

FOOD AID FLOWS AND DISTANCE

Bruno Larue

Centre de Recherche en économie de l'Environnement, de l'Agroalimentaire,
des Transports et de l'Énergie (CREATE)
Université Laval

Érick Duchesne

Institut Québécois des Hautes Études Internationales (IQHEI) and CREATE
Université Laval

Pierre-Alexandre Laberge

IQHEI
Université Laval

Francis Langlois

Montréal International

Abstract

Food aid is often viewed as a donation of food to starving people gathered in refugee camps during a famine, but it also includes international food sales on concessional terms. In this respect, it resembles international trade. It has also been argued that food aid can be used as a tool to strengthen bilateral trade relationships. Accordingly, the specification and estimation of food aid models could borrow from recent advances in trade flow modeling. This paper uses different model specifications to evaluate separate impacts of political donor interests, economic donor interests, recipient needs and good governance. In doing so, it disaggregates the data according to delivery modes. The results show that a mix of altruistic motives, economic and political interests, under different specifications, is responsible for the allocation of international food aid.

FOOD AID FLOWS AND DISTANCE

1- Introduction

The number of malnourished individuals has been trending down slowly during the last 20 years, but the 2008 peak in primary commodity prices showed that there could be significant variations around the trend (FAO, 2015). Feeding the world remains a formidable challenge and given the magnitude of the problem, there have been much concern about how food aid donors and food assistance providers allocate their resources. It has been shown that food aid flows are influenced by humanitarian considerations (e.g., Kuhlitz and Abdulai, 2012), but that political and economic factors can be even more important (e.g., Ball and Johnson, 1996). As early as McKinlay and Little (1977), determinants of aid programs were classified in terms of donor interests and recipient needs. At about the same time, Wallenstein (1976) claimed that food aid was a political weapon used to advance diplomacy and strengthen international relations, with donors competing for influence using food aid as lobbying contributions.¹ It was also long recognized that food aid was a mean to dispose of grain surpluses spurred by agricultural production and export subsidies in donor countries and that food aid could be a tool to boost bilateral trade. It is also legitimate for donors to be concerned about the effectiveness of their contributions. In-kind contributions can depress local markets and discourage investment in local food production capacity (Kirwan and Maxwell, 2007). Food aid can also be diverted and hence end up beyond the reach of targeted populations. This is particularly likely

¹ Bottlenecks occur in aid delivery under emergency conditions and every donor wants its aid to be delivered first. Not surprisingly, the French government voiced its annoyance when the United States took control of the Port-au-Prince airport and delayed the arrival of French aid in the wake of the 2010 earthquake in Haiti (The Telegraph, 2010).

when there are conflicts and it has been shown that food aid flows extend civil conflicts (Nunn and Qian, 2014). Thus, donors must take into consideration factors such as governance and political and economic risks in recipient countries, as advocated by Boone (1996) for foreign aid. Other factors can also come into play. Nunn and Qian (2015) have shown that former colonial ties influence food aid flows from European countries. In this paper, we focus on the role of distance while accounting for other key determinants.

We hypothesize that distance matter in several ways. First, the needs of nearby countries are more likely to illicit public sympathy than the needs of distant ones in part because countries that are close to one another are likely to share a language, a culture and workers. Neumayer (2005) contends that donors use food aid to exert greater regional influence. Geographical proximity, like former colonial ties, can possibly create a hierarchy among recipient countries that would otherwise be equally deserving of food aid. Food aid can be given or sold at a discount², but transport costs must often be paid by the recipient country with the additional constraint that the shipping firm be based in the donor country. In such cases, the main beneficiaries of food aid are industries located in donor countries (Barrett and Maxwell, 2005). Shipping accounts for a sizeable portion of food aid costs and transfers to domestic shippers are significant. Park and Koo (2004) show that shipping rates are increasing with distance. However, they also show that shipping rates vary across routes and across food

² For example, Title I of the US food aid program is essentially about aid in the form of subsidized loans. Cardwell, Fridfinnson and Rude (2007) discuss WTO export subsidy constraints (or lack of) on food aid provided as concessional loans.

commodities. As a result, it is how on average distance impacts on the profits made by firms shipping food aid.³

Distance might also influence food aid flows to the extent that donors' behavior is motivated by market development and international trade. The literature on trade flows and gravity modeling shows that trade falls very rapidly with distance. With advances in transport logistics and equipment since the "container revolution" in the 1950s, it is clear that the adverse effect of distance on trade goes far beyond what could be attributed to transportation costs and constitutes a puzzle (Disdier and Head, 2008).⁴ Huang (2007) argues that distance creates unfamiliarity effects amongst uncertainty-averse agents that severely limit exports to distant destinations. Networks develop more easily when traders based in different countries share a language, have similar institutions and values. All else equal, potential recipients that are located to donors should receive more food aid if the trade potential of recipients are taken into account in the allocation of food aid. On the other hand, the increasing popularity of triangular and local purchases⁵ to expedite food aid flows in emergency situation should lessen the incidence of distance on food aid allocation.

³ When demand for shipping services is high, shipping firms might prefer shorter aid shipments to do more shipments of aid and non-aid goods particularly when shorter hauls have higher probabilities of backhaul than hauls to distant countries.

⁴ Carrère et al. (2013) revisit the distance puzzle by applying improvements in the measurement of distance, model specification and estimation to characterize the evolution of trade elasticity to distance over time. The puzzle remains for trade involving low income countries, but it is less obvious when trade flows are specific to high income countries.

⁵ Changes in farm policy in industrialized countries and the realization that cash, vouchers and local and regional procurement (LRP) programs offered several advantages has contributed to the rapid decline in in-kind food aid volume from 15.5 million ton in 1999 to 5.5 million ton in 2010 (Lentz et al. 2013). LRP, cash and vouchers may stimulate investment in regional food production capacity. In 2008, Canada opened 100 percent of its food assistance budget to international procurement to support the purchase of food in developing countries. The

Since there are three delivery modes through which food aid can flow from donors to recipients, we will analyze the incidence of distance on food flows by delivery mode. Direct transfers of food assistance correspond to aid sent directly from the donor to the recipient. The proportion of food aid allocated through this delivery mode has progressively decreased from 91% in 1988 to 63% in 2012.⁶ Direct transfers are often viewed as tied aid, meant to help populations in need and national stakeholders (Clay, 2006). A triangular or regional purchase is «transaction by which a donor provides commodities purchased in a third country as food aid to a final recipient country» (WFP, 2009). This delivery mode increases food trade between developing countries (Cathie, 1997). Finally, local purchases are « transactions by which food aid is purchased and distributed in the recipient country» (WFP, 2009). Obviously, this mode can only be considered when there is more than enough food in some parts of the recipient country and when the country's infrastructure can sustain the safe and rapid transport of food within the country. The evidence reported in Lentz, Passareli and Barrett (2013) confirm that local and regional purchases save time and reduce costs significantly. While direct transfers have been shown to depress local food prices, it was feared that local purchases could cause significant domestic price increases, but Garg et al. (2013) found a minimal impact.

Our empirical model measures the effect of distance on food aid flows by taking into account recipients' needs and governance shortcomings, political alignment between donors and recipients, grain production in recipient and donor countries, and capacity to give in donor

policy switch for the European Union occurred in 2010 and in just a few years, the United States went from doing no LRP to be "the world's largest LRP donor" (Lentz et al. 2013, p.2).

⁶ These statistics were computed from data downloaded from the food aid information system of the World Food Programme (WFP) <http://www.wfp.org/fais/quantity-reporting>.

countries and capacity to buy food in recipient countries, proxied by per capita GDP and population of donors and recipients . We tackle zero aid flows and heteroscedasticity by using a negative binomial random effect estimator, which can be considered as a natural panel extension of Santos and Silva's (2006) popular PPML estimator. We find that...

The remainder of this paper is organized as follows. The next section discusses the theoretical foundation of our empirical model, estimation issues as well as the data. Section 4 presents our estimation results regarding the determinants of food aid flows by delivery mode while the last section dwells on the policy implications of our results.

2- The model, estimation issues and the data

Food aid recipients do not generally receive aid from all possible donors nor do they get aid forever. As such food aid flows are characterized by many "zeros", just like trade flows and some of the advances made in the specification and estimation of gravity models since the seminal paper of McCallum (1995) can be put to use to analyze food aid flows. Along with distance, gravity models typically include the GDPs of the exporting and importing countries because larger countries, all else equal, typically trade more with one another (Krugman, 1979). Recently, Fieler (2013) relaxed the assumption of homothetic preferences and hence allowed per capita income and population to affect trade differently. Intuitively, the size of the donor country should impact food aid at the extensive and at the intensive margins and the same can be said for the size of the needs of the recipient country. However, the size effects generated by population and per capita income may not be identical. Therefore, per capita income and population variables for donors and recipients are included separately in our specification.

The influence of grain surplus in donor countries on food aid flows was grounded in the design of food aid programs in many countries where it was stipulated that food aid had to be sourced domestically. Not surprisingly, there is very strong and consistent empirical support regarding the grain surplus disposal hypothesis (e.g., Eggleston, 1987; Shapouri and Missiaen, 1990; Ball and Johnson, 1996; Barrett, 1998; Webb, 2000;). The domestic sourcing requirement of US food aid was recently exploited by Nunn and Qian (2014) who use lagged wheat production in the United States as an instrument to correct for a bias due to reverse causality in measuring the incidence of US food aid on the incidence and duration of civil conflicts in recipient countries. Because the United States is the largest donor and that other traditional donors are also large suppliers of in-kind aid, grain production in donor countries is included as a determinant. Grain production in the recipient country is also included. A larger production reduces the recipient's need as regions can trade with one another. This could be seen as a direct effect. However, if people in the food-deficient region lack cash to buy from regions enjoying food surpluses, then a larger production makes local purchase food aid more appealing from the donor's perspective. Needs in recipient countries are also measured by average caloric intake. Following McKinlay and Little's (1977) classification, good governance in recipient countries completes the specification of our model of food aid flows by delivery mode.⁷

Our data set features potential food aid flows between 18 donor countries and 141 recipient countries. The donors include: Australia, Canada, China, Denmark, the European Community⁸, France, Germany, Italy, Japan, the Netherlands, Norway, Sweden, the United

⁷ Zahariadis et al (2000) is a rare study that jointly evaluated the impact of these categories of determinants.

⁸ We consider the separate impact of EC programs and those of their member countries.

Kingdom and the United States.⁹ The recipients are countries that received food aid during the period covered by our sample and are included in the Food Aid Convention as potential recipients. Our dependent variable is the amount of food aid sent by a donor country i and received by the recipient country j calculated in thousand-ton grain equivalents.¹⁰ The data was obtained from the FAIS program of the *World Food Programme*. Food aid flows are available over the 1988-2012 period. Unfortunately, the country and period coverage for some of the other variables is not as extensive.

As previously mentioned, “Ins and outs” are observed, some recipients do not get any aid from some donors and zero food aid flows are common and must be dealt with. The ubiquity of zeros and the frequent occurrence of heteroscedasticity in trade data have made the estimation of the standard log-log gravity equation problematic. Santos Silva and Tenreyro (2006) have proposed a “natural fix” by advocating the estimation of the gravity model with a dependent variable in level and the Poisson Pseudo-Maximum Likelihood (PPML) estimator. Since then, many authors like Burger et al. (2009) and Winchester et al. (2012) have used generalizations of the Poisson estimator (i.e., negative binomial and zero-inflated negative binomial models with random effects) to estimate gravity models on panel data. Early studies of food aid flows mostly relied on Ordinary Least Squares (OLS) (e.g., Ball and Johnson, 1996) and Tobit regressions (e.g., Eggleston, 1987; Nunnenkamp and Thiele, 2006). As illustrated by Deaton (1997, 85-89), the Tobit estimator which is a popular instrument to deal with “zeros”

⁹ Russia and the Republic of Korea were not included because the only recipients of their aid contributions were, respectively, the Ukraine and the Democratic People’s Republic of Korea.

¹⁰ More than half of the value of US food aid in 1999-2000 was actually transportation costs according to Barrett and Maxwell (2005). Because shipping is mainly conducted by domestic firms, this portion can be regarded as a domestic transfer. This is why quantity is regarded as a better measure in many food aid studies.

may not perform better than OLS in the presence of heteroskedasticity and non-normal errors. Santos Silva and Tenreyro (2006) provide additional Monte Carlo simulations results that favor Poisson-like estimators to analyze heteroskedastic trade flows.¹¹

The originality of our analysis stems from performing separate estimations for each mode of distribution for food aid and for different time periods. By allowing for determinants to have different impacts depending on the mode of distribution of food aid, we hope to develop a better understanding of how distance, needs, and other economic and political factors impact on food aid flows. The purpose behind estimations over different time periods is to gauge how donor behavior has changed over time.

For a given distributional mode, our model is specified as follows:

$$Y_{ij} = \exp(\beta' X_{ij}) + e_{ij}$$

where Y_{ij} is the volume of aid sent by donor country i to recipient country j , X_{ij} are explanatory variables and e_{ij} is an error term. We allow for random effects to address the panel nature of our data. The interpretation of the coefficients is straightforward: when the explanatory variables are continuous and in levels, the coefficients are quasi-elasticities ($\beta_k = \frac{\partial y}{\partial x_{ijk}} \frac{1}{y}$), while when the explanatory variables are continuous but expressed in logs, the coefficients are

¹¹ Gouriéroux et al. (1984) show that a Poisson regression is efficient even when the data does not follow a Poisson distribution.

elasticities ($\beta_l = \frac{\partial y}{\partial x_{ijl}} \frac{x_{ijl}}{y}$). As for the coefficients of binary explanatory variables, their marginal effect can be calculated by the finite-difference method to approximate a derivative.

The gravity model predicts the volume of trade decreases rapidly with distance and it follows that distance would have a negative effect on food aid flows if donors are influenced by trade considerations. Similarly, bonds between two people are likely to be weaker when countries are separated by great distances, but other factors like common languages or colonial links might mitigate this effect, hence the need to include enough control variables in the model specification. In the event of a food crisis in a given recipient country, donors that are nearby are expected to be more responsive than far away countries. Even in the absence of religious, racial or cultural ties, a nearby donor may still be more generous simply to avoid the migration of a hungry foreign population. However, to the extent that local and triangular purchases are made to speed up food deliveries in emergency situations, one would expect distance to have a positive coefficient or at least one that is less negative than for direct transfers. Thus, our prior is that the sign and/or the magnitude of the distance coefficient should vary across distribution modes. Our measure of distance is the log of the harmonic distance (*dist*) between the donor and the recipient for each dyad¹². For the European Community, we use Belgium as point of origin.

Following in the tradition of Eggleston (1987), Ball and Johnson (1996), Zahariadis et al. (2000), Diven (2001), Neumayer (2005) and Fariss (2007), it is hypothesized that food aid flows

¹² Harmonic distance accounts for the geographic distribution of population within each country. For more details see Head and Mayer (2002).

are conditioned, at least in part, by the needs of recipient countries.¹³ Donors are likely to be motivated by altruism and by the recognition that food aid can help achieve greater international prosperity and security (Keohane and Nye, 1977). Whether decision makers are themselves altruistic or not is irrelevant as long as noble sentiments shape public opinion and that the latter influences government decisions (Moravcsik, 1997).

The needs of recipient countries are assumed to be growing with the population of the recipient country (*lpop_rec*) and to be decreasing in the log of the average level of calories consumed (*lcalor*)¹⁴ and per capita income (*lgdpcap_rec*).¹⁵ It has been conjectured that food aid allocated to large recipient countries may have a more significant political impact in donor countries (Fariss, 2007) and if true, this would only strengthen the positive effect of the recipient country's population on food aid flows. A low level of average food intake is a sure sign of need, but food shortages can be regionalized because conflicts. To account for this, we use a binary variable (*conflict*) that takes a value of one whenever there is a conflict in a recipient country. Our measure was computed from the UCDP/PRIO armed conflict dataset.

A country's food security is conditioned by its ability to source foods from domestic and international suppliers. Accordingly, we introduce the log of the recipient country's cereal production (*lprod_rec*) and the recipient country's average agricultural tariff (*tariff_rec*) into our

¹³ This paper does not attempt to determine if donors are efficient in responding to recipients' needs. For studies on this topic, see Young and Abbott (2008), Barrett (2001) and Barrett and Heisey (2002). In particular, Young and Abbott (2008) find that donors were more efficient in the second half of the 1990s.

¹⁴ The average caloric intake is expressed in Kcal/per capita/per day in recipient countries. Other food aid studies such as Hermann et al. (1992), Neumayer (2005) and Young and Abbott (2008) have used this indicator because it represents quite accurately food aid needs at a macro level.

¹⁵ Other studies like Shapouri and Missiaen (1990), Hermann et al. (1992), Ball and Johnson (1996) and Neumayer (2005) used GDP and implicitly assumed that per capita GDP and population have identical effects.

model specification. All else equal, a recipient country with a larger cereal production should have a lesser need for food aid. Thus, we anticipate a negative effect for this variable. It is well-known that the optimal tariff for a small open economy is zero in the absence of externalities or market failures (Larue and Gervais, 2002). However, when a country must rely on trade taxes to fund public services, possibly because it cannot implement other types of taxes, the optimal tariff is obviously positive, but it should not be set so high as to eliminate imports (Choi and Lapan, 1991). Countries that discourage imports are more vulnerable to weather shocks. As a result, recipient countries with high agricultural tariffs are more likely to need food aid. On the other hand, high agricultural tariffs can signal incompetent governance which can be a turn off for donors.

Trade is relatively more important for small countries than it is for large ones. This is why so-called border effects are larger for small countries than for large ones. The degree of openness to trade reflects a country's integration in the world economy and its ability to secure gains from trade. All else equal, a higher degree of openness should translate into a higher capacity to feed one's population and hence be less dependent on food aid. On the other hand, a high openness can be regarded by donors as a sign of good governance which suggests that the aid would be delivered efficiently and that the recipient could perhaps become a valuable trade partner. The sign on the coefficient of *lopenness* is a priori ambiguous. Donors' interest in governance is also measured through *polity* which varies between -10 and 10 in measuring the strength of democracy in a recipient country.

The supply of food aid is conditioned by the capacity of donor countries to give and potentially by their economic and political interests. Some studies found that economic

interests are less important than political and military interests in explaining the pattern of food aid (e.g., Ball and Johnson, 1996; Zahariadis et al, 2000). Neumayer (2005) found no role for economic interests, but whether economic interests have become less or more important over time is still a contentious issue (Barrett and Maxwell, 2005). Many donors are net exporters of cereals and their food aid policies made it plain that food aid distribution need not be orthogonal to their economic interests (Cathie, 1997). We test for the influence of economic interests with the log value of trade between pairs of donor and recipient countries.

All else equal, donors with larger population and per capita income are expected to have larger food aid programs, especially when local and triangular purchases are concerned. The capacity of a donor to provide direct transfers can be measured by its production of cereals. Having a large supply of cereals may potentially induce a shift away from local and triangular purchases to favor direct transfers.

Many studies have focused on a donor's political interests to explain its pattern of food aid allocation. Early studies covering the Cold War era tested hypotheses about military ties between donors and the recipients (Eggleston, 1987; Ball and Johnson, 1996; Zahariadis et al, 2000), but post-Cold War investigations emphasized the role of political affinities and cultural similarities between donors and recipients (Neumayer, 2005). We use the Index of United Nations Voting Similarity (*agree2un*) to ascertain whether political affinities have an incidence on food aid flows. This variable, measures the similarity of voting records of pairs of donors and recipients in the United Nations General Assembly. For cultural similarities, we use common language and religion which typically enter the specification of gravity models. The former is a binary variable that equals one when two countries share the same official language while the

latter is an index varying between 0 and 1 that measures the extent by which the relative importance of different religions in the donor countries is similar to that in recipient countries.

Table 1 displays descriptive statistics about the explanatory variables used in this study. The heterogeneity of recipient countries comes across at a glance of the minima and maxima of variables that are specific to recipient countries. For example, the average agricultural tariff varies from 0% to 91%. One can also see the ubiquity of zeros in trade data as some pairs of donors and recipients do not trade at all. Because the number of countries and years vary across data sources, the number of observations varies across variables.

3- Results

Our results are presented in Tables 2-5. We relied on a negative binomial model with random effects to estimate our model of food aid flows to address the zero aid flows, the heteroscedasticity notoriously present in data about flows between country-pairs and the panel structure of our data. Table 2 features a more parsimonious specification to explain local purchases, triangular purchases, direct transfers and total food aid over the full period (1988-2012). Table 3 present results based from a specification with additional controls. The purpose is to gauge the robustness of estimates on key variables like distance, caloric intake, trade between donors and recipients as well as political affinity.

From table 2, we can see that the effect of distance varies across distribution modes as per our priors. Distance is negative in all cases, but the coefficient is much smaller in absolute value for triangular and local purchases than for direct transfers or total aid. For triangular purchases, the coefficient is statistically significant at a level slightly above the standard 0.05.

Recipients that are far away from donors get less food aid than recipients that are geographically closer, all else equal. Intuitively, local and triangular purchases are meant to counter delays in food deliveries over long distances and this should tend to increase the distance coefficients for local and triangular purchases relative to the distance coefficient for direct transfers. The fact that the distance coefficients for local and triangular purchases are negative simply reflect Huang's (2007) notion of unfamiliarity that grows with distance.

As expected, the coefficients for average caloric intake are negative. This confirms that donors are responsive to the needs of recipient countries, but the relative magnitudes of the coefficients tell us that needs are less important when food aid is distributed through direct transfers. Recipient countries that produce more cereals tend to have less food aid distributed through direct transfers and triangular purchases. The needs of the population for food aid are diminished when the country can achieve a higher level of self-sufficiency. This could be likened to a gross supply effect. However, there has to be cereal production in some parts of a country if local purchases are to be made. The capacity to source locally food aid is positively correlated with domestic production and this distribution effect offsets the gross supply effect. This is why the production of cereals does not significantly impact local purchases.

Production of cereals in donor countries has a significantly positive influence on the volume of direct transfers. It was hypothesized that it could also induce a substitution effect across distribution modes, as donor countries with larger domestic production of cereals are likely to favor direct transfers at the expense of local and triangular purchases. A 1% increase in cereal production in donor countries induces an increase of 0.43% in direct transfers and reductions in local and triangular purchases of 0.11% and 0.32% respectively.

Recipient countries with higher gdp per capita receive significantly less food aid. Not surprisingly, the elasticity is larger for local purchases of food aid. An increase in per capita income in donor countries increase the capacity to pay for food aid and this is particularly noticeable for local and triangular purchases. As expected, recipient countries with a larger population tend to get more food aid and donor countries with a larger population tend to give more. The relative importance of trade in the economy of recipient countries has a negative coefficient and is statistically significant for local purchases and direct transfers. Countries that are less integrated into the world economy are less likely to be able to purchase the food they need. Recipient countries with high agricultural tariffs tend to receive less food aid in the form of local purchases, but more in the form of direct transfers. Protectionist donors tend to provide more in direct transfers and less in triangular purchases.

The level of trade between donors and recipients matters mainly in terms of how food aid is distributed, not so much on the amount. It has a positive effect on the volume of local and triangular purchases, but a negative effect on direct transfers. Conflicts exacerbate needs in recipient countries, but make local purchases more difficult. Thus, it is not surprising to have positive and significant coefficients for all types of food aid distribution except local purchases. Political affinity, as measured by similarities in voting at the United Nations, has a positive influence on the volume of food aid locally purchased or obtained through triangular purchases, but a negative effect on direct transfers. Polity increases local purchases at the expense of triangular purchases but it has no significant effect on triangular purchases.

The results in table 3 are qualitatively similar to the ones reported in Table 2, but the addition of controls like religion, colony and common language impact on the magnitude of the

elasticities or quasi-elasticities. The distance elasticities tend to be smaller in magnitude, but negative effects of distance remain. Tables 4 and 5 present results based on early and late subsamples. They show that the incidence of distance has changed over time. The elasticities for local purchases and direct transfers are negative for both the 1988-1998 and 2002-2012 subperiods but they are not statistically significant in the latter subperiod.

5- Conclusion

International assistance is an important aspect of North-South relations. Within the context of primary food price increases, it becomes increasingly important to gain a better understanding of the concept of food security in general, and the relationship it holds with international food aid, in particular. Several aspects of international assistance have been investigated, but we believe that our analysis fills a void in the food aid literature. We did not try to understand what motivates the absolute level of food aid or the strategic decision to use a delivery mode rather than another, but we turned our attention to the motives sustaining food aid allocation patterns. We find that food aid distribution is a complex phenomenon that is dependent on geographic and demographic imperatives, donors' political and economic motives, and recipients' needs and respects for political and civil rights. We also innovated by breaking down food aid data according to their delivery modes. By doing so, we believe that we provided a more accurate and nuanced view of "how food aid works." Finally, we take solace in the realization that classical explanations of total food aid largely hold, despite our use of a more sophisticated econometric analysis that accounts for the high occurrence of zeros and adjusts for heteroskedasticity in the data.

Obviously, this is not the last word on international food assistance. Future studies must pay greater attention to domestic factors influencing aid allocation. Furthermore, we assume that different motivations underlie Non-Governmental Organizations (NGOs) and private donors' decision to provide international aid. Some of our findings are probably invalid in regards to these non-state actors. Also, the relationship between good governance and aid distribution deserves further scrutiny. Finally, we believe that food aid data should also be broken down according to program types. The motives sustaining the allocation of food aid are probably different for program, project or emergency aid.

References

- Allison Jr, G. T., & Beschel Jr., R. P. (1992). Can the United States promote democracy? *Political Science Quarterly*, 107, 81-98.
- Ball, R., & Johnson, C. (1996). Political, economic, and humanitarian motivations for PL 480 food aid: Evidence from Africa. *Economic Development and Cultural Change*, 44(3), 515-537.
- Barbieri, K., Omar, M., Keshk, G., & Pollins, B. (2009). Trading data: Evaluating our assumptions and coding rules. *Conflict Management and Peace Science*, 26(5), 471-491.
- Barrett, C. B. (1998). Food aid: Is it development assistance, trade promotion, both, or neither? *American Journal of Agricultural Economics*, 80(3), 566-571.
- Barrett, C. B. (2001). Does food aid stabilize food availability? *Economic Development and Cultural Change*, 49(2), 335-349.
- Barrett, C. B., & Heisey, K. C. (2002). How effectively does multilateral food aid respond to fluctuating needs? *Food Policy*, 27(5-6), 477-491.
- Barrett, C. B., & Maxwell, D. G. (2005). *Food aid after fifty years, recasting its role*. London: Routledge.
- Boone, P. (1996). Politics and the effectiveness of foreign aid. *European Economic Review* 40(2), 289-329.
- Burger, M., Van Oort, F., & Linders, G. (2009). On the specification of the gravity model of trade: Zeros, excess zeros and zero-inflated estimation. *Spatial Economic Analysis*, 4(2), 167-190.
- Burnside, C., & Dollar, D. (2000). Aid, policies, and growth. *The American Economic Review*, 90(4), 847-868.
- Cameron, A. C., & Trivedi, P. K. (2009). *Microeconometrics using stata*. United States of America: Stata press.
- Cardwell, R., Fridfinnson, B., & Rude, J. (2007). *Food aid as surplus disposal? The WTO, export competition disciplines and the disposition of food aid*. Canadian Agricultural Trade Policy Research Network working paper.
- Carrère, C., de Melo, J. & Wilson, J. (2013). The distance puzzle and low-income countries : an update. *Journal of Economic Surveys*, 27(4), 717-742.
- Cathie, J. (1997). *European food aid policy*. England: Ashgate Publishing Limited.

- Choi, E.K. & Lapan, H.E. (1991). Optimal trade policies for a developing country under uncertainty, *Journal of Development Economics* 35, 243–60.
- CIDA. (2006). *Food aid-synthesis report*. Retrieved June 5, 2010, from <http://www.acdi-cida.gc.ca/acdi-cida/acdi-cida.nsf/eng/REN-218132135-PK4>
- Clad, J. C., & Stone, R. D. (1993). New mission for foreign aid. *Foreign Affairs*, 72, 196-205.
- Clay, E. J. (1985). *Review of food aid policy changes since 1978* No. Occasional Papers, No 1. World Food Programme.
- D’Souza, F. (1994). Democracy as a cure for famine. *Journal of Peace Research*, 31(4), 369-373.
- Deibel, T. L. (1992). Strategies before containment. *International Security*, 16, 79-108.
- Diamond, L. (1992). Promoting democracy. *Foreign Policy*, 87, 25-46.
- Disdier, A & Head, K. (2008). The puzzling persistence of the distance effect on bilateral trade. *The Review of Economics and Statistics*, 90(1), 37-48.
- Diven, P. J. (2001). The domestic determinants of US food aid policy. *Food Policy*, 26(5), 455-474.
- Diven, P. J. (2006). A coincidence of interests: The hyperpluralism of U.S. food aid policy. *Foreign Policy Analysis*, 2, 361-384.
- Eggleston, R. C. (1987). Determinants of the levels and distribution of PL 480 food aid: 1955-1979. *World Development*, 15(6), 797-808.
- Faostat. (2015). *FAO statistic*. Retrieved October 15, 2015, from <Http://faostat.fao.org/default.aspx>.
- Fariss, C. (2007). Human rights and the strategic use of US foreign food aid. (Master Thesis, University of North Texas, Department of Political Science).
- Food Aid Convention, (1999).
- France 24. (2010). *France foreign ministry denies objecting to the US handling of aid flights*. Retrieved November 10, 2010, from <http://www.france24.com/en/20100116-haiti-france-airlift-us-earthquake-joyandet>
- Freedom House. (2008). *Freedom in the world data*. Retrieved October 15, 2008, from <http://freedomhouse.org/template.cfm?page=15>
- Gaddis, J. L. (1992). *The United States and the end of the cold war*. New York: Oxford University Press.
- Garg, T., C.B. Barrett, M.I. Gomez, E.C. Lentz, W.J. Violette. 2013. Market Prices and Food Aid

Local and Regional Procurement and Distribution: A Multi-Country Analysis. *World Development*, 49, 19-29.

Gartzke, E. (2006). United Nations General Assembly voting, 1946-2002 version 3.0.

<http://www.Columbia.edu/~eg589/datasets>,

Gourieroux, C., Monfort, A., & Trognon, A. (1984). Pseudo maximum likelihoods methods: Applications to poisson models. *Econometrica*, 52, 701-720.

Head, K., & Mayer, T. (2002). Illusory border effects: Distance mismeasurement inflates estimates of home bias in trade. *Centre d'Études Prospectives Et d'Informations Internationales (CEPII), Working Paper No 2002-01*

Herrmann, R., Prinz, C., & Schenck, P. (1992). How food aid affects food trade and how food trade matters to the international allocation of food aid. *Journal of Economic Development*, 17(1), 71-98.

Heston, A., Summers, R., & Aten, B. (2006). Penn world table version 6.2. *Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania*,

Huang, R. R. (2007). Distance and trade: Disentangling unfamiliarity effects and transport cost effect. *European Economic Review*, 51, 161-181.

Jervis, R. (1991). The future of world politics. *International Security*, 16, 39-73.

Kegley, C. W. J. (1993). The neoidealist moment in international studies? realist myths and the new international realities: ISA presidential address march 27, 1993 acapulco, mexico. *International Studies Quarterly*, 37(2), 131-146.

Keohane, R. O., & Nye, J. S. (1977). *Power and interdependence, world politics in transition*. Boston: Little, Brown and Company.

King, G. (1988). Statistical models for political science event counts: Bias in conventional procedures and evidence for the potential Poisson regression model. *American Journal of Political Science*, 32, 838-863.

Kuhlgatz, C. & Abdulai, A. 2012. Food Aid and Malnutrition in Developing Countries: Evidence from Global Food Aid Allocation. *Journal of Development Studies*, 48(12), 1765-1783.

Lentz, E.C., Barrett, C.B. , Gómez, M.I. , & Maxwell D. G. (2013). On the choice and impacts of innovative international food assistance instruments. *World Development*, 49,1-8.

Larue, B. & Gervais, J.P. (2002). Welfare-maximizing and revenue-maximizing tariffs with a few domestic firms. *Canadian Journal of Economics*, 35,786-804.

- Lentz, E.C., S. Passarelli, C.B. Barrett. (2013). The Timeliness and Cost-Effectiveness of the Local and Regional Procurement of Food Aid. *World Development*, 49, 9-18.
- Luttrell, C. B. (1973). The Russian wheat deal – Hindsight vs. Foresight. *The Federal Reserve Bank of St. Louis*.
- McCallum, J. (1995). National borders matter: Canada-U.S. regional trade patterns. *The American Economic Review*, 85(3), 615-623.
- McKinlay, R. D., & Little, R. (1977). A foreign policy model of U.S. bilateral aid allocation. *World Politics*, 30(1), 58-86.
- Meernik, J., Krueger, E. L., & Poe, S. C. (1998). Testing models of U.S. foreign policy: Foreign aid during and after the cold war. *The Journal of Politics*, 60(1), 63-85.
- Moravcsik, A. (1997). Taking preference seriously: A liberal theory of international politics. *International Organization*, 51(4), 512-553.
- Neumayer, E. (2003). *The pattern of aid giving*. London: Routledge.
- Neumayer, E. (2005). Is the allocation of food aid free from donor interest bias? *The Journal of Development Studies*, 41(3), 394-411.
- Nunn, N. & Qian, N. (2014). US Food Aid and Civil Conflict. *American Economic Review*, 104(6), 1630-1666.
- Nunn, N. & Qian, N. (2015). The determinants of food aid provisions to Africa and the developing world in Edwards, S., Johnson, S., and Weil, D.N. *African Successes: Sustainable Growth, Volume 4*, Chicago: U. of Chicago Press.
- Nunnenkamp, P., & Thiele, R. (2006). Targeting aid to the needy and deserving: Nothing but promises? *The World Economy*, 143(4), 596-630.
- Organization for Economic Cooperation and Development. (2006). *The development effectiveness of food aid: Does tying matter?*. Belgium: OECD Publishing.
- Park, P.P. & Koo, W.W. (2004). An econometric analysis of ocean freight rates for grain shipments from the United States to major importing countries, *Journal of the Transportation Research Forum*, 43(2), 85-100.
- Santos Silva, J. M. C., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641-658.
- Sen, A. (1994). Liberty and poverty : Political rights and economics. *The New Republic*, 210(10), 31-37.
- Sen, A. (1999). Democracy as a universal value. *Journal of Democracy*, 10(3), 3-17.

- Shapouri, S., & Missiaen, M. (1990). *Food aid: Motivation and allocation criteria* U.S. Departement of Agriculture, Economic Research Service.
- The Telegraph. January 18, 2010. Haiti earthquake: France criticises US 'occupation'. <http://www.telegraph.co.uk/news/worldnews/centralamericaandthecaribbean/haiti/7020093/Haiti-earthquake-France-criticises-US-occupation.html> (consulted on October 23, 2015).
- Wallensteen, P. (1976). Scarce goods as political weapons: The case of food. *Journal of Peace Research*, 13(4), 277-298.
- Watkins, K. (2004). Northern agricultural policies and world poverty: Will the Doha "Development round" make a difference? In F. Bourguignon, P. Jacquet & B. Pleskovic (Eds.), *Economic integration and social responsibility* (Annual World Bank Conference on Development Economic Europe ed). Washington.
- Webb, P. (2000). Food aid in the 21 century: A new diet or the same old menu? Brussels.
- World Bank Institute. (2009). *Worldwide governance indicators*. Retrieved January 5, 2009, from <http://info.worldbank.org.proxy.binghamton.edu/governance/wgi/index.asp>
- World food programme*. Retrieved October/15, 2009, from <http://www.wfp.org/fais/>
- Young, L. M., & Abbott, P. C. (2008). Food aid donor allocation decisions after 1990. *Canadian Journal of Agricultural Economics*, 56(1), 27-50.
- Zahariadis, N., Travis, R., & Ward, J. B. (2000). US food aid to sub-saharan Africa: Politics or philanthropy? *Social Science Quarterly*, 81(2), 663-676.

Table 1. Summary of explanatory variables

Variable	Obs.	Mean	Std.Dev.	Min.	Max
Ldist	55227	8.817795	.6438373	5.934736	9.884789
Lcalor	57194	7.809002	.1767621	7.288791	8.236156
lprod_rec	62373	13.45781	3.345056	0	20.11309
lprod_don	63175	16.98954	1.701147	13.82553	20.11309
lgdpcap_rec	48093	7.146025	1.231472	4.143135	10.41181
lgdpcap_don	48247	10.04726	.9539197	5.818193	11.50849
lpop_rec	49171	15.66988	1.901437	10.59988	21.02389
lpop_don	48247	17.67845	1.564663	15.2506	21.02389
lopeness	58287	4.239399	.5776457	-1.175052	6.27615
ltrade_dyad	63178	4.625566	4.68915	0	20.17629
polity	54799	1.809832	6.466069	-10	10
tariff_rec	59499	18.20476	9.973059	0	91.23
tariff_don	63175	10.07074	8.85187	1.06	56.07
conflict	63178	.1910792	.3931544	0	1
agree2un	58821	.7951741	.1935026	0	1
religion	52425	.1604781	.1947743	.0000131	.9703795

Table 2: Food aid flows by distribution modes, 1988-2012 without controls for religious proximity, common official language and colonial links.

	Local_P	Triangular_P	Direct_T	Total
ldist	-0.1801 ^{***} (0.0471)	-0.0804 (0.0411)	-0.3544 ^{***} (0.0306)	-0.2000 ^{***} (0.0239)
lcalor	-1.0537 ^{***} (0.1821)	-1.5986 ^{***} (0.1554)	-0.8452 ^{***} (0.1265)	-1.0280 ^{***} (0.0995)
lprod_rec	-0.0317 (0.0216)	-0.1383 ^{***} (0.0140)	-0.0584 ^{***} (0.0112)	-0.0738 ^{***} (0.0089)
lprod_don	-0.1052 ^{***} (0.0218)	-0.3195 ^{***} (0.0198)	0.4276 ^{***} (0.0193)	-0.0049 (0.0131)
lgdpcap_rec	-0.6489 ^{***} (0.0325)	-0.5117 ^{***} (0.0297)	-0.3306 ^{***} (0.0240)	-0.5213 ^{***} (0.0181)
lgdpcap_don	1.0122 ^{***} (0.0667)	1.2725 ^{***} (0.0657)	0.6451 ^{***} (0.0468)	0.9799 ^{***} (0.0363)
lpop_rec	0.1784 ^{***} (0.0343)	0.2408 ^{***} (0.0276)	0.0979 ^{***} (0.0218)	0.1544 ^{***} (0.0165)
lpop_don	0.2396 ^{***} (0.0281)	0.5610 ^{***} (0.0256)	-0.1320 ^{***} (0.0228)	0.1924 ^{***} (0.0165)
lopeness	-0.0765 [*] (0.0376)	0.0472 (0.0414)	-0.1697 ^{***} (0.0329)	-0.0043 (0.0223)
ltrade_dyad	0.0677 ^{***} (0.0076)	0.0351 ^{***} (0.0072)	-0.1012 ^{***} (0.0063)	-0.0250 ^{***} (0.0045)
polity	0.0268 ^{***} (0.0034)	-0.0114 ^{***} (0.0031)	-0.0018 (0.0024)	0.0056 ^{**} (0.0019)
tariff_rec	-0.0162 ^{***} (0.0023)	-0.0017 (0.0021)	0.0116 ^{***} (0.0014)	0.0054 ^{***} (0.0012)
tariff_don	0.0006 (0.0075)	-0.0283 ^{***} (0.0075)	0.0602 ^{***} (0.0045)	0.0419 ^{***} (0.0038)
conflict	0.0548 (0.0430)	0.2261 ^{***} (0.0389)	0.1208 ^{***} (0.0335)	0.1577 ^{***} (0.0255)
agree2un	0.5137 ^{***} (0.1265)	0.9646 ^{***} (0.1178)	-1.3043 ^{***} (0.0789)	-0.7139 ^{***} (0.0657)
N	34984	34984	34984	34984
ll	-4.251e+04	-5.275e+04	-7.716e+04	-1.246e+05

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Food aid flows by distribution modes, 1988-2012.

	Local_P	Triangular_P	Direct_T	Total
ldist	-0.1388** (0.0527)	-0.0901 (0.0473)	-0.3769*** (0.0356)	-0.1854*** (0.0237)
lcalor	-0.9766*** (0.2185)	-1.6699*** (0.1817)	-0.7918*** (0.1498)	-1.6433*** (0.1111)
lprod_rec	0.0239 (0.0267)	-0.1434*** (0.0152)	-0.0550*** (0.0129)	-0.0613*** (0.0094)
lprod_don	-0.1639*** (0.0253)	-0.3405*** (0.0234)	0.3919*** (0.0220)	-0.0032 (0.0144)
lgdpcap_rec	-0.7318*** (0.0372)	-0.5433*** (0.0342)	-0.3519*** (0.0281)	-0.6352*** (0.0191)
lgdpcap_don	0.7693*** (0.0749)	1.1077*** (0.0738)	0.3227*** (0.0535)	0.8901*** (0.0388)
lpop_rec	0.1247** (0.0397)	0.2313*** (0.0304)	0.0689** (0.0245)	0.1208*** (0.0173)
lpop_don	0.1869*** (0.0333)	0.4968*** (0.0300)	-0.1984*** (0.0268)	0.1485*** (0.0183)
lopeness	-0.2834*** (0.0535)	-0.0053 (0.0475)	-0.2025*** (0.0391)	-0.2166*** (0.0278)
ltrade_dyad	0.1000*** (0.0085)	0.0487*** (0.0080)	-0.0822*** (0.0069)	0.0086 (0.0047)
polity	0.0222*** (0.0039)	-0.0062 (0.0036)	0.0064* (0.0028)	0.0117*** (0.0020)
tariff_rec	-0.0205*** (0.0027)	-0.0022 (0.0024)	0.0099*** (0.0016)	0.0063*** (0.0012)
tariff_don	-0.0157 (0.0084)	-0.0586*** (0.0084)	0.0363*** (0.0050)	0.0232*** (0.0041)
conflict	0.0680 (0.0472)	0.2446*** (0.0418)	0.1592*** (0.0365)	0.1955*** (0.0271)
agree2un	0.2044 (0.1471)	0.7322*** (0.1331)	-1.7853*** (0.1006)	-1.0628*** (0.0745)
religion	0.7835*** (0.1448)	-0.1121 (0.1344)	0.1037 (0.1055)	0.0222 (0.0758)
comlang_off	-0.1541 (0.0805)	-0.1757* (0.0775)	-0.1210* (0.0493)	-0.1153** (0.0401)
colony	-0.3628** (0.1118)	0.0258 (0.0984)	-0.8918*** (0.1015)	-0.5266*** (0.0628)
N	29208	29208	29208	29208
ll	-3.428e+04	-4.300e+04	-6.129e+04	-1.027e+05

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Food aid flows by distribution modes, 1988-1998.

	Local_P	Triangular_P	Direct_T	Total
ldist	-0.2633* (0.1080)	0.3652*** (0.0713)	-0.1531*** (0.0461)	-0.0207 (0.0345)
lcalor	-1.5301*** (0.4093)	-2.4848*** (0.2818)	-0.5024** (0.1880)	-1.3229*** (0.1509)
lprod_rec	-0.0369 (0.0424)	-0.0356 (0.0229)	-0.0178 (0.0169)	-0.0076 (0.0128)
lprod_don	-0.2978*** (0.0480)	-0.5080*** (0.0367)	0.4299*** (0.0268)	0.1285*** (0.0201)
lgdpcap_rec	-0.7735*** (0.0827)	-0.6535*** (0.0584)	-0.5853*** (0.0405)	-0.6787*** (0.0305)
lgdpcap_don	1.0574*** (0.1552)	1.4597*** (0.1444)	0.3469*** (0.0759)	0.8795*** (0.0674)
lpop_rec	0.2510** (0.0804)	-0.0529 (0.0517)	-0.2497*** (0.0371)	-0.1725*** (0.0281)
lpop_don	0.2307** (0.0747)	0.6603*** (0.0514)	-0.5727*** (0.0394)	-0.1484*** (0.0290)
lopeness	-0.0530 (0.0970)	-0.1285 (0.0692)	-0.1964*** (0.0491)	-0.2538*** (0.0382)
ltrade_dyad	0.0848* (0.0411)	0.1163*** (0.0292)	0.2214*** (0.0204)	0.1826*** (0.0157)
polity	0.0306*** (0.0065)	-0.0275*** (0.0054)	0.0004 (0.0033)	-0.0006 (0.0027)
tariff_rec	-0.0069 (0.0044)	0.0094** (0.0032)	0.0090*** (0.0019)	0.0125*** (0.0016)
tariff_don	0.0584*** (0.0132)	0.0217 (0.0125)	-0.0126* (0.0063)	0.0012 (0.0056)
conflict	-0.0056 (0.0887)	0.3861*** (0.0679)	0.1585*** (0.0449)	0.1975*** (0.0373)
agree2un	0.6259* (0.3074)	1.7840*** (0.2312)	-1.7398*** (0.1358)	-1.0492*** (0.1054)
religion	1.1958*** (0.2634)	0.1774 (0.2052)	-0.2979* (0.1366)	0.0018 (0.1041)
comlang_off	-0.1943 (0.1722)	-0.5630*** (0.1445)	-0.2551*** (0.0655)	-0.1038 (0.0568)
colony	0.1373 (0.2055)	0.3423* (0.1604)	-1.1257*** (0.1256)	-0.9013*** (0.0930)
N	12997	12997	12997	12997
ll	-1.079e+04	-1.455e+04	-3.795e+04	-5.099e+04

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Food aid flows by distribution modes, 2002-2012.

	Local_P	Triangular_P	Direct_T	Total
ldist	-0.0683 (0.0551)	-0.3146*** (0.0642)	-0.0340 (0.0874)	-0.2615*** (0.0503)
lcalor	-2.0504*** (0.2786)	-2.3549*** (0.2626)	-0.9647* (0.3824)	-1.7296*** (0.2080)
lprod_rec	0.1092** (0.0367)	-0.1430*** (0.0225)	-0.2037*** (0.0309)	-0.1177*** (0.0197)
lprod_don	-0.0809* (0.0334)	-0.2194*** (0.0346)	0.3447*** (0.0576)	-0.0690* (0.0272)
lgdpcap_rec	-0.7481*** (0.0422)	-0.5712*** (0.0454)	-0.7283*** (0.0628)	-0.6452*** (0.0346)
lgdpcap_don	0.7519*** (0.0917)	0.6775*** (0.0911)	1.0319*** (0.1441)	0.8757*** (0.0693)
lpop_rec	0.0781 (0.0503)	0.3042*** (0.0459)	0.4056*** (0.0584)	0.2929*** (0.0341)
lpop_don	0.1685*** (0.0411)	0.2845*** (0.0432)	0.2374*** (0.0599)	0.3025*** (0.0338)
lopeness	-0.6344*** (0.0711)	0.0086 (0.0776)	-0.0381 (0.0999)	-0.1120 (0.0585)
ltrade_dyad	0.0868*** (0.0095)	0.0310*** (0.0091)	-0.0959*** (0.0130)	-0.0123 (0.0068)
polity	0.0151** (0.0051)	-0.0054 (0.0058)	0.0413*** (0.0074)	0.0123** (0.0042)
tariff_rec	-0.0107** (0.0035)	0.0045 (0.0037)	-0.0125* (0.0053)	-0.0090** (0.0028)
tariff_don	-0.0169 (0.0129)	-0.0292* (0.0142)	0.0398 (0.0212)	0.0062 (0.0102)
conflict	0.1891** (0.0629)	0.2006** (0.0620)	0.2898*** (0.0829)	0.2080*** (0.0477)
agree2un	0.3842* (0.1903)	0.3851 (0.2018)	-1.8264*** (0.2529)	-1.2248*** (0.1424)
religion	0.2987 (0.1717)	-0.4271* (0.1877)	0.0920 (0.2590)	-0.2978* (0.1414)
comlang_off	-0.0466 (0.0898)	0.1060 (0.1027)	-0.2300* (0.1091)	-0.1842* (0.0738)
colony	-0.6769*** (0.1423)	-0.2407 (0.1367)	-0.8644** (0.3140)	-0.4349*** (0.1091)
N	12397	12397	12397	12397
ll	-1.886e+04	-2.285e+04	-1.518e+04	-3.897e+04

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$