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Comments greatly appreciated

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Does Food Aid Stabilize Food Availability?

Abstract: This paper explores the empirical relationship between U.S. food aid flows per capita and nonconcessional food availability per capita in PL 480 recipient economies. The evidence suggests PL 480, while modestly progressive in its distribution, is if anything procyclical in recipient economies. Food aid fails to stabilize food availability. Both increased domestic food production – i.e., agricultural development – and commercial trade appear more effective than food aid in advancing food security objectives through the stabilization of food availability per capita in low-income economies.

Key words: Food aid, Food security, procyclicality, Tobit estimation

JEL Codes: Q1, O1, F1

Does Food Aid Stabilize Food Availability?

The stubborn persistence of food insecurity, hunger, and malnutrition in spite of steady growth in per capita global food production underlines the centrality of distribution systems to the alleviation of food insecurity. Although global per capita food production has increased roughly 15 percent in the past twenty years, a substantial subpopulation continues to suffer from malnutrition. The most commonly cited figure suggests that 800 million or so people experience protein energy (or macronutrient) malnutrition. And that statistic ignores a much larger cohort suffering micronutrient (especially iodine, iron, or vitamin A) deficiency, or facing significant, but as-yet-unrealized threat of macronutrient or micronutrient deprivation (Barrett forthcoming). Recent large-scale natural and manmade disasters, particularly in Sub-Saharan Africa, have brought extraordinary episodes of deprivation and threatened full-blown famine. Combating food insecurity in this world of plenty demands, among other things, improved distribution systems to ensure that food flows to those areas where it is most scarce.

Human physiology makes optimal food consumption volumes per capita relatively stable. Food supply, however, is notoriously volatile, especially in low-income economies relatively dependent on rainfed, rather than irrigated, agriculture. Fluctuations in domestic per capita production lead to highly variable import volume requirements in food importing nations. Trade is the principal means for international food distribution at the macro level. But poorer countries often lack the foreign exchange necessary to purchase commercially all the food needed to meet their population's nutritional requirements. Food aid is therefore often suggested as a way to cope with

variable food import requirements and restricted commercial import capacity in low-income economies.

The basic logic of food aid for food security is simple. In so far as food aid is meant to address food availability shortfalls that might cause undernutrition, food aid should flow disproportionately to countries exhibiting low per capita nonconcessional food availability (NA), a sharp negative deviation from trend NA, or both. But does food aid in fact stabilize food availability in recipient economies? That is the question tackled in this paper, as I explore the empirical relationship between food aid flows per capita from the United States' PL480 programs and nonconcessional food availability per capita in PL480 recipient economies. If food aid indeed stabilizes food availability, then per capita food aid flows should be inversely related to recipients' per capita nonconcessional food availability, in terms of levels, deviations from trend, or both. This is an empirically testable hypothesis that, to the best of my knowledge, has not yet been studied.

Nonconcessional Food Availability Trends in PL480 Recipient Economies

Let me begin with some definition of terms and data description. Because individual physiology drives nutritional needs, and in order to be able to compare countries with vastly different human populations, all figures reported are in per capita terms. In order to work with readily comparable series without introducing serious aggregation bias problems, I use cereals volumes to proxy total food production, nonconcessional availability (production plus commercial imports), and aid flows per capita. Annual production, commercial import, and population data, 1961-95, were provided by the Food and Agriculture Organization of the United Nations, while disaggregated (by year, commodity, Title, and recipient country) PL480 food aid flows data were made available by the

U.S. Department of Agriculture's Economic Research Service. The data cover 124 different recipient economies, representing all PL 480 recipients during the period other than Japan and developed European economies.[1] For those countries that achieved independence after 1961, only independence-era data are used, yielding an uneven panel of data.

The food available to feed a country's residents comes from one of four sources: domestic production, domestic inventories, commercial imports from abroad, or food aid inflows from abroad. This paper looks at how the latter source, food aid, covaries with the first three in order to establish whether food aid helps stabilize aggregate food availability. A data problem emerges immediately. Reliable cereals inventories data are unavailable for most countries, particularly poorer food aid recipients. But since interannual cereals stocks per capita are generally quite small in developing countries, the unrealistic limiting assumption that per capita inventories equal zero probably has little effect on the forthcoming analysis. I should also point out that I do not include total food aid flows from all donors; the analysis considers only PL480 shipments from the United States. A planned extension of this analysis will include multilateral flows from the World Food Programme and aggregate food aid flows. But since PL 480 comprised about two-thirds of global food aid, 1961-95, the data used here should capture the basic patterns prevailing more broadly.

Own production and commercial trade account for the vast majority of cereals availability in PL480 recipient nations. Pooling across years and recipients, domestic production's mean (median) proportion of aggregate national cereals availability, defined as production plus commercial imports

[1] The 1961-95 PL 480 recipients omitted from the data set are Austria, Finland, France, Germany, Hungary, Iceland, Italy, Japan, Malta, and Spain.

plus PL480 receipts, was 69.3 (80.2) percent.[2] Mean (median) commercial imports accounted for another 28.6 (17.6) percent of recipient country food availability, leaving only a tiny fraction covered by PL480 shipments most years in most recipient countries, as can be seen in Table 1 and graphically in Figure 1. Given that PL 480 flows rarely comprise more than a negligible proportion of total food availability in recipient countries, this suggests that food aid can play, at best, a very limited stabilizing role.

The 1961-95 Green Revolution era of rapid biochemical improvements to cropping systems, brought unprecedentedly rapid annual average growth of 0.5 percent in global cereals production per capita (Barrett forthcoming). PL 480 recipients, however, lagged significantly behind. Annual average growth rates in production and NA for each PL480 recipient, 1961-95, were estimated by equations (1) and (2), respectively.

$$\ln(\text{PRODUCTION}_t)=\alpha_{0P}+\alpha_{1P}\,\text{YEAR}+\epsilon_{Pt} \quad (1)$$

$$\ln(\text{NA}_t)=\alpha_{0N}+\alpha_{1N}\,\text{YEAR}+\epsilon_{Nt} \quad (2)$$

Across the 124 PL 480 recipients, the median annual growth rate in per capita cereals production was -0.2 percent, i.e., more than half (53%) the countries suffered negative average annual growth. The voluminous literature on food aid emphasizes its potential disincentive effects on recipient country production, and perhaps the sluggish growth in recipient production reflects this (Maxwell and Singer 1979; Ruttan 1993; Barrett forthcoming). Rapid growth in Pl 480 recipients' commercial cereals imports has made up for sluggish cereals production growth. The median annual growth rate in per capita nonconcessional cereals availability was 0.5 percent, the same as the global growth rate in per

[2] Note that this "aggregate" cereals availability figures omits both food aid receipts other than PL 480 shipments and domestic cereals inventories, although these are both relatively small volumes.

capita cereals production (and therefore global NA). Still, more than one-third (37%) of the countries exhibit negative average annual growth even in NA.

While the trends are informative, the variability around trend NA is of at least as much interest, in that this reflects short-run instability in food supplies to which food aid is supposed to at least partly respond if it is to serve food security objectives. The standard errors of the residuals of equations (1) and (2), ϵ_{Pt} and ϵ_{Nt}, capture this interannual variability around trend production and nonconcessional availability, respectively. In the next section, I study the empirical relationship between PL 480 flows and ϵ_{Nt} in order to test whether PL 480 flows stabilize food availability (i.e., covary negatively with shocks to trend nonconcessional food availability). But first, let's quickly look more carefully at the regression results from equations (1) and (2).

Among PL480 recipients there exists a negative univariate relationship between the average annual growth rate and the standard deviation around trend of cereals production per capita. Let v_P be the standard deviation of the ϵ_{Pt} series and v_N be the standard deviation of the ϵ_{Nt} series. Regressing v_P on α_{1P} and an intercept term yields a partial correlation coefficient estimate of -0.914 (with a standard error of the estimate of 0.465).[3] This simple result supports the intuitive hypothesis that faster growth in cereals productivity tends to bring with it greater stability in per capita production. Put differently, agricultural development appears important not only to increasing developing countries' food availability but also to stabilizing food availability. Since own production comprises by far the greatest share of developing countries' food availability, this relationship deserves serious attention.

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[3] Unlike, cereals production, NA variability and growth rates are unrelated in the set of PL 480 recipient economies.

Moreover, because production makes up the bulk of countries' food availability (Figure 1), domestic food production drives nonconcessional food availability. The simple ordinary least squares regression of the annual average growth rates in PL 480 recipients' nonconcessional cereals availability, α_{1N}, on production per capita, α_{1P}, shows that the two are positively and statistically significantly related, as one would expect.[4] The statistically significant, sub-unit (0.644) estimated partial correlation coefficient also reflects the effective role that commercial international trade plays in stabilizing food availability in developing countries. NA responds at less than a one-for-one rate to changes in domestic production. Commercial trade's stabilizing effect is also reflected by the fact that $v_N<v_P$ in more than 80 percent of the sample recipients. The mean reduction in the standard deviation of per capita cereals volumes is greater than eight percent per annum, from $\bar{v}_P = 0.237$ to $\bar{v}_N = 0.156$. Contrary to some populist claims, commercial food trade contributes significantly to the stabilization of food availability in developing countries.

While commercial cereals trade plays a crucial role in stabilizing food availability in low- and middle-income countries, binding foreign exchange constraints nonetheless commonly limit the capacity of poorer countries to dampen food supply volatility through commercial markets. At 15.6 percent, the standard deviation of NA per capita in PL 480 recipients remains more than three times the world standard deviation around trend of 4.7 percent. Indeed, 122 of 124 PL480 recipients evince more variable NA than the global rate (all except Georgia and Russia). Given the residual need for food consumption smoothing in developing countries, the core question remains: have PL 480 food aid shipments helped to stabilize food availability in the face of extraordinary variability in

[4] The OLS regression result is: $\alpha_{1N} = -0.006 + \underset{(0.102)}{0.644}\ \alpha_{1P}$

recipients' nonconcessional food availability? Put differently, how effectively has PL480 targeted food insecurity at the national level?

PL 480 Responsiveness To Need: An Empirical Analysis

PL480 flows have dominated global food aid since the program's inception in 1954. There are two basic types of PL480 food aid: program (Titles I and III) and emergency (Title II). A primary reason to examine PL480 flows disaggregated between program and emergency assistance is the popular belief that Title II flows are more responsive to need, particularly to short-term instability in recipient country NA. Yet program food aid has long dominated PL480 flows. Between 1954 and 1995, Titles I and III of PL480 accounted for better than 80 percent of the more than 300 million metric tons of U.S. food aid and more than half of total worldwide food aid flows. That said, program (emergency) food aid has steadily diminished (grown) in importance over the past twenty years. Program flows averaged 86% of PL480 deliveries and were at least 80% each year prior to 1973, but averaged only 72%, 1973-95, and were above 80% only 3 of those 23 years. Title II shipments surpassed Title I flows for the first time only in 1993.

There are at least four interrelated reasons to be skeptical about the effectiveness of PL480 food aid in dampening variability in recipient country food availability. First, previous studies have shown US food aid has been driven largely by geopolitical considerations, with relatively little targeting toward countries with pronounced food deficits (Ruttan 1993, 1995; Ball and Johnson 1996). Political objectives tend to trump food security concerns in Washington. Second, and related to the first, PL480 flows have shown far greater persistence over the years than is consistent with the claim that they respond to transitory nonconcessional food availability shortfalls in recipient countries

(Barrett 1998). Third, PL480 flows — indeed bilateral flows more generally — have proved procyclical in aggregate, not countercyclical, because they are budgeted in monetary rather than volume terms (Barrett forthcoming). Fourth, until quite recently few good early warning systems existed to anticipate emergencies accurately, so food aid deliveries are largely reactive and therefore often ill-timed. Of these four concerns, only the latter situation may be improving significantly in the case of PL480, although early warning systems continue to have a spotty performance record (Barrett forthcoming).

The simplest way to establish whether food aid dampens the variability of recipient country food availability is to estimate the empirical relationship between food aid flows per capita, FA, and both the levels, NA, and the deviations from trend NA , ϵ_N, from equation (2). If food aid flows to those most in absolute need, as reflected by a negative correlation between PL 480 and NA levels, then food aid can be described as progressive. If food aid responds negatively to deviations from national trend NA, then FA has a stabilizing, countercyclical effect. The magnitude of the latter relationship is of particular interest as it indicates the compensation proportion, i.e., the proportion of a shortfall that is made up for by PL 480 flows.

Since FA is a nonnegative variable often taking zero value, this relationship is estimated by the Tobit model:

$$FA_{it} = \beta_0 + \beta_1 \epsilon_{Nit} + \beta_2 NA_{it} + \omega_{it} \qquad \text{if } FA_{it} > 0 \qquad (3a)$$

$$FA_{it} = 0 \qquad \text{if } FA_{it} = 0 \qquad (3b)$$

where i indexes recipient countries and t indexes years. β_1 captures the stabilization effect of food aid, while β_2 reflects the distributional effect. Since the data are pooled cross-sectional and time series, it is necessary to test first for fixed effects in cross-section, intertemporally, or both. The

specification test statistics suggest it is necessary only to control for unobserved region-specific effects.[5] A bit later, I consider the results of country- and year-specific estimation of (3) to see whether imposing a universal relationship masks different relations in a nontrivial subsample of countries (it doesn't).

Four interesting results appear in Table 2. The β_1 and β_2 estimates are of uniformly low magnitude, most of the β_1 (β_2) estimates are positive (negative), and most of the estimates are not statistically significantly different from zero. The low magnitudes and statistical significance reflect the negligible contribution of food aid to aggregate food availability in food recipient economies, as suggested earlier by Figure 1. The negative and statistically significant β_2 estimate suggests that PL 480 has flowed somewhat more to food scarce than food abundant economies. Although the point estimates are of uniformly low magnitude, there appears to be some global progressivity to PL480 distribution. But the counterintuitively positive signs of the β_1 estimates suggest that food aid flows have been, if anything, procyclical, not countercyclical on average. The data support the claim that PL480 has been (modestly) distributionally progressive, but not that it has stabilized food availability.

These results hold not only in the full pool of 124 developing country PL 480 recipients, but also in three subsamples of particular interest. In the 1960s and into the 1970s food aid — especially program (Title I) PL 480 — was disproportionately concentrated on South Asia. For South Asia, home to the largest number of the world's food insecure, PL 480 flows have been statistically significantly procyclical while the estimated progressivity effect is not statistically significantly

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[5] Using the general model form $FA_{it}=\beta_0+\beta_1\epsilon_{it}+\beta_2 NA_{it}+\sum_j \delta_j REGION_{jit}+\sum_t \gamma_t YR_{it}+\omega_{it}$ if $FA_{it} > 0$, likelihood ratio tests of the joint restrictions $\delta_j=0\ \forall\ j$, $\gamma_t=0\ \forall\ t$, or both yield test statistics that uniformly support rejecting the null hypothesis of $\delta_j=0\ \forall\ j$ at any level of statistical significance for program, emergency, or all PL 480 aid, and uniformly fail to support rejecting the null hypothesis of $\gamma_t=0\ \forall\ t$ at even the ten percent significance level for program, emergency, or all PL 480 flows. Test details are available from the author by request.

different from zero. Since the world food crisis of the mid-1970s, PL 480 — especially humanitarian (Title II) flows — have been disproportionately focused on Sub-Saharan Africa (SSA), the only world region in which the proportion of the population suffering food insecurity has not fallen significantly for a generation. PL 480 flows to SSA are of particularly low magnitude and statistical significance, and of the wrong (positive) sign to support either the claim that PL 480 has stabilized African food availability or the claim that food aid has flowed most generously to those countries most in need. Finally, I also ran the regression for an international group of countries whose PL 480 programs (or termination of those programs) are widely recognized as geopolitically motivated. One might suspect that the estimation results from the full sample are contaminated by the inclusion of countries whose PL 480 programs have been plainly driven by non-economic and non-humanitarian considerations. The curious result is that while the magnitudes and statistical significance of the parameter estimates are also low, only in this subsample do we get negative point estimates for both β_1 and β_2. So the subset of geopolitically motivated PL 480 country programs do not seem to distort the estimation results in the full sample.[6] The results are also qualitatively unchanged when we reestimate off emergency (Title II) food aid alone or program (Titles I and III) food aid alone, as shown in Tables 3 and 4, respectively. PL 480 food aid, of any sort, has not stabilized food availability on average in recipient economies, even though its distribution has been modestly progressive on a global -- if not always regional -- scale.

Given the idiosyncracies of PL 480 programs in individual recipient countries, and the evolving rhetoric and operational codes of PL480 over 35 years, one might be skeptical of the results

[6] The qualitative results in the rightmost column of Table 2 are robust to each of the several combinations of countries tried in the “geopolitically motivated” set.

from regressions using data pooled across countries and years. The same qualitative results obtain, however, when one examines the distribution of country- or year-specific estimation results.[7] For example, the distribution of country-specific estimates of model (3) shows that most parameter estimates are statistically insignificantly different from zero, extraordinarily few β_1 estimates are less than -0.1 (which would imply ten percent average stabilization effect from PL 480 flows) or even statistically significantly negative, and PL 480 most commonly flows procyclically around recipients' food availability trend, not countercyclically (Table 5). The consistency between the patterns found in the distribution of parameter estimates derived from the country-specific time series and the estimated from the pooled sample reported in Tables 2-4 suggests that country-specific differences due to variation in local PL480 operations or recipient country policy do not explain the failure of food aid to stabilize food availability. Although not reported here, the same basic results obtain in cross-section, in the distribution of year-specific estimates.[8] Moreover, the common claim that improvements have been made to PL 480 operations based on past lessons learned finds no support in these estimates. There were only five years, 1961-95, in which both the β_1 and β_2 point estimates were positive in cross-section. Three of the five came in the 1990s, in emergency, program, and pooled PL 480 samples alike. So the claim that PL480 distribution meets distributional and stabilization goals more effectively today than in the (Cold War) past finds no support in these data.

The macro data used in this analysis cannot capture prospective changes in the efficacy of intranational food distribution systems in reaching food insecure subpopulations. So although these

[7] In estimating the country-specific time series, the regression residuals were subjected to diagnostic portmanteau statistics for autocorrelation. In those (relatively few) instances where autocorrelation was evident, appropriate correction was made using Box-Jenkins techniques.

[8] A table presenting these results is available from the author by request.

regression results suggest food aid is ineffective in stabilizing food availability at the macro level, and indeed may be more likely to modestly *destabilize* food availability in recipient countries, it is possible that food aid targeting within recipient economies is nonetheless much more successful in stabilizing food availability for particular food-insecure communities or individuals. There is certainly much anecdotal evidence of emergency food aid distributions proving helpful in averting humanitarian disasters on short notice (Barrett forthcoming; Shaw and Clay 1993). And there has been notable progress in the modalities of emergency food aid delivery, although this seems more true for World Food Programme distributions than PL480 flows (Barrett 1998, forthcoming; Clay et al. 1996). Nonetheless, emergency food aid deliveries are often mistimed, misallocated, or both, sometimes doing more harm than good (Jackson with Eade 1992; Stewart 1998). And the only study of which I am aware that studies community- and household-level food aid targeting using micro-level data finds that food aid flows disproportionately to the most food secure regions and households in Ethiopia (Clay et al. 1998).[9] Given the uneven project-level performance of Title II PL480, the evidence presented here puts the burden of proof on those who would claim that PL 480 food aid is effectively enough targeted to overcome its insignificant macro-level effects in stabilizing recipient food availability.

Conclusions

Improving food security and nutritional outcomes around the world will require dampening the extraordinary variability in per capita food availability in low-income economies. Improved food

[9] Note that cross-sectional studies like Clay et al. (1998) test only what I term the "progressivity" of food aid distribution. No one appears to have yet studied the dynamic "stabilization" effects at the micro level.

productivity and commercial international trade appear far more useful than PL 480 food aid in achieving that objective. The small volumes, opaque allocation mechanisms, and bureaucratically cumbersome procurement procedures behind PL 480 have made food aid a relatively ineffective response mechanism to instability or insufficiency in macro-level food availability. While there are surely particular emergencies in which food aid can play an effective role in stabilizing and improving food availability (Shaw and Clay 1993, Ruttan 1995, Stewart 1998), commercial trade and more rapid domestic food productivity growth both appear more effective in stabilizing developing country food availability in the regular course of development. Perhaps if food aid were targeted entirely toward relieving food insecurity it could be a more effective instrument. But food aid has long been intensely political, serving many masters. So long as that remains the case, food aid is unlikely to stabilize per capita food availability effectively.

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Table 1: Shares of Aggregate Cereals Availability
PL 480 Recipients, 1961-95

	Own Production	Commercial Imports	PL 480
Mean	0.693	0.286	0.021
Median	0.803	0.176	0.002
Std. Deviation	0.294	0.286	0.047
Maximum	1.000	1.000	0.644
Minimum	0	0	0

Table 2: Tobit Regression Results, All PL 480 (Titles I, II, and III)

	All 124 Countries	*South Asia*	*Sub-Saharan Africa*	*Geopolitically Motivated*
β_1 (stabilization effect)	0.001 (0.004)	0.038 (0.012)	0.001 (0.002)	-0.008 (0.010)
β_2 (distributional effect)	-0.029 (0.010)	-0.029 (0.037)	0.014 (0.012)	-0.008 (0.029)
ln(L)	-553.0	-231.6	-319.6	-188.0
n	3838	210	1453	880

Standard errors in parentheses.

Tobit regressions including regional dummy variables to control for fixed effects. Regions included are Central Africa, Central America, East Africa, East Asia, Europe, Middle East, North Africa, North America, South America, South Asia, Southeast Asia, Southern Africa, former USSR, West Africa, West Asia, and former Yugoslavia. South America is the base for the global model, West Africa is the base for the Sub-Saharan Africa model, and Europe is the base for the geopolitically motivated model. No fixed effects were found in the South Asia model.

South Asia: Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka.

Sub-Saharan Africa: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Canary Islands, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Sao Tome Principe, Senegal, Seychelles, Sierra Leone, Somalia, Sudan, Swaziland, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe.

Geopolitically Motivated: Afghanistan, Belarus, Bosnia, Cyprus, Dominican Republic, Egypt, El Salvador, Ethiopia, Gaza Strip, Haiti, Honduras, Iran, Iraq, Israel, Jordan, Korea, Laos, Lebanon, Nicaragua, Philippines, Poland, Russia, Somalia, Sudan, Syria, Taiwan, Ukraine, Vietnam, Zaire.

Table 3: Tobit Regression Results, Emergency (Title II) PL 480

	All 124 Countries	*South Asia*	*Sub-Saharan Africa*	*Geopolitically Motivated*
β_1 (stabilization effect)	0.001 (0.001)	0.002 (0.002)	0.001 (0.001)	-0.00003 (0.001)
β_2 (distributional effect)	-0.006 (0.001)	-0.008 (0.007)	0.005 (0.004)	-0.009 (0.004)
ln(L)	-2299.2	-385.4	-619.4	-823.7
n	3838	210	1453	880

Standard errors in parentheses. Same notes apply as on Table 2.

Table 4: Tobit Regression Results, Program (Titles I and III) PL 480

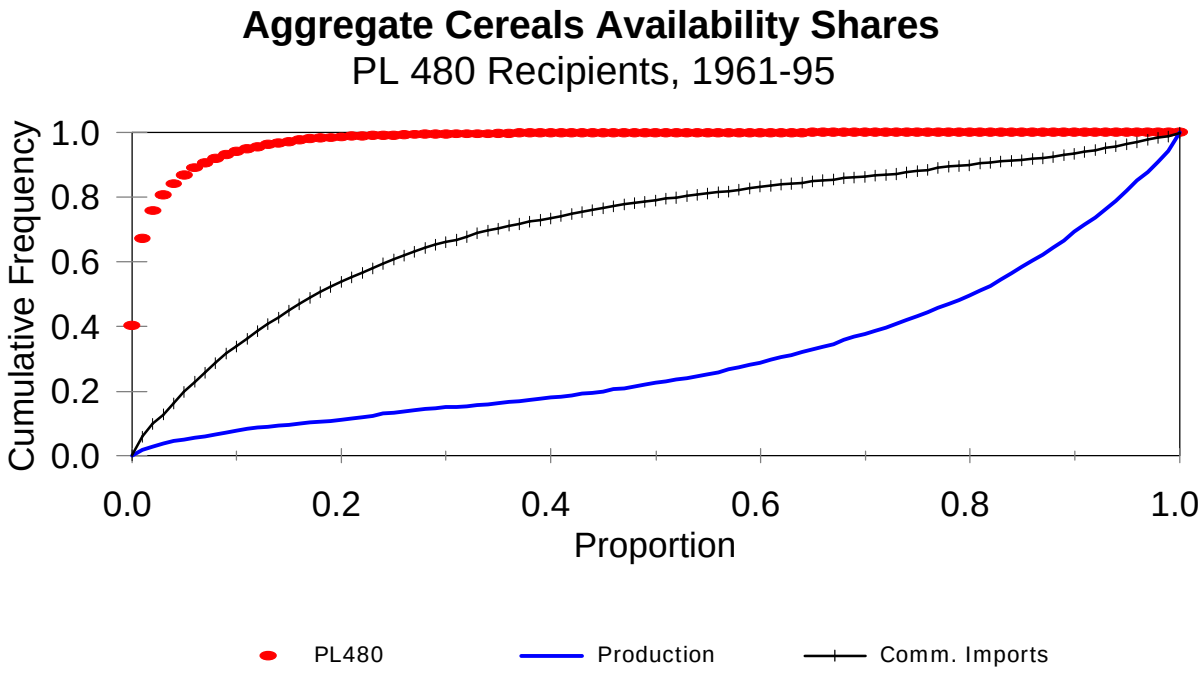
	All 124 Countries	*South Asia*	*Sub-Saharan Africa*	*Geopolitically Motivated*
β_1 (stabilization effect)	0.0004 (0.004)	0.037 (0.011)	0.001 (0.002)	-0.008 (0.009)
β_2 (distributional effect)	-0.025 (0.009)	-0.023 (0.035)	0.009 (0.009)	-0.003 (0.027)
ln(L)	-623.8	-240.9	-374.7	-206.3
n	3838	210	1453	880

Standard errors in parentheses. Same notes apply as on Table 2.

Table 5: Descriptive Statistics of Country-Specific Tobit Regression Results

	All PL 480	Title II only	Titles I and III only
Stabilization effects: $\beta_1 > 0$ (%)	67.7	67.6	71.8
Reject H_0: $\beta_1 = 0$ (%)	26.6	28.8	43.5
o/w $\beta_1 < 0$ (%)	6.4	8.9	9.9
10^{th} percentile β_1	-0.084	-0.002	-0.074
Median β_1	0.014	0.004	0.008
90^{th} percentile β_1	0.152	0.055	0.345
Distributional effects: $\beta_2 > 0$ (%)	36.3	30.6	56.4
Reject H_0: $\beta_2 = 0$ (%)	17.7	17.1	34.6
o/w $\beta_2 < 0$ (%)	11.3	11.7	24.3
10^{th} percentile β_2	-0.091	-0.034	-0.187
Median β_2	-0.008	-0.003	-0.012
90^{th} percentile β_2	0.074	0.017	0.088
n	124	111	78

Figure 1


Aggregate Cereals Availability Shares
PL 480 Recipients, 1961-95
Cumulative Frequency
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Proportion
PL480
Production
Comm. Imports