stages of a food crisis. Food is likely more effective as a weapon once civil war has already commenced, or else it could produce more grievances that further inflame anti-government feelings and undermine authority.

Finally, the results move the academic literature forward. In particular, the results clearly indicate that grievances matter, although not to the total exclusion of greed, presuming that the measure of primary commodities captures this latter concept. In fact, states that contain both grievances and greed seem to be at an extreme risk of civil war onset. The effect of food supply also opens up avenues for future research into the effect of other basic needs: access to clean water, housing, and so on. As we noted at the beginning of the paper, wealth may matter, but it is more important to recognize why people want money if we are to comprehend why they revolt. In other words, Rousseau's princess may have been on the right track: if only they had cake.

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Table 1: Civil War Onset Using Country-Years from 1960 to 1999

	Model 1	Model 2	Model 3	Model 4
Primary Commodities	6.36	6.36	8.20	7.36
	(2.09)**	(2.09)**	(2.45)**	(2.25)**
Primary Commodities Squared	-11.84	-12.37	-14.88	-13.93
	(-1.88)*	(-1.98)**	(-2.16)*	(-2.13)**
Log of Income	-0.38	-0.18	-0.33	-0.14
	(-2.62)***	(-1.11)	(-1.79)*	(-0.52)
Economic Growth	-14.29	-14.31	-14.51	-15.16
	(-5.45)***	(-5.51)***	(-5.68)***	(-5.61)***
Log Population	0.26	0.27	0.32	0.33
	(3.80)***	(3.84)***	(3.83)***	(4.01)***
Fractionalization	-	-	-0.0001 (-1.22)	-0.0001 (-1.00)
Ethnic Dominance	-	- -	0.38 (1.58)	0.44 (1.77)*
Geographic Concentration	- -	-	-0.29 (-0.46)	-0.35 (-0.53)
Caloric Consumption (logged)	-	-1.41	-1.28	102.38
	-	(-2.40)**	(-2.19)**	(1.77)*
Logged Caloric Consumption Squared	-	- -	- -	-6.75 (-1.79)*
Peace Years	-0.004	-0.004	-0.004	-0.003
	(-4.48)***	(-4.37)***	(-4.25)***	(-4.13)***
Constant	-3.03	6.38	5.93	-393.60
	(-2.16)**	(1.49)	(1.41)	(-1.76)*
Number of Observations	4430	4430	4430	4430
Log Likelihood	-311.65	-310.52	-308.71	-306.84
Chi-Squared	115.21	127.52	144.60	127.36
P-value for Chi Squared	0.00	0.00	0.00	0.00

Note: * p<0.10; ** p<0.05; ***p<0.01 (Two-Tailed tests with robust standard errors clustered on the state)

Z-scores are in the parentheses and all models are logit estimations.

Table 2: Civil War Onset from 1960 to 1999 with a Sample Split on Level of Development

	Model 1	Model 2	Model 3	Model 4
	(Less Developed)	(More Developed)	(Less Developed)	(More Developed)
Primary Commodities	2.28	19.24	2.57	24.66
	(0.65)	(2.30)**	(0.72)	(2.25)**
Primary Commodities Squared	-3.36	-43.53	-3.87	-59.18
•	(-0.50)	(-1.94)*	(-0.57)	(-1.71)*
Economic Growth	-13.17	-16.46	-12.61	-16.64
	(-4.00)***	(-3.77)***	(-3.96)***	(-3.37)***
Log Population	0.25	0.63	0.25	0.49
	(3.39)***	(2.38)***	(3.28)***	(2.09)**
Fractionalization	-3.43E-06	-3.00E-04	-3.36E-06	-0.0003
	(-0.05)	(-1.27)	(-0.05)	(-1.31)
Ethnic Dominance	0.23	1.17	0.17	1.05
	(0.76)	(2.42)**	(0.58)	(1.94)*
Geographic Concentration	-0.47	-1.58	-0.44	-0.97
	(-0.58)	(-1.51)	(-0.55)	(-0.93)
Caloric Consumption (logged)	109.24	152.27	-2.19	-2.34
. (35)	(1.45)^	(1.31)^	(-2.08)**	(-2.46)**
Logged Caloric Consumption Squared	-7.27	-10.10	-	-
	(-1.48)^	(-1.35)^	-	-
Peace Years	-0.003	-0.005	-0.003	-0.005
	(-3.59)***	(-3.18)***	(-3.50)***	(-3.48)***
Constant	-415.46	-582.30	11.65	9.62
	(-1.44)	(-1.29)	(1.40)	(1.19)
Number of Observations	2357	2073	2357	2073
Log Likelihood	-228.46	-72.98	-229.12	-76.17
Chi-Squared	52.47	154.16	56.66	144.97
P-value for Chi Squared	0.00	0.00	0.00	0.00

Note: * p<0.10; ** p<0.05; ***p<0.01 (Two-Tailed tests with robust standard errors clustered on the state)

Note $\mbox{^{\smallfrown}}$ means that the two coefficients are jointly significant at the 0.10 level.

Z-scores are in the parentheses and all models are logit estimations.

Table 3: Civil War Onset from 1960 to 1999 Using an Interaction between Greed and Grievance

Table 3. Civil was Offset from 1700 to 1777 Osing an interaction between	Model 1	
Primary Commodities	111.61 (1.66)*	
Primary Commodities Squared	-14.57 (-2.39)**	
Caloric Consumption (logged) * Primary Commodities	-13.48 (-1.55)^^	
Economic Growth	-15.62 (-5.74)***	
Log of Income	-0.16 (-0.58)	
Log Population	0.34 (4.05)***	
Fractionalization	-1.00E-04 (-1.08)	
Ethnic Dominance	0.44 (1.82)*	
Geographic Concentration	-0.48 (-0.73)	
Caloric Consumption (logged)	114.85 (2.06)**	
Logged Caloric Consumption Squared	-7.44 (-2.05)**	
Peace Years	-0.003 (-4.17)***	
Constant	-448.35 (-2.08)**	
Number of Observations Log Likelihood Chi-Squared P-value for Chi Squared	4430 -305.67 131.08 0.00	

Note: * p<0.10; *** p<0.05; ***p<0.01 (Two-Tailed tests with robust standard errors clustered on the state) Note:^^ indicates joint significance with caloric consumption and primary commodities at the 0.05 level Z-scores are in the parentheses and all models are logit estimations.







