Who Benefits from U.S. Food Aid?

A thesis

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I. Introduction

Food aid is often painted publically as a way to help fight hunger and malnutrition. Although everyone agrees that food aid is critical for countries in need, suspicions of negative long run disincentive effects for local producers have brought public criticism. In the short run, critics claim food aid undercuts local farmers, who are driven out of their jobs and into poverty. They maintain that this occurs when food aid augments the supply of food, depressing local prices and creating disincentives for farmers to produce and governments to invest in agriculture. In the long run, they say this impedes the development of local agriculture and could lead to dependency. In contrast, proponents of food aid claim the disincentive effects on production are unfounded and lack empirical evidence. They see food aid as beneficial to both donors and recipients, asserting that it prevents malnutrition, increases trade, and helps avert food price spikes.

Understanding the effects of food aid is important to avoid dependency traps and poverty in recipient countries. In 2008, the International Labour Organization estimated that more than one billion people in the world were employed in agriculture. With such large numbers, any small displacement could have large consequences, especially for those near the poverty line. Although food aid provides benefits, it is crucial to understand if and how food aid negatively affects domestic production. Understanding the various repercussions of food aid will lead to better informed policy decisions and more efficient aid provision in the future.

Although food aid is supplied by many countries, this paper focuses solely on the United States' food aid shipments for two reasons. First, the U.S. is historically the largest food aid donor in the world: U.S. food aid accounted for 59% of food aid shipments by major donors

from 1995-2005. (Hanrahan 2006) Secondly, aside from South Korea, the U.S. is the only donor that sells part of its food aid. (IATP 2005) Unlike other countries which provide food aid primarily for humanitarian purposes, the U.S. has a history of supplying governments with food aid on concessionary terms for them to sell to boost their budgets. The size and unique composition of American food aid makes it apt for analysis.

Although the debate on the effects of food aid began with Schultz in 1960, relatively little has been done empirically. The majority of previous studies have focused on World Food ProgramProgram donations with a focus on the household level or Sub-Saharan Africa. Most analyses also examine a time of only one to two decades without commodity subcategories. With such diverse methods, results among all studies are widely varied. This paper seeks to clarify and refine the debate by being the first paper to examine U.S. food aid on a global scale with a long-term view. We seek to answer conclusively the question: does the provision of food aid decrease the recipient country's domestic production?

Using data on U.S. food aid shipments from 1960-2000, we utilize a regression using instrumental variables and fixed effects by country and commodity in a 2SLS regression. This paper finds the effect changes over time depending on the type of food aid that dominated the evaluated period. The changing effect of food aid contains inherent policy applications and provides a hypothesis as to why the results in the previous literature vary so widely.

This paper is organized as follows: the subsequent section provides background information on the formation and composition of food aid; the paper then continues with a description of the theoretical framework and literature surrounding the issue, data, methodology, and finally the results; we conclude with a discussion of our findings and implications for the future.

II. Background

U.S. food aid came into existence in 1954 under the Agricultural Trade Development and Assistance Act (Public Law 480). The Institute for Agriculture and Trade Policy defines food aid in terms of three characteristics: it must cross at least one international border, it must be provided for free or at a cost lower than the market price, and it must be actual food or goods to be exchanged for food. (2005) U.S. food aid shipments were initially composed of two different categories of food aid: ProgramProgram (Title I) and Emergency (Title II). ProgramProgram food aid is a transfer between governments on concessionary terms and can include all types of agricultural commodities. It is primarily sold on credit or grant terms rather than through donations. The recipient government is free to distribute the food aid as it pleases. Typically, governments sell the food aid on the market to raise revenue. In contrast, Title II or Emergency food aid is typically freely given in response to a dire need for food due to disasters or civil strife. It is provided primarily though intergovernmental organizations such as the World Food program.

Although program and emergency aid currently and historically dominate U.S. food aid shipments, it is important to note that two other groups, though only composing a small proportion of total aid, were added to P.L. 480. Project Food (Title III) Aid was added in 1990 and is granted for development-related programs such as Food for Work programs. The U.S. allows Project food aid to be sold to generate funds. The Farmer-to-Farmer program (Title V) was added in 1985 and provides technical assistance to farmers and agribusinesses in developing countries. Title IV of P.L. 480 describes the administration of food aid programs.

The relative proportions of program, emergency, and project food aid have varied over time. Although emergency food aid currently makes up the majority of U.S. food aid shipments,

program food aid dominated U.S. food aid flows in the 1960s and 1970s. However, starting in the 1980s, proportions began to change. Since 1980, program food aid has declined by more than 90% in inflation-adjusted terms. In contrast, Emergency food aid started to increase significantly in the early 1990s and currently dwarfs other forms of food aid. (CRS 2010) The changing composition of food aid appropriations in the 1990s, which favored Emergency over program aid, has been attributed to the decline of food stockpiles by donor countries, the end of the Cold War, and the addition of food security as a formal objective of U.S. food assistance. (Barrett 2004)

Besides providing relief, U.S. food aid was initially conceived as a way to promote trade and provide markets for surplus food stocks. Because of this, food aid maintains several provisions meant to protect U.S. interests. One requirement worth noting is that food assistance recipients maintain Usual Marketing Requirements (UMRs). UMRs are measurements indicating a country's level of trade of various commodities using an average of the past five years' commercial imports of the commodities in question. For example, wheat food aid imported into Ethiopia for a given time period, usually the fiscal year, is not to accede the average commercial imports of wheat to Ethiopia over the last five years. (FAO 2001) In theory, this requirement is an attempt to prevent displacement of commercial imports that would hurt donor countries and ensure that food aid is added to the domestic supply or maintains 'additionality'. (Deaton 1980) Emergency food aid shipments are not limited by this requirement. Because of the increasing proportion of Emergency food aid, almost all food aid transactions are currently exempt from the UMR restriction. (IATP 2005) However, even in the past, UMRs were hard to enforce. As a consequence, food aid has been found to displace a

substantial proportion of imports, oftentimes estimated at as much as 60%. (Hall 1980, Stevens 1979, Lavy 1990, Barrett et al. 1999, Clay et al. 2005)

The commodities that are sent as food aid have stayed roughly constant over time. As seen in Figure 1, grains have dominated U.S. food aid shipments. Although we lacked exact figures of food aid broken down by Title before 1992, the decreasing percentage of tobacco and cotton, two commodities that would not be sent in the case of an emergency, serves as a signal of the declining use of program food aid. In total, grains and preparation made up 68% of the food aid shipments between 1960 and 2000. Of the grain shipments, wheat made up the largest segment with an average of 65%. (Figure 2)

Recipients of food aid have varied considerably over the years. As can be seen from the chart in Figure 3, Israel was the largest gross recipient of food aid in the 1960s and 1970s. In per capita terms, as can be seen in Figures 4, the largest recipient since 1960 has been the northern part of Africa and the Middle East. In Figure 5, high income countries (HIC) received almost no food aid in the 1980s and 1990s compared to an average of 16% in the previous two decades. This again implies the changing composition of food aid from nonemergency to emergency during those decades. Africa has received an increasing share of food aid whereas Latin America's portion has stayed relatively constant. It also is worth noting that the quantity of food aid going to Eastern European countries skyrocketed in the 1990s after the fall of the Berlin Wall.

III. Literature Review

A clear consensus has not yet been reached among scholars on the effect food aid shipments have on recipient countries' production due to mixed results in both quantitative and

qualitative research. Food aid shipments have been hypothesized to have disincentive, neutral or even positive effects on domestic production. Overall, the literature tends to focus on data at the household level or in a single country. Analysis at the macro level rarely examines U.S. food aid shipments since the data is relatively hard to obtain. Instead, empirical studies that examine multiple countries tend to use data from the World Food Programme (WPF) and often find a neutral or slightly positive effect. Overall, qualitative research has a tendency to conclude that there is a disincentive effect, while quantitative research generally finds a neutral or a slightly positive effect.

The first study that proposed a disincentive effect for food aid was put forth by Schultz in 1960. Schultz suggested that food aid could discourage domestic production if it saturated the market, which can occur when UMRs are maintained or when a country is closed to trade. For example, if Ethiopia receives wheat food aid but is also required to maintain its average import quantity of wheat for the last five years (UMR), the wheat food aid will add to the amount of wheat usually in the Ethiopian market. With more wheat in the market due to a country's inability to chose to import less, there will be excess supply and farmers will be discouraged from farming. Schultz never guessed how much production would increase with the removal of food aid. One estimate was put forth by Gelan (2007). He estimated, using a computable general equilibrium model, that if food aid were removed in Ethiopia, the food producing sector would expand by as much as 2.2%. Similar to Schultz's findings, the disincentive effect is overwhelmingly predicted in qualitative literature such as Tschirley et al. (1996) and Jackson et al. (1982). However, one inherent flaw in case studies without empirical evidence is that they could be confusing causality with simultaneity; in other words, food aid sent in response to low domestic production is erroneously blamed for causing the decrease in production. When taking

simultaneity into account, the magnitude of the effect of food aid on domestic production is open for debate.

Still, others hypothesize food aid can encourage domestic production: if the aid is not a perfect substitute or if it is complementary to a commodity in the market, demand for the domestic commodity could increase. Additionally, if food aid replaces imports, the money saved could lead to higher demand and increased food production if the savings are used for agricultural development. Dayton-Johnson and Hoddinott (2003) found positive effects of food aid once individual characteristics at the household level were taken into account. Lavy (1990) also found a positive effect using Vector auto-regression analysis and differencing to eliminate country specific effects on panel data from 33 countries in Africa throughout 1970-1987. However, due to the differencing, as Kirwan and McMillan pointed out (2007), Lavy's analysis highlights year-to-year changes while ignoring the more important long run trend. Additionally, Lavy's account is flawed in that it fails to account for variables, such as disasters and rainfall, which differ over time.

Additionally, if a country is open to international trade, Lowder (2005) hypothesizes that any disincentive effect would be mitigated. Recipient countries open to international trade could use the food aid to replace imports they otherwise would have bought at full price. Barrett (2001) found food aid receipts consistently replace 60-80% of the commercial food imports recipient countries would have made. If food aid displaces imports, the market supply stays the same and food prices will not change. Likewise, if food aid is given to replace lost food in an emergency, the supply of food would remain constant. Without a change in producer prices or

an increase in the domestic supply of food, there are no disincentive or incentive effects on production.

Finally, there is the possibility that food aid could have no effect on domestic production. Multiple studies corroborate no effect of food aid on domestic production. McMillan and Kirwan (2007) use non-parametric regressions to identify trends in the production and consumption patterns in Ethiopia. They find no disincentive effect of wheat food aid on domestic production. Likewise, at the household level, Peter Little (2008) compared the percentages between recipients and non-recipients of food aid who engaged in such activities as wage work or small businesses. He concluded that there was little evidence to support food aid dependency. Similarly, Abdulai et. al (2005) found a neutral effect. Their paper examined the impact of emergency food aid flows through the World Food Programme in the short run on per capita production across sub-Saharan Africa from 1970-2000. The authors examined the VAR characteristics at the national level and controlled for country specific variables such as rainfall and disasters in order to establish the dynamic effects of U.S. food aid on food production.

Common reasons for conflicting findings on the effect of food aid often include different methodologies, focuses, or short time horizons. Dayton-Johnson and Hoddinott (2003) and Abdulai et al. (2005) both implied that divergent results could be due to a failure to take confounding variables into account: they each found strong disincentive effects at the household level in rural Ethiopia until household and village characteristics were accounted for. Barrett (1999) suggests that the differences in theories about the effect of food aid on domestic production may be attributed to the time frame the analyst is considering, since food aid could initially have a negative effect on domestic production but have positive effects years later.

When examining the effects of food aid, especially at the national level, the observed outcome is largely dependent on several factors about individual countries including the openness of the country to international trade, the substitutability between the food aid commodities and local goods, and how well the food aid is targeted to individuals who need it. If a country is open to trade, it has the opportunity to displace imports with the food aid shipments. With regards to substitutability, if a food aid commodity is foreign and undesirable to local palates, it will not compete with locally produced goods, and disincentive effects will be negligible. The targeting of the food aid is also important: if the food aid is given to the extremely poor, the disincentive effect will be lessened since the poor are unlikely to be large buyers or sellers of commodities.

Previous empirical literature yields variant results. (See Table 8) Our goal in this paper was to examine U.S. food aid shipments almost since its inception. Unlike WFP food aid, U.S. food aid did not always prioritize using food aid for humanitarian reasons. We use a unique method by controlling for country-commodity fixed effects and instrumenting food aid on political variables. We expect the effects to vary by region due to the widely divergent conditions on the ground. There is also likely to be changing effects over time depending on whether project or program food aid dominated.

Theory

We hypothesize that the effect of food aid depends on whether there is an increase or decrease in domestic supply and that a surplus or deficit of food depends on the type of food aid. Emergency food aid should have a neutral or positive effect on domestic production, while

program food aid should have a negative effect. Consider a recipient country *A* with an initial domestic food supply *S*, consisting of all food available for consumption, at time *t* equal to:

$$1)\ S_{A,t} = \emptyset_{\ t} + \ IM_t$$

Let IM_t measure the total amount of food imported into the country from abroad and $\emptyset_{\ t}$ be the total amount of food produced domestically and available for consumption by country A, be defined as:

$$2)\ \emptyset_{\ t} = Prod_t + Stock_t \ - EX_t$$

$Prod_t$is the total amount of food harvested domestically. $Stock_t$ is the amount of food added to domestic supply from stock piles saved from harvests in previous years. $EX_t$is the total amount of food exports a country sends.

In the event of an emergency in the following time period, domestic food supply would decrease by an amount γ due to disaster, drought, flood, or civil strife. To counteract the decrease, Emergency or Title II food aid,ε, would be sent. We assume $\varepsilon_{t+1} \leq \gamma_{t+1}$ based on previous empirical research. This is a valid assumption based on empirical research. The USDA (2004) found that food aid, on average, has covered 92% of food production shortfalls between 1981-2000. If Emergency food aid is close to or less than the decrease in food available on the domestic market due to an emergency, the supply of food aid would remain constant or even decrease.

$$3)\ S_{A,t+1} = \emptyset_{\ t+1} + IM_{t+1} - \gamma_{t+1} + \varepsilon_{t+1} \leq S_{\ A,t} \ \ if \ \ \varepsilon_{t+1} \leq \emptyset_{\ t+1}$$

If the amount of food aid is equal to the decrease from the shock γ_t, there will not be a change in the production in the period after the shock. If the food aid is less than the shock, there

would be a decrease in domestic food supply which would cause the price of food to increase. Increased prices would cause more farmers to plant more food in time *t+1* so that the food produced domestically the year following the shock will be greater than the amount of food originally produced or $\emptyset_{t+2} > \emptyset_{t}$.

Alternatively, in the case of program aid, the assistance is not in response to a decrease in production, so the domestic supply of food can react in one of two ways. If the country is open to trade and ignores UMRs, the supply would remain steady if food aid imports displace exports:

$$4)\ S_{A,t+1} = \emptyset_{t+1} + IM_{t+1} = S_{A,t}\ if\ \ EX_t = \varepsilon_t$$

If exports do not entirely displace food aid, a market surplus will result.

$$5)\ S_{A,t+1} = \emptyset_{t+1} + \alpha\varepsilon_{t+1} > S_{A,t}\ where\ EX_t = (1-\alpha)\varepsilon_{t+1}$$

With a surplus of agricultural goods, prices will decrease. Decreasing prices have been documented in the literature (Faminow, 1995; Clay et al., 1996; Tschirley and Howard, 2003; Barrett and Maxwell, 2005) with the sale of food aid. As prices decrease, farmers find it unprofitable to produce food. Some producers would be driven out of the market causing fewer crops to be planted. This will result in decreased domestic food production the following year. Alternately, if they are not driven entirely out of the market, domestic agricultural producers' behavior would change: they would choose to allocate fewer resources to production and storage so that $\emptyset_{t+2} < \emptyset_{t}$. This effect could also extend to the government level. With lower domestic production, governments have fewer incentives to fund agricultural investment or to push policy

reform.[1] Countries can become dependent on food aid if the decrease in domestic production is large or lasts a long time.

Based on theory, we intuitively expect to find a small negative effect of food aid on domestic production; this is because the supply of food aid generally makes up less than 2% of the total domestic food supply. Besides the fact that food aid composes only a small initial proportion of the national food supply, previous literature has also found that countries generally displace a substantial part of their imports with food aid. (Hall 1980, Stevens 1979, Lavy 1990, Barrett et al. 1999, Clay et al. 2005) Thus, the relative excess supply of food generated by food aid should be small. However, we expect the effect to vary by time period. Although data distinguishing between emergency and program food aid was unavailable, we do know the relative proportions of each type of food aid during our dataset and expect the effect to change across time. During the 1960s and 1970s when program food aid made up a greater share of food aid shipments, the negative effect on domestic production should be stronger. In the 1980s, we should see a lessened effect of food aid on domestic production as the proportion of Emergency and program food aid equalized. In contrast, during the 1990s when emergency food aid made up the greatest proportion of shipments, a neutral or positive effect should be observed. We also expect the effects to vary by region, depending on the time period when they received the most aid.

IV. Data Description

[1] An empirical explanation of decreased governmental investment and policy reform in agriculture would involve regressing food aid on domestic research and development and is beyond the scope of this paper. However, it could be fruitful area for future research.

Before describing the methodology behind the regressions, a short description of the data used to generate the variables is necessary. Several calculations and aggregations were necessary to make the data on food aid and domestic production comparable. The following paragraphs elaborate on the sources, characteristics, and calculations that were used to produce each variable.

A. Food Aid

"Food aid" is measured as all food aid that was sent by the United States and fell under Public Law 480. This includes U.S. shipments of food aid that went through the World Food Programme and aggregates Program, Emergency, and Project food aid under the androgynous title of food aid. The data from 1961-1972 was input by hand from a publication by the Economic Research Service at the USDA called "Agricultural Exports under Public Law 480". The 1973-1989 data was downloaded from the USDA Economics, Statistics and Market Information System (ESMIS**)** and the 1992-2000 data came from pdf files that were emailed from the USDA-Foreign Agricultural service. Food aid value is measured in $1000 and was converted into constant US dollars with a base year of 2000. We also converted it into food aid per capita by dividing it by population data from the Penn World Tables v6.2. Due to changes in the organization of food aid supervision, data from 1990 and 1991 is unavailable.

B. Domestic Production Values

Domestic production was measured in tonnes and taken from the Food and Agricultural Organization Statistics Division (FAOSTAT) of the United Nations. The compilation of the data was supplied by the governments of the countries in response to annual FAO questionnaires. Domestic production measures primary products including noncommercial food in addition to

food products on the domestic market. Generally, fruit and vegetable data exclude food not grown for sale. If the harvest of commodities took place between years, the entire yield is allocated to the year in which most of the harvesting took place.

In order to compare different commodities, we needed to convert the quantities of domestic production into values based in U.S. dollars. In order to do this, Producer Prices in local currency units were also taken from the FAO. Producer Prices measure the price of primary crops at the point of initial sale. The data is representative of the national average of prices received by farmers for individual commodities in a given year. Prices were measured in Local Currency units per tonne and exhibit statistical breaks when there was a change of currency. Some countries do not collect initial selling prices and FAO alternately uses the values used in the compilation of national accounts. It is the policy of the FAO Statistics Division to calculate missing price data if data on production has not been recorded.

After calculating the value of domestically produced commodities in local currency prices, the observations were converted into nominal US dollars using exchange rate data from the Penn World Tables v6.2. This value was then turned into constant U.S. dollars with a base year of 2000. Finally, the variable was divided by the population from the Penn World Tables v6.2 within each country for a given year.

C. Making Food Aid and Domestic Production Comparable

Even once domestic production quantities are converted into U.S. dollars, the data on food aid and domestic production is still not comparable. Since the FAOSTAT and Food Aid data were gathered from completely different sources, their definitions and categories of commodities are different. FAOSTAT data was initially very disaggregated in relation to the

food aid data. To ensure corresponding commodity categories, the domestic production and food aid data were aggregated into 9 broad categories under the titles Animals and Animal Products, Corn, Dairy Products, Fruits and Preparations, Grains and Preparations, Oilseed and product, Rice, Vegetables and Preparations and Wheat.

D. Controls

Measurements for disasters were taken from the EM-DAT International Disaster Database created by the World Health Organization and the Belgian Government. The data adds the number of disasters within a given year with each disaster taking on a value of 1. The average number of disasters was .9191 with a standard deviation of 1.34. Asia had the highest mean of 3.077. (Table 1) The data covers Geophysical, Meteorological, Hydrological, Climatological, and Biological disasters. For an event to count as a disaster one of the following criteria must be met: ten or more people are killed, more than 100 people are affected, a state of emergency is declared, or a call for international assistance occurs.

Rain was also included as a control variable to account for too much or too little rain which would affect the harvest. Annual rainfall was measured in millimeters. This data was taken from Climatic Research Unit at the Tyndall Centre.

E. Instruments for Food Aid

When examining whether food aid hurts domestic production, an endogeneity problem arises. Reverse causality may be inferred because food aid shipments are oftentimes sent in response to low production. However, many studies show that donors often give aid because of political alliances rather than humanitarian concerns. Domestic agricultural production in a recipient country does not affect whether a country aligns with the U.S. However, U.S. political

alliances may affect whether a country receives U.S. aid and thus potentially affect domestic production in recipient countries. Therefore, instruments measuring the degree of alignment with U.S. policy were gathered as means of solving the endogeneity problem.

Two variables were used towards this purpose. The first, entitled s3uni, measures a country's alliance with the U.S. through its pattern of voting in the UN. This data is from the Affinity of Nations Index by Gartzke and Voeten. Observations are assigned any value in the range of -1 (least similar) to 1 (most similar) interests. Overall, s3uni consisted of 20196 observations and had an average of .0687. As would be expected, all regions expect North Africa and the Middle East and Asia had an average positive value.

We also utilized a second variable which measures U.S. military assistance per year per capita in constant U.S. dollars with 2000 as the base year. This variable augments s3uni as a measure of alignment since countries are inclined to give military support to allies. Military assistance includes all military accounts with a non-economic development purpose. It has a total of 12,867 observations, which is significantly less than the observations of other variables utilized. The mean was 18.31 million constant U.S. dollars for all regions with high income countries exhibiting the highest average with 100.76 million constant U.S. dollars. (See Table 1) The data comes from the companion to the *U.S. Overseas Loans and Grants, Obligations and Loan Authorizations (the Greenbook)* produced by USAID, which provides a historical record of all loans and grants authorized by the U.S. Government each year.

IV. Estimating Equations and Results

A. Estimating Equation

We explore the long run relationship between domestic food production and U.S. food aid using a 2SLS instrumental variable model with country-commodity and time fixed effects. However, when thinking about the specifications, first consider the following simple model:

$$1)\ lnProd_{ijt} = \beta_0 + \beta_1 lnFA_{ijt-1} + \beta_2 lnRain_{ijt} + \beta_3 Disasters_{ijt} + \vartheta_{ijt} + \mu_{ijt}$$

Let $lnprod_{ijt}$ be the natural log of the value of domestic production of recipient country i at time t for commodity j in U.S. constant dollars. Let $lnfaid$ equal the natural log of the value of food aid shipments in $1000 constant U.S. dollars for commodity j received by that country in the previous year.

Both rain and disasters are included as control variables. $Rain$ is the natural log of the millimeters of precipitation that the recipient country received in one year. We tried including rain-squared but found it did not provide a better fit. *Disasters* is the number of Geophysical, Meteorological, Hydrological, Climatological, and Biological disasters experienced by a country in a given year.

The natural log was taken of domestic production, food aid, and rain after adding one to the original observations. This modification was used to preserve data, since the natural log of one is equal to zero.

Let ϑ_{ijt} be a vector of the unobserved individual effects of each country and commodity. This accounts for the influence of characteristics such as infrastructure, culture, targeting, soil, ease of a commodity growing in a given country, and the like, which are assumed to be distributed independently across countries and commodities over time. Let μ_{ijt} be the random errors that cause the predicted value of domestic production to vary.

Food aid is lagged by one year because current food aid will not affect current domestic production. Lagging food aid provides a potential solution to the endogeneity problem since current domestic production cannot affect food aid in the previous period. Intuitively, due to the nature of farming, farmers cannot change what they harvest at the time food aid is received since the crop has already been planted. Instead, food aid received in the previous year when farmers decide what to plant will effect domestic production in the following period. Food aid was lagged to account for this relationship.

Despite the inclusion of controls and the lagged food aid variable, there are several problems with this model. The model assumes that the effect would be the same across all countries and commodities.

Failing to take into account individual characteristics of various countries and commodities will generate biased estimates of the impact of food aid on domestic supply. In order to measure the individual effect, we difference the equation using fixed effects to eliminate ϑ_{ijt} from the equation since OLS will be biased due to the correlation between the country-commodity specific effects and lagged variable. Thus, cross-sectional differences in factors such as soil and terrain do not pose a problem. The new equation will take the following form:

2) $$\ln prod_{ijt} = \beta_0 + \beta_1 lnFaid_{ijt} + \beta_2 lnRain_{ijt} + \beta_3 Disasters_{ijt} + \beta_4 yrdum^* + \mu_{ijt}$$

Yearly dummy variables are included to account for any trend in the underlying data, as well as influences that would affect all countries in a given year. With the inclusion of rain, disasters, and yearly dummies and the elimination of country-commodity fixed-effects, little that affects both food production and aid is unaccounted for.

Despite these inclusions, lagging food aid over time is a weak solution to the endogeneity problem since negative correlation likely exists with present variables. A stronger solution to the endogeneity in the relationship between food aid and domestic production is the use of instrumental variables. Besides solving the simulataneity problem, the addition of instrumental variables in the regression will correct any omitted variable or selection bias due to attrition in the unbalanced panel data. To mitigate these problems, we instrument food aid with variables that measure political alignment with the U.S. The first stage equation in the 2SLS takes the form:

$$3a)\ \widehat{lnFaid}_{ijt-1} = \alpha_0 + \alpha_1 lnRain_{ijt-1} + \alpha_2 Disasters_{ijt-1} + \alpha_3 S3uni_{ijt-1} + \alpha_4 lnMilitary_{ijt-1} + \alpha_5 yrdum^* + \varepsilon_{ijt}$$

The second stage equation is of the form:

$$3b)\ lnProd_{ijt} = \beta_0 + \beta_1 lnRain_{ijt} + \beta_2 Disasters_{ijt} + \hat{\beta}_3 \widehat{lnFaid}_{ijt-1} + \beta_5 yrdum^* + \mu_{ijt}$$

The first variable, *S3uni*, is a measure of the degree of affinity a country has with the U.S., based on how a similarly that country votes to the U.S. in the UN. It was created by Gartzke and Voeten and values range anywhere from most dissimilar at -1 to most similar with a value of 1. *Military* is the natural log of the total amount of military assistance in constant U.S. dollars with a base year of 2000 that a country received in a given year.

With the addition of instrumental variables, we assume:

$$a)\ Cov\left(S3uni_{ijt-1}, lnMilitary_{ijt-1}, \mu_{ijt}\right) = 0$$

$$b)\ Cov(S3uni_{ijt-1}, lnMilitary_{ijt-1}, lnFaid) \neq 0$$

Instrumenting food aid with *Military* posed a challenge. There were 8,625observations for *Military* than other variables; this difference in observations will decrease the sample size in the 2SLS regression. We were unable to replace all missing values of *lnMilitary* with zero and generate dummy variables to distinguish these replaced values.

In order to effectively compare the results between the fixed effects models with and without instrumental variables, a reduced sample size was created by dropping observations where *lnMilitary* was missing. This generated a dataset with 10,471 observations. We expect the coefficient on rain to be positive, disasters to be negative, and the coefficient on food aid to change between periods with the changing composition of food aid. We expect a negative coefficient on food aid in the 1960s and 1970s when program food aid dominated, a neutral effect in the 1980s as program food aid decreased, and a slightly positive or neutral effect in the 1990s as emergency food aid composed the majority of food aid.Theoretically, emergency food aid should not negatively affect domestic production since it replaces lost food. In contrast, program food aid should have a negative effect as it is a government-to-government transfer which creates a surplus of food on the domestic market.

The inclusion of instruments should cause the coefficient of food aid to become more positive in the 2SLS model compared to the fixed effects model, as it will better correct the negative bias due to simultaneity of food aid and domestic production across time. However, the effectiveness of the instrumental variables should decrease with time as emergency food aid becomes a larger share of food aid. This is because whether a country receives emergency food aid is less likely to be related to its degree of political alignment with the U.S.

B. Results

a. Overall

Overall, we found a statistically significant negative effect of food aid on domestic production in the fixed effects regression with the full sample of 19,181 observations over the time period 1960-2000. (Table 2) This regression predicted a statistically significant 1% increase in food aid would decrease domestic production by .35%. Rain was positive as expected. Disasters proved to be insignificant. A similar result was seen in the reduced sample of 10,471 observations. (Table 3) Domestic Production decreased .31% with a 1% increase in food aid.

With the addition of instrumental variables measuring political alignment, the effect of food aid turned positive. With a 1% increase in food aid, domestic production is predicted to increase by 1.36%. A Sargan-Hansen statistic was calculated and found to have a p-value of .39. (Table 3) With this value, we fail to reject the null that *S3uni* and *Military* are exogenous. As expected, rain and disasters were both significant with a positive and negative sign respectively.

b. By Region

For a better understanding of the effect of these variables**,** we regressed the estimating equation regressed separately by region. The regions include Africa, Asia, Eastern Europe, Latin America, Middle East/North Africa, and High Income Countries. With the fixed effects model applied to the reduced sample, as can be seen in Table 5, coefficients of food aid share vary considerably by region. Latin America (LAC) and the Northern Part of Africa and the Middle East (MENA) are the only areas that exhibit statistically significant effects. Food aid to LAC

decreases domestic production by .61%, whereas food aid to MENA decreases it by .15%. These results with the reduced sample parallel those in the full sample with fixed effects. (Table 4)

Both of these effects turn positive with the inclusion of instrumental variables. However, with Instrumental Variables included, all regions (Africa, Asia, High Income Countries, and Latin America) that have a statistically significant coefficient on food aid exhibit positive effects. Asia saw the largest positive effect on domestic production with an increase of 1.7% for a 1% increase in food aid.

c. By Time

To evaluate whether the type of food aid changes the effect, we broke up the regressions into three time periods: before 1980, the 1980s, and the 1990s. The 1960s and 1970s were dominated by program food aid, the 1980s saw a decrease in program food aid while Emergency food aid remained stable, and then in the 1990s, Emergency food aid increased as program food aid continued to dwindle.

Looking at Table 6 with country-commodity FE on the full sample, a 1% increase in food aid causes domestic production to decrease by .40% at the 1% statistical significance level in the 1960s and 1970s. The effect becomes less negative but also looses statistical significance with time.

In the reduced sample (Table 7), the fixed effects exhibit a similar trend as the full sample fixed effects. The results for the instrumental variable regressions yield more insight. The instrumental variables pass the Sargan-Hansen test for the pre-1980s period and the 1980s, but the instrumental variables reject the null in the 1990s period. This makes sense: in the

1990s, food aid was given increasingly for emergencies and would thus be less likely given on the basis of political alignment, making the instruments ineffective.

For the pre-1980s period, a 1% increase in food aid was found to decrease domestic production by 1.12%. The disaster coefficient on this regression is inexplicably positive but takes the low coefficient value of .07. For the 1980s period, the effect of food aid reverses: a 1% increase in food aid is seen to increase domestic supply by 1.31% ceteris paribus at the 5% significance level. Unsurprisingly, in both regressions, *S3uni* and *lnMilitary* are significant at the 5% level in the first stage.

In contrast, during the 1990s, the regression has a Sargan-Hansen p-value of .449 and *S3uni* and *lnMilitary* are insignificant in the first stage regression. Food aid, although statistically insignificant, exhibits a positive coefficient of 3.6.

C. Discussion of Results

This paper examined the effect of food aid on domestic production using country-commodity fixed effects and IVs with country-commodity FE in a 2SLS regression. The inclusion of instrumental variables created a more efficient result in the periods before 1990. We found that there is a statistically significant positive effect between food aid and domestic production: for every 1% increase in food aid in the fixed effects, instrumental variable model, domestic production increases by 1.36%.

Although the magnitude of the overall effect is large, the finding that the effect changes over time periods is important. The effect on domestic production became steadily less negative as time increases. This is in line with the theory that the effect of U.S. food aid shipments should change with the changing composition of food aid. "Since the later 1980s, the expenditures for

emergency P.L.480 Title II had risen from approximately 47 to 54% of the total dollar budget. In contrast, over the same period, the government-to-government (program) food aid dropped from nearly $300 million annually to $116 million and was virtually zero in 2001." (Marchione 2002) Theoretically, Emergency food aid should not negatively affect domestic production since it replaces food lost to strife or disasters. In contrast, program food aid should have a negative effect as it is a government-to-government transfer which creates a surplus of food on the domestic market.

The change in the effect with the changing composition of food aid yields two worthwhile insights. First, food aid policy can improve its effectiveness by entirely eliminating the use of program food aid. Although program food aid is essentially eliminated from use, Project Food Aid gives food to NGOs and projects to sell on the market to supplement their funding. It is comparable to program food aid on the local scale. Both Project and program food aid should be reconsidered; food aid should only be sent to address food insecurity in humanitarian emergencies.

Secondly, the literature must be examined in a new light. This paper examined U.S. food aid practically since its inception. Most of the previous empirical studies examine food aid over shorter time horizons of approximately two decades. (Table 8) Since we found the effect of food aid changing over time, the time period previous research utilized could drastically affect their results. For example, two studies with the same specification will have opposite conclusions if one uses data from the 1970s while the other uses data from the 1990s. Similarly, if a paper used data only from the World Food Programme which only provides humanitarian assistance, they should only find a positive effect no matter the time frame. Future research must be sensitive to the nature of data used.

VI. Conclusion

With small farmers making up the majority of people near the poverty line, it is important to understand the relationship between U.S. food aid and domestic production. This paper has probed the link between the two against the background of U.S. food aid shipments over forty years around the globe. Using an instrumental variable model with fixed effects across commodities and countries over time, we found a positive effect of food aid on domestic production. However, when we broke the data into time periods based on when emergency or program food aid dominated shipments, we saw a changing effect.

Our overall finding of a positive effect is consistent with the literature. However, the change over time adds a new angle to the food aid debate. By utilizing a longer time line than most studies that reaches nearly to the beginning of food aid, we show that the type of food aid is important. Current and future studies must consider the data and time period used when interpreting results, as varying timelines can affect outcomes.

In future work, we plan to examine the impact of food aid on child mortality and governments' investment in agriculture to gain a better overall view of the net benefits of food aid.

References

1. Abdulai, Awudu, Christopher B. Barrett and John Hoddinott. 2005. "Does Food Aid Really Have Disincentive Effects? New Evience from Sub-Saharan Africa." *World Development* 10,1689-1704.

2. Barrett, Christopher B., Sandeep Mohapatra, and Donald Snyder. 1999. "The Dynamic Effects of U.S. Food Aid." *Economic Inquiry* 37.4, 647-56.

3. Barrett, Christopher B. 2001. "Does Food Aid Stabilize Food Availability?" *Economic Development and Cultural Change* 49, 335-41.

4. Barrett, Christopher. 2004. "Food Aid After Fifty Years: Recasting its Role." Presentation on 4/15/2004.

5. Barrett, Christopher and Daniel G. Maxwell. 2004. "PL480 Food Aid: We Can Do Better." *Choices: The Magazine of Food, Farm.* http://www.choicesmagazine.org/2004-3/2004-3-12.htm

6. Bezuneh, Mesfin, Brady J. Deaton, and George W. Norton. 1988. "Food Aid Impacts in Rural Kenya." *American Journal of Agricultural Economics* 70.1, 181-91.

7. Clay, E. et al. 1996. "Joint evaluation of European Union programprogramme food aid: Synthesis report". Overseas Development Institute, London.

8. Clay, E. et al. 2004. "The Development Effectiveness of Food Aid: Does tying matter?" Report DCD/DAC/EFE(2004)9. Brussels, OECD/DAC.

9. Dayton-Johnson, Jeff, and John Hoddinott. 2003. "Aid, policies and growth, redux." *Dalhousie University*.

10. Deaton, Brady J. 1980. "Public Law 480: The Critical Choices. " *American Journal of Agricultural Economics* 62, no. 5:988-992

11. Diven, Polly. 2001. "The Domestic Determinants of US Food Aid Policy." *Food Policy* 26, no.5:455-474.

12. EM-DAT and CRED. The International Disaster Database.

13. Faminow, M.D. 1995. "Issues in Valuing Food Aid: the Cash or In-kind Controversy. *Food Policy*, 20 (1), 3-10

14. FAO. 2001. "Reporting Procedures and Consultative Obligations Under the FAO Principles of Surplus Disposal: a guide for members of the FAO Consultative

Subcommittee on Surplus Disposal." *Food and Agriculture Organizations of the United Nations.* Rome. 2001.

15. Gartzke, Erik and Voeten. The Affinity of Nations Index. V4.0. 10 March 2006. hdl:1902.1/12379 UNF:3:Hpf6qOkDdzzvXF9m66yLTg==

16. Gelan, Ayele U. 2007. "Does Food Aid have Disincentive Effects on Local Production? A General Equilibrium perspective on food aid in Ethiopia." *Food Policy* 32, 436-458.

17. Hall, L. L. 1980. "Evaluating the Effects of P. L. 480 Wheat Imports on Brazil's Grain Sector." Amer. J. Agr. Econ. 62, 19-28.

18. Heston, Alan, R. Summers and B. Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006.

19. Ho, Melissa and C.E. Hanrahan. 2010. "International Food Aid ProgramPrograms: Background and Issues." *Congressional Research Service,* R41072

20. Hoag, Karen. "U.S. food aid data 1992-2000" Email to Barrett Kirwan.

21. Hanrahan, Charles E. and Carol Canada. 2006. "International Food Aid: U.S. and Other Donor Contributions." *Congressional Research Service,* RS21279

22. International Labour Organisation. 2001. "Convention Concerning health and Safety in Agriculture, Number 184." Geneva. http://www.ilo.org/public/english//standards/relm/ilc/ilc89/pdf/c184.pdf

23. Institute for Agriculture and Trade Policy. 2005. "U.S. Food Aid: Time to Get it Right." pg. 3

24. Isenman, Paul J., and H. W. Singer. 1977. "Food Aid: Disincentive Effects and Their Policy Implications." *Economic Development and Cultural Change*, 25.2, 205-37.

25. Jackson, T. and Eade, D. 1982. "Against the Grain: The Dilemma of Project Food Aid." Oxford, UK, Oxfam Print room.

26. Kirwan, Barrett E. and McMillan, Margaret. 2007. "Food Aid and Poverty. American Journal of Agricultural Economics 89, 5:1152-1160. http://ssrn.com/abstract=1100210 or doi:10.1111/j.1467-8276.2007.01076.x

27. Lavy, Victor. 1990. "Does Food Aid Depress Food Production? The Disincentive Dilemma in the African Context." *Population and Human Resources Department, the World Bank.* WPS 460.

28. Lentz, Erin et al. 2005. “Food Aid and Dependency: Implications for Emergency Food Security Assessments.” *World Food ProgramProgramme.*

29. Little, Peter D. 2008. “Food Aid Dependency in Northeastern Ethiopia: Myth or Reality.” *World Development* 36.5, 860-874.

30. Lowder, Sarah K. 2004. "A Post-Schultzian View of Food Aid, Trade, and Developing Country Cereal Production: A Panel Data Analysis.” Diss. Ohio State University. http://ideas.repec.org/p/ags/aaea04/19919.html.

31. Marchione, Thomas J. 2002. “Foods Provided through U.S. Government Emergency Food Aid ProgramPrograms: Policies and Customs Governing Their Formulation, Selection, and Distribution.” *The Journal of Nutrition* 32, 2104S-2111S.

32. Mitchell,T.D. et al. 2003. “A comprehensive set of climate scenarios for Europe and the globe.” Created at the Tyndall Centre (www.tyndall.ac.uk) on 09.05.2003

33. Mohapatra, Sandeep et al. 1999. "Does Food Aid Really Discourage Domestic Production?" *Indian Journal of Agriculture Economics* 54.2, 212-19.

34. Ninno, Carlo et al. 2004. “Food Aid and Food Security in the Short- and Long Run: Country Experience from Asia and sub-Saharan Africa.” *Special Protection: The World Bank.* Discussion Paper No.0538.

35. Singer, H. W., and S. J. Maxwell. 1979. "Food Aid to Developing Countries: A Survey." *World Development* 7, 225-47.

36. Stevens, Christopher. 1979. “Food Aid and the Developing World.” London: Overseas Development Institute.

37. Tadesse, Getaw and Gerald Shively. 2010. “Food aid, food prices and Producer Disincentives in Ethiopia.” *American Journal of Agricultural Economics.* http://www.agecon.purdue.edu/staff/shively/Tadesse%20and% 20Shively%20 (AJAE%202010).pdf

38. Tschirley, David, Cynthia Donovan, and Michael T. Weber. 1996. “Food Aid and Food Markets: lessons from Mozambique.” *Food Policy* 21.2, 189-209.

39. Tschirley, D. and J. Howard. 2003. “Title II Food Aid and Agricultural Development in Sub-Saharan Africa: towards a principled argument on when, and when not, to monetize. *MSU International Development Working Papers.* Michigan State University, East Lansing, MI. No.91.

40. U.S. Overseas Loans and Grants: Obligations and Loan Authorizations, July 1, 1945-September 30, 2008. http://gbk.eads.usaidallnet.gov/data/

41. USDA Economic Research Service, "U.S. Agricultural Exports under Public Law 480." ERS - Foreign 395. Oct 1974. Data from 1960-1973.

42. USDA Economic Research Service. "U.S. Concessional Agricultural Exports - PL480 (Updated 2/94)." downloaded from usda.mannlib.cornell.edu. Data from 1972-1989.

43. USDA Economic Research Service. 2004. "Global Food Security: Prospects and the Role of Food Aid." GPFA-15.

Figure 1: Food Aid by Main Commodity Categories

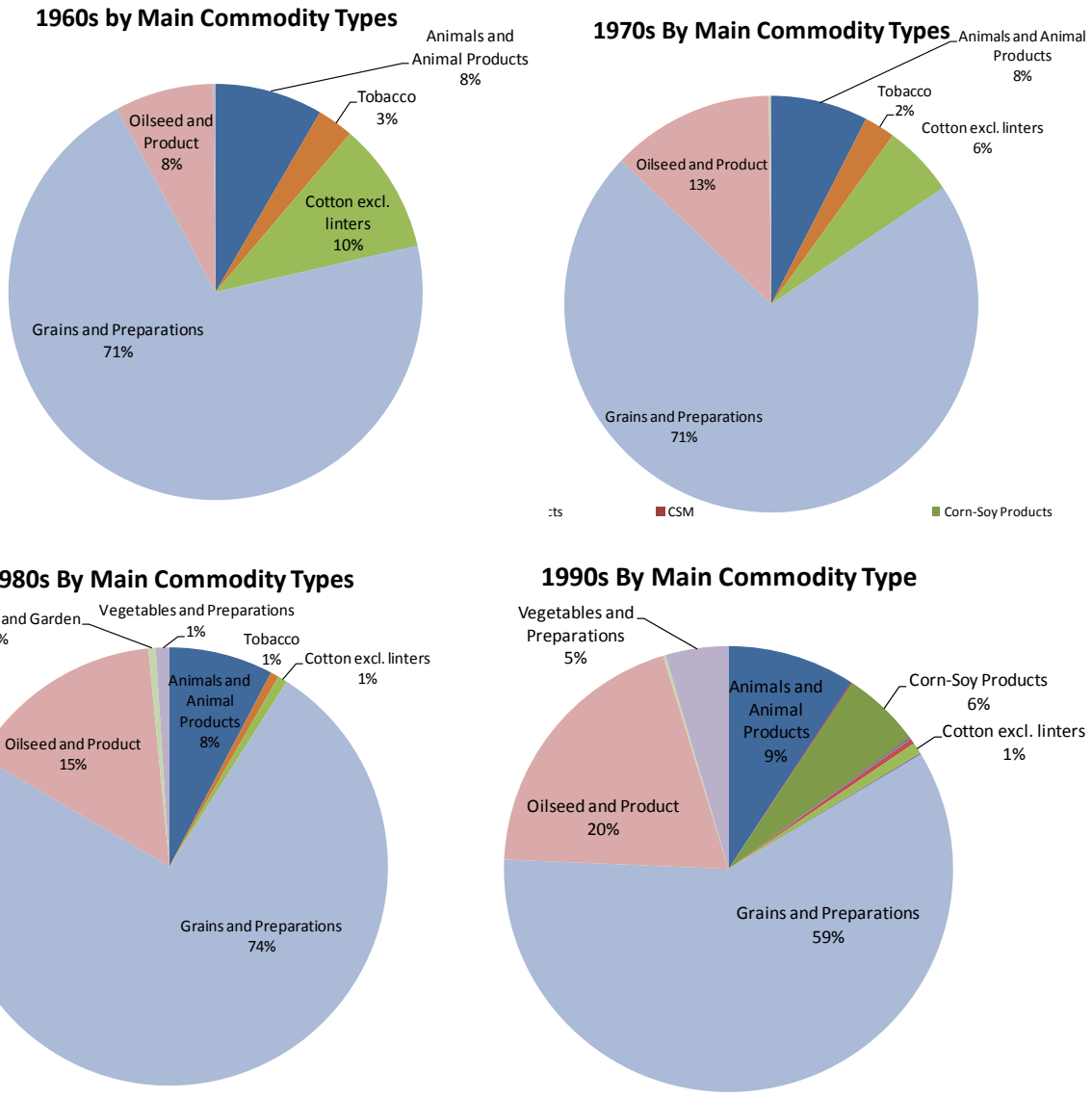

Figure 2: Grains and Preparations Over Time

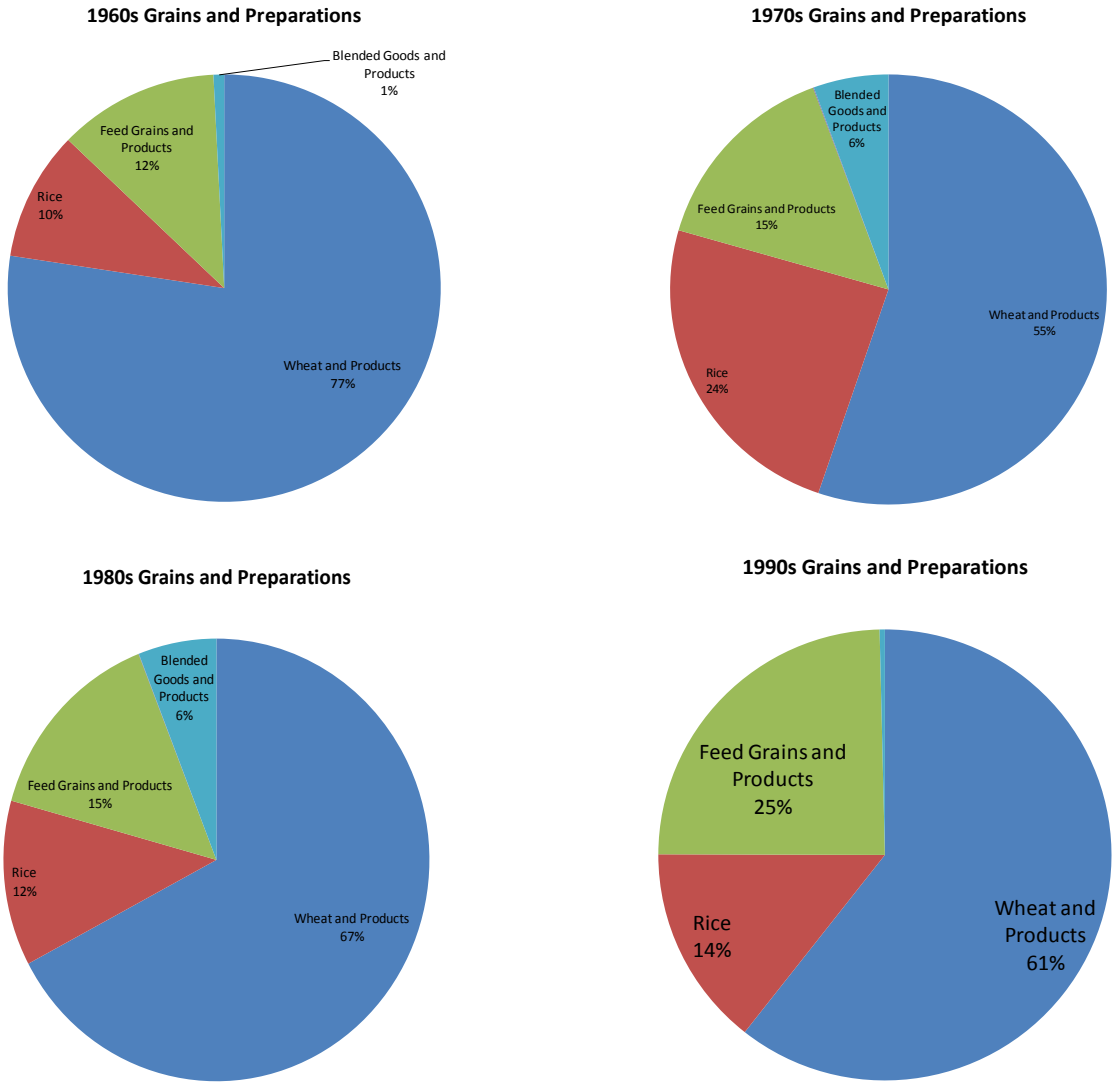

Figure 3: Highest Aid Recipients over Time

Region	1960-2000	1960s	1970s	1980s	1990s
World					
1	Israel	Israel	Israel	Jamaica	Liberia
2	Jamaica	Iceland	Jordan	El Salvador	Guyana
3	Liberia	Tunisia	Korea, South	Egypt	Bosnia and Herzegovina
4	Jordan	Jordan	Tunisia	Botswana	Suriname
5	Guyana	Korea, South	Egypt	Costa Rica	Armenia
6	Egypt	Egypt	Dominican Republic	Bolivia	Jamaica
7	El Salvador	Dominican Republic	Lesotho	Lesotho	Cape Verde
8	Bolivia	Malta	Viet Nam	Mauritania	Georgia
9	Tunisia	Chile	Jamaica	Somalia	Jordan
10	Iceland	Viet Nam	Portugal	Liberia	Kyrgyzstan
MENA					
1	Jordan	Tunisia	Jordan	Egypt	Jordan
2	Egypt	Jordan	Tunisia	Tunisia	Djibouti
3	Tunisia	Egypt	Egypt	Djibouti	Morocco
4	Morocco	Syiria	Lebanon	Morocco	Lebanon
5	Djibouti	Algeria	Morocco	Jordan	Tunisia
6	Lebanon	Libya	Syiria	Lebanon	Yemen
7	Syiria	Iran	Djibouti	Yemen	Egypt
8	Yemen	Lebanon	Iran	Syiria	Iraq
9	Algeria	Iraq	Yemen	Algeria	Syiria
10	Iran	Yemen	Algeria		Algeria
AFRICA					
1	Liberia	Guinea	Lesotho	Botswana	Liberia
2	Botswana	Seychelles	Botswana	Lesotho	Cape Verde
3	Lesotho	Ghana	Guinea	Mauritania	Rwanda
4	Somalia	Liberia	Seychelles	Somalia	Congo, PR
5	Mauritania	Sierra Leone	Mauritania	Liberia	Angola
6	Cape Verde	Senegal	Mauritius	Mauritius	Sao Tome and Principe
7	Mauritius	Sudan	Gambia	Sudan	Sierra Leone
8	Gambia	Kenya	Ghana	Seychelles	Somalia
9	Seychelles	Cote D'Ivoire	Senegal	Gambia	Gambia
10	Sierra Leone	Gambia	Somalia	Senegal	Mozambique
ASIA					
1	Sri Lanka	Viet Nam	Viet Nam	Sri Lanka	Sri Lanka
2	Viet Nam	Pakistan	Sri Lanka	Pakistan	Mongolia
3	Pakistan	India	Cambodia	Bangladesh	Korea, North
4	Bangladesh	Sri Lanka	Pakistan	Philippines	Afghanistan
5	Philippines	Philippines	Bangladesh	Indonesia	Bangladesh
6	Cambodia	Afghanistan	Indonesia	Cambodia	Philippines
7	Indonesia	Laos	Philippines	Nepal	Pakistan
8	Afghanistan	Indonesia	Laos	Afghanistan	Indonesia
9	India	China (mainland)	Afghanistan	India	India
10	Mongolia	Cambodia	India	Laos	Bhutan
ECA					
1	Bosnia and Herzegovina	Turkey	Turkey	Poland	Bosnia and Herzegovina
2	Armenia	Poland	Romania	Turkey	Armenia
3	Georgia		Poland	Albania	Georgia
4	Kyrgyzstan			Armenia	Kyrgyzstan
5	Albania			Azerbaijan	Albania
6	Tajikistan			Belarus	Lithuania
7	Lithuania			Bosnia and Herzegovina	Tajikistan
8	Poland			Bulgaria	Moldova
9	Moldova			Georgia	Belarus
10	Turkey			Croatia	Turkmenistan
HIC					
1	Israel	Israel	Israel	Portugal	Estonia
2	Iceland	Iceland	Korea, South	Trinidad and Tobago	Slovenia
3	Korea, South	Korea, South	Portugal	Korea, South	
4	Portugal	Malta	Iceland	Barbados	
5	Malta	Greece	Cyprus	Cyprus	
6	Cyprus	Trinidad and Tobago	Malta	Israel	
7	Greece	Spain	Barbados		
8	Estonia	Cyprus	Trinidad and Tobago		
9	Trinidad and Tobago	Portugal	Singapore		
10	Spain	Austria	Denmark		
LAC					
1	Jamaica	Dominican Republic	Dominican Republic	Jamaica	Guyana
2	Guyana	Chile	Jamaica	El Salvador	Suriname
3	El Salvador	Bolivia	Bolivia	Costa Rica	Jamaica
4	Bolivia	Paraguay	Chile	Bolivia	Nicaragua
5	Dominican Republic	Uruguay	Haiti	Dominican Republic	Haiti
6	Haiti	Brazil	Uruguay	Haiti	Honduras
7	Honduras	Jamaica	Guyana	Honduras	El Salvador
8	Suriname	Peru	Honduras	Guyana	Bolivia
9	Costa Rica	Colombia	Ecuador	Guatemala	Peru
10	Peru	Ecuador	Guatemala	Peru	Guatemala

Source: Authors' calculations with data from PL480 ????

Figure 4: Food Aid per Capita by Regions

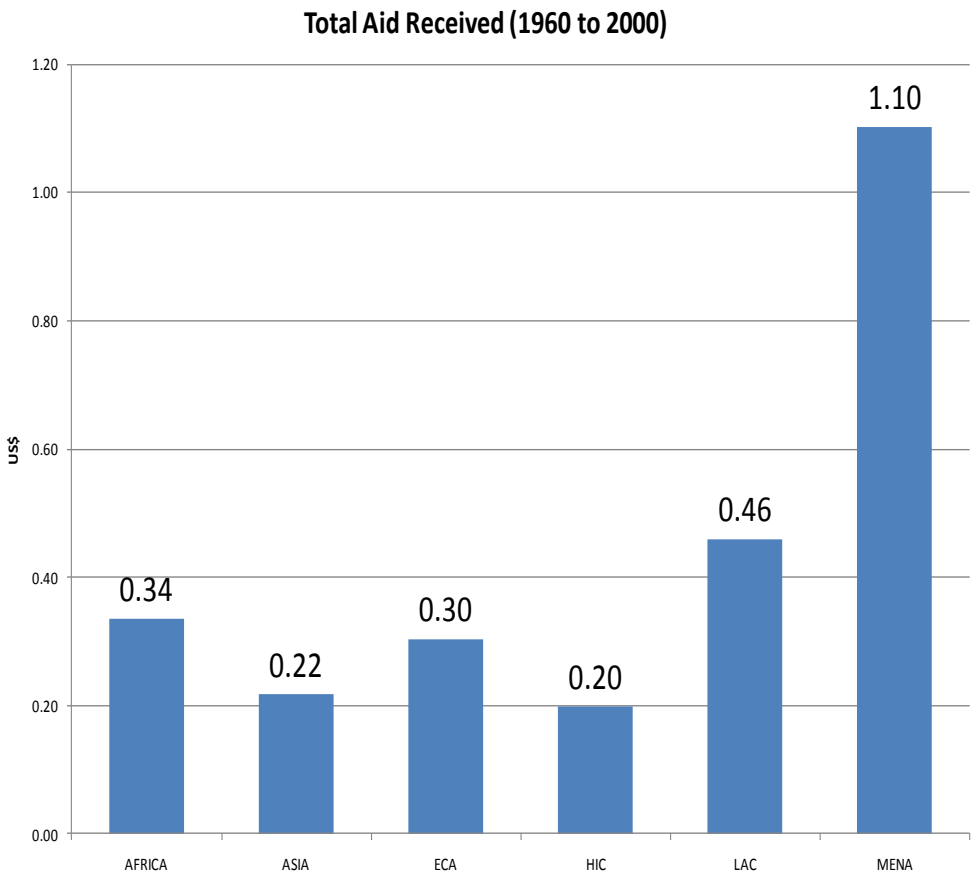

Figure 5: Food Aid by Capita, Region, and decade

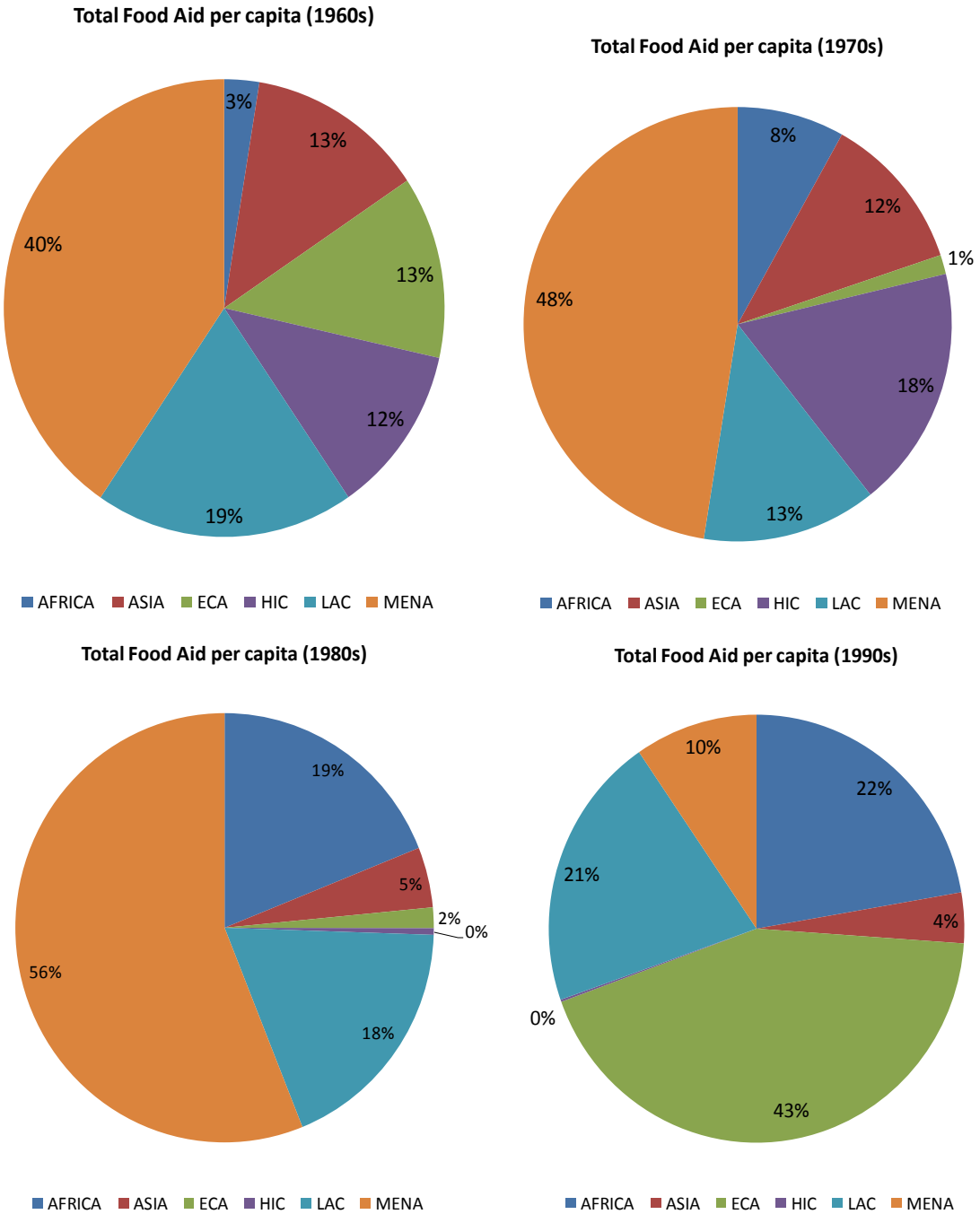

Table 1. Summary Statistics by Region

	Mean	Std. Dev.	# of obs.
Overall			
Prodv_pc	$4.87x10^{8}$	$8.39x10^{9}$	21492
FAv_pc	.321	1.34	21492
Disasters	.9191	1.96	20843
Rain	1213.74	799.01	20770
s3uni	.0687	.384	20196
Military	18.31	120.37	12867
Africa			
Prodv_pc	8.59	43.91	7815
FAv_pc	.229	.778	7815
Disasters	.462	.944	7607
Rain	1067.11	625.42	7597
s3uni	-.031	.348	7335
Military	.808	2.04	3363
Asia			
Prodv_pc	74.82	574.72	2674
FAv_pc	.144	.448	2674
Disasters	3.077	3.977	2431
Rain	1691.822	838.79	2471
s3uni	-0.054	0.334	2560
Military	16.89	55.51	2013
ECA			
Prodv_pc	0.89	$1.06x10^{7}$	1061
FAv_pc	.621	1.42	1061
Disasters	1.36	2.81	1047
Rain	590.48	199.52	1040
s3uni	.099	0.34	1039
military	7.48	10.47	574
HI			
Prodv_pc	16.6	39.15	2714
FAv_pc	.43	2.74	2714
Disasters	.392	0.814	2530
Rain	1004.55	544.47	2710
s3uni	.475	0.312	2258
military	100.76	325.32	1568
LAC			
Prodv_pc	$1.99x10^{9}$	$1.69x10^{10}$	5247
FAv_pc	0.399	1.26	5247

Disasters	.944	1.33	5247
Rain	1834.80	719.10	4971
s3uni	.154	.38	5081
military	2.98	6.5	4124
MENA			
Prodv_pc	11.58	28.79	1981
FAv_pc	.408	1.11	1981
Disasters	.400	.897	1981
Rain	234.61	186.53	1981
s3uni	-0.109	0.276	1923
military	19.86	33.58	1225

Table 2. Country-Commodity Fixed Effects (Full Sample)

VARIABLES	Full sample
Llnfaid	-0.3516***
	(0.04)
Lnrain	0.5250***
	(0.11)
Disasters	0.0173
	(0.01)
Constant	-1.8672**
	(0.77)
Observations	19181
No. Clusters	908

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Dependent variable: Log of Domestic Production per capita (constant 2000 US dollars)

Regressions with year fixed effects

Table 3. Country-Commodity FE model, IV Model
(Reduced Sample)

VARIABLES	FE	IV	First
	(1)	(2)	(3)
Llnfaid	-0.3122***	1.3621**	--
	(0.05)	(0.53)	
lnrain	0.6019***	0.7450***	-0.0690**
	(0.15)	(0.17)	(0.03)
disasters	-0.0573***	-0.0605***	0.0133***
	(0.02)	(0.02)	(0.00)
Llnmilitary	--	--	0.0226***
			(0.00)
Ls3uni	--	--	-0.2408***
			(0.03)
Constant	-0.9553	-4.0024***	0.7282***
	(1.07)	(1.25)	(0.21)
Sargan-Hansen statistic (P-value)	--	0.39	--
F-statistic	--	--	55.27
Observations	10471	10471	10471
No. Clusters	796	764	764

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10
Dependent variable (FE and IV models): Log of Domestic Production per capita (2000 constant US dollars)
Regressions with year fixed effects

Table 4. Country-Commodity FE by Region (Full Sample)

	Africa	Asia	ECA	HIC	LAC	MENA
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Llnfaid	-0.0469*	0.0796	-0.4889**	0.0377	-0.5297***	-0.1180***
	(0.02)	(0.06)	(0.21)	(0.04)	(0.13)	(0.03)
Lnrain	-0.0629	0.1506	1.0490	-0.6161***	0.6427	0.1756*
	(0.05)	(0.18)	(0.72)	(0.15)	(0.46)	(0.09)
Disasters	-0.0058	0.0325***	-0.2957***	0.0564	0.1436**	0.0754***
	(0.01)	(0.01)	(0.05)	(0.04)	(0.06)	(0.02)
Constant	1.5086***	1.0735	-3.0774	7.2434***	-3.0239	0.5497
	(0.37)	(1.36)	(4.44)	(1.06)	(3.39)	(0.60)
Observations	7083	2142	890	2372	4793	1901
No. Clusters	293	85	122	151	178	79

Regressions with year fixed effects
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10
Dependent variable: Log of Domestic Production per capita (constant 2000 US dollars)

Table 5. Country-Commodity FE, IV by Region (Reduced Sample)

	Africa			Asia			ECA		
VARIABLES	FE (1)	IV (2)	First (3)	FE (4)	IV (5)	First (6)	FE (7)	IV (8)	First (9)
Llnfaid	0.0348	1.6465***	--	0.1433	1.7152**	--	0.5747**	1.6253	--
	(0.04)	(0.46)		(0.09)	(0.68)		(0.22)	(2.24)	
lnrain	0.2310***	0.1279	0.1042**	0.2015	0.4462	-0.1212	2.1734*	2.3601*	0.0400
	(0.09)	(0.13)	(0.05)	(0.25)	(0.29)	(0.08)	(1.20)	(1.24)	(0.27)
disasters	0.0106	-0.0102	0.0115	0.0161	0.0064	0.0063	-0.3998***	-0.4470***	0.0384***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.00)	(0.05)	(0.12)	(0.01)
Llnmilitary	--	--	0.0278***	--	--	0.0172***	--	--	-0.0857*
			(0.01)			(0.01)			(0.04)
Ls3uni	--	--	-0.0061	--	--	-0.2897***	--	--	-0.2658
			(0.04)			(0.07)			(0.18)
Constant	-0.2871	-0.0658	-0.3858	0.6786	-0.7798	0.5832	-4.7498	-13.7859	0.0228
	(0.59)	(0.83)	(0.34)	(1.87)	(2.09)	(0.60)	(7.74)	(8.44)	(1.69)
Sargan-Hansen statistic (P-value)	--	0.274	--	--	0.271	--	--	0.521	--
F-statistic	--	--	13.99	--	--	11.61	--	--	0.730
Observations	2915	2915	2915	1254	11254	1254	450	450	450
No. Clusters	263	263	263	76	74	74	15	14	14

*** p<0.01, ** p<0.05, * p<0.10
Regressions with year fixed effects
Standard errors in parentheses
Dependent variable (FE and IV models): Log of Domestic Production per capita (2000 constant US dollars)

Table 5. Country-Commodity FE, IV by Region (Reduced Sample) (contd.)

	HIC			LAC			MENA		
VARIABLES	FE (10)	IV (11)	First (12)	FE (13)	IV (14)	First (15)	FE (16)	IV (17)	First (18)
Llnfaid	-0.0608	0.2880**	--	-0.6139***	1.9159**	--	-0.1587***	2.3147	--
	(0.05)	(0.127)		(0.14)	(0.88)		(0.04)	(1.62)	
lnrain	-0.2658	-0.0740	-0.1597	1.5760***	1.6698***	0.0142	0.2380**	0.6145	-0.1967**
	(0.20)	(0.22)	(0.15)	(0.48)	(0.51)	(0.06)	(0.11)	(0.38)	(0.08)
disasters	0.0400	-0.0016	0.0755**	-0.1309**	-0.1311**	0.0113	-0.0650	0.0848	-0.0543*
	(0.05)	(0.06)	(0.04)	(0.06)	(0.07)	(0.01)	(0.04)	(0.12)	(0.03)
Llnmilitary	--	--	0.0123	--	--	0.0542***	--	--	0.0190***
			(0.02)			(0.01)			(0.001)
Ls3uni	--	--	-0.8316***	--	--	-0.1557***	--	--	-0.3357
			(0.16)			(0.05)			(0.27)
Constant	4.9176***	3.2553**	0.5360	-9.4849***	-11.1099***	0.3133	-0.0713	-3.0119	0.7112
	(1.33)	(1.52)	(0.98)	(3.54)	(3.85)	(0.44)	(0.65)	(2.91)	(0.48)
Sargan-Hansen statistic (P-value)	--	0.150	--	--	0.276	--	--	0.392	--
F-statistic	--	--	14.21	--	--	48.18	--	--	11.544
Observations	1115	1115	1115	3498	3498	3498	1151	1151	1151
No. Clusters	115	115	115	171	171	171	75	75	75

Table 6: Country-Commodity FE over Time (Full Sample)

VARIABLES	Pre-1980s (1)	1980s (2)	1990s (3)
Llnfaid	-0.4031***	-0.0541	0.0534
	(0.05)	(0.06)	(0.11)
Lnrain	0.5564***	0.4233***	-0.0004
	(0.13)	(0.12)	(0.29)
Disasters	0.0634***	0.0673***	-0.0551**
	(0.02)	(0.02)	(0.03)
Constant	-0.3812	0.2973	2.0134
	(0.89)	(0.80)	(1.98)
Observations	11373	5730	1761
No. Clusters	774	573	450

Dependent variable: Log of Domestic Production per capita (constant 2000 US dollars)
Standard errors in parentheses
Regressions with year fixed effects
*** p<0.01, ** p<0.05, * p<0.10

Table 7. Country-Commodity Fixed Effects and First-Stage Estimates By Time (Reduced Sample)

	Pre-1980			1980s			1990s		
VARIABLES	FE	IV	First	FE	IV	First	FE	IV	First
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Llnfaid	-1.2338**	-1.1162*	--	-0.0039	1.3062**	--	0.2015	3.6097	--
	(0.09)	(0.68)	--	(0.05)	(0.56)	--	(0.13)	(5.23)	--
lnrain	1.1601***	1.1288***	-0.0868**	0.2063**	0.1098	0.0994***	-0.0387	0.4448	0.0353
	(0.25)	(0.27)	(0.04)	(0.09)	(0.12)	(0.04)	(0.31)	(0.40)	(0.09)
disasters	0.0311	0.0743**	0.0045	0.0404***	0.0414**	-0.0037	-0.0805***	-0.0717*	0.0046
	(0.03)	(0.03)	(0.01)	(0.02)	(0.02)	(0.01)	(0.03)	(0.04)	(0.01)
Llnmilitary	--	--	0.0439***	--	--	0.0125**	--		-0.0039
			(0.00)			(0.01)			(0.01)
Ls3uni	--	--	0.1036**	--	--	-0.2359***	--		0.0369
			(0.04)			(0.05)			(0.06)
Constant	-2.9429*	-2.7739	0.7183**	1.2333**	1.9626***	-0.3462	3.1328	-3.3088	0.3048
	(1.71)	(1.90)	(0.28)	(0.62)	(0.73)	(0.24)	(2.14)	(3.17)	(0.63)
Sargan-Hansen statistic (P-value)	--	-.338	--	--	0.19	--	--	0.049	--
F-statistic	--	--	42.94	--	--	14.72	--	--	0.273
Observations	5401	5401	5401	3716	3716	3716	1148	1148	1148
No. Clusters	500	481	481	458	458	458	355	320	320

Dependent variable: Log of Domestic Production per capita (2000 constant US dollars)
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10
Regressions with year fixed effects

Table 8. Previous Literature

Author	Title	Method	Data Source	Data Years	Result
Abdulai et al. (2005)	Does Food Aid Really have Disincentive Effects? New Evidence from Sub-Saharan Africa	VAR characteristics, GMM	Sub-Saharan Africa, WFP Food Aid Data	1970-2000	Modest positive effect on production
Barrett (1998)	Food Aid: Is it Development Assistance, Trade Promotion, Both, or Neither?	VAR, impulse response functions	US food aid	1961-1995, across 18 biggest recipient countries	Neither a simulative nor contractionary effect on production
Barrett (1999)	The Dynamic Effects of U.S. Food Aid	VAR	18 countries using US cereal Program food aid shipments	1961-1995	Negligible negative effect on production
Barrett (2001)	Does Food Aid Stabilize Food Availability?	Tobit	124 countries, P.L.480	1961-1995	Stabilizes access to food
Benzuneh (1988)	Food Aid Impacts in Rural Kenya	Linear Program Model	UN Food For Work Programs, household model, surveys	only 2 years of data	Increased own-farm production and reduced FFW activities in year 2
Hall (1980)	Evaluating the Effects of P.L. 480 Wheat Imports on Brazil's Grain Sector	Simultaneous Equation Model	PL 480, Program wheat shipments to Brazil	1952-1971	Increase attributed to use of revenue to support the price of domestic wheat producers
Lavy (1990)	Does Food Aid Depress Food Production? The Disincentive Dilemma in the African Context	VAR	All food aid to 33 countries in Africa	1970-1987	Positive effect on production
Little (2008)	Food Aid Dependency in Northeastern Ethiopia: Myth or Reality	Statistics, case studies	households in south Wollo, Ethiopia	1990-2000,2002-2003 (drought periods)	No effect on production
Lowder (2009)	A Post-Schultzian View of Food Aid, Trade, and Developing Country Cereal Production: A Panel Data Analysis	VAR	WFP food aid	1988-2001, 64 countries	No effect on production

Tadesse et al. (2010)	Food aid, Food Prices and Producer Disincentives in Ethiopia	Seemingly unrelated regression models for food prices	examine 3 markets	1996-2006	Finds disincentive effect when food aid constitutes more than 10% of domestic production
Tschirley et al. (1996)	Food Aid and Food Markets: lessons from Mozambique	Correlation	examined non emergency food aid in 3 local markets	1990-1995	Reduced incentives to produce