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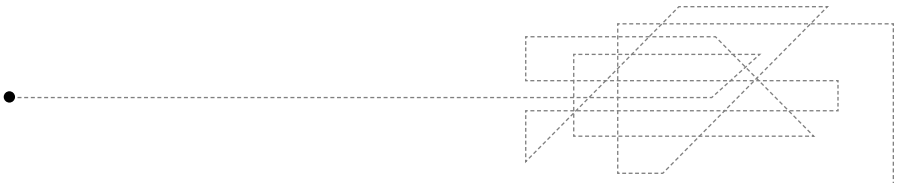
Source: *Transportation Journal*, Vol. 54, No. 2 (Spring 2015), pp. 159-185

Published by: Penn State University Press

Stable URL: https://www.jstor.org/stable/10.5325/transportationj.54.2.0159



Food Aid Procurement and Transportation Decision-making in Governmental Agencies: The United Nations/European Union versus the United States Approach

Koray Özpolat, Dina Ribbink, Douglas N. Hales, and Robert J. Windle

Abstract

This article conceptually and empirically examines sourcing of food aid, comparing the approaches promoted by the United States with those of the United Nations (UN) and the European Union (EU). In the recipient country approach (RCA) promoted by the United Nations and the European Union, transaction cost economics (TCE) suggests that RCA provides faster aid with fewer transaction costs. In the donor country approach (DCA) practiced by the United States, the resource-based view (RBV) suggests that the superior resources of a donor country assure a higher quality, safer, and plentiful food supply. Using a comparative case analysis with data provided by the United States Agency for International Development (USAID), we provide evidence that RCA and DCA as practiced in reality are both suboptimal. Improved sourcing and transportation options computed through quantitative methods can offer significant benefits over both approaches. We propose a contingency approach that reduces landed costs of food aid by giving governmental relief organizations more flexibility in RCA versus DCA sourcing, which can be justified by resource dependency theory (RDT). Our findings contribute to the decision-making and policy discussion about the efficiency of governmental food-aid programs.

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Transportation Journal, Vol. 54, No. 2, 2015

Keywords
Humanitarian logistics, food aid, resource-based view, resource dependency theory, transaction cost economics

Introduction

While the number of undernourished people fell by 17 percent in the past two decades, chronic hunger affected 842 million people worldwide between 2011 and 2013 (FAO, IFAD, and WFP 2013). In addition, recent increases in the frequency and magnitude of disasters have strained resources of government agencies and organizations that attempt to provide relief. The United States Agency for International Development (USAID) responds to global food needs through its Food-for-Peace initiative (FFP). While USAID sources the food aid mostly from the US agricultural markets, partner organizations, such as World Food Program (WFP), and private volunteer groups (e.g., American Red Cross, Save the Children Federation, Cooperative for American Relief Everywhere [CARE], Oxford Committee for Famine Relief [OXFAM]), are responsible for the physical distribution of the goods (USAID 2012). Contrary to USAID's approach, the EU and UN food-relief efforts promote local and regional procurement. Proponents of both approaches claim various benefits of their procurement and distribution strategies. The lack of comparative studies in the academic literature means that current decision makers may be selecting relief strategies based on intuition or political concerns rather than on the effectiveness of relief efforts.

The purpose of this study is to examine which approach is more efficient in providing food aid to a disaster zone by using three sets of archival data: USAID's emergency food-aid shipment data, Food and Agriculture organization's (FAO) historical average crop producer data, and US Bureau of Transportation Statistics reports. In this study, we refer to the USAID approach as the "donor country approach" (DCA) and the UN/EU approach as the "recipient country approach" (RCA). While the recent trend in global food aid is towards more flexible, mixed-strategy approaches that utilize both local and regional procurement (USAID 2012), no academic study has yet examined which approach is more efficient. Based on USAID emergency food-aid shipment data and published historical average crop producer prices data, quantitative decision-making tools are used to compare the two food-aid sourcing strategies and also provide conceptual support for each.

Traditional economic theories are utilized to justify examination of DCA and RCA. We find that the DCA can be partially explained by the resource-based view (RBV) (Conner and Prahalad 1996) where the donor

country organization views itself as having a resource advantage that is not easily duplicated by other countries. These resources, including food, volunteers, money, and transportation, may be key to effective sourcing. In the context of government agencies that provide the majority of disaster relief, Wernerfelt (1984) argues that government contacts are also resources, and first movers in this area can create competitive advantages. A competitive reason given by USAID for providing aid is to create a market for the US-grown agricultural goods (Long et al. 1995). The RBV is a revenue-focused theory whereby higher rents can be earned through greater availability and quality of donor country food. The proposition that RBV explains the actions of donor countries is further supported by the fact that US agricultural resources supply half of the global food relief (USAID/USDA 2012).

On the other hand, the actions by governments that promote the RCA can be explained by transaction cost economics (TCE) (Coase 1988). Here organizational behavior is driven by a desire to minimize information and coordination costs, and policing and enforcement costs of providing food relief. The application of TCE to governmental actions is in the literature (Crocker and Masten 1996; Shelanski and Klein 1995; Williamson 1998), but empirical examinations comparing them to alternative strategies are sparse.

Grounding the two relief aid sourcing approaches in RBV and TCE, we search for answers to the following research questions:

RQ 1: Is the DCA or the RCA a more cost efficient food-aid option?
RQ 2: Is there an improved solution available that is more cost-efficient than either the DCA or the RCA?

This study contributes to the literature by using theories and quantitative techniques to demonstrate that neither the pure DCA nor the pure RCA universally provide the best available solution to food relief aid. Instead, we show that their efficiencies are contingent and a case-by-case analysis is needed to estimate which is more applicable given a specific relief scenario. This study contributes to governmental decision-making by providing a model where the USAID approach and the EU/UN approach can be evaluated in any relief aid situation.

The article is organized as follows: first we summarize the relevant arguments of both academics and practitioners in the disaster response field. Next, we model and compare the costs of the DCA to those of the RCA to estimate their relative efficacy on food delivery by using data obtained from USAID and FAO. Then, we empirically test which sourcing option is

more cost efficient under multiple transportation cost scenarios using data published by the US Bureau of Transportation Statistics International Trade Report (BTS 2014). Finally, we provide a theoretical explanation of the approaches and conclude by discussing the implications on governmental food-aid decisions.

Literature Review

USAID is a US governmental agency tasked with a mission to "end extreme global poverty and enable resilient, democratic societies to realize their potential" (http://www.usaid.gov). The agency's Office of Food for Peace (FFP) aims to address global food security by providing food aid to people affected by natural or manmade disasters. This aid can take the form of fast, emergency food relief meant to prevent immediate loss of life or health, or longer-term development food relief over a number of years. While the United Nations had been involved in relief efforts since World War II, the legislative framework for the US government's international food aid started with the Agricultural Trade Development and Assistance Act (PL-480) in 1954. As signed by President Eisenhower, the act's primary purpose was to "lay the basis for a permanent expansion of our exports of agricultural products with lasting benefits to ourselves and peoples of other lands" (USAID 2004). In 1961 President Kennedy renamed PL-480 as "Food for Peace" (FFP) and steered the emphasis of the act toward more humanitarian goals. The economic goals of the program were simultaneously achieved by putting legal requirements to donate US-grown food and ship it overseas by using US-flagged vessels (also called "Cargo Preference"). These two goals—providing maximum food aid and using US agricultural products and transportation resources—often conflict with each other. Actually, two other big donors—European Union and United Nations—promote a local/regional sourcing strategy that purports to be more efficient than USAID by supporting faster recovery to the disaster area. Recognizing the inefficiencies created by the constraints, the US government decided to experiment with other forms of food aid, such as local and regional procurement of food commodities (2008 Farm Bill), cash transfers, and food vouchers through the Emergency Food Security (ESP) Program.

As a prominent member of the food relief supply chain (see fig. 1), USAID is the single largest food donor, providing over half of global food aid (Atwood, McPherson, and Natsios 2008; Shapouri and Rosen 2004). The two major direct costs involved in providing food relief are procurement costs and transportation costs. According to Falasca and Zobel (2011, 152), "procurement activities

Figure 1 A Typical Governmental Food Relief Supply Chain

Note: Adapted from Oloruntoba and Gray 2006 (emphasis on Government donor, international agency, and international NGOs added)

account for 65 percent of the expenditures." International transportation costs make up a significant portion of the remaining 35 percent. Seeking a balance of these two costs will result in more food being made available to deal with the ever-increasing number of catastrophes.

Although a number of studies have addressed the issue of goods and personnel allocation in humanitarian relief, there is a paucity of research that considers the procurement decision (Falasca and Zobel 2011) in conjunction with transportation. As highlighted in figure 1, our study focuses on the upstream aspects of the food relief supply chain—specifically on sourcing food-aid commodities. Day et al. (2012) categorize humanitarian relief efforts in five stages including *preplanning*, *initiation*, *ramp-up*, *steady-state*, and *termination (transformation)*. Our analysis covers the steady-state stage of the relief works when agencies can focus on cost efficiencies rather than responsiveness. Because this study focuses on the governmental decision-making process, it examines procurement and transportation cost decisions from the food source (government donor) through the International agency (USAID) to the first International Non-Governmental Organization (e.g., World Food program [WFP]), which is typically responsible for downstream flow of the food to the aid recipients in the relief supply chain.

Relief Efforts

A relief supply network is highly complex (Kovács and Spens 2007), and the interaction among its members is driven by multiple transactions. Oloruntoba and Gray (2006) use a more sequential model as depicted in figure 1. Some studies that focus only on the final leg in the distribution of aid to recipients (Balcik et al. 2010), while others emphasize the big picture and focus on the supply chain network as a whole (Beamon and Balcik 2008).

As reported by Taupiac (2001), humanitarian relief goods procurement is on the rise. While scientific research in organizational disaster relief has grown in the past two decades (Kunz and Reiner 2012), out of 247 articles in humanitarian disaster relief reviewed by Yu et al. (2014), only 9 were related to procurement (sourcing), pointing to the need for more emphasis in the upstream stages of humanitarian supply chains.

Donor Country versus Recipient Country Approaches (DCA vs. RCA)

In the field of relief aid, both DCA and RCA have been commonly used. The European Union and the United Nations have historically promoted the RCA, although their representative governments did not always follow this approach. For example, in 2003, 60 percent of all UN relief aid went to Africa, but only 10 percent was sourced from there (Rienstra 2004). They argue that this creates an imbalance that slows economic recovery for the recipient countries and keep them aid-dependent (Hoffman et al. 1994; WFP 2006). Responding to this imbalance, the United Nations passed a resolution encouraging RCA, including sourcing from developing countries with economies in transition. The resolution had marginal success, improving RCA from about 45 percent in 2004 to 54 percent in 2008 (United Nations 2009). On the other hand, the US government, while relaxing restrictions somewhat, is still dominantly using DCA. Of the approximately $2 billion in US food aid in 2011, only $232 million (11%) was dedicated to the RCA, as part of the Emergency Food Security (EFS) program, which allows local and regional procurement as well as cash transfers and food vouchers (USAID 2012).

Conceptually there are numerous theories used to explain various logistics phenomena (Defee et al. 2010). However, the vast majority is from other disciplines and rarely applied to humanitarian logistics (HL). Defee et al. (2010) argue that without more theory, the discipline cannot progress and mature. In fact, we found no organizational theories applied to HL at a strategic level in the Defee et al. (2010) paper. Therefore, using an expert panel, we borrow from organizational theory to provide support for the DCA, because it can be conceptually linked to the RBV of the organization (Conner and Prahalad 1996) where the donor country organization views itself as having a resource advantage that is not easily duplicated. In the context of government, Wernerfelt (1984) argues that organizations should consider government contacts as resources, and says that first movers in this area can create competitive advantages. In the case of food relief, it is not a direct competitive environment; however,

a competitive reason given by USAID for providing aid is to create a market for their homegrown agricultural goods (Long et al. 1995). The RBV is a revenue-focused theory whereby higher rents can be earned on a premium resource, that is, the availability and quality of donor country food.

Similarly, transaction cost economics (TCE) can be used to explain the behavior of governments and organizations, such as EU and UN, which adopt the RCA to provide disaster relief and development aid. The EU/UN approach proposes that the total cost of food aid is minimized by sourcing in the recipient country because transportation and procurement costs are lower due to on-site or near-site sourcing (WFP 2006). Unlike RBV, TCE is a cost-based approach that does not expressly consider behavior driven by future revenue from resources.

However, the theories are not mutually exclusive when explaining the behavior of organizations in disaster relief. A comparison shows that the two theories can be complementary. For example, conceptually the RCA is related to the TCE's promotion of the vertical integration of an organization where one entity controls the supply of goods to market, so RCA assumes that many of the benefits are driven by a recipient country's ability to control the aid process as efficiently as a vertically integrated organization. However, the recipient country can also provide aid locally that is superior to DCA, for example, available food items that are climate sensitive, such as corn and wheat. In this case the activities of the relief organizations can be explained by RBV.

In TCE costs are divided into three categories: (a) search and information costs needed to coordinate resources that deliver aid to affected areas, (b) bargaining costs for purchasing goods and services, and (c) policing and enforcement costs to ensure aid is provided according to the laws and expectations of donors. The costs that are reduced through an RCA are the information costs, and the policing and enforcement costs. Trent and Monczka (2003) conceptually argue that all food relief procurement is generic and therefore requires limited product or supply chain expertise. RCA reduces more than transaction costs by also reducing transportation costs (Brause 2009; Rienstra 2004), while also considering important cultural sensitivities such as tastes and preferences that may differ from the donor country (GAO 2009). This suggests that RBV may explain some of the recipient-country activities where local contexts apply. For example, during the Bosnian war, Muslim populations did not eat some of the distributed UN food aid because it contained pork. In Afghanistan, relief packets from donor countries containing peanut butter and jelly were sold in the black market because recipients were not familiar with their use (Filipov and

Neuffer 2001). Similarly, in the context of enforcement costs, 35,000 tons of genetically modified maize donated by the United States was rejected initially by the Zambian government and had to be milled as flour before last-mile distribution (Tomasini and Van Wasenhove 2009). This supports the proposition that the enforcement costs could have been reduced through RCA because the local governments or relief organizations would better know the recipients' sensitivities.

However, sourcing close to the site of a disaster area that already relies on external support can be difficult. First, the local market might not have the resources to fill the large demand for food (Beresford and Pettit 2012; CARE 2006). Second, the transportation infrastructure in the recipient country might be damaged (Beresford and Pettit 2012), and large bulk purchases by relief agencies and food shortages can drive local prices higher than those at the donor country (Carney 2012). Third, relief organizations must develop the resources to supply an aid network on the fly in the wake of an unpredictable catastrophe (Van Wassenhove 2006). Fourth, recipient country information infrastructure may be damaged, and bargaining and sourcing from an unknown market may create opportunistic behavior through exorbitant prices or poor quality. Unlike businesses that use historical data to judge and qualify a supplier, RCA requires swift trust (Kotabe, Martin, and Domoto 2003) because procurements are often short-term purchases, thus providing little incentive for a long-term relationship. Finally, to bargain and procure large quantities in RCA, key personnel are needed on-site. These factors can make sourcing in the recipient country challenging.

The DCA also has some advantages over the RCA. For example, donor-country governments have intimate knowledge of their markets, suppliers, and transportation capabilities as well as the quality and prices of the commodities (Rienstra 2004). Since donor countries are mostly located in the industrialized world, the resources they control have a higher level of predictability and stability that are not present in developing countries (Trautmann et al. 2009). Using DCA allows governments to exercise more control, capturing economies of scale and scope that makes the whole process less costly (Arnold 1999).

Conceptually, the use of DCA can partially be explained by the RBV (Conner and Prahalad 1996) where USAID views US-grown food as a competitive advantage. The United States has only 4 percent of the world's population, yet provides over 50 percent of world food aid (Atwood, McPherson, and Natsios 2008; Shapouri and Rosen 2004). While

countries do not directly compete for providing relief aid, as is suggested in a business application of the RBV, one objective of USAID is to promote markets for US agricultural goods and US-flagged vessels. Next, government-funded agencies are sensitive to lobbying efforts in the donor country. For example, Voss (2009, 8) reports that external stakeholders of the FFP program in the United States (e.g., farmers and shippers) have significantly influenced "the size and complexity of the program much to their own benefit," making donor-country sourcing a more preferred option during budget appropriations in the national parliaments. Finally, introducing additional supplies into the recipient country during times of a disaster can help avoid inflation and stabilize prices (GAO 2009). This literature supports the proposition that, in some contexts, the DCA may be a more efficient approach to food relief efforts. While Wernerfelt (1984) has previously discussed government relations in the context of RBV, to our knowledge this is the first application of the RBV in relief aid. However, as discussed in the RCA section with RBV, TCE can be complementary in explaining some behaviors of the donor country in that while located farther from the disaster, modern transportation technology owned by a donor country, such as aircrafts capable of precise air drops of aid, may be less expensive than trying to use the damaged infrastructure of a recipient country.

Earmarking of Funds

The earmarking of funds is a factor that influences the selection between DCA and RCA, as observed in USAID's legal requirement to donate mostly US-grown food commodities as international relief aid and transport those commodities by US-flagged vessels. Earmarking is a budgeting tool used by politicians to reserve funding for specific projects that create political goodwill. In the foreign aid context, Adugna (2009) observes that earmarking takes place at one or both of two stages: (a) the sourcing stage (e.g., having to buy the food aid from the donor country market), and (b) the using stage (e.g., funds dedicated to a specific project in the recipient country). The earmarking of USAID's funds, in the context of this article, takes place in the sourcing stage as per Adugna's (2009) classification.

Economists have often criticized earmarking for misallocating resources (McCleary 1991; Minear and Weiss 1992). In the context of food relief, funds with strings attached cannot be allocated optimally by relief organizations, but must be used according to the donor country's wishes (Barman 2008), resulting in 30 percent to 50 percent higher costs

(CARE 2006). Analyzing the impact of earmarking on humanitarian fleet efficiencies, Besiou, Pedraza-Martinez, and Van Wassenhove (2012) suggest that earmarking has negative consequences on DCA lead times and costs by preventing reallocation of vehicles to new disasters, and wasting resources. Due to the earmark on USAID funds, food and transportation are sequentially purchased from the United States through a bid process (Bagchi, Paul, and Maloni 2011; Trestrail, Paul, and Maloni 2009). Consequently, lead times are long due to complex bureaucratic ordering cycles, and the need to ship the food commodities overseas. Therefore, by current law USAID cannot fully practice RCA and one of the goals of this article is to demonstrate the inefficiencies created by these earmarks. The literature conceptually supports both the RCA and DCA, but does not provide empirical testing or examination of a possible better solution.

Methodology

The Model

To increase the relevance of our comparison of DCA and RCA, we use a comparative case study with actual procurement costs of governmental food-aid shipments to locations around the world. To estimate the cost of donor country sourcing, we first aggregated data for six perishable food commodities (lentils, beans, wheat, green peas, corn, and rice) and calculated the actual purchase costs of USAID's food-aid shipments to five recipient countries (Rwanda, Ethiopia, El Salvador, Nicaragua, and Bosnia-Herzegovina). Then we used historical commodity prices in the recipient countries to calculate the cost of purchasing the same quantity and type of commodities if they were procured locally in the recipient country. The results were aggregated at commodity and country levels and then compared to identify which approach is more efficient (excluding the transportation costs). Next, we investigate the impact of transportation costs by generating three unique transportation scenarios—low ($15/metric ton), medium ($30/metric ton), and high ($75/metric ton). This was done not only to add transportation costs, but also to simulate the effect of the volatility in transportation prices due to fuel surcharges, and on-peak/premium demand charges worldwide.

The first dataset in this study is USAID's commodity transport (October 1993–July 2005) from Lake Charles/Louisiana warehouse, which acts as the main prepositioning hub for USAID's international food aid shipments. Information was available for 52 stock-keeping-units (SKUs) transported to 69 countries. We narrowed down our focus on six of the

most common food commodities (lentils, beans, wheat, green peas, corn, and rice) that dominated the relief aid shipments and five recipient countries (Rwanda, Ethiopia, El Salvador, Nicaragua, and Bosnia-Herzegovina). Our choice of recipient countries was based on two criteria, both of which are subject to the constraint of data availability: (a) diversity: representation from every continent, and (b) volume: countries with highest volume of shipment in a particular continent were picked up. Eventually, we ended up with five countries from three continents. The shipment data were available in weight (metric-tons [MT]) and value (US dollars [USD]). To compare the DCA procurement costs with possible RCA procurement costs, we supplemented USAID data with information from Food and Agriculture Organization (FAO) (FAOSTAT 2009). FAO provides historical average crop producer prices by country, in USD/MT. In table 1, average donor country (USAID) costs of commodities are listed next to the recipient country's prices in USD/MT. For example, "462/460" in the second column from the left for year 1995 shows that the price of beans was $462 in the recipient country (Rwanda) and $460 in the donor country (USAID's purchase price) in that particular year. While some countries in Asia (e.g., Iraq) also received USAID food-aid shipments, we could not include them in our comparative analysis due to lack of local commodity price data.

As transportation is a significant portion of total landed costs, we investigate the impact of different levels of transportation charges on USAID's cost efficiency by adopting a scenario-based approach. We scanned US Department of Agriculture (USDA)'s monthly "Grain Transportation Reports" (http://www.ams.usda.gov/tmdtsb/grain) and the US Bureau of Transportation Statistics (BTS) to compute the upper and lower bounds for long-distance grain freight rates from the US Gulf. Fluctuations from $10 to $75 per MT in the 1995–2004 period were observed, which were possibly caused by fuel surcharges, peak versus off-peak demand, and so on. Thus, we employ three transportation rate scenarios (see columns C, D, and E of table 2 below): $15/MT, $30/MT, and $75/MT. The $30/MT rate is an approximation of the average transportation rate during the 1995–2004 period. The $15/MT rate is reflective of the relatively low cost at the end of 1998 through mid-2002. The $75/MT rat represents the temporary hike observed in early 2004. Applying these transportation rates to the commodities in our dataset, we generate a total of four scenarios and compare the total costs (combination of purchase and transportation cost). Scenario 0, the base case, reflects the ratio of the DCA procurement cost to the RCA. Scenario 1 provides insights into total cost with relatively low shipping cost

Table 1/Comparison of RCA versus DCA (USAID) Commodity Prices

	Purchase Cost in Recipient Country / Purchase Cost in Donor Country													
	Rwanda			Ethiopia			El Salvador			Nicaragua			Bosnia-Herzegovina	
Year	Beans	Corn	Wheat	Wheat	Green Peas	Lentil	Beans	Corn	Rice	Beans	Corn	Rice	Beans	Wheat
1995	462/460	195/106	N/A	253/148	N/A	390/480	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1996	323/600	147/122	N/A	214/200	N/A	388/374	N/A	N/A	N/A	N/A	N/A	N/A	1719/600	208/165
1997	634/550	N/A	N/A	192/165	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1320/600	167/165
1998	542/550	347/133	567/166	205/152	251/238	353/332	808/440	220/128	219/378	856/458	189/128	236/373	1115/692	151/160
1999	N/A	228/122	N/A	220/167	252/201	331/332	863/440	N/A	186/378	724/440	N/A	212/378	N/A	N/A
2000	N/A	N/A	N/A	199/138	227/210	299/354	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2001	N/A	N/A	N/A	145/138	N/A	N/A	631/382	248/123	209/231	528/383	153/123	N/A	N/A	N/A
2002	N/A	N/A	N/A	122/181	203/375	N/A	N/A	N/A	N/A	471/632	163/135	N/A	N/A	N/A
2003	185/388	108/147	N/A	179/182	214/312	267/575	528/549	280/144	N/A	N/A	137/144	N/A	N/A	N/A
2004	N/A	102/102	N/A	179/168	254/289	350/447	655/508	240/144	N/A	N/A	N/A	N/A	N/A	N/A

Note: All amounts are reported in US$/MT.

Table 2/Comparison of RCA versus DCA (USAID) Total Costs—Three Transportation Cost Scenarios

Country	Commodity	Purchase Cost ($)		Donor Country Purchase Cost + Transportation Cost			DCA/RCA Total Cost Ratio			
		Recipient Country Column A	Donor Country Column B	B + $15/MT ($) Column C	B + $30/MT ($) Column D	B + $75/MT ($) Column E	Scenario 0 B / A	Scenario 1 C / A	Scenario 2 D / A	Scenario 3 E / A
Bosnia-Herzegovina	Beans	5,598,000	2,448,480	2,520,710	2,592,940	2,809,631	0.44	0.45	0.46	0.50
	Wheat	6,158,850	5,353,250	5,843,072	6,332,894	7,802,362	0.87	0.95	1.03	1.27
El Salvador	Beans	822,920	584,050	601,279	618,509	670,197	0.71	0.73	0.75	0.81
	Corn	1,231,440	656,460	733,922	811,385	1,043,771	0.53	0.60	0.66	0.85
	Rice	530,280	842,940	879,186	915,433	1,024,172	1.59	1.66	1.73	1.93
Ethiopia	Green Peas	1,403,820	1,489,220	1,543,577	1,597,933	1,761,003	1.06	1.10	1.14	1.25
	Lentils	16,916,040	24,058,660	25,393,916	26,729,171	30,746,967	1.42	1.50	1.58	1.82
	Wheat	285,438,235	281,690,550	307,465,235	333,239,921	410,563,977	0.99	1.08	1.17	1.44
Nicaragua	Beans	2,900,950	1,839,320	1,893,580	1,947,840	2,110,620	0.63	0.65	0.67	0.73
	Corn	1,175,430	1,004,670	1,123,221	1,241,772	1,597,425	0.85	0.96	1.06	1.36
	Rice	4,513,360	7,465,055	7,786,052	8,107,050	9,070,042	1.65	1.73	1.80	2.01
Rwanda	Beans	14,762,740	15,780,800	16,246,334	16,711,867	18,108,468	1.07	1.10	1.13	1.23
	Corn	28,726,010	16,173,720	18,082,219	19,990,718	25,716,215	0.56	0.63	0.70	0.90
	Wheat	4,536,000	1,328,000	1,449,512	1,571,024	1,935,560	0.29	0.32	0.35	0.43

of $15/MT. Scenario 2 reflects average shipping cost of $30/MT, and scenario 3 higher shipping cost of US $75/MT. As this is a comparative study, our focus is not actually on the absolute cost figures, but on the relative differences between RCA and DCA. Hence, the three-scenario approach allows us to get dynamic insights into the relationship between transportation cost variability and optimal choice between RCA and DCA.

Interviews with Practitioners

We provided a copy of this study to a panel of 22 practitioners and academics selected from universities, government, US agriculture industry, aid volunteers, and nongovernmental organizations (NGOs). The profile of the panel is shown in table 6 below. Eleven academics were selected from the United States, Europe, South Africa, and China. First, the academics were asked to read the cases and submit ideas for alternative theories that may explain the RCA and the DCA, as well as the improved solution. Next, the results were shown to all participants and several rounds of Delphi were conducted until agreement was reached on inclusion of the RBV, TCE, and RDT theories. In the last round of Delphi, each academic rated each theory against each scenario on a scale of "1" to "7," with "1" representing no applicability of the theory to explain the scenario, and "7" representing a full explanation of the scenario by the theory. Open comments are reported in the next section. Then, academics and practitioners were asked to evaluate the practicality of our improved scenario to real governmental food-relief efforts. A score of "1" indicates that the improved scenario has no practical application and is unlikely to be used by a governmental agency in food-aid relief. A score of "7" indicates that the improved solution could be applied in virtually all governmental food-relief efforts worldwide.

Results

Overall Analysis

Comparative case results are provided in tables 2–5. Using Ethiopia as an example in table 2, USAID sent approximately $24 million worth of lentils between 1995 and 2004 (column B). Had the lentils been purchased in the recipient country (Ethiopia), procurement costs would be $16.9 million (column A). Similarly, wheat shipped to Rwanda was purchased in the United States at a cost of $1.3 million, significantly lower than the estimated $4.5 million if procured in the recipient country (Rwandan) market. In columns C, D, and E of table 2, the transportation charges ($15/MT, $30/MT, and $75/MT) are added to the USAID's purchase costs in column B. For example,

the lentils, including a low shipping cost of $15/MT led to total cost of $25.4 million to Ethiopia. In scenarios 2 and 3, the costs are $26.7 million and $30.7 million, respectively.

Next, in the right half of table 2, we calculate the total cost ratios of procuring in the donor country versus the recipient country across four scenarios. Looking at scenario 0 (column B/A), the base case with no shipping cost, we find that DCA is less costly in the majority of country-commodity pairs, that is, cost of beans in the donor country is 44 percent of those in Bosnia-Herzegovina (total cost ratio = ratio of DCA cost to RCA cost of 0.44). Total cost ratios (to be called "ratio" in the rest of the article) above 1 indicate it is less costly to source from the recipient country, while ratios below 1 show that DCA is less costly. For example, corn (ratios—El Salvador: 0.53, Nicaragua: 0.85, Rwanda: 0.56) and wheat (Bosnia: 0.87, Ethiopia: 0.99, Rwanda: 0.29) are procured less costly in the donor country than recipient country. Beans cost less in the donor country (Bosnia: 0.44, El Salvador 0.71, Nicaragua: 0.63, Rwanda: 1.07). Rice (El Salvador 1.59 and Nicaragua: 1.65), lentils (Ethiopia: 1.45), and (Ethiopia: 1.06) are all more expensive to purchase in the donor country.

Scenario 1, transportation charge of $15/MT, gave mostly similar results to those of the base scenario. The only exception is the wheat in Ethiopia, which costs 8 percent more in DCA (ratio of 1.08) than in RCA when transportation cost is added at $15/MT to the DCA procurement costs. In scenario 2, with an increase to $30/MT in transportation costs, we find the total cost of wheat for Bosnia-Herzegovina and corn for Nicaragua are cheaper (3% and 6%, respectively) compared to scenarios 0 and 1. In scenario 3, while the ratios increase in favor of RCA, interestingly, no significant change is observed relative to scenario 2. In other words, increasing transportation cost from $30/MT to $75/MT does not change the optimal sourcing location (RCA or DCA) for any of the commodities in any recipient country. Overall, we observe that both country characteristics and commodity type impact the total cost ratio between DCA and RCA. Answering RQ1, neither RCA nor DCA is uniformly better than the other. Next, we investigate systematic differences across countries.

Country-level Analysis

In table 3 the data are aggregated across commodities to observe country-level cost (dis)advantages in the recipient country's national market over the donor country market, including the varying transportation costs.

Table 3/Comparison of DCA (USAID) versus RCA for Selected Countries

	DCA/RCA Procurement Cost	DCA/RCA Costs		
		$15/MT Rate	$30/MT Rate	$75/MT rate
	Scenario 0	Scenario 1	Scenario 2	Scenario 3
Bosnia-Herzegovina (beans and wheat)	0.66	0.71	0.76	0.90
El Salvador (beans, corn, and rice)	0.81	0.86	0.91	1.08
Ethiopia (green peas, lentils, and wheat)	1.01	1.10	1.19	1.46
Nicaragua (beans, corn, and rice)	1.20	1.26	1.32	1.49
Rwanda (beans, corn, and wheat)	0.69	0.75	0.80	0.95

With total cost ratios below 1, we find that in the base scenario, sourcing food commodities from Bosnia-Herzegovina (ratio of 0.66), El Salvador (0.81), and Rwanda (0.69) are more expensive than sourcing from the donor country, while sourcing food commodities locally in Ethiopia (1.01) and Nicaragua (1.20) will result in savings. These results are consistent at the $15/MT and $30/MT transportation rates of scenarios 1 and 2, respectively. Only in scenario 3 (high transportation rate of $75/MT) is there a change in this pattern because sourcing from the recipient country of El Salvador is now 8 percent more efficient than sourcing in the donor country. Contrary to the recent trend in international food aid toward local and regional procurement, our results display no generalizable cost advantage for the RCA over the DCA. Answering RQ2, the improved solution is rather contingent in that, for certain countries (Bosnia and Rwanda), sourcing from the donor country is more cost efficient, while in others (Nicaragua and Ethiopia), recipient country sourcing is always cheaper regardless of the variation in transportation rates. It is important to note that the tables are not designed for comparisons across countries, that is, one cannot directly compare the results for Bosnia with those from Ethiopia because the transportation rates differ for each location. The tables are designed to compare each scenario within a particular country at the transportation rates of $15, $30, and $75. Next, we compare RCA and DCA at the commodity level.

Commodity-level Analysis

Aggregating shipments across countries/regions (see table 4) suggests that DCA (in the US context) has a cost advantage for corn (ratios ranging

Table 4/Total Cost Ratios of the DCA to the RCA for Food Commodities

	DCA/RCA Procurement Cost	DCA/RCA Cost		
		$15/MT rate	$30/MT rate	$75/MT rate
	Scenario 0	Scenario 1	Scenario 2	Scenario 3
Corn	0.57	0.64	0.71	0.92
Beans	0.86	0.88	0.91	0.98
Wheat	0.97	1.06	1.15	1.42
Green Peas	1.06	1.10	1.14	1.25
Lentils	1.42	1.50	1.58	1.82
Rice	1.65	1.72	1.79	2.00

from 0.57 to 0.92), and beans (0.86 to 0.98) across all transportation scenarios. On the other hand, lentils (1.42 to 1.82), rice (1.65 to 2.00), and green peas (1.06 to 1.25) are more economical to purchase in the recipient countries. The findings are less clear for wheat (0.97 to 1.42), which accounts for the largest volume of aid. In the base scenario with no transportation cost, wheat in the donor country is cheaper (2.7%). However, in scenarios 1–3, the transportation charges significantly increase the cost (ratios: 1.06, 1.15, and 1.42), making the RCA less costly. International aid shipments incur transportation costs, which makes the base scenario 0 hypothetical. Hence, we could put the wheat in the same basket with lentils, rice, and green peas for which RCA, on average, is more economical than DCA. Next, we aggregate across both commodities and countries to compare the RCA and DCA approaches.

Savings from Improved Sourcing Decisions

Table 5 provides an overview of savings using contextual sourcing rather than pure RCA or DCA. Column A reports USAID's total procurement costs of all six commodities purchased as relief aid to the five recipient countries at different transportation rates. For example, as shown in column A, USAID spent over $360 million in the 1995–2004 period to purchase the six commodities sent to five recipient countries (scenario 0). Looking at the last row of the same column, total costs increase to over $514 million when transportation costs are added at $75/MT. Column B shows that purchasing all the relief aid locally in the recipient countries would cost approximately $374 million. Comparing the total DCA-only and RCA-only costs in columns A and B, we find that sourcing from recipient countries provide some savings over the DCA in all but the base scenario.

In column C, we show the improved purchase decision scenario, in which the sourcing decision is made for each shipment, i.e., the donor

Table 5/Savings from Improved Sourcing

	Pure DCA Column A	Pure RCA Column B	Improved Purchase Decision	Savings from Improved	Purchase Decision
			Min (DCA, RCA)	Over Pure DCA	Over Pure RCA
			Column C	A/C	B/C
Scenario 0: No FC	$360,715,175	$374,714,075	$349,204,380	3.2 %	7.3 %
Scenario 1: $15 FC/MT	$391,561,815	$374,714,075	$355,811,990	9.1 %	5.3 %
Scenario 2: $30 FC/MT	$422,408,457	$374,714,075	$358,431,171	15.1 %	4.5 %
Scenario 3: $75 FC/MT	$514,960,410	$374,714,075	$365,184,749	29.1 %	2.6 %

could pick DCA or RCA purely based on cost efficiency. For example, if all commodities were procured in the lower-cost location, the total procurement cost of the base scenario would be $349 million, lower than either DCA-only ($360 million) or RCA-only sourcing ($374 million). We find that with improved sourcing, the donor (USAID) could realize savings of 3.2 percent (column A/C). These savings increase with higher transportation rates. In the final scenario with transportation cost of $75/MT, USAID could realize cost efficiencies of 29.1 percent by reducing the total cost of $514 million down to $365 million. Similarly, we find that this improved sourcing strategy still generates cost savings (ranging from 7.3% to 2.6% as depicted in the last column) when compared to the strategy of sourcing only in the recipient countries. Hence, we could say that the improved purchase decision results in cost savings compared to both DCA and RCA.

Interview Results

Table 6 reports the results of the ratings given by the 22 panel members. Only 11 academics were asked to review the theoretical section of the study, while all 22 raters were asked to rate the practicality of the improved solution.

The theoretical evaluation from all 11 academics supports the proposition that RBV explains a substantial portion of the behavior of the DCA in this study, reporting a mean of 5.27/7.00. Comments from the raters indicated that the United States is arguably the most efficient food producer in the world, while maintaining a high standard of quality and safe supply. This makes food a resource that gives the US agricultural industry power domestically and internationally when it comes to food aid with economic benefits. However, as the donor countries change to those of the EU nations,

Table 6/Results of Interviews

Rater	RBV (DCA)	TCE (RCA)	RDT (Improved)	Improved Solution (Practicality)
United States—Academic	6	4	5	6
United States—Academic	6	5	6	6
Europe—Academic	4	7	6	5
Europe—Academic	5	6	5	4
Europe—Academic	5	5	5	6
Europe—Academic	6	5	5	5
Europe—Academic	4	5	4	5
South Africa—Academic	6	3	4	5
China1—Academic	5	5	6	5
China2—Academic	6	6	6	6
China3—Academic	5	7	5	6
USAID 1				5
USAID 2				5
USAID 3				6
AFBF 1				2
AFBF 2				3
Peace Corps 1				5
Peace Corps 2				6
Peace Corps 3				4
American RCA 1				5
American RCA 2				5
US Politician				4
Mean	5.27	5.27	5.18	4.95

China, Korea, or Japan, the RBV may predict less of their behavior. These nations rely on substantial food imports; therefore, while a major driver of food aid from these nations may be to encourage exports or political goodwill, their behavior may require other theoretical contributions in addition to RBV.

The academics had similar strong support for the TCE explaining RCA, with their scores also averaging 5.27/7.00. The weakest support came from the South African academic because she indicated that for the TCE to be considered as a strong theoretical contribution, a government responsible for controlling a RCA in its home country must behave in a similar manner as a vertically integrated company. While TCE has been previously

applied to governmental activities, the studies were conducted only on stable governments. She argues that in the case of a country with an unstable government, where aid is likely to be needed, TCE may not apply due to insufficient control of the food supply. With stable recipient country governments, TCE is more applicable.

Discussion

In this study, we contrasted the costs of procuring and transporting food-aid commodities from the donor country to a select number of recipient country markets (DCA) with the costs of purchasing those food commodities locally in the recipient countries (RCA). Our findings show that neither DCA nor RCA provides the most efficient solution. The type of commodity, level of transaction costs, local market prices, and transportation rates are all key determinants in efficient sourcing decisions. The DCA has a cost advantage for some commodities in our dataset such as corn and beans, while the RCA has an advantage in rice and lentils. Therefore, despite the USAID's adoption of DCA and the UN/EU's adoption of RCA, the improved solution is a combination of both approaches contingent on the ability of a country to maintain an information infrastructure, and police and enforce the movement of goods, as well as the availability of a commodity in a potentially resource-constrained environment. In cases where the DCA is more efficient or where there are no significant cost differences, sourcing from a known market with stable prices can provide additional benefits not captured in this study, such as reduced search cost and higher quality of food. However, when coordination costs are significantly cheaper in the recipient countries, sourcing from markets close to the affected area may reduce response time and provide some economic recovery for the recipient countries.

While proximity of the recipient country to the donor country is an important factor influencing transportation rates, our analysis shows that varying transportation rates, escalating from $15/MT to $30/MT then to $75/MT surprisingly did not alter the direction of the total cost ratios. Referring back to table 4 (above), we see that it makes more economic sense to source green peas, lentils, and rice in the recipient countries at any of the three transportation rates. For wheat, DCA is advantageous only if transportation is free as depicted in scenario 0 and for other three transportation cost scenarios; wheat is cheaper to buy in the recipient countries due to added costs of transportation. In contrast, corn and beans are always cheaper to buy in the donor country even at the highest transport cost of $75/MT.

Considering these findings, a characteristic of the commodity—annual production volume in the donor country—might play a role by influencing donor country commodity prices through presence or lack of scale economies. Referring to table 4 (scenario 0), the total cost ratio (DCA/RCA) is the greatest for rice (1.65) and lowest for corn (0.57). Interestingly, while the United States is only a minor rice producer, it is the top corn producer of the world (http://faostat.fao.org/). Overall, our findings show that some commodities are better sourced in the donor countries and others in the recipient countries, even under significant transportation cost variations.

Sometimes a donor country might prefer to source all aid commodities in a single location to reduce transaction costs. Our country level analyses (table 3 above) also prove to be quite robust against variations in transportation costs. Bosnia and Rwanda are relatively expensive sourcing locations, and DCA makes more economic sense for sending aid to these countries at any transportation rate. On the other hand, Ethiopia and Nicaragua offer significant savings for RCA. The only location that is somewhat sensitive to transportation rate variation is El Salvador. As shown in the second row of table 3, an increase in transportation rate from $30/MT to $75/MT pushes the country-level ratio from 0.91 to 1.08, making RCA more economical only at high transportation rates in El Salvador.

Overall, we observe that our findings are not sensitive, but robust across a wide range of transportation costs observed between 1995 and 2004. This robustness allows us to generalize our findings and recommend policymakers to use them.

Theoretical Support for the Improved Solution by using Resource Dependence Theory

This study shows that neither the RCA nor the DCA in response to disaster aid is optimally effective in all contexts, and varies across the type of relief provided and the location of the disaster region. Therefore, neither the RBV nor the TCE alone adequately explains the behavior of either the recipient or donor countries. This is because in applying the improved solution to disaster relief, all organizations must depend on resources that originate from their own environment, whether internal or external to the organization. This mixed-relief solution can be explained by the resource dependency theory (RDT) (Pfeffer and Salancik 1978), which suggests that while internal resources are controlled by the firm, external resources are controlled by other organizations, allowing them to exert some control over each other.

RDT overlaps with the RBV as both theories propose that resources are the basis of organizational power. RDT links power and resource dependence—the more critical or rare a resource, the more power derived from it. This, therefore, requires legally independent organizations, that is, NGOs and governments, to depend on each other to obtain the best results. In the context of food relief agencies, the RDT explains that a donor-country government can provide food more efficiently by examining each relief project situationally and choosing the improved solution by adopting a contingency approach, whether DCA, RCA, or a combination. The benefit to the DCA is that more aid is delivered (output) for the same level of resource (input), thus improving the marginal benefits derived from a donor country, translating into greater voter/constituent satisfaction in recipient countries. This creates mutual benefits and suggests that RDT could partially explain how benefits are derived for both parties in our improved solution, and the motivation for government agencies to implement it. This is supported by the expert panel (see table 6 above).

Implications

Many DCA donations or countries are funded by public resources and are subject to constraints in their procurement and logistics policies similar to USAID. Our findings show that USAID's mandate to source the majority of its food relief aid domestically can result in significant supply chain cost inefficiencies. Hence, we recommend that USAID be given flexibility to decide on the sourcing location of US international food aid.

Recently, the US administration seems to be more supportive of the RCA. For example, USAID's Emergency Food Security Program (EFSP), launched in April 2010, received $232 million funding in the fiscal year (FY) 2011, which gives the agency full flexibility to procure food aid locally/regionally, distribute cash or issue food vouchers to beneficiaries directly. In the FY 2015 budget proposal, the Obama administration has recommended to further increase those flexible resources (USAID 2015). However, resistance against this partial bypass around the DCA is also building up. On April 1, 2014, the US Congress passed the Coast Guard and Maritime Transportation Act of 2014 (US Congress 2014), which increases the Cargo Preference for US food aid programs to 75 percent (from the current rate of 50 %). President Obama opposed the bill, suggesting that this new threshold would increase the annual transportation costs of foreign food aid by $75 million (Peterson 2014). Hence, this article could contribute to the ongoing RCA vs. DCA debate in Washington, DC, by demonstrating the inefficiencies of earmarked donor funding.

Conclusion

This study makes significant contributions to the academic and practitioner literature in humanitarian supply chains. First of all, we show that for donor countries there could be untapped potential in their supply chains to reduce procurement and transportation costs through RCA. While DCA results in higher procurement costs, considering both recipient-country and donor-country markets in the sourcing strategy will reduce costs. Second, our study is one of the first to empirically assess the cost structure of a relief organization's procurement policy. As concluded by Kovács and Spens (2011), the lack of empirical research in relief aid due to unavailability of field data is a striking shortcoming in developing improved and practical solutions. Thus, we believe that, by using actual shipment data of USAID and matching it with the archival data of FAO, this paper makes a significant contribution to the literature as well.

Our study empirically supports the research of Besiou, Pedraza-Martinez, and Van Wassenhove (2012) that while earmarking has been instrumental in continuation of governmental support, it also results in both misallocation of resources and inefficient aid delivery. Using a hybrid approach—sourcing from both the donor countries and recipient countries—provides the improved solution. In addition to being cost efficient, it allows donor countries to provide timely help, while balancing the interests of the recipient countries. Otherwise, inefficiencies in these programs eventually translate into fewer people fed. Sourcing only in the donor countries' commodity markets or buying only in the recipient countries are both suboptimal solutions and have significant cost implications.

Last, this study provides theoretical support for both the DCA and RCA using concepts derived from the RBV and the TCE theories, as well as an improved approach that is partially explained by the RDT concept. While they are not mutually exclusive, these theories do explain unique characteristics of all food-relief options explored in our study. To our knowledge, this is the first study to apply common empirical and costing techniques, and theories used in the operations literature to improve governmental relief efforts based on real sourcing and transportation data from actual relief efforts.

Limitations and Suggestions for Future Research

While our scenario approach provides lower and upper boundaries of total costs, this study could further be enhanced by using actual transportation charges and transaction costs in calculations. Additional data could also be helpful in extending this study to other countries in Asia. Furthermore, donor countries also face the additional challenge of funding short-term

warehousing for the goods before they can be shipped to the NGOs. These warehousing costs (and the potential cost of securing the goods) are currently not accounted for in our model and, hence, might significantly influence the final outcome of the scenarios.

While we focus on cost efficiency in this study, effectiveness is often seen as a more important performance measure than efficiency for emergency food-aid supply chains. We think that both are important in the delivery of aid. Lack of effectiveness will result in suboptimal aid for a region, while a lack of efficiency results in fewer goods delivered to affected areas. Looking at potential tradeoffs between effectiveness and efficiency is, hence, an area of future research.

This study addresses the issue of governmental operations from a sourcing organization's perspective. We compare RCA to DCA in the US context and provide suggestions for the redesign of sourcing policies in relief supply chains without addressing issues in the final distribution of the aid through NGOs. Given that the majority of recipient countries have limited or nonexistent infrastructure, the final leg is often challenging and expensive, creating an opportunity for research in distribution of aid.

We applied common TCE, RBV, and RDT theories to explain organizational behavior in governmental organizations and also recognize that other theories may also apply. While TCE and RDT have been applied to government activities and policies, there is a paucity of literature applying RBV. Further theoretical work is necessary to discover how existing theories can be applied to food-relief agencies to explain and predict their behavior during relief projects.

Note

The authors would like to thank the University of Rhode Island Transportation Center (URITC) and Director Deborah Rosen for supporting this research.

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