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Exploring Recipient Preferences and Allocation Mechanisms in the Distribution of Development Aid

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Abstract

This study uses incentive-compatible techniques to obtain valuations of 14 common poverty reduction interventions from (probable) aid recipients. Recipients' valuations for these interventions are highly heterogeneous both across interventions and across recipients of the same intervention. Valuation for interventions does not correlate with overall poverty or with perceived need for specific interventions, suggesting that targeting individuals with high valuations based on recipient characteristics is difficult. Through simulations, this study assesses how various allocation mechanisms—cash transfers and voting—compare in generating recipient surplus in the allocation of aid. When markets function and constraints on joint private contributions to public goods do not bind, cash transfers generate considerably more recipient surplus than voting. Even when cash transfers cannot enable public goods and some services, they may still outperform voting at very low resource levels. However, as resource levels increase, voting dominates cash transfers from a surplus-maximization perspective.

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1. Introduction

Many of billions of dollars are spent each year on aid programs. In 2018, for example, OECD countries provided US$149 billion in official development assistance,[1] and US charitable giving to international programs was US$23 billion in 2017.[2] Beyond this, governments of developing countries allocate even more substantial amounts to programs intended to benefit the poor and spur development. These billions of dollars are allocated across a wide variety of programs focused on infrastructure, education, health, agriculture, direct assistance (e.g., subsidized goods, food aid, livestock transfers, and cash

1   OECD, *oecd.org*, https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/official-development-assistance.htm (accessed October 13, 2019).
2   Charity Navigator, "Giving Statistics", https://www.charitynavigator.org, https://www.charitynavigator.org/index.cfm?bay=content.view&cpid=42 (accessed October 13, 2019).

transfers), and other initiatives. Yet it is incredibly difficult to decide how best to allocate development resources.

Easterly (2002) suggested that the allocation of aid and development dollars is a function of complex political and bureaucratic processes, which can lead to suboptimal outcomes and generally ineffective spending, and a relatively large literature has examined those processes. The majority of the research has focused on determinants of aggregate aid flows between countries, identifying factors such as donor self-interest (Hoeffler and Outram 2011; Berthélemy and Tichit 2004; Feeny and McGillivray 2008; Alesina and Dollar 2000), recipient country characteristics (Claessens, Cassimon, and Van Campenhout 2009; Neumayer 2005; Hoeffler and Outram 2011; Berthélemy and Tichit 2004), recipient country lobbying (Lahiri and Raimondos-Møller 2000), and donor country politics (Brech and Potrafke 2014; Feeny and McGillivray 2008) as central to determining aggregate aid flows.

Less research has focused on the allocation of aid resources across sectors and specific interventions. Thiele, Nunnenkamp, and Dreher (2007) assessed how the Millennium Development Goals have shaped the specific allocation of donor aid, finding that donor allocations strongly support some goals, while for other goals the gap between rhetoric and actual aid allocation is large. Raschky and Schwindt (2012) considered the choice between cash and in-kind aid in humanitarian relief efforts, but did not consider allocation decisions outside the humanitarian context. Several other studies have evaluated whether specific needs are related to aid funding intended to address those needs. Lee and Lim (2014), for example, showed that aid allocation for health projects is responsive to health statistics at the country level: as measures of infant mortality, child mortality, and HIV prevalence deteriorate, health aid increases, a finding that is substantiated in Stepping (2016). Kasuga (2008), on the other hand, did not find a relationship between sector-specific donor funding and need, proxied by World Development Indicators data.

Allocation decisions in aid, however, do not stop at the sector level; development dollars must ultimately be dedicated to specific interventions and delivered by identifiable entities in particular geographies. Several mechanisms are used to accomplish this, including top-down planning, decentralization, and enabling individual choice. Governments and multilateral and bilateral institutions often employ top-down planning, which can be seen in the five- or ten-year development plans commonly produced by national governments or the World Bank's project documentation. A strength of the top-down approach is that it can, in theory, drive allocation decisions from the highest-level trade-offs between competing goals. On the other hand, the top-down approach tends to lack context-specific information and ignore local heterogeneity.

An alternative approach that makes use of local information is to involve local government bodies in allocation decisions, based on the assumption that these entities will act in the interests of their constituents. For example, following the adoption of a new constitution in 2010, Kenya—the country of focus for this study—has taken a decentralization approach (Shilaho 2016; Cheeseman, Lynch, and Willis 2016; Steeves 2015). In its devolution process, the central government of Kenya delegated many powers and decisions to county governments, allowing each to tailor decisions to local context. Although this approach has some advantages, it also has limitations from the perspective of optimal allocation of aid resources. Specifically, local officials could be influenced by their own political and personal ambitions in making allocation decisions, and the feedback mechanism to officials is weak: a periodic vote, which is influenced by myriad local issues, does not provide a clear signal as to the satisfaction of constituents with the allocation of aid resources. Cash transfers, which are increasingly common (Bastagli et al. 2016) represent an even more radical form of decentralization, allowing each individual to make allocation decisions about aid resources. Cash transfers have the advantage of allowing custom allocations at the individual level, but a disadvantage is that it is difficult to enable public goods through individual cash transfers.

Because of the limitations of various allocation processes, there have been attempts to engage citizens more directly in allocation decisions through citizen surveys and online participation channels (Robbins, Simonsen, and Feldman 2008; Holzer and Kim 2004; Johnson and Hein 1983). One particularly common method of eliciting relevant information for allocation decisions is assessing citizens' willingness to pay.

This method has been used in a wide variety of settings, from health care resource allocation (Shiroiwa et al. 2010; King et al. 2005) to environmental goods (Kotchen, Turk, and Leiserowitz 2017) and sustainably produced beer (Carley and Yahng 2018). With respect to economic development, several studies have directly elicited recipients' preferences or valuations before delivering aid: Hidrobo et al. (2014) conducted randomized controlled trials in Ecuador, Uganda, Niger, and Yemen to assess the impact and cost-effectiveness of cash, food vouchers, and food transfers. The impact evaluations also incorporated surveys of beneficiaries' preferences for the different transfer modalities. Khera (2014) conducted qualitative and quantitative surveys of rural households across India to elicit preferences for cash versus food transfers through the Public Distribution System. Ghatak, Kumar, and Mitra (2013) conducted a household survey among the beneficiaries of the Bihar Chief Minister's Bicycle Programme (which provides money to purchase a bicycle for every student enrolled in ninth grade at a government school) to examine program coverage, benefit utilization by recipients, and beneficiaries' preferences for cash versus in-kind transfers. Additionally, Berry, Fischer, and Guiteras (2015) and Jack (2013) have suggested that willingness to pay for aid and economic development programs is related to the impact of such programs, although Shapiro (2019) has found that valuation for interventions is unrelated to outcomes when the value of the transfer to the recipient is controlled for.

Recipients' valuations, or willingness to pay, for aid interventions have been measured in various studies, but to the author's knowledge there has not been a systematic attempt to understand the distribution of aid recipients' valuations across many potential interventions or to test the implications of this information as it relates to the efficiency of various mechanisms for allocating aid. To address that gap, this study elicits (potential) recipients' valuations for 14 common uses of aid dollars, chosen based on a review of existing aid projects in Kenya. The 14 interventions include both private goods and services and local public goods; they also include interventions in various sectors such as health, education, and agriculture. For each potential use of resources, respondents were asked what amount of cash would make them just as well off as receiving the intervention. In estimating respondents' valuations, this study employs various mechanisms to incentivize truthful reporting, and gives cash or the intervention to randomly selected respondents. The chance that respondents will actually receive what they say they want makes it optimal for them to truthfully report their cash-equivalent value for the intervention. The data reveal substantial variation in recipients' valuations across interventions as well as across individuals offered the same intervention. The former suggests that providing highly valued (on average) interventions can achieve relatively large gains in recipient surplus (measured as the difference between the recipient's valuation and the estimated cost of the intervention), while other interventions will actually waste resources (as many recipients value the intervention less than its cost). The latter form of variation suggests that significant gains in recipient surplus can be had by targeting interventions to individuals who value them most.

This study further explores how variation in valuations relates to various recipient characteristics and proxies for need. Valuations do not correlate with overall recipient poverty, the most common proxy used for targeting. Using poverty-proxy means tests for targeting may be justified from an equity or ethical perspective, but not from an efficiency perspective (i.e., maximizing recipient surplus). Moreover, this study shows that many proxies for need of a specific intervention do not predict valuation for that intervention. While "need" has been shown to influence aggregate aid flows, it does not appear to be an effective method for micro-targeting specific interventions.

While centralized, decentralized, and individual allocation mechanisms have been deployed in multiple contexts, little is known about their comparative efficiency and effectiveness. This study explores the implications of various allocation mechanisms for recipient surplus. Specifically, a simulation exercise assumes that the study sample is the target group for interventions and that the specific interventions included in the study represent all possible uses of aid dollars. Given these assumptions, the author does not intend to make assertions about the relative desirability of specific interventions, but rather aims to draw general conclusions about how allocation can best be accomplished when recipient preferences are highly variable. The simulation evaluates two allocation mechanisms: cash transfers, which permit

maximal recipient discretion, and voting, which is akin to the outcome aimed at through decentralized decision-making. Each mechanism is benchmarked against a central planner, who is assumed to have full knowledge and be able to maximize recipient surplus. The simulation shows that when resources are scarce and valuations of interventions are heterogeneous, cash transfers can generate significantly more recipient surplus than allocation by vote. However, this applies only when markets function and when frictions on collective action do not preclude the provision of local public goods through cash transfers. When recipients can use cash transfers only for private goods, a voting mechanism tends to outperform cash transfers. This suggests that coupling cash transfers with interventions to reduce frictions on voluntary provision of public goods may be a more efficient allocation strategy than deploying mechanisms of identifying highly valued public goods across the entire population, such as voting or decentralized decision-making.

This study does not imply that governments, donors, and development organizations should align resources entirely with the preferences of aid recipients. Recipient preferences are one of many factors to consider in the allocation of resources to aid and development programs; evidence, impact evaluations, politics, and technology are also important. Furthermore, the results of this study pertain only to a limited set of existing interventions; some technological advances in health could be very highly valued, for example, and R&D spending may be more valuable than anything else. The overall message is that the preferences and needs of aid recipients are highly variable and not easily observable; aid organizations and governments should not assume that programs are equally valued by all recipients, or that recipients who appear to "need" an intervention will value it more highly than others. If organizations seek to take into account recipient valuations and recipient surplus in allocation decisions, effort must be expended to understand whether valuations can be predicted using external data, and, if not, care should be taken in selecting the optimal allocation mechanism for distributing resources across specific interventions, including a consideration of cash transfers and mechanisms to facilitate the joint provision of local public goods.

2. Study Design

This section details the intervention selection, location selection, data collection, and intervention for this study.

Intervention Selection

In selecting specific interventions to include in the study, the author has focused on interventions that are provided by governments, aid organizations, and non-governmental organizations. Since the procedure for obtaining a recipient's valuation of a program was incentivized, the choice of interventions was further constrained: the intervention needed to be something that could feasibly be delivered by the research team. The first step in selecting interventions was to identify entities responsible for funding and/or delivery of development programs in Kenya, specifically the government of Kenya (GoK), official development assistance (ODA) by multilateral and bilateral donors, philanthropic foundations, and international non-governmental organizations (INGOs). For each of these entities, data on development program spending in Kenya were collected. GoK spending data were obtained from Kenya Open Data.[3] To focus on development spending in particular, GoK spending was classified according to category (e.g., "Security", "Education") and then according to whether it was likely to directly improve the economic situation of Kenyans (e.g., education and health), was delivered through macroeconomic channels (e.g., trade policy and infrastructure investment), or was part of a government service (e.g., national defense). This study focuses on spending that is likely to directly improve the economic situation of Kenyans. Bilateral and

3   Government of Kenya, "Kenya Government Funded Projects 2015" and "Kenya Open Budget Program Based Budget 2015", http://www.opendata.go.ke/ (accessed October 13, 2019).

multilateral donor data were obtained from the OECD.[4] For foundations, this study focuses on two large and prominent foundations, the Gates Foundation and the Ford Foundation, obtaining grant-level data from annual statements and reports.[5] Finally, seven large INGOs, with total charitable spending in excess of US$500 million in 2014, were selected and spending data from annual and financial reports obtained.[6]

Priority sectors were identified using these sources of development spending data. For the GoK, the primary sectors involved with directly improving the economic situation of Kenyans are education (25 percent of GoK spending), health (3 percent of GoK spending), agriculture (3 percent of GoK spending), and water (2 percent of GoK spending). Among categories intended to benefit Kenyans through macroeconomic channels, the major sectors include transport (15 percent of GoK spending) and energy (7 percent of GoK spending). OECD data indicate that the main category (46 percent) of ODA to Kenya goes to "Social Infrastructure & Services." Major subcategories include health (62 percent of category spending), water (14 percent of category spending), and education (7 percent of category spending). The primary specific program areas are sexually transmitted disease control, malaria control, large water systems, and primary eduction. For the Gates Foundation, the primary spending categories are agriculture (20 percent), financial services for the poor (19 percent), family planning (16 percent), and water, sanitation, and hygiene (12 percent). Ford Foundation grants were highly varied, with many larger grants focused on human rights issues. The INGOs had varied programs, classified according to idiosyncratic categorizations; broad areas assigned to these categories suggest that the primary sectors of focus are health (30 percent) and humanitarian, emergency, and disaster assistance (24 percent).

Priority sectors for this study were selected based on major overall categories of development spending. A back-of-the-envelope calculation, which may include double counting but is indicative, suggests that the vast majority of spending is by the GoK (72 percent) and ODA actors (24 percent). Foundations and INGOs make up a relatively small percentage of spending. Therefore this study focuses on sectors that are primary for the GoK and ODA spending, namely education, health (including reproductive health), agriculture, water, and energy.

Having identified major categories of development spending, data on the specific programs delivered within each broad category were collected by reviewing project documentation. Large GoK programs within each category were evaluated, and 34 programs were selected and researched to identify whether it would be feasible to replicate elements of the program.[7] For ODA-funded programs, this study focuses on USAID programs, as USAID is the largest donor to Kenya among bilateral and multilateral donors; 13 programs were selected for further investigation.

From this research, a list of specific interventions (e.g., extension services, agricultural input subsides, family planning services) that appeared important was compiled; this was done based on the number of GoK or USAID programs in which the specific intervention was included and on the size of the program budget. The list was filtered down to a smaller list of interventions based on logistical considerations of what could feasibly be provided to respondents (in order to incentivize accurate revelation of indifference points between cash and the program). The final list of interventions included in the study is given

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4   https://stats.oecd.org/
5   https://www.gatesfoundation.org/How-We-Work/Quick-Links/Grants-Database (accessed October 13, 2019) and https://www.fordfoundation.org/library/financial-statements/2014-annual-tax-return-form-990-pf/ (accessed October 13, 2019).
6   These include CARE International, Catholic Relief Services, Médecins Sans Frontières, Oxfam International, Plan International, Save the Children, and World Vision International (https://www.undp.org/content/dam/china/docs/Publications/UNDP-CH11%20An%20Overview%20of%20International%20NGOs%20in%20Development%20Cooperation.pdf) (accessed October 13, 2019).
7   Government of Kenya, "Kenya Government Funded Projects 2015", http://www.opendata.go.ke/ (accessed October 13, 2019).

below. Note that this is not a perfectly scientific exercise; public documentation of large-scale development projects is high-level and vague, making it difficult to understand in many instances exactly what goods and services are to be provided to recipients.

(1) Agriculture
   (a) Extension: group-based agricultural extension courses over the period of one cropping season
   (b) Inputs: 50 kg of fertilizer
(2) Water
   (a) Water supply: an easily accessible water source, such as a water tank for the community
   (b) Hygiene/WASH education: a group-based single session on safe water practices
   (c) Hygiene/WASH supplies: basic hygiene supplies (soap and chlorine for water treatment) for two months
(3) Health
   (a) Family planning services: one free visit to a family planning clinic to receive family planning services, with an allowance for transportation
   (b) Condoms: a box of 50 condoms
   (c) Bed nets: an insecticide-treated bed net
(4) Education
   (a) Teacher training: training for one teacher
   (b) Computers in schools: computers provided to one government-run school
   (c) Out-of-school tutoring: weekly tutoring sessions for one child for one school term
   (d) Vocational training: a vocational training course in computer skills
   (e) Financial literacy training: a group-based training session on financial management
(5) Energy
   (a) Solar power: a solar power system that can power a lamp and recharge a cell phone

Location Selection

The aim of this study is to understand the preferences of current or potential recipients of development programs; therefore, the study was conducted in areas with relatively high rates of poverty. Beginning with a list of Kenyan counties, all counties with a poverty rate of less than 40 percent, or just below the 2005 national rate of 46 percent,[8] were excluded from consideration. The one exception is Nairobi County, as this study sought to include low-income households in urban centers as well as in rural areas. Due to logistical considerations, counties in the lower third of household density were also removed from consideration. The remaining counties were then prioritized based on poverty rate, household density, fertilizer use, prevalence of HIV infection, diarrhea and malaria prevalence, bed net use, and secondary school enrollment rate. The data (all obtained from Kenya Open Data) were used to create heat maps of the levels of these measures for each area and thus to select less well-off areas. Ultimately, data were collected from three Kenyan counties: Nairobi, Nakuru, and Makueni. As no county was clearly worse off on all dimensions, the selection was somewhat subjective; this article does not claim that the selected areas are objectively the poorest ones in Kenya, or that the sample is representative of Kenya as a whole.

Within the Nakuru and Makueni counties, enumerators conducted village censuses to identify eligible recipients (defined by housing construction materials—see below) and surveyed all eligible households in each village. Data were collected in a total of 25 villages. In Nairobi, respondents were selected from Kibera, an informal settlement, and were filtered by employment status as a proxy for poverty (those with regular formal employment were not surveyed). This was done by the Busara Center for Behavioral Economics, which maintains a database of around 10,000 potential survey respondents in Kibera.

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8   World Bank, https://data.worldbank.org/country/kenya (accessed October 13, 2019).

Data and Program Delivery

The baseline survey was conducted with 806 individuals across the three counties. The follow-up survey reached 793 of these individuals. In Nairobi, eligible individuals include people residing in Kibera who were over 18 years of age and not formally employed. In Nakuru and Makueni, eligible individuals are those over 18 years of age residing in a home made of all or partially natural materials (e.g., wood and local stone or mud; homes that include cement or cinder blocks were excluded). Eligible households were first identified and later revisited for data collection if they met the screening criteria.

A baseline survey was administered to each respondent, with the goal of eliciting indifference points between cash and aid programs. Specifically, respondents were asked what amount of cash would make them as well off as receiving the intervention that had just been described to them. This was done using a variety of methods, such as the Becker-DeGroot-Marschak method, multiple price lists, and simple questioning (based on a hypothetical scenario). Recipients were not informed about the estimated cost of the intervention, but rather were given details of the intervention and asked only for a valuation. The supplementary online appendix (available with this article at *The World Bank Economic Review* website) provides full details of the interventions described to respondents (supplementary online appendix S1) and the implementation of each value-elicitation method (supplementary online appendix S2). The reason for using various methods was to understand whether specific methods are more or less reliable in eliciting consistent answers from respondents. That question is addressed in a separate study (Jang and Shapiro 2018).

Following the baseline survey, a particular intervention to be offered to each recipient was selected by lottery. Subsequently, the research team revisited the respondent and offered them the intervention or a sum of cash close to their previously stated indifference point. Roughly half of the sample made the choice predicted by their indifference point, and it does not appear that any method is more consistent in eliciting true valuations than others (for details see Jang and Shapiro [2018]). If respondents chose to receive the program, the goods or services were delivered in person by an individual not involved in the initial data collection. For respondents choosing cash, a transfer was sent through the M-Pesa digital payment platform. Both cash and interventions were delivered on the same day to equalize trust across the two options. The research team followed up with recipients (by phone or in person) to confirm receipt of goods, services, or cash. Of the 116 program recipients that could be contacted, 6 reported not receiving the program, whereas for cash respondents the research team was able to verify through the receipt confirmation survey and M-Pesa details that all respondents received the transfer.

3. Results

This section begins with an overview of recipient valuations, before assessing targeting approaches and allocation mechanisms.

Overview of Recipient Valuations

The analysis begins with examining the distribution of recipients' valuations for interventions and seeking to understand the primary dimensions by which valuations vary. To place interventions on a similar scale, the reported valuation for each intervention was divided by its estimated cost (on a per-person basis, ignoring problems of indivisibility, which is reasonable assuming a large population of recipients). The estimated cost of each intervention and the basis for that cost is presented in supplementary online appendix S3. These estimates are by definition approximate; a range of costs is reasonable and validated by external benchmarks. The general implications of the analysis do not depend on the specific cost estimates, and particular sensitivities to cost assumptions are noted below.

Figure 1 shows the 25th, 50th, and 75th percentiles of recipient valuations for each intervention relative to the cost of the intervention. The vertical line indicates a value-to-cost ratio of 1. The interquartile range for many interventions lies substantially to the right of the vertical line, indicating

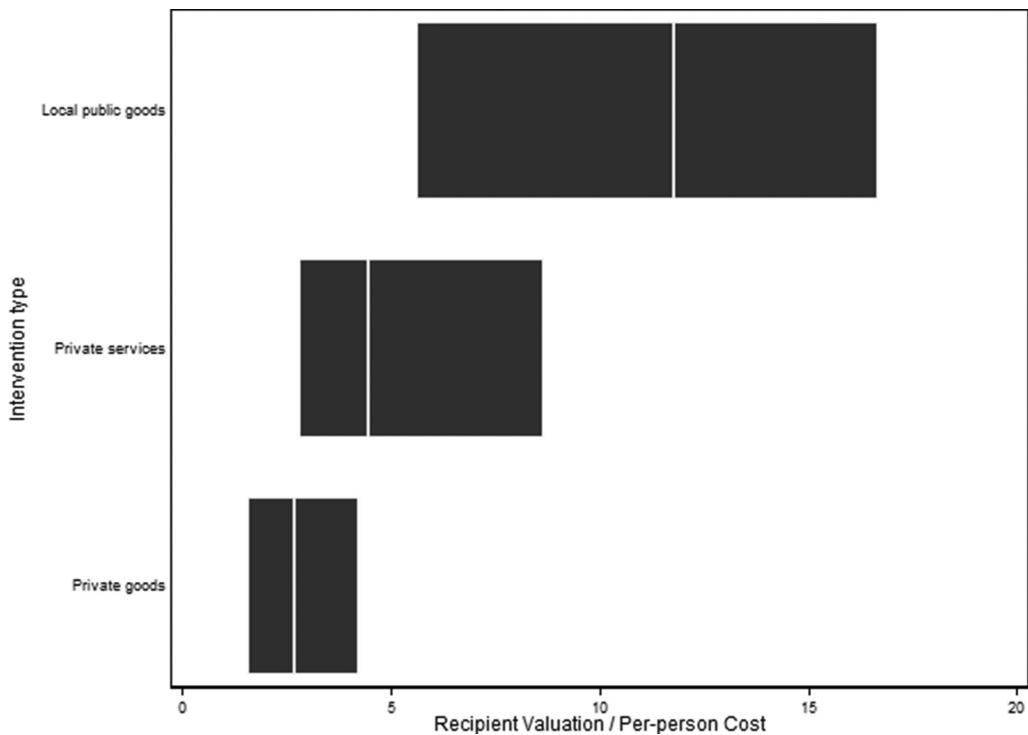**Figure 1.** Recipient Valuation-to-Cost Ratio by Program
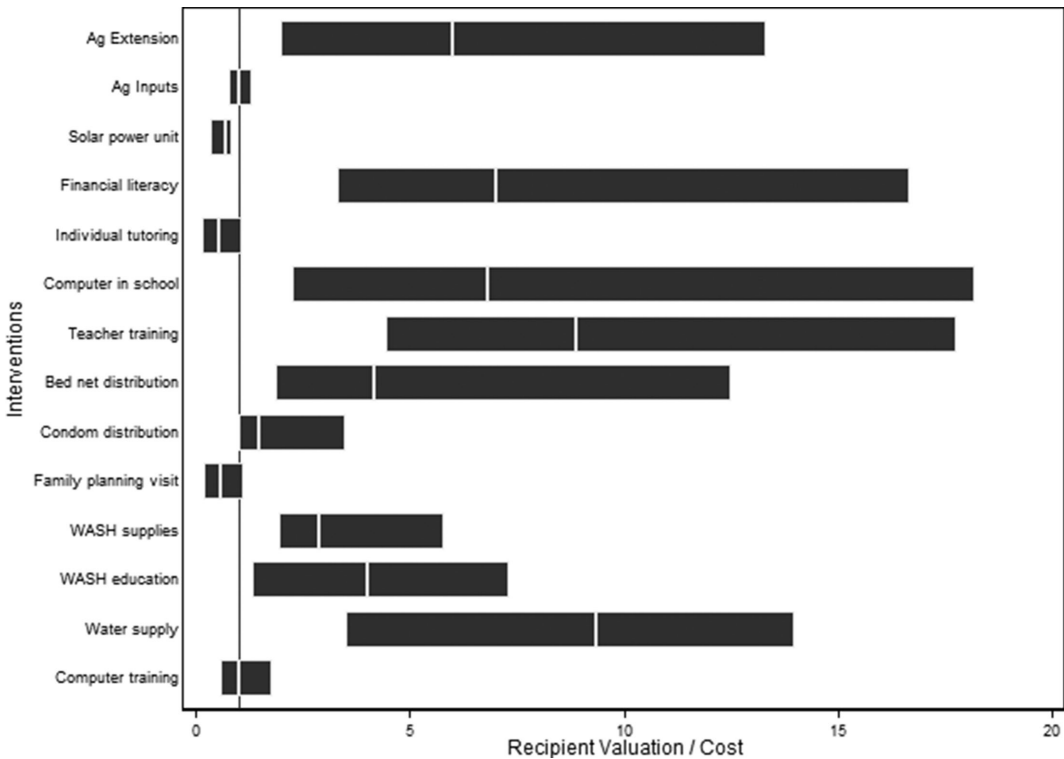
Source: Author's analysis based on own data.

Note: Box plots display the distribution of the recipient value-to-cost ratio spanning the interquartile range for each intervention; the left end of each box represents the 25th percentile valuation for the intervention indicated in the row, and the right end of the box represents the 75th percentile valuation. The white line inside each box represents the median valuation. The vertical black line indicates a value-to-cost ratio of 1.

that the majority of respondents see substantial value in these interventions relative to the estimated cost. The interquartile range for another group of interventions, however, falls across the vertical line, which indicates that providing the intervention to some people would be value-creating (i.e., valuation exceeds cost) while providing it to others would be value-destroying relative to a simple cash transfer (i.e., valuation is less than cost). This is primarily the case for private goods that can be purchased in open markets. While it is reasonable that some people value the provision of private goods less than the cost (e.g., those who choose not to purchase the goods), it is somewhat perplexing that some other individuals value private goods, which can be obtained in the market, above their cost. This may partly reflect transaction costs of obtaining the item. Also, in qualitative discussions with individuals expressing these valuations, commitment was the most common theme: individuals were willing to forgo a cash transfer higher than the cost of an item they desire as a way to, in effect, commit themselves to purchasing that item.

What is perhaps most striking is the very high across-respondent variation in valuations for some interventions, with the maximum variation in valuation ranging from 3 times to 18 times (for computers in schools) the estimated cost of the intervention. In cases where the range of valuations crosses the vertical line, the implications for efficiency in distribution are clear: providing the intervention to some individuals destroys value, while providing it to others creates value. But even where the range of valuations is to the right of the vertical line (i.e., respondents prefer the intervention to cash), substantial aggregate recipient surplus could be achieved by targeting specific interventions to people who value them most. While the specific position of each interquartile range depends on the estimated cost of the

Figure 2. Ratio of Recipient Valuation to Per-Person Cost by Program Type

Source: Author's analysis based on own data.
Note: Box plots display the distribution of the recipient value-to-cost ratio by intervention type. Recipient valuations are averaged across all interventions in each of three categories: private goods, private services, and local public goods. The left end of each box represents the 25th percentile valuation for interventions belonging to the type indicated in the row, and the right end of the box represents the 75th percentile valuation. The white line inside each box represents the median valuation.

intervention, the general conclusions hold over a range of cost estimates, and the variation is apparent in the distributions of raw valuations (independent of cost), as shown in fig. S4.1 in the supplementary online appendix.

Assessing Targeting Approaches

Since fig. 1 suggests that a large recipient surplus could be achieved by targeting interventions to people who value them most, the next question explored in this study is whether several common approaches to targeting achieve that end. One approach is to focus on public goods. This targets widely and allows for a degree of self-selection by the users of public goods. Figure 2 shows the interquartile ranges of value-to-cost ratios averaged over various types of interventions: local public goods, which are non-rival and non-excludable at the school or village level (village water supply, teacher training, and computers in schools); private services that are intangible and not readily available on the market (computer skills training, WASH education, financial literacy education, agricultural extension, and tutoring); and private goods that can easily be purchased at local markets (WASH supplies, visit to family planning clinic, condoms, bed net, solar energy supply, and agricultural inputs). In this figure, indivisibilities in the provision of public goods and group services are ignored, meaning that the cost assigned to these interventions is the average cost per person (e.g., the cost of teacher training is divided by an assumed class size of 30). This is reasonable if one assumes a large recipient population, i.e., there are many people who have the same valuation for a public good or training service and the cost can be spread over that group. When looking at the total cost of interventions (shown in fig. S4.2 of the supplementary online appendix), recipients value

private goods well above other types of interventions, suggesting that while few would pay to provide a public good in its entirety, many would contribute the average cost of such a good. Returning to fig. 2, the median value-to-cost ratio is lowest for private goods (valuation is approximately 3 times cost) and highest for local public goods. Moreover, the variation in value-to-cost ratio is much smaller for private goods (with interquartile range of valuations between 2 and 4 times the cost) than for services (between 3 and 8 times the cost) and public goods (between 4 and 9 times the cost). Thus, to some extent, focusing on public goods or group training services, where there is the chance for individual self-selection into the intervention, may capture individuals with particularly high valuations for the interventions.

While a focus on public goods tilts toward interventions that generate substantial consumer surplus, simply providing public goods does not discriminate at the individual level in terms of who should receive which intervention. The most common form of targeting that discriminates at the individual level relies on proxies of "need." Such proxies include general economic welfare (e.g., consumption) or perceived specific needs for particular interventions (e.g., agricultural assistance to marginal farmers or bed nets to families at risk of malaria). Table 1 shows the average value-to-cost ratio for each intervention across five quintiles of per-capita consumption, derived from a regression of consumption quintile dummies on valuation. The general trend suggests that wealthier individuals value interventions more highly. This may reflect an implicitly higher willingness to pay (ability to afford) in wealthier people, or it may indicate that the poorest of the poor face liquidity constraints that cause them to prefer cash to programs. A test of equality of the coefficients, however, cannot be rejected for 10 of the 14 interventions considered, and where equality can be rejected the differences in valuations across quintiles of consumption are modest. While this does not negate the justification for targeting according to general poverty based on equity or ethical considerations, it does indicate that targeting according to general poverty is unlikely to be optimal in terms of efficiency (consumer surplus maximization) considerations.

Turning to targeting based on specific needs rather than general need, fig. 3 shows valuations according to specific proxies for need. The top row examines whether individuals without sufficient water, electricity, and a bed net value water supplies, electricity, and bed nets, respectively, more highly than others. Individuals with electricity do value access to a solar energy supply unit less than those without electricity (their value-to-cost ratio is about 0.1 less than that for individuals without electricity); however, it does not appear that people without sufficient water or a bed net value those interventions differently than others. The bottom row of fig. 3 and table 2 evaluate whether the perception of how well a student is doing in school affects valuation for tutoring sessions, whether the number of children in a household impacts valuation for family planning services, and whether time spent in agriculture predicts valuation of agricultural interventions (extension and inputs). The answer appears to be "no": the mean valuations across various quantiles of the independent variable (need proxy) are not significantly different from one another, as confirmed by the p-value of a test that all means are equal. Although in some instances (electricity in this particular sample) perceived need for an intervention correlates with valuation of that intervention, this is not universally the case, and so proxies of need may be an inefficient method of allocating interventions to individuals who value them most.

Evaluating Allocation Mechanisms

When individual targeting of interventions is impossible or impractical, alternative means of allocation will determine recipient surplus. This article next considers how various allocation mechanisms affect the total recipient surplus and the distribution of that surplus. Three specific allocation mechanisms are considered.

- Central planner: This mechanism assumes a central planner with full knowledge of each recipient's valuation for each intervention. The planner's objective is to maximize total recipient surplus when facing a fixed budget constraint. Specifically, this is accomplished by implementing the solution to

Table 1. Valuation by Quintiles of Household Per-Capita Consumption

	Vocational training (1)	Water supply (2)	WASH education (3)	WASH supplies (4)	Family planning (5)	Condom distribution (6)	Bed net distribution (7)	Teacher training (8)	Computers (9)	Tutoring (10)	Financial education (11)	Solar energy (12)	Agricultural inputs (13)	Extension (14)
Quintile 1 (poorest)	1.09	10.42	5.51	4.34	0.75	2.32	6.88	12.66	14.71	0.55	11.63	0.69	1.1	9.52
	(0.24)	(0.80)	(0.39)	(0.33)	(0.08)	(0.19)	(0.56)	(0.75)	(1.36)	(0.04)	(0.98)	(0.03)	(0.05)	(0.86)
Quintile 2	0.87	10.82	4.87	4.93	0.84	2.62	7.33	11.6	14.47	0.64	10.49	0.64	1.07	8.97
	(0.18)	(0.83)	(0.40)	(0.33)	(0.07)	(0.19)	(0.58)	(0.75)	(1.36)	(0.04)	(0.98)	(0.03)	(0.05)	(0.91)
Quintile 3	1.4	11.43	4.74	4.85	0.9	2.19	6.46	11.98	13.76	0.63	11.48	0.65	1.09	7.78
	(0.14)	(0.83)	(0.41)	(0.33)	(0.07)	(0.19)	(0.58)	(0.75)	(1.36)	(0.04)	(0.98)	(0.03)	(0.06)	(0.99)
Quintile 4	1.27	10.65	5.49	4.67	1.01	2.27	6.77	11.98	14.37	0.69	13.23	0.66	1.02	10.54
	(0.12)	(0.81)	(0.41)	(0.33)	(0.08)	(0.19)	(0.57)	(0.75)	(1.36)	(0.04)	(0.98)	(0.03)	(0.06)	(1.11)
Quintile 5 (richest)	1.57	12.37	6.46	5.35	0.91	2.43	7.68	13.54	15.82	0.76	14.81	0.69	1.08	11.44
	(0.11)	(0.84)	(0.42)	(0.33)	(0.08)	(0.19)	(0.58)	(0.75)	(1.36)	(0.04)	(0.98)	(0.03)	(0.07)	(1.26)
Observations	265	726	719	793	740	747	733	793	793	793	793	720	488	528
R^2	0.65	0.56	0.56	0.57	0.48	0.52	0.51	0.63	0.42	0.59	0.5	0.75	0.78	0.46
p-value equality of coefficients	0.01	0.47	0.03	0.29	0.18	0.52	0.6	0.38	0.87	0.01	0.02	0.66	0.9	0.16

Source: Author's analysis based on own data.

Notes: The table shows regressions of respondents' value-to-cost ratio for the interventions indicated in the column headings on dummies for each quintile of household per-capita consumption. For each intervention, the *p*-value of a test of equality of the coefficients is also shown. Standard errors are given in parentheses.

Table 2. Recipient Valuation-to-Cost Ratio by Proxies of Need

	Tutoring: value/cost (1)	Family planning: value/cost (2)	Agricultural interventions: value/cost (3)
School performance tercile 1	0.68 (0.03)		
School performance tercile 2	0.62 (0.05)		
School performance tercile 3	0.6 (0.04)		
Number of kids quintile 1		0.87 (0.06)	
Number of kids quintile 2		0.85 (0.08)	
Number of kids quintile 3		0.96 (0.08)	
Number of kids quintile 4		0.94 (0.09)	
Number of kids quintile 5		0.76 (0.10)	
Time in agriculture quintile 1			5.45 (0.66)
Time in agriculture quintile 2			5.05 (0.67)
Time in agriculture quintile 3			5.78 (0.67)
Time in agriculture quintile 4			4.73 (0.66)
Time in agriculture quintile 5			6.57 (0.67)
Observations	577	740	833
R^2	0.58	0.48	0.3
p-value equality of coefficients	0.29	0.52	0.34

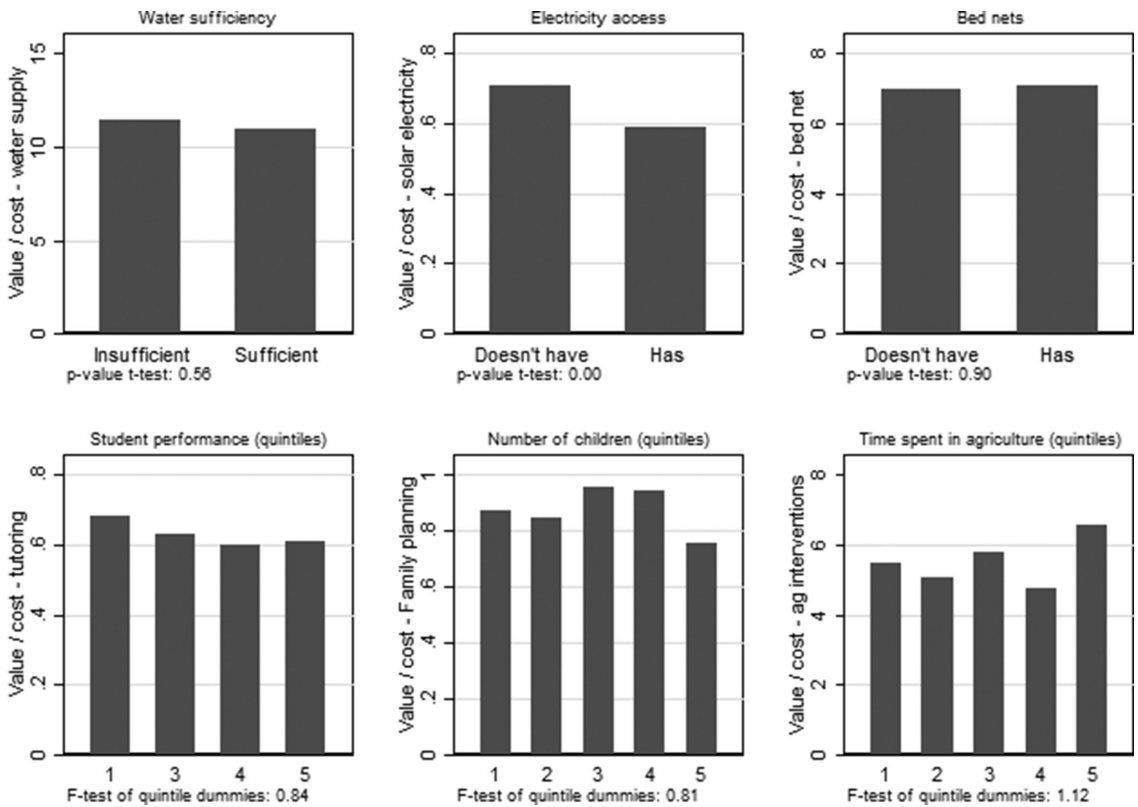*Source*: Author's analysis based on own data.

Notes: The table shows regressions of respondents' value-to-cost ratio for the interventions indicated in the column headings on dummies for each quantile of the variables indicated in the rows. Standard errors are given in parentheses.

the "knapsack problem"[9] using recipient valuations and the cost of each intervention. This mechanism serves as a benchmark in that it represents the maximum possible recipient surplus under a fixed budget constraint.

- Cash transfer: In this mechanism, each individual is allocated a fixed budget (such that the sum of individual budgets equals the total budget from the central planner's problem). Beginning with each individual's highest-ranked intervention (according to value-to-cost ratio), the individual progressively "purchases" interventions until their budget is exhausted. Generally, fractional purchases of an intervention are not allowed except for the final purchase; this ensures that the budget is exhausted in all allocation mechanisms and allows for proper comparison. In the base case, individuals are able to "purchase" a public good based on their share of the price (e.g., to purchase a water source serving 250 people for $\frac{1}{250}$th of the price). This is sensible assuming a large population and ignoring frictions

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9   The knapsack problem is a problem in combinatorial optimization: given a set of items, each with a weight and a value, determine which items to include in the knapsack to maximize its value subject to an aggregate weight limit. The solution to this problem was implemented with the custom Stata "knapsack" command (https://github.com/worldbank/stata/blob/master/src/knapsack/knapsack.sthlp).

Figure 3. Recipient Valuation-to-Cost Ratio by Proxies of Need
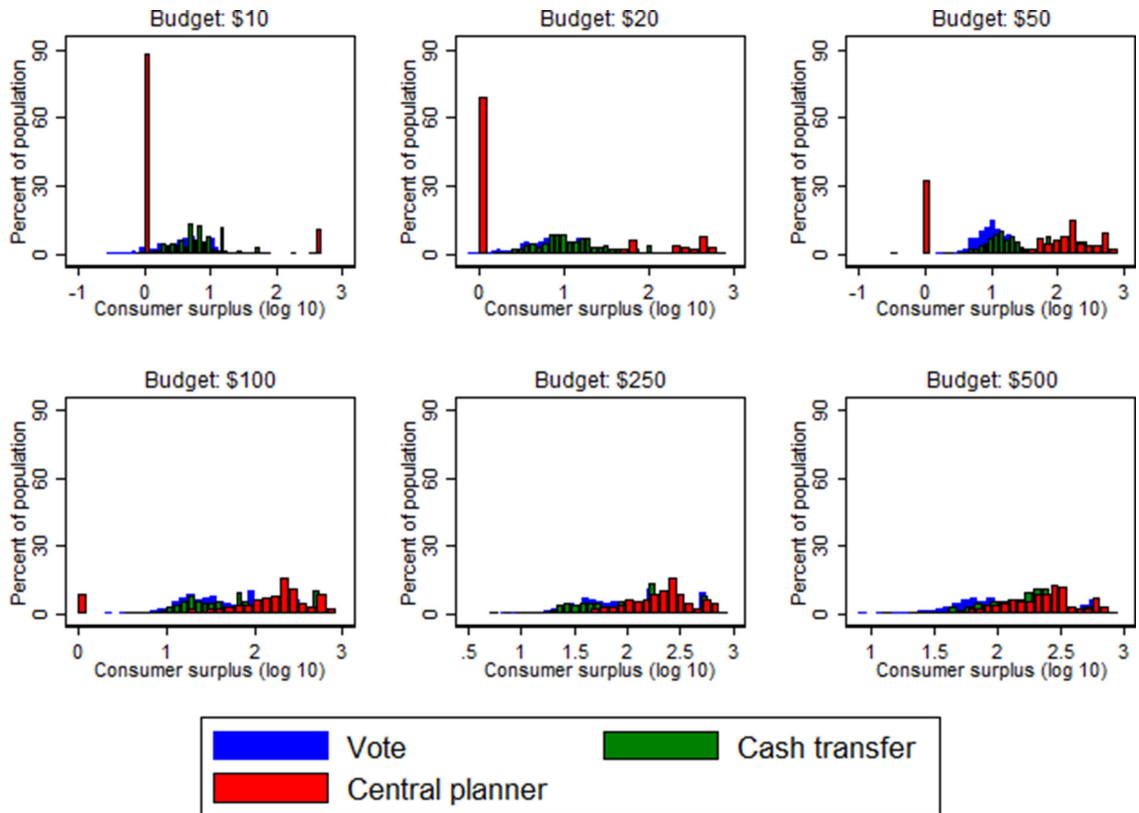

Source: Author's analysis based on own data.
Note: The top left graph shows the average value-to-cost ratio for water supply, disaggregated by whether the respondent has a sufficient or an insufficient supply of water. The top middle graph shows the average value-to-cost ratio for a solar energy system, disaggregated by whether the respondent has electricity or not. The top right graph shows the average value-to-cost ratio for a free bed net, disaggregated by whether the respondent has a bed net or not. The bottom left graph shows the average value-to-cost ratio for tutoring, disaggregated by quintiles of perceived student performance. The bottom middle graph shows the average value-to-cost ratio for family planning services, disaggregated by quintiles of the number of children. The bottom right graph shows the average value-to-cost ratio for agricultural interventions, disaggregated by quintiles of time spent working in agriculture.

in contributions to public goods (e.g., free riding). This article also considers the case where individuals can only purchase private goods with their cash transfers.

- Voting: In this mechanism the population selects interventions based on an iterated plurality vote. First, the intervention that is ranked highest (according to value-to-cost ratio) by the most recipients is selected. That intervention is provided to all recipients, and the budget is correspondingly reduced. The intervention that is ranked highest among previously unselected interventions is then chosen and provided to all recipients. This continues until the budget is exhausted. The votes are conducted separately by urban and rural populations as these populations are offered different interventions (e.g., the agricultural interventions were not offered in Nairobi, and computer training was not offered in rural areas). This study also explored alternative voting mechanisms (e.g., Borda count), but the selection of interventions was found to be nearly identical across different voting mechanisms.

Figure 4 shows the distribution of recipient surplus (shown on a base-10 logarithmic scale for readability) under each of these three allocation mechanisms for budgets corresponding to US$10, 20, 50, 100, 250, and 500 per person. Although the central planner always generates the maximum aggregate surplus, for relatively low budgets its distribution of recipient surplus is highly unequal, with the majority of people

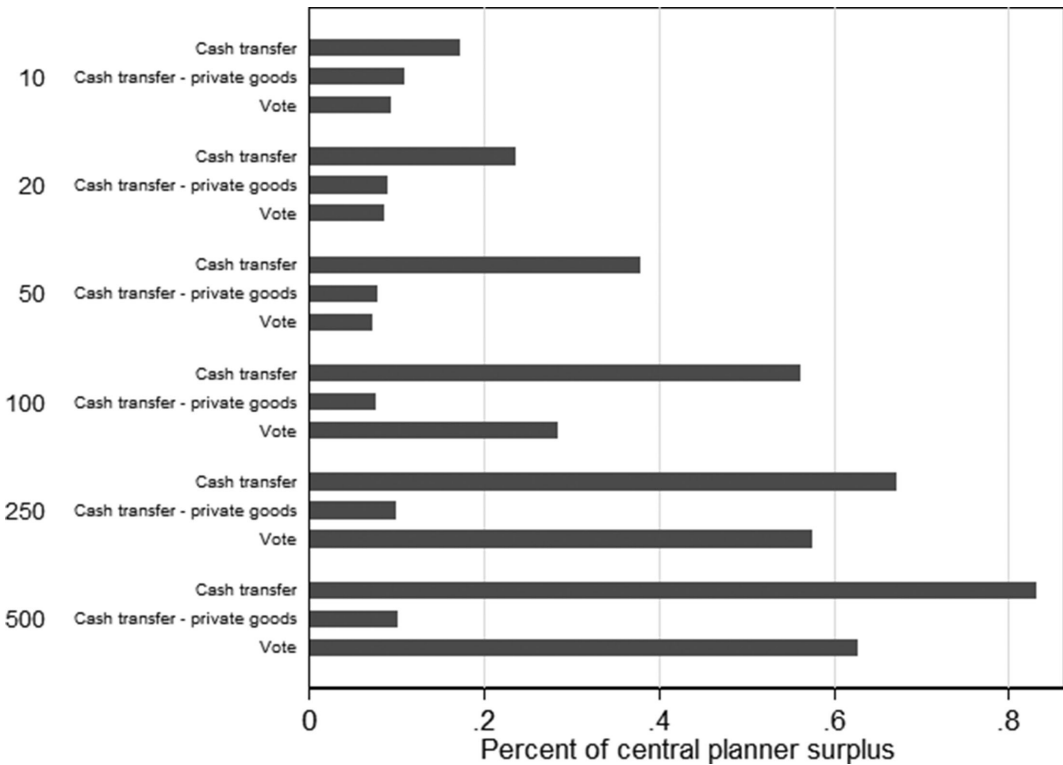**Figure 4.** Histograms of Consumer Surplus by Allocation Mechanism and Budget

Source: Author's analysis based on own data.
Note: The graphs show the distribution of recipient surplus (defined as recipient value for an intervention minus its cost) under the various allocation mechanisms indicated in the legend, for hypothetical budgets of $10, $20, $50, $100, $250, and $500 per recipient. Surplus is shown on a base-10 logarithmic scale for readability.

receiving no intervention and no surplus and with approximately 10 percent of the population receiving multiple interventions. The mechanisms of individual choice through cash transfers and voting generate more equitable distributions, with cash transfers outperforming voting as long as coordination frictions in the provision of public goods and market failures are ignored. As the per-capita intervention budget increases, the distribution of surplus by each allocation mechanism begins to converge (intuitively, most people are getting most interventions when budgets are high); this suggests that the choice of allocation mechanism is most important in a setting of low resources.

Figure 5 focuses on the relative (to the central planner's solution) total surplus induced by each allocation mechanism, ignoring the distribution of that surplus. For each allocation mechanism and budget (indicated on the far left), the length of the bar represents the percentage of the planner surplus that the mechanism in question delivers. The figure mirrors the implications from fig. 4 in that cash transfers tend to outperform voting, but less so as the budget constraint becomes less binding. This figure also shows the relative surplus for a cash transfer mechanism where individuals are not able to coordinate in order to fund public goods and cannot purchase private services (primarily group-based training) in the open market. At very low per-capita budgets, this cash transfer mechanism outperforms voting. This is because individuals have highly variable valuations for interventions, and voting enforces the same interventions for all recipients while cash transfers provide the flexibility to purchase an individual's most-valued intervention. As the per-capita budget increases, however, the lost surplus from the inability to obtain public

Figure 5. Relative Recipient Surplus by Allocation Mechanism and Budget

Note: The graphs show the cumulative recipient surplus (defined as recipient value for an intervention minus its cost) under the various allocation mechanisms indicated in the rows, expressed as a percentage of the central planner surplus (i.e., the maximum attainable cumulative surplus). Results are shown for hypothetical budgets of $10, $20, $50, $100, $250, and $500 per recipient, indicated by the numbers on the far left.

goods and private services not available on the market outweighs the additional flexibility provided by cash transfers.

4. Conclusion

The question of how to allocate aid and development dollars across programs is critically important to donors and governments; yet it is difficult to determine what relative weights to place on different programs. Governments, multilateral institutions, and non-governmental organizations typically fund a wide variety of aid programs, the selection of which is driven by the unique priorities and politics of each institution. In theory, in a representative democracy the allocation decisions made by government officials should reflect the preferences of aid recipients who have helped put them in office. Furthermore, many donors endeavor to include recipient perspectives in the design of aid programs. Given imperfections in institutions and informational limitations, however, the allocation of aid resources may not be particularly good with respect to recipient preferences.

This study considers one measure of goodness of an allocation, namely the recipient surplus, measured as the difference between a recipient's valuation for an intervention and its cost. The first finding is that valuations are highly variable across interventions and across individuals offered the same intervention. While a good deal of research effort has gone into addressing the first source of variation (e.g., randomized controlled trials to assess average effectiveness of an intervention), comparatively little is known

about how to optimally target interventions within a particular population. The present study shows that commonly used measures for allocating aid, such as overall poverty or perceived need for a particular intervention, do not correlate strongly with individuals' valuations for interventions.

When valuations are private information and uncorrelated with observable factors, the allocation of interventions to individuals who value them most must be done through the choice of an appropriate allocation mechanism. Through simulations, this study examines two allocation mechanisms: direct voting on allocation decisions and decentralized allocation decisions enabled by cash transfers. The simulations suggest that when preferences are highly heterogeneous, direct voting procedures are unlikely to maximize allocative efficiency (as measured by recipient surplus). If frictions on private contributions to public goods do not bind, cash transfers are a significantly more efficient allocation mechanism. Even when cash transfers cannot enable public goods and some services, at very low resource levels cash transfers may still outperform voting. As resource levels increase, however, cash transfers perform quite poorly when public goods cannot be obtained through individual cash transfers and when some services are not available in the market.

There are several limitations to this study. First, it is possible that the results are specific to the particular interventions considered and the manner in which they were presented to potential recipients. This study intentionally included a relatively wide variety of interventions to limit the chance that results would be specific to the particular interventions. However, the results of the study do not necessarily extend to all types of intervention or specific instances of those interventions. Second, normalization by cost of the intervention is necessary for conducting the analysis, which means that the results depend not only on the valuations for specific interventions given by the recipients but also on the assumed costs of those interventions. As seen in fig. 1, there is great deal of variation in the valuations recipients place on interventions, indicating that recipient surplus will be sensitive to the allocation mechanism used, regardless of the specific costs of those interventions. However, it is also possible that the specific results are informed by the assumed costs.

The implications of this study are, firstly, that valuations of aid interventions are highly variable and that effort should be put into determining how to target specific interventions to specific people. Moreover, it is often not sufficient to target based on overall poverty or even based on variables that relate to an individual's need for a specific intervention. Currently, the majority of research on aid focuses on the effectiveness of aid generally and of specific interventions in particular, without much emphasis on allocative efficiency or systematic heterogeneity in program impacts. This study suggests that substantial welfare gains can be had by addressing this research gap. Second, this study shows that the particular mechanism used to incorporate recipient preferences in allocation decisions has significant effects on the efficiency and equity of the allocation. Voting procedures provide limited benefits when preferences are highly heterogeneous. Cash transfers, on the other hand, are comparatively efficient when constraints on private contributions to local public goods do not bind and when markets function. This suggests that cash transfers coupled with interventions to facilitate the joint private provision of local public goods and to resolve market imperfections may be a more efficient strategy of allocating aid resources than alternative mechanisms that incorporate recipient preferences, such as direct voting or decentralizing allocation decisions.

References

Alesina, A., and D. Dollar. 2000. "Who Gives Foreign Aid to Whom and Why?" *Journal of Economic Growth* 5 (1): 33–63.

Bastagli, F., J. Hagen-Zanker, L. Harman, V. Barca, G. Sturge, T. Schmidt, and L. Pellerano. 2016. "Cash Transfers: What Does the Evidence Say?" ODI Report, July 2016, Overseas Development Institute, London, UK. https://www.odi.org/sites/odi.org.uk/files/resource-documents/11316.pdf.

Berry, J., G. Fischer, and R. P. Guiteras. 2015. "Eliciting and Utilizing Willingness to Pay: Evidence from Field Trials in Northern Ghana." CEPR Discussion Paper No. DP10703, Centre for Economic Policy Research, London, UK.

Berthélemy, J.-C., and A. Tichit. 2004. "Bilateral Donors' Aid Allocation Decisions: A Three-dimensional Panel Analysis." *International Review of Economics & Finance* 13 (3): 253–74.

Brech, V., and N. Potrafke. 2014. "Donor Ideology and Types of Foreign Aid." *Journal of Comparative Economics* 42 (1): 61–75.

Carley, S., and L. Yahng. 2018. "Willingness-to-Pay for Sustainable Beer." *PLoS One* 13 (10): e0204917.

Cheeseman, N., G. Lynch, and J. Willis. 2016. "Decentralisation in Kenya: The Governance of Governors." *Journal of Modern African Studies* 54 (1): 1–35.

Claessens, S., D. Cassimon, and B. Van Campenhout. 2009. "Evidence on Changes in Aid Allocation Criteria." *World Bank Economic Review* 23 (2): 185–208.

Easterly, W. 2002. "The Cartel of Good Intentions: Bureaucracy Versus Markets in Foreign Aid." CGS Working Paper No. 4, Center for Global Development, Washington, DC.

Feeny, S., and M. McGillivray. 2008. "What Determines Bilateral Aid Allocations? Evidence from Time Series Data." *Review of Development Economics* 12 (3): 515–29.

Ghatak, M., C. Kumar, and S. Mitra. 2013. "Cash vs Kind: Understanding the Preferences of the Bicycle-Programme Beneficiaries in Bihar." IGC Working Paper, July 2013, International Growth Centre, London, UK.

Hidrobo, M., J. Hoddinott, A. Peterman, A. Margolies, and V. Moreira. 2014. "Cash, Food, or Vouchers? Evidence from a Randomized Experiment in Northern Ecuador." *Journal of Development Economics* 107 (March): 144–56.

Hoeffler, A., and V. Outram. 2011. "Need, Merit, or Self-Interest—What Determines the Allocation of Aid?" *Review of Development Economics* 15 (2): 237–50.

Holzer, M., and S.-T. Kim. 2004. *Digital Governance in Municipalities Worldwide*. Newark, NJ: National Center for Public Productivity, Rutgers University.

Jack, B. K. 2013. "Private Information and the Allocation of Land Use Subsidies in Malawi." *American Economic Journal: Applied Economics* 5 (3): 113–35.

Jang, C., and J. Shapiro. 2018. "Assessing the Reliability of Experimental Valuation Techniques." Working Paper, July 2018, Busara Center for Behavioral Economics, Nairobi, Kenya.

Johnson, K. F., and C. Hein. 1983. "Municipal use of Citizen Surveys." *Journal of Urban Affairs* 5 (3): 241–48.

Kasuga, H. 2008. "Aid Allocation Across Sectors: Does Aid Fit Well with Recipients' Development Priorities?" RIETI Discussion Paper No. 08-E-039, Research Institute of Economy, Trade and Industry, Tokyo, Japan.

Khera, R. 2014. "Cash vs In-Kind Transfers: Indian Data Meets Theory." *Food Policy* 46 (June): 116–28.

King J. T., J. Tsevat, Jr., J. R. Lave, and M. S. Roberts. 2005. "Willingness to Pay for a Quality-Adjusted Life Year: Implications for Societal Health Care Resource Allocation." *Medical Decision Making* 25 (6): 667–77.

Kotchen, M. J., Z. M. Turk, and A. A. Leiserowitz. 2017. "Public Willingness to Pay for a US Carbon Tax and Preferences for Spending the Revenue." *Environmental Research Letters* 12 (9): 094012.

Lahiri, S., and P. Raimondos-Møller. 2000. "Lobbying by Ethnic Groups and Aid Allocation." *Economic Journal* 110 (462): 62–79.

Lee, S. A., and J.-Y. Lim. 2014. "Does International Health Aid Follow Recipients' Needs? Extensive and Intensive Margins of Health Aid Allocation." *World Development* 64 (December): 104–20.

Neumayer, E. 2005. "Is the Allocation of Food Aid Free from Donor Interest Bias?" *Journal of Development Studies* 41 (3): 394–411.

Raschky, P. A., and M. Schwindt. 2012. "On the Channel and Type of Aid: The Case of International Disaster Assistance." *European Journal of Political Economy* 28 (1): 119–31.

Robbins, M. D., B. Simonsen, and B. Feldman. 2008. "Citizens and Resource Allocation: Improving Decision Making with Interactive Web-Based Citizen Participation." *Public Administration Review* 68 (3): 564–75.

Shapiro, J. 2019. "The Impact of Recipient Choice on Aid Effectiveness." *World Development* 116 (April): 137–49.

Shilaho, W. K. 2016. "Challenge of Localising Governance in Kenya: Devolution." *Journal of Public Administration* 51 (1): 7–24.

Shiroiwa, T., Y.-K. Sung, T. Fukuda, H.-C. Lang, S.-C. Bae, and K. Tsutani. 2010. "International Survey on Willingness-to-Pay (WTP) for One Additional QALY Gained: What is the Threshold of Cost Effectiveness?" *Health Economics* 19 (4): 422–37.

Steeves, J. 2015. "Devolution in Kenya: Derailed or On Track?" *Commonwealth & Comparative Politics* 53 (4): 457–74.

Stepping, K. M. 2016. "Do Health Conditions Determine the Flow of External Health Resources? Evidence from Panel Data." *European Journal of Development Research* 28 (2): 270–93.

Thiele, R., P. Nunnenkamp, and A. Dreher. 2007. "Do Donors Target Aid in Line with the Millennium Development Goals? A Sector Perspective of Aid Allocation." *Review of World Economics* 143 (4): 596–630.