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How responsive are private transfers to income? Evidence from a laissez-faire economy

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Abstract

In recent years there has been burgeoning interest in how private transfers respond to household income, or "transfer derivatives". Much of it is fueled by the specter of "crowding out": the more responsive are private transfers, the more likely they could be supplanted by expansions in public transfers, weakening or destroying the latter's distributive impact. Yet there is also an emerging consensus that actual transfer derivatives are trivial, at least for the United States, suggesting that crowding out might loom larger in the minds of some economists than in the data. But perhaps crowding out is a fait accompli in the United States. Accordingly, we focus on the Philippines, which has a much smaller public sector. We also pursue a novel theoretical angle, which generates a sharp, non-linear relationship between private transfer receipts and income, in the form of a spline. Our empirical work applies recently developed estimation techniques that treat the spline's threshold as an unknown parameter, and they uncover transfer derivatives much larger than conventional methods reveal. Notably, private transfers patterns are consistent with altruistic preferences, effective risk sharing, or both. In accord with theoretical predictions, however, strong transfer derivatives prevail only among low-income households. Our findings suggest that attempts to aid the poor could be thwarted by private responses, which leak benefits to richer households in the form of lighter burdens of support for less fortunate kin. So the problems that operative private transfers create for public redistribution policy, first pointed out by Becker and Barro over 25-years-ago, do indeed matter empirically.

Keywords: Altruism; Exchange; Private transfers; Crowding out
JEL classification: O15; O16; J14; I30; H55

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1. Introduction

How responsive are private, inter-household income transfers to household resources? This relationship, called "transfer derivatives", has both normative and positive implications. If private transfers respond sharply to changes in household resources, government transfers could have limited distributional effects; they might simply "crowd out" private ones. From the earliest treatment of private transfers, in the work of Becker (1974) and Barro (1974), crowding out has been raised as a theoretical possibility. Transfer derivatives matter not just for policy but for our understanding of human nature. For example, the altruism model predicts that reductions in household resources are met with large increases in private transfer inflows. And if transfers mitigate risk, they would follow the same qualitative pattern, even not altruistically motivated. Alternatively, if transfers are payments in exchange, they could be either positively or negatively related to household resources (Cox, 1987).

The existing evidence, however, suggests that crowding out is a non-issue, at least for developed countries. No empirical studies indicate a dramatic response of private transfers to household resources. Most imply that a dollar increase in the income would generate a reduction in private transfers of only a few cents; some even indicate a small increase. Cox and Jakubson (1995) estimate that a dollar increase in public welfare spending would be met with a 12-cent reduction in private transfers, at most. Altonji et al. (1997) find similarly tepid transfer derivatives. Despite the focus in the theoretical literature on the specter of crowding out, there does not seem to be much evidence for it, generating considerable dissonance between theory and empirics.

The United States might be the wrong place to look for crowding out, however, because its existing public spending may have rendered it a fait accompli. We can only speculate about the exact magnitude of the reduction in private transfers caused by the expansions of public income redistribution in the United States in the 1930s and 1960s, for example, because a consistent time-series for private transfers does not exist. However, another form of private transfer, charity, does appear to have been displaced dollar-for-dollar by the public relief programs of the 1930s (Roberts, 1984)[1].

This reasoning suggests that we should turn to other settings. Private transfers are not nearly as widespread or as large a fraction of income in the United States as they are in developing countries. Data from countries with smaller systems of public redistribution might afford a cleaner test of the crowding out hypothesis.

There is perhaps a second reason for the paucity of evidence for crowding out. Even if economists look in the right places (i.e. countries with meager public income redistribution) they might mistakenly mis-measure the strength of transfer derivatives because of model mis-specification. For example, a variant of the Becker altruist model, augmented to

[1] In addition to private transfers and charity, there are several other possible private behavioral responses to social insurance: labor supply (Moffitt, 1992), savings (Feldstein, 1974), and private insurance purchases (Cutler and Gruber, 1996), for example. Cox and Jimenez (1995) argue that, while most behavioral responses redound to program recipients, private transfer distortions are more troublesome for targeting poverty alleviation because they tend to benefit high-income private donors.

include the possibility of inter-household exchange, implies that the transfer–income relationship can be highly non-linear. Other commonly used models of household transfers, such as the risk-sharing model, in which preferences are not necessarily altruistic, can also imply non-constant transfer derivatives. In our empirical work, we posit that the non-linearities take the form of a spline. We estimate this model by non-linear least squares (NLLS), treating the threshold as an unknown parameter, using recently developed econometric techniques (Hansen, 1996; Chan and Tsay, 1998). Our empirical work indicates that failure to specify such non-linearity can cause transfer derivatives to be severely mis-measured.

The intuition for the non-linearity in income–transfer relationships comes from thinking about the strength and type of transfer motive that is likely to prevail depending on the potential recipient's income. Imagine a household facing especially dire straits and receiving outside private help. The transfers it receives could well be motivated by a friend or relative's unvarnished altruism, much in the same way that the rescue of a drowning man might be motivated by nothing more than concern for the victim's life. These transfers have especially strong transfer derivatives (Becker, 1974). But let the recipient's own resources expand and the altruistic motivation might evaporate, even though the transfers themselves might not. They could still occur, only now for non-altruistic reasons such as payments in exchange. The key point is that the latter form of transfer need not have as dramatic transfer derivatives. The derivative depends on the transfer motive, which in turn depends on household pre-transfer income.

We use the altruism motive only as an illustration. We cannot prove that transfers, even if they are highly responsive to household incomes, are necessarily altruistic. For example, perhaps households enter into mutually beneficial, self-interested co-insurance contracts, which can imply similar non-linearities in transfer derivatives. "A" might help "B" only when B's resources drop below a certain level, for example. Contracts like these would also generate non-linearities in the transfer–income relationship.

We use data for the Philippines, a country with minimal public income redistribution, and find that private transfers follow a sharp, non-linear pattern that implies substantial crowding out for lower-income households, but much weaker transfer derivatives for other households. We also find that ignoring the non-monotonicity in the transfer–income relationship generates deceptively small transfer derivatives, similar to the ones that characterize many earlier studies that ignore possible non-linearities. Our findings have potentially far-reaching implications for government behavior and policy, implying that government attempts to alter the distribution of economic well being can sometimes be thwarted by private behavioral responses. Ignoring these responses can make public transfer programs appear more effective than they really are.

The findings also could have implications for our understanding of human nature and underlying motivations for private transfers, but here we must tread cautiously. Our finding of strong transfer derivatives for lower-income households is consistent with, though certainly not proof of, altruistic preferences. It is obviously illogical to accept the hypothesis of altruism, or any other behavioral hypothesis for that matter, because the same patterns could be generated by some other process, such as self-interested co-insurance contracts. Still, we find the consistency with the predictions of the altruism model noteworthy in light of previous theoretical and empirical work. Altruistic prefer-

ences are often invoked on commonsensical grounds[2]. But after being taken to the data, the altruism model has emerged beleaguered—up until now there has been hardly a shred of evidence to support its predicted income effects. So it is striking that the transfer derivatives we find are consistent with altruism, though we hasten to add they do not necessarily imply that altruistic preferences exist.

2. Non-monotonic transfer–income relationships

There are several reasons why the transfer–income relationship could be non-monotonic. They include: the exchange versus altruistic motives for giving (loan repayments can be modeled within this framework), and the insurance motive for transfers.

2.1. Altruism and exchange

Altruism versus exchange is a leading dichotomy in the private transfers literature. Recent papers that allude to these alternative motives include, for example, Laitner (1997), McGarry and Schoeni (1995) and Ioannides and Kan (2000). We show that this (by now, standard) framework can imply a non-constant transfer derivative once we account for the possibility that the two motives may co-exist.

When transfer donors have alternating altruistic and selfish concerns, transfer receipts can exhibit a non-linear pattern in recipient income, first falling sharply and then leveling off or even rising. The pattern is determined by the motive prevailing at the margin, and the fact that altruism is more likely to be operative at the margin when recipients are in dire straits. Donors who help desperately poor relatives or bystanders who attempt to save drowning victims, act not in expectation of remuneration but solely out of altruistic concern. Their contributions have a pronounced inverse relationship with recipient resources. The introduction of a poverty alleviation program, for example, or the sudden appearance of a rescue squad, allow donors to cut back sharply on the provision of help. So when recipients are desperate, transfers are altruistically motivated and they fall sharply with improvements in recipient resources. The model of private transfers that predominates at this stage is the altruism model of Becker (1974)[3].

But when recipients are well off enough, transfers can cease to be altruistic at the margin. The donor may still care about the recipient (and be happy to learn, for example, of the latter's recent lottery winnings) without going out of his way to help him. But even if altruistic motives are not operative, transfers can still occur. Unlike the Becker–Barro model, in which transfers stop upon reaching altruism's limits, our approach allows for non-altruistic transfers. For example, the donor might contribute money to the recipient, but with

[2] For example, Becker and Murphy (1988) argue that "The altruism assumption is supported by the many sacrifices parents frequently make for children. Parents spend money, time, and effort on children through child care, expenditures on education and health, gifts, and bequests" (Becker and Murphy, p. 3).

[3] Though the analysis below is expressed in terms of "donors" and "recipients", analyses of altruism are usually applied to family behavior, and therefore, we could just as well substitute, for example, the term "parent" for donor and "child" for recipient. The donor–recipient labels are chosen merely for convenience.

the expectation of receiving a quid pro quo[4]. Unlike altruistic transfers, non-altruistic ones need not be bear a strong, inverse relationship to recipient incomes (indeed, the two may be positively related, as in the case where recipients are paid their hourly wage for providing time-intensive services). So recipient resources rise to a certain threshold where the transfer motive switches from altruism to exchange. At this point the relationship between recipient income and transfer amounts received can change dramatically. Hence the importance of the non-linear specification between the two variables.

Consider the following simple model of transfers, a variant of the one in Cox (1987). Suppose the utility of the donor, U_d, is given by:

$$U_d = U(C_d,\ s,\ V(C_r,\ s)), \tag{1}$$

where, V is the recipient's well being; C_i, $i = d, r$ denote donor and recipient consumption; and s denotes "services" that the recipient might provide to the donor[5].

Expression (1) embodies both altruism and exchange. The donor cares about the recipient so that $\partial U_d/\partial V > 0$. But the recipient must be compensated for any services he provides, because we assume that $\partial V/\partial s < 0$. The partial effects of the other arguments in (1) are positive. In particular, the donor enjoys services provided by the recipient. The budget constraints for donor and recipient are $C_d = I_d - T$ and $C_r = I_r + T$, where T denotes financial transfers given by the donor to the recipient and the I_i are pre-transfer incomes.

"Services" is a catchall term standing for anything that the recipient provides the donor in exchange for money: help with home production, for instance, or behaving in a way the donor prefers. Alternatively, they might be future financial transfers, so that if T is a loan, s would be the discounted value of repayments.

We assume neither transfers nor services have market substitutes; donor and recipient are engaged in a bilateral monopoly. Assume that the donor dominates the bargaining arrangement so that transfers exactly compensate for services. This assumption has the virtue of nesting the traditional altruism formulation of Becker (1974) and Barro (1974) into a more generalized model featuring both altruism and exchange.

When is a transfer altruistic and when is it exchange-related? The recipients' utility from severing relations with the donor is $V_0 = V(I_r,\ 0)$—the recipient receives no transfers and provides no services. The dominant donor faces the participation constraint that $V = V_0$. If the constraint is binding, the transfer is exchange-related—transfers provide exact compensation for services. Otherwise, transfers are altruistic because they increase the well being of the recipient. Suppose transfers are altruistically motivated. In this case, $\partial T/\partial I_r < 0$. Recipients with higher pre-transfer income require smaller transfers to attain the level of consumption that is optimal from the donor's point of view. The effect of I_r on T can be large. For example, with Cobb–Douglas preferences and equal weighting of donor and recipient utility ($\partial U/\partial V = 1$), the value of $\partial T/\partial I_r$ is minus one-half.

[4] In the Filipino context, the quid pro quo might spring from a form of reciprocity called utang na loob, literally "debt inside oneself", which compels recipients to repay donors (Lopez, 1991).

[5] For simplicity, and without losing anything essential, we assume that (1) is additively separable.

If transfers are exchange-motivated, the relationship between T and I_r is different. Think of transfers as the product of an implicit price of services, p, and s. It is easy to show that $\partial s/\partial I_r < 0$ and $\partial p/\partial I_r > 0$ (Cox, 1987). So transfers can rise or fall with I_r depending on whether the price effect dominates the quantity effect. It can be shown that, if transfers both rise and fall with I_r, they will first rise and then fall, generating an inverted-U-shaped relationship between transfers and recipient income[6].

The participation constraint makes it clear why altruism prevails when recipient income is low, because in this case the constraint does not bind. Donors with an indigent relative make transfers strictly to raise his well being. Once recipients become well of enough, exchange becomes the operative motive at the margin.

With these results in mind, we describe the relationship between recipient income and transfers, which is depicted in Fig. 1. Start with a very low value for recipient income—somewhere between 0 and K. The recipient is poor, so the transfer is altruistic, and transfers fall with recipient income. But once the threshold K is reached, transfers become exchange-motivated, where they have an inverted-U-shaped relation to recipient income. Finally, once the recipient's income becomes large enough (I_r'') he becomes independent of the donor, and transfers cease altogether.

The simple model is informative for empirical work in two ways. First, it suggests that specifications of transfer functions should be non-linear in recipient income. Second, the model can address the "crowding-out" of private transfers by public ones. Suppose a public income transfer scheme raises every low-income household's income to K. Then altruistically motivated transfers will disappear, leaving only exchange-related ones. Further increases in public transfers can actually "'crowd in" private transfers if they occur along the segment K—I_r'. Finally, if public transfers expand enough to give everyone a minimum income of I_r'', private transfers may disappear altogether.

2.2. Household risk-sharing

While one facet of the literature on private transfers emphasizes the role of altruism and other motivations for private transfers in the family, an alternative but related approach characterizes private transfers as one of many strategies for pooling risk. As Becker (1974) noted in his seminal work on social interactions, operative, altruistic transfers can imply effective risk sharing between donor and recipient. But altruism is not necessary for such co-insurance to occur, and there have been many recent papers that have analyzed the connection between private interhousehold transfers and the sharing of risks without it. These models, like the altruism–exchange framework, can imply non-constant transfer derivatives.

Consider, for example, Townsend's (1994) analysis for rural India. To cope with stochastic income shocks, a household joins a conglomeration of households that pool and share resources, leaving it vulnerable only to shocks affecting the group at large.

Analytically, the problem of risk-sharing is nearly identical to familial altruism, except that decisions are made by a "social planner" rather than by the family head (see, e.g.

[6] See, for example, Cox (1987).

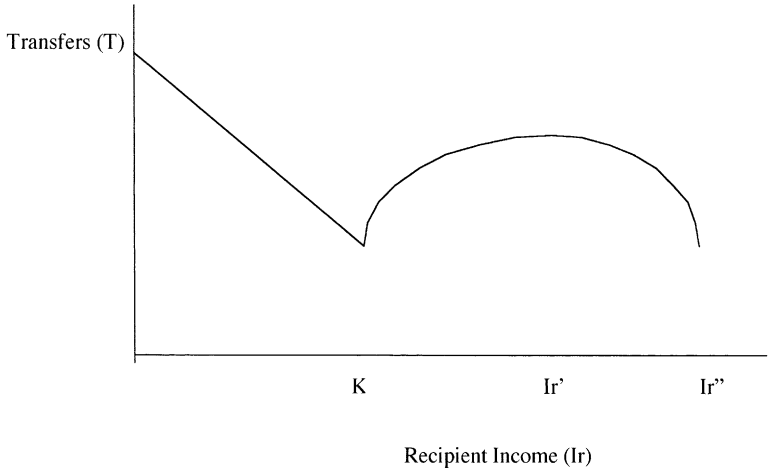

Fig. 1. The relationship between private transfers and income.

Mace, 1991). In addition, the risk-sharing literature has tended to emphasize all forms of coping with risk, including, in addition to inter-household transfers, other forms of household redistribution, financial intermediation, and the like. And while the empirical work has tended to focus on the "bottom line" of consumption outcomes, rather than the risk-sharing methods themselves, the implications for transfers are similar to those predicted by the altruism model. If private, inter-household transfers are used for dealing with risks associated with shortfalls in household resources, then transfers receipts and recipient resources should be inversely related. In addition, under full risk-sharing we would expect that transfers would be more responsive to income at low levels of recipient income, since a disproportionate number of these households would have been likely to experience negative income shocks to be remedied by insurance payments. At very low incomes, the effects of these shocks might be profound as households struggle to survive, necessitating greater "insurance" payouts. For those who are able to access precautionary savings or formal insurance or credit channels, negative income shocks are less likely to trigger dramatic private transfer responses. So with household risk sharing, as with altruistically motivated transfers, there are likely to be non-linearities in transfer derivatives[7]. Moreover, such a relationship would be discontinuous depending upon access to formal insurance or capital markets.

[7] Other, more subtle non-linearities may arise from problems of commitment and implementability of risk-sharing (e.g. Coate and Ravallion, 1993). Co-insurance schemes for protecting against extreme disasters may not be sustainable between two self-interested parties who always have the option of defecting from their informal insurance arrangements. This "implementability constraint" serves to limit transfer payments to households who have experienced extreme shocks. Considerations like these introduce non-linearities that differ from those in Fig. 1. Transfers are only responsive to household income if such income is high enough that the implementability constraint does not bind. Once the shock becomes so severe that this constraint binds, transfers no longer expand with further reductions in income (see Coate and Ravallion, pp. 10–11).

3. Evidence on transfer derivatives

Are private transfers responsive to recipient incomes? The empirical literature using United States data indicates that the answer is no. The earliest studies were about bequests, and the predominant pattern was found to be equal sharing among children (e.g. Menchik, 1980). Later studies, such as Wilhelm (1996) had more extensive information on the characteristics of children but produced the same equal-sharing result; bequest were found to be remarkably insensitive to the incomes of potential recipients. Inter-vivos transfers might be thought to be more compensatory because they are more likely to be deliberate[8]. But existing studies point either to positive income effects (e.g. Cox, 1987), or negative effects that are quite small in magnitude (e.g. McGarry and Schoeni, 1995)[9].

Transfer derivatives have been used to test various motives for private transfers (e.g. Cox, 1987; Altonji et al., 1997). Altruism places a restriction on these derivatives: a dollar increase in recipient income, accompanied by a dollar decline in donor income, should prompt an exact dollar reduction in private transfers. This restriction was tested and rejected by Cox and Rank (1992) and Altonji et al. (1997). The former found positive recipient income effects for transfers and the latter negative ones, but in each case altruism's restrictions were rejected because the estimated transfer derivatives were quite small.

Perhaps one reason for the small income effects on transfers in the United States is that public income transfer programs have already crowded out the private transfers most likely to be responsive to income. The evidence for developing countries is less clear cut. Some studies find an inverse relationship between recipient income and transfer amounts (e.g. Kaufmann and Lindauer, 1986, El Salvador; Kaufmann, 1982, the Philippines and Ravallion and Dearden, 1988, rural households in Java). But still others find a positive relationship (e.g. Lucas and Stark, 1985, Botswana; Ravallion and Dearden, 1988, urban households in Java and Cox et al., 1998, urban households in Peru). A problem with each of these studies, however, is that none contains a specification for recipient income that is flexible enough to capture the complete transfer pattern depicted in Fig. 1[10].

In sum, lack of flexibility in functional form and the existence of a large welfare state in the United States may have made it difficult to detect evidence for substantial transfer derivatives. Since our work is for a country with little public income redistribution, we should be able to better detect the full range of behavior depicted in Fig. 1. Before proceeding to the empirical work, we place the public safety nets of the Philippines in perspective.

[8] A recent study by McGarry (1999) is the only one that analyzes both bequests and inter-vivos transfers. She finds that inter-vivos transfers tend to be allocated to children in a compensatory fashion, whereas bequests are mostly shared equally.

[9] For a review of studies that address the separate issue of the overall size of private transfers in the United States, see Gale and Scholtz (1994).

[10] The only study which approaches the subject of non-linearities, and finds substantial income effects, is that of Kaufmann (1982), which we discuss in more detail below. In addition, a recent paper by Schoeni (1997) emphasizes non-constant transfer derivatives and finds income effects that are qualitatively consistent with Fig. 1. But his estimated transfer derivatives, like those found in the rest of the United States studies, are minuscule.

4. Social insurance in the Philippines

How does the Philippines compare to other countries in terms in terms of allocation of GNP to social welfare spending? The table below indicates rankings for an assortment of countries for welfare and other payments[11]. The fraction of GNP devoted to social welfare spending in the Philippines is several orders of magnitude smaller that of developed countries such as the United States and the United Kingdom, and it is dwarfed by those of welfare states like Sweden and the Netherlands. Even among other developing countries similarly classified as "middle income", such as Morocco, Korea and Thailand, the share of welfare payments is relatively small.

1988 Public welfare and housing payments as a percentage of:

Country	GNP	All government expenditures	Per capita GNP (1988 US $)
Sweden	22.1	54.2	19 300
Netherlands	22.1	39.6	14 520
UK	11.6	30.9	12 810
USA	7.2	31.5	19 840
Sri Lanka	3.7	11.7	420
Morocco	2.1	7.3	830
Korea	1.3	8.5	3600
Thailand	0.1	5.4	1000
Indonesia	0.04	1.7	440
Philippines	0.03	2.2	630
Uganda	0.03	2.9	280

Source: World Development Report 1990, "World Development Indicators", Tables 1 and 11, World Bank, Washington, DC, 1990 (World Bank, 1990).

The main components of the public safety net in the Philippines are food subsidy programs, public works employment, livelihood creation (i.e. training) programs, credit for small and medium enterprises and farms. There is a formal social security program that provides benefits for old age, disability, death, workman's injury, illness and maternity. But this system only covers government workers and 60% of workers in the formal sector.

According to a recent World Bank evaluation, welfare spending in the Philippines is costly to administer and poorly targeted:

> Few of the resources currently spent on government livelihood programs or labor-based public works reach the poorest groups. Even the cash and in-kind transfer programs do not target effectively (p. 49, World Bank, 1996).

[11] These numbers include a wider range of categories than would normally be included in "welfare payments". They cover expenditures on housing and slum clearance activities, sanitary services, compensation payments for sickness and disability, pensions, unemployment payments, family and child allowances, and the cost of providing welfare services such as care for the elderly, the disabled and children. Nonetheless, they are indicative of the relative importance of welfare payments across countries.

The same report also cautioned that "The public provision of a safety net for the poorest must be designed to complement rather than replace existing private arrangements of private transfers, which are already widespread in the Philippines (p. 44)". However, many discussions of private transfer behavior are necessarily impressionistic, because, until recently, information about such transfers was not commonly available in the Philippines.

5. Empirical work

5.1. Descriptive overview

The Family Income and Expenditures Survey (FIES) of the Philippines is undertaken every 3 years to gather income and consumption information for a representative cross-section of Filipino households. The main objective of the survey is to obtain information about expenditure patterns, income sources and inequality and to obtain information for updating weights in the consumer price index. The FIES is the only official household survey of income and spending patterns which is nationally representative[12].

The survey gathers information about sources of income (both cash and in-kind), demographic variables such as family size, marital status and number of children by age group, and job-related information such as earnings and employment status. In addition, the survey asks respondents to report on a variety of transfers, both in-kind and cash, from domestic sources and from overseas. The survey's definition of private transfers includes only interhousehold transfers, so that redistribution within the household is not measured. The FIES covers 18 922 households: 8863 urban households and 10 059 rural ones.

Tables 1 and 2 list household characteristics by whether households were net recipients or givers of transfers. Table 1 refers to urban households and Table 2 to rural ones. We consider the two separately because of the large differences between urban and rural standards of living.

Nearly all households participate in transfer networks, and private transfers are large component of total household income. Eighty-eight percent of the urban households were involved with transfers, either as donors, recipients, or both. In the urban sample gross transfer receipts accounted for 12% of total household income. Among urban recipients, these receipts accounted for nearly 20% of total household income.

More households received transfers than gave them, in part because international remittances account for a large fraction of total receipts. Another reason for the discrepancy is that households were asked more questions about receipts than about gifts. Only one module in the survey was concerned with gifts and respondents were asked only summary questions. Three modules dealt with receipts, including the value of in-kind transfers and those received from abroad. Therefore, gifts are likely to be under-reported

[12] There is no public use file that is as easily available as similar data sets in the United States. We were able to get a copy of the 1988 FIES as part of a team working on a World Bank basic economic report, and a copies of the data files that we use are available upon request from the authors.

Table 1
Selected characteristics of Filipino Urban Households by private-transfer status

Variable	(1) Net transfer recipients	(2) Net transfer donors	(3) Others[a]	(4) All households
Income				
Total income before transfers	46 730.30	123 720.50	81 937.29	59 522.50
Proportion with retirement income	0.063	0.078	0.066	0.065
Retirement income	862.429	2225.170	1014.570	1031.140
Total income after transfers	56 796.54	122 460.44	81 937.29	67 246.81
Education				
Some primary or none	0.175	0.137	0.138	0.166
Primary graduate	0.200	0.144	0.180	0.191
Some secondary	0.125	0.114	0.117	0.123
Secondary graduate	0.221	0.203	0.227	0.219
Some university	0.141	0.133	0.163	0.143
University graduate	0.139	0.268	0.174	0.158
Other characteristics				
Age of household head	45.376	47.072	44.715	45.482
Married	0.824	0.833	0.861	0.830
Female-headed households	0.185	0.131	0.114	0.170
Husband and wife both work	0.291	0.385	0.312	0.304
Head not employed	0.183	0.115	0.132	0.169
Number of children aged 1 or less	0.115	0.090	0.103	0.111
Number of children aged 1–7	0.789	0.650	0.763	0.771
Number of children aged 8–15	1.071	1.018	1.003	1.057
Household size	5.270	5.425	5.390	5.302
Transfers				
Proportion giving net transfers	0.000	1.000	0.000	0.110
Net transfers given (amount)	0.000	1260.060	0.000	138.758
Proportion receiving net transfers	1.000	0.000	0.000	0.767
Net transfers received (amount)	10 066.24	0.000	0.000	7724.31
Proportion giving gross transfers	0.429	1.000	0.008	0.441
Gross transfers given (amount)	194.22	1511.57	2.891	315.844
Proportion receiving gross transfers	1.000	0.451	0.008	0.818
Gross transfers received (amount)	10 260.46	251.514	2.891	7901.39
Proportion receiving from abroad	0.264	0.005	0.000	0.203
Transfers received from abroad (amount)	6518.75	25.000	0.000	5004.90
Number of cases	6801	976	1086	8863

[a] Neither a net-transfer recipient nor a net-transfer donor.

relative to receipts[13]. Despite this, an examination of household characteristics according to their private transfer behavior conveys useful information about private transfer flows. Consider the urban households in Table 1. Recipients have the lowest average pre-transfer income (Table 1, column 1), and donors have the highest. This pattern suggests that transfers

[13] In the usual case we might suspect under-reporting to work in the opposite direction to the extent that donors exaggerate their generosity or recipients downplay their dependency.

Table 2
Selected characteristics of Filipino rural households by private-transfer status

Variable	(1) Net transfer recipients	(2) Net transfer donors	(3) Others[a]	(4) All households
Income				
Total income before transfers	22 899.29	41 539.12	26 792.76	25 098.24
Proportion with retirement income	0.023	0.021	0.013	0.022
Retirement income	220.539	249.757	141.505	218.205
Total income after transfers	26 711.54	40 749.30	26 792.76	28 255.98
Education				
Some primary or none	0.438	0.424	0.426	0.436
Primary graduate	0.276	0.230	0.253	0.269
Some secondary	0.094	0.109	0.107	0.096
Secondary graduate	0.106	0.107	0.130	0.108
Some university	0.051	0.058	0.032	0.050
University graduate	0.036	0.071	0.051	0.041
Other characteristics				
Age of household head	46.402	45.119	45.218	46.188
Married	0.849	0.907	0.862	0.856
Female-headed households	0.123	0.066	0.102	0.116
Husband and wife both work	0.271	0.270	0.259	0.271
Head not employed	0.094	0.040	0.063	0.086
Number of children aged 1 or less	0.129	0.102	0.108	0.125
Number of children aged 1–7	0.896	0.850	0.862	0.889
Number of children aged 8–15	1.249	1.237	1.192	1.244
Household size	5.290	5.390	5.211	5.295
Transfers				
Proportion giving net transfers	0.000	1.000	0.000	0.104
Net transfers given (amount)	0.000	789.823	0.000	81.974
Proportion receiving net transfers	1.000	0	0.000	0.828
Net transfers received (amount)	3812.25	0	0.000	3157.74
Proportion giving gross transfers	0.473	1.000	0.013	0.497
Gross transfers given (amount)	115.663	1023.99	2.792	202.272
Proportion receiving gross transfers	1.000	0.611	0.013	0.893
Gross transfers received (amount)	3927.92	234.165	2.792	3278.04
Proportion receiving from abroad	0.126	0.009	0.000	0.105
Transfers received from abroad (amount)	1835.43	8.075	0.000	1521.15
Number of cases	8332	1044	683	10 059

[a] Neither a net-transfer recipient nor a net-transfer donor.

indeed flow from high- to low-income households. The same pattern exists for rural households (Table 2). Ninety-three percent of them were involved with private transfers and gross transfer receipts made up 12% of total income. In both samples, transfer recipients are less educated than donors, and the proportions of female-headed households and households whose head is not employed are higher among recipients than donors.

Private transfers help equalize the distribution of income. In previous work using the data set we found that, for the sample overall, private transfers increase the income share

of the lowest quintile by 62%, and reduce the share of the top quintile by nearly 6% (Cox and Jimenez, 1995). We also found that private transfers appeared to alleviate poverty, in the sense that poverty rates calculated without including private transfers were much higher than actual ones[14]. But we did not use a rigorous framework for understanding or estimating non-linearities in the income–transfer relationship.

5.2. Estimates of transfer functions

How responsive are private transfers to income? To answer this question, we estimate a regression spline model for net transfer receipts, T, defined as gross transfers received minus gross transfers given.

5.2.1. Specification

To model nonlinearity, we use a continuous linear spline with a single knot. A continuous linear spline is similar to a threshold regression, with the important exception that the regression function is constrained to be continuous in pre-transfer income I. Let K denote the knot, or threshold level of income (as in Fig. 1) at which transfer behavior switches from altruistic to non-altruistic. Let $d_1(K)$ denote a dummy variable that takes the value 1 if $I \leq K$ and 0 if $I>K$, and let $d_2(K) = 1 - d(K)$ denote a dummy variable that takes the value 1 if $I>K$. For fixed K the continuous linear spline is a linear function of the variables $(I-K)d_1(K)$ and $(I-K)d_2(K)$ as well as the other regressors.

If the knot K were known, the model could be estimated by ordinary least squares (OLS). Since K is unknown, it should be estimated along with the other regression parameters[15]. NLLS is the appropriate estimation criterion. Since the knot enters in a non-linear and non-differential manner, conventional gradient search techniques to implement NLLS are inappropriate. Instead, we employ a method that is sometimes called conditional least squares, and works as follows. For any K the model is estimated by OLS, yielding the sum of squared errors as a function of K. The least squares estimate of K is found by searching over K and selecting the value that yields the lowest sum of squared errors[16]. For this value of K the slope parameters are estimated by OLS. Chan and Tsay (1998) have shown that these NLLS estimates are consistent and asymptotically normal, and these authors also provide estimates of the asymptotic variance–covariance matrix.

To reduce the influence of the extremely wealthy, we omitted the top 2% wealthiest households (measured by pre-transfer income) from each sample. Since here we are treating pre-transfer income as exogenous, this does not induce sample selection bias. As a regressor, we included a dummy variable for households with zero pre-transfer income (the sensitivity of the results to this specification are discussed later). We also include the

[14] Urban poverty rates were one-third higher without private transfers—42 versus 32%. The comparable figures for rural households were 66 versus 59% (Cox and Jimenez, 1995).

[15] In earlier, descriptive work (Cox and Jimenez, 1995) we estimated a spline function for transfer receipts but treated the non-linearity in an ad hoc way by fixing the nodes of the spline at quartiles in pre-transfer income.

[16] For a sample of size n with m parameters, at most $n-2m$ distinct values for K may be considered. For a complete search, it is sufficient to examine the values of K equaling the sample values of the threshold variable (in our case I), excluding the extremely smallest and largest values to ensure that at least m observations lie on each side of the threshold. This is what we did for our calculations.

level of retirement income and a dummy for the presence of retirement income, to account for the differential behavior of retirees[17].

We include other household characteristics besides pre-transfer income in the transfer function. Education of the household head is included to capture permanent income effects. Age is included in light of evidence that liquidity constraints may play an important role in private transfer behavior (e.g. Cox, 1990; Guiso and Jappelli, 1991; Cox et al., 1998; McGarry, 1999). Such constraints would affect the timing of transfers. For example, they may be targeted to younger households who have not yet established their reputations in credit markets. We include a dummy variable indicating whether the household is headed by a woman because nearly all studies of private transfers indicate that they are disproportionately targeted toward women (e.g. Lucas and Stark, 1985, Botswana; Kaufmann and Lindauer, 1986, El Salvador; Cox et al., 1998, Peru; Guiso and Jappelli, 1991, Italy; Cox, 1987, United States). Further we include a dummy for whether the household head is employed and whether husband and wife are both employed. In addition, we control for marital status, household size and composition, and region.

Female-headed and married households receive much more transfers than others. The gender effect is consistent with the long list of other studies of private transfers that find that transfers are disproportionately targeted toward women. Evidence for marriage effects for transfers is more ambiguous; some studies find positive effects and others negative ones. But part of these demographic effects could be the result of overseas remittances. Consider a household in which the primary earner is the husband. Suppose that he is currently working abroad and remitting part of his income to his wife and children. Since transfers from abroad are much larger than those from domestic sources (Table 1), especially large transfers would tend to accrue to married, female-headed households[18]. We control for this situation by including a dummy for these households[19].

One potential problem with the estimates we present below is that income is not randomly assigned to recipients. Indeed, private transfer income itself could affect pre-transfer recipient income, by, for example, reducing work incentives and hence earnings. This would mean that causality would be reversed and that our income measure would be correlated with the error terms in the transfer equation.

Absent a pure or even natural experiment, we can only imperfectly correct for this type of endogeneity. To check robustness of our results to possible endogeneity, we alternatively estimate the model using region-specific instruments. In the Philippines, there are important structural and spatial characteristics that lead to differences in income determination across regions. These include geophysical differences in the island nation as well as different initial economic endowments. However, we argue that these may not be as

[17] The information comes from the section of the FIES income module dealing with miscellaneous income sources. Respondents were asked: "During the period specified, did you or any member of your family receive, in cash or in kind, any pension and retirement, workmen's compensation, and social security benefits"?

[18] Among those urban households who receive a transfer from abroad, the proportion of married female heads is over three times higher than in the urban sample overall (5 versus 17%).

[19] This takes into account a major concern that the motives of non-residents who are still considered household members may be different from those of others. What we cannot control for is the possibility that the female may be absent.

important in determining transfer behavior. We show that our results are robust to these types of corrections.

5.2.2. Estimated transfer functions

Transfer function estimates and standard errors[20] for urban households are given in the first two columns of Table 3. The key parameters are the first three. The estimate of the knot (income threshold) is 21 840 pesos, which corresponds to the 29th sample income quantile. For incomes below the 29th percentile, the slope of the transfer function is -0.39, implying a high trade-off between income sources. For incomes above the threshold, the estimated transfer function is utterly flat. A good understanding of the transfer function can be found by examining Fig. 2, which plots the estimated transfer function (holding all other regressors fixed at their sample means). The non-linear effect of income on transfers is striking and strong, and is consistent with the theoretical considerations discussed earlier. The point estimates are consistent with the idea, for example, that altruistic transfers could be important for low-income households, but not operative for higher-income groups[21]. On a final note, households with no pre-transfer income receive an additional 10 656 pesos in transfers above that suggested by the transfer function displayed in Fig. 2. This suggests a very strong non-linearity for extremely low incomes.

It is revealing to contrast the spline with results from the more standard linear specification, where the OLS estimate of the coefficient on income drops to the tiny value of -0.022, a figure consistent with the kinds of income effects found in many existing studies of private transfers. Thus a researcher who tests the effect of income on transfers by fitting a linear model would erroneously conclude that there only a small relationship between the two.

The estimates and standard errors for rural households appear in the third and fourth columns of Table 3, and a plot of the estimated transfer function is given in Fig. 3. Rural patterns for transfers are quite similar to urban ones. The most striking similarity is that for income levels below the threshold, the transfer function has the nearly identical slope of -0.40. A slight difference is that for income levels above the threshold, rural households have a slope of -0.03, which is significantly different from zero. Another difference is that the income threshold (to switch from altruistic to non-altruistic transfers) is 10 793 pesos, which is about one-half that of the urban sample. Since rural incomes are lower, however, the threshold of 10 793 pesos corresponds to the 20th income quantile for the rural sample, which is a point in the income distribution similar to that found for the urban sample.

We assessed the fit of the linear spline through a series of specification tests. First, we replaced the linear spline in income I with an ninth-order polynomial. The estimated

[20] The reported standard errors are appropriate for homoskedastic errors. Standard errors robust to heteroskedasticity were also calculated, but were not meaningfully different.

[21] The finding of such strong recipient income effects is all the more striking in light of the fact that we cannot include the income of the donor household in the regression. The omission of donor income is likely to bias recipient income coefficients toward zero. Evidence from the United States (Cox and Rank, 1992; Altonji et al., 1997) and for Peru (Cox et al., 1998) indicates that such omitted variable bias is indeed positive, though numerically small.

Table 3
Transfer functions, dependent variable—net transfers received[a]

Variable	(1) Urban households		(2) Rural households	
	Coefficient	Standard error	Coefficient	Standard error
Income				
Income threshold (K)	21 840	(1835)	10 793	(918)
Income below K	− 0.389	(0.065)	− 0.398	(0.071)
Income above K	− 0.008	(0.006)	− 0.032	(0.007)
No income	10 656	(2872)	13 072	(4636)
Retirement income	− 0.044	(0.024)	− 0.101	(0.055)
Has retirement income	− 1128	(893)	964	(780)
Education				
Primary graduate	874	(635)	874	(204)
Some secondary	522	(718)	1200	(294)
Secondary graduate	3239	(651)	1993	(292)
Some university	6290	(725)	4220	(400)
University graduate	7051	(755)	4919	(489)
Other characteristics				
Age of household head	− 16	(18)	7	(8)
Female-headed households	1111	(1001)	628	(444)
Married	277	(906)	449	(391)
Married and female-headed	31 699	(1358)	15 536	(725)
Number of children aged 1 or less	− 33	(575)	84	(237)
Number of children aged 1 – 7	− 234	(210)	− 37	(90)
Number of children aged 8 – 15	469	(159)	264	(65)
Number of adults	844	(129)	546	(68)
Husband and wife both work	− 1107	(444)	− 511	(193)
Head not employed	7677	(597)	5150	(331)
Observations	8684		9857	
R-squared	0.24		0.19	

Note: Regressions also included 14 regional dummy indicators (coefficient estimates not reported).
[a] Dependent variable is gross transfers received minus gross transfers given.

transfer functions are displayed in Figs. 2 and 3 along with the linear spline estimates. The polynomial functions closely match the shape of the linear spline, giving strong informal support for our chosen specification (in the following section we discuss formal tests for the spline specification against the polynomial alternative). Second, we omitted the dummy for households with zero pre-transfer income. For the urban sample, the slope of the transfer function for altruistic transfers (low pre-transfer income) steepened slightly to -0.46, and that for the rural sample steepened to -0.42. Third, we allowed the spline function to be quadratic for the non-altruistic (high income) regime, but the quadratic term was statistically insignificant, and the graphs of the estimated transfer functions were not meaningfully different than the graphs for the linear spline presented in Figs. 2 and 3. Fourth, we included a quadratic term in the age of the household head, but this variable was insignificant in both samples.

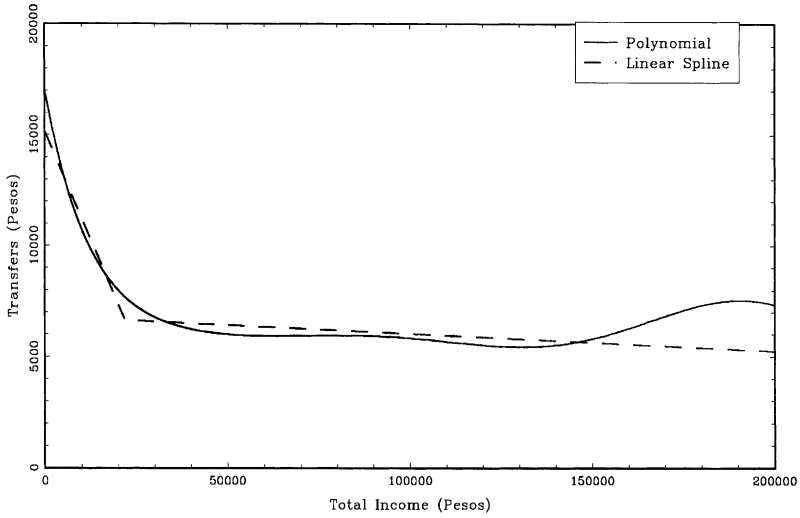

Fig. 2. Transfer functions for urban households.

As another specification test, we estimated a model that allowed for the kink K to be random across households. Assuming that K is normally distributed with mean κ and variance ω and independent of the regression error, it is straightforward to calculate the conditional mean of T given I and the other regressors. By allowing $\omega>0$, this model softens the kink in the mean transfer function, while $\omega=0$ specializes to the linear spline. We estimated the parameters by NLLS. The point estimate for the urban sample was positive but not significantly different from zero, and the point estimate for the rural

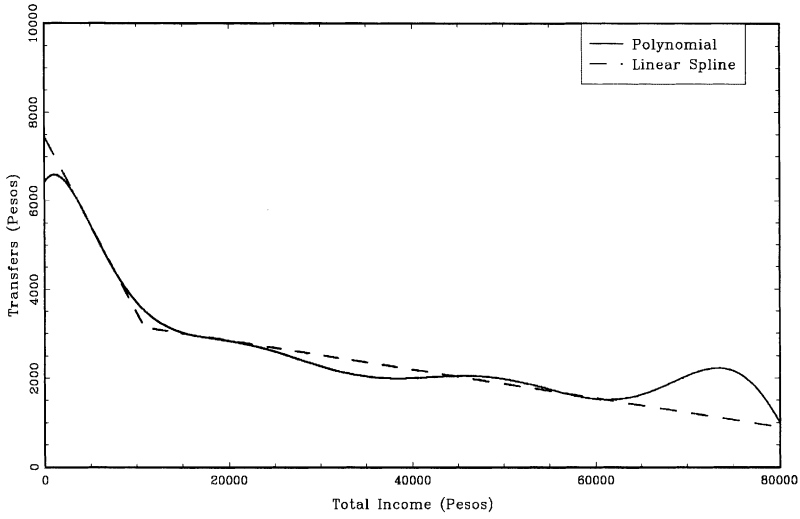

Fig. 3. Transfer functions for rural households.

sample was identically zero. We conclude that the data strongly support the linear spline specification.

Finally, we treated household income as endogenous. For simplicity, we held the knot fixed at the value estimate by NLLS, and focused on estimation of the other parameters, treating the variables $(I-K)d_1(K)$ and $(I-K)d_2(K)$ as endogenous. Handling endogeneity requires locating an instrument that is correlated with household income, but is not a determinant of household transfers (conditional on the other regressors). Our candidate is region-specific equations for income, as there are meaningful regional differences in income determination but no obvious reason why the income transfer equation will differ across regions. For each of the 17 geographical regions identified in our sample, we separately estimated linear equations for household income as a function of all the exogenous variables. This yielded predicted income $\hat{I}$. Noting that the endogenous variables are nonlinear functions of I, we used $\hat{I}$ and $\hat{I}^2$ as instrumental variables and estimated the equation by efficient GMM. The estimates for the urban sample changed the least, with the slope for incomes below the knot estimated to be -0.24 and the slope above the knot estimated to be -0.01 (the standard errors are 0.28 and 0.03, respectively). The results for the rural sample were problematic, with the two slopes estimated at -0.14 and -0.10 (the standard errors are 0.30 and 0.05, respectively). Overall, the GMM estimates are reasonably close to those obtained by NLLS, but are considerably less precise. Our inference is that income endogeneity does not appear to be an important problem[22].

The estimated threshold has another potentially interesting interpretation as the "private" analog of the Philippine poverty line, which is calculated according to the value of the assumed minimum consumption bundle for an acceptable standard of living. To the extent that the node marks the point that triggers changes in household behavior, it could be interpreted as a poverty line that is perceived by households, either for altruistic reasons or to compensate for lack of access to formal insurance or credit markets. If so, it would be interesting to compare to the Philippine poverty line. In 1988, the poverty line (adjusted to take into account food requirements for the poor) was computed to be 3800 pesos per person per year (World Bank, 1993). The income threshold we estimate for urban areas is about 21 840 pesos per household is almost exactly the same, since at 5.3 persons per household, this translates into 4120 pesos per year.

5.2.3. Tests of the generalized transfers model

The generalized theory of private transfers in Section 2 had the strong implication that the transfer function takes the form of a spline, and this motivated the econometric specifications reported in Table 3. Since altruism cum exchange implies the spline form, we can test this hypothesis by testing whether a spline exists in the transfer function.

[22] One seemingly plausible channel for reverse causality would be that income effects from private transfers dilute incentives to work, thus generating an inverse relationship between pre-private-transfer income and transfers. But to apply such an explanation to the very large transfer derivatives that we find for low-income Filipino households would require income elasticities of labor supply stronger than -2. But no evidence, either for developing countries (e.g. Jacoby, 1993; Skoufias, 1993) or developed ones (see, e.g. Blundell and MaCurdy, 1999) indicates elasticities anywhere near that large. Further, the similarity of estimated income elasticities across developed and developing countries casts doubt on the idea that labor supply behavior would generate the marked non-linearities in transfer derivatives that we observe.

Testing for the presence of a spline relationship is non-standard from the statistical point of view. The null hypothesis of no spline is equivalent to the hypothesis that the regression slopes in the two regimes are equal. But in this case, the knot K is not identified, and it is known that test statistics (such as t- or F-statistics) do not have conventional asymptotic distributions. Hansen (1996) shows that the bootstrap allows the calculation of asymptotically valid P-values in this context. Technical details are given in Appendix A.

We report bootstrap P-values for the two samples in Table 4. For each model, 1000 bootstrap replications were made. The first line reports Wald statistics and bootstrap P-values of the test of a linear specification against the alternative of a linear spline. In neither sample did a single bootstrap statistic exceed the actual value, yielding estimated P-values of 0.00, which means that linearity is easily rejected in favor of a linear spline at all significance levels. Similarly, the second line in Table 4 reports tests of a quadratic transfer function (that is, a linear regression of T on I, I^2, and the other control variables) against the alternative of a quadratic spline (the use of a quadratic spline under the alternative is done so that the hypotheses are nested). Again, the quadratic specification is rejected at all significance levels for both samples in favor of the spline specification. The tests show that the spline is necessary to capture the correct transfer function.

One might ask whether a higher order polynomial could adequately approximate the unknown transfer function. We repeated our hypothesis tests for transfer functions modeled as simple polynomials up to order 7. The results are quite interesting. For the urban samples the spline effect is statistically significant for polynomials of order 5 and below, which is strong evidence that the transfer effect consistent with altruism prevails for lower income households. The evidence from the rural samples is somewhat less strong, as the spline effect is statistically significant only for polynomials of order 3 and below.

Another question is whether the specification of a single knot spline function is appropriate. To assess this question, we performed a two-step Wald test for a second knot or threshold effect. Since this testing problem is non-standard, we again used bootstrap methods to assess statistical significance. The results are presented in Table 5. Neither test statistic is close to significant. This means that with high confidence, the hypothesis of a linear spline with a single knot cannot be rejected against the alternative of a linear spline with two knots.

Table 4
Bootstrap tests of polynomial transfer function against spline transfer function

Polynomial	Urban		Rural	
order	Wald statistic	P-value[a]	Wald statistic	P-value[a]
1	65.7	0.00	50.8	0.00
2	45.1	0.00	29.1	0.00
3	27.8	0.00	15.6	0.02
4	18.4	0.02	10.8	0.25
5	19.3	0.05	10.6	0.38
6	13.9	0.24	12.6	0.32
7	14.8	0.29	14.4	0.25

[a] Percentage of simulated Wald statistics that exceed sample Wald statistic out of 1000 bootstrap replications. P-values less than 0.05 indicate rejection at the 5% level.

Table 5
Bootstrap tests of single knot spline against double knot spline

Urban		Rural	
Wald statistic	*P*-value[a]	Wald statistic	*P*-value[a]
1.65	0.65	3.45	0.44

[a] Percentage of simulated Wald statistics that exceed sample Wald statistic out of 1000 bootstrap replications. *P*-values less than 0.05 indicate rejection at the 5% level.

In summary, the evidence shows that there is strong statistical evidence in favor of a strong kink in the transfer function that is well approximated by a linear spline with a single knot, and cannot be well approximated by a low-order polynomial. This statistical evidence supports the generalized model of altruism described above.

5.2.4. Other regressors

Better-educated households receive more transfers, which is consistent with altruism in the presence of liquidity constraints (Cox, 1990). When a recipient faces a binding borrowing constraint, transfers help fill the gap between desired consumption and permanent income. Suppose that the recipient's future income rises, with current income constant. If desired consumption is determined by permanent income, the gap between it and current income widens. Hence the optimal transfer increases[23].

One instance in which urban and rural samples differ is with respect to estimated age effects. Age–transfer profiles slope downward for urban households but upward for rural ones. While the effect is not pronounced, the sign pattern does suggest that transfers are more likely to function as old-age support in rural areas, where pension coverage is much lower. Negative age effects are also consistent with the idea that private transfers respond to liquidity constraints, since we would expect that transfers would be directed toward consumers who have not yet established reputations in formal credit markets.

The size and composition of the household appears to matter. The presence of infants and young children (up to age 7) has no measurable effect on transfers. Older children (age 8–15) have a slight positive effect, and the number of adults has a larger positive effect (844 peso per adult for urban, 546 peso for rural).

Households headed by someone who is not employed receive a 7677-peso boost (urban) in transfers (5150 peso for a rural household). On the other hand, if both the husband and wife both work, then transfer amounts are reduced (1107 peso for urban, 511 peso for rural). With income constant, dual earner status implies lower earnings per person, which might prompt altruistically motivated transfers. On the other hand, if the husband and wife both work, they may be better able to cope with income variability, which would be consistent with receiving less private transfers.

[23] Consider the following simple numerical example. Suppose that an altruistic donor overlaps with a recipient for two periods. The donor, but not the recipient, has access to capital markets and income of [200, 200]. The recipient has income of [60, 100]. Assume that the subjective rate of time preference equals the interest rate and that the donor weights the recipient's utility equal to his own. The consumption profile for each person is [140, 140], and first-period transfers are 80. Now suppose that the recipient's second-period income increases by 4. His optimal consumption is now 141. With current income constant, transfers must rise by 1 to enable the recipient to attain this new level.

Finally, we observe that marriage has no effect on transfers, and female-headed households receive a statistically insignificant boost. An important effect is reserved for married female-headed households, which receive increased transfers of 31 699 peso in the urban sample and 15 536 in the rural sample. This is consistent with the hypothesis that the husbands are working abroad and are remitting their income to their spouses.

6. Other results

This section contains a variety of other estimation results aimed at ascertaining the robustness of our main results to further considerations. We performed various sample splits and modifications of our measure of private transfers. While the details vary, the overall conclusions are similar to those in the previous section; transfer derivatives are large for low-income households and the relationship between private transfers and pre-private transfer income is highly non-linear. Nonetheless, these results are worth summarizing because they provide useful additional insights into private transfer behavior.

6.1. Transfers from outside the Philippines

One-fifth of the urban households and a little over a tenth of the rural households received transfers from people residing outside the Philippines. There could be reasons why these transfers might be different from those from domestic sources for at least a couple of reasons. First, the persons remitting these international transfers are likely to have substantially higher incomes on average than the typical domestic donor. Indeed, the average transfer received from sources outside the Philippines is about seven times larger than the average transfer coming from within the country[24]. Second, households receiving from overseas are probably more likely to be receiving from a family member who belongs to the household, so that such transfers could really be viewed as part of the household's regular income. Households headed by married women, for example, are over-represented among the recipients of transfers from abroad[25]. Third, since the income disparity between donor and recipient is likely to be larger among those receiving transfers from abroad, the transfer might be more likely to be altruistic in nature[26].

In light of the potential differences between transfers from abroad and other transfers, we dropped households who received the former and re-estimated the transfer functions for urban and rural households. The income effects are summarized in Table 6, row a. Despite the large differences between international and domestic transfers, the findings without recipients of international transfers are remarkably similar to our baseline findings.

[24] Urban households who received a transfer from abroad got an average of 24 603 pesos, compared with 3691 pesos among those who received a transfer from domestic sources. The comparable figures for rural households are 14 449 and 1986 pesos, respectively.

[25] Seventeen percent of the urban households who received a transfer from abroad were headed by married women, compared with 2% of urban households not receiving a transfer from abroad. The comparable figures for rural households are 10 and 1%, respectively.

[26] This is an interpretation suggested by one of the referees.

Table 6
Transfer functions, dependent variable—net transfers received[a]

Variable	(1) Urban households		(2) Rural households	
	Coefficient	Standard error	Coefficient	Standard error
(*a*) *No international transfer recipients*				
Income threshold (*K*)	14 578	(972)	8313	(378)
Income below *K*	− 0.312	(0.044)	− 0.425	(0.043)
Income above *K*	− 0.014	(0.002)	− 0.020	(0.002)
(*b*) *Not secondary graduate*				
Income threshold (*K*)	27 476	(2599)	9124	(1386)
Income below *K*	− 0.258	(0.046)	− 0.488	(0.019)
Income above *K*	− 0.002	(0.010)	− 0.006	(0.012)
(*c*) *Secondary graduate*				
Income threshold (*K*)	20 126	(3070)	13 080	(1644)
Income below *K*	− 0.483	(0.158)	− 0.715	(0.208)
Income above *K*	0.007	(0.008)	− 0.005	(0.016)
(*d*) *Family size 4 or less*				
Income threshold (*K*)	21 800	(3565)	10 203	(2274)
Income below *K*	− 0.309	(0.083)	− 0.268	(0.098)
Income above *K*	− 0.026	(0.011)	− 0.056	(0.013)
(*e*) *Family size 5 or more*				
Income threshold (*K*)	19 930	(15 778)	10 143	(523)
Income below *K*	− 0.659	(0.128)	− 1.060	(0.160)
Income above *K*	0.002	(0.007)	− 0.018	(0.008)
(*f*) *Household head aged 45 or younger*				
Income threshold (*K*)	28 260	(3541)	10 128	(971)
Income below *K*	− 0.240	(0.058)	− 0.471	(0.127)
Income above *K*	− 0.008	(0.011)	− 0.010	(0.009)
(*g*) *Household head older than 45*				
Income threshold (*K*)	25 780	(3747)	24 709	(3535)
Income below *K*	− 0.277	(0.081)	− 0.143	(0.029)
Income above *K*	0.025	(0.008)	− 0.010	(0.014)

[a] Dependent variable is gross transfers received minus gross transfers given.

In particular, as before, we find pronounced non-linear effects, with strong transfer derivatives for lower-income households and much smaller derivatives for higher income households[27].

[27] Note that the estimated knot point is somewhat smaller once households receiving international transfers are dropped from the sample, but it would be difficult to read too much into this finding, or to conduct a formal statistical test of these differences, since we are using choosing the sample using the dependent variable.

6.2. Sample splits by education, family size and age

Is behavior different for households with heads who are better educated? How about for larger households, or older ones? Does the same non-linear pattern hold up across these various sub-samples? How about the estimated knot point? We split the sample according to education (whether or not the household head had a completed secondary education or better), family size (four or less vs. five or more) and age (household head older than 45 or not). The results for pre-private-transfer income are summarized in rows b–g of Table 6.

For each sub-sample, the estimated income effects follow the same pattern as those of Section 5; a large transfer derivative for income below the knot point and much smaller effects thereafter. Further, while the point estimates vary, they are all within sampling variability. That is, none of the estimates for the urban household sub-samples in column 1 of Table 6 is significantly different from its counterpart in column 1 of Table 3. Likewise for rural households; none of the estimates in column 2 of Table 6 is significantly different from their counterparts in column 2 of Table 3.

Should we have expected the estimated knot point to vary? There are reasons to have expected that it might have. One of the limitations of the FIES data is that it does not contain any information pertaining to the potential private transfer donors. We know that individual household's characteristics, but not those of, say, the respondent's parents. With a positive intergenerational correlation in education, we would expect more educated respondents to have better educated, wealthier parents. The altruism model predicts that the threshold point at which altruistic transfers cease would increase with donor income. For this reason, we might have expected the estimated knot point to be larger for the more educated sub-samples. This is indeed what we see for the rural households, whose more educated sub-sample has an estimated knot point of 13 080 pesos compared with the less educated sub-sample's 9124 pesos (Table 6, column 2). But the difference is not statistically significant. Further the pattern is reversed among urban households (though again the difference is not significant).

An alternative possibility is that the knot point might represent a fixed threshold, below which households have difficulty meeting basic needs, particularly nutritional requirements. But our experiments with sample splits according to household size revealed that the estimated knot point is rather impervious to changes along this dimension.

Clearly, without information about donor income it is not possible to determine whether the knot is generated by the relationship between donor and recipient resources or recipient resources alone[28]. One thing is certain, however, which is that, since donor and recipient incomes are likely to be positively correlated, our finding of very strong negative income effects are all the more striking in light of the likely direction of omitted variable bias for estimations of recipient income effects[29].

[28] Like most data sets containing private transfer information, the FIES contains no information about incomes of the potential donor households with whom recipient households are linked.

[29] The three existing sources of information concerning such omitted variable bias, Cox and Rank (1992) and Altonji et al. (1997) (for the US) and Cox et al. (1998) (for Peru) each indicate that such bias is positive (albeit small) suggesting that our estimated recipient income effects would be even larger in absolute value were we able to control for donor incomes.

6.3. Other modifications

Recall that we define transfer receipts as inflows net of outflows. An alternative would be to estimate relationships for gross transfers received. We repeated the estimates for transfers defined in this way, and our results hardly differ at all from those already reported[30]. We also estimated, separately, an equation for gross transfers given. This equation contains the rather unsurprising result that gross outflows of transfers rise with income, something that our first two summary tables already indicates. The mixed-motives approach to private transfer behavior does not have any obvious implications for non-linear transfer effects with respect to donor income. And indeed, unlike the estimates for receipts, those for outflows do not suggest any significant non-linearities[31].

7. Conclusion

A primary reason for the surge of interest in family behavior in economics is its implications for government redistribution policy. Researchers and policymakers are both becoming aware that the effects of public income redistribution depend in part on private responses to them, including private transfers. Ironically, it may be that the best place to investigate the effects of the "crowding out" of private transfers for public ones is where little public transfers exist, because in these settings it is likely to be easier to measure the full range of responsive and non-responsive transfers.

Our results suggest that the potential for crowding out is indeed large for public transfers targeted toward those in the lower reaches of the income distribution. Our spline estimates indicate that, depending on the sample, anywhere from 30 to 80% of private transfers could be crowded out for those in (roughly) the lowest quintile of pre-private transfer income.

Our estimated tradeoff between private transfers and recipient income is much higher than existing studies, either for the United States or for developing countries, with one interesting exception that we mentioned earlier. Kaufmann (1982) examined private transfer behavior among urban households in the Philippines and El Salvador. Kaufmann develops a theory of transfers that is different from ours, but is nonetheless focused on a non-linear relationship between transfers and income[32]. Accordingly, he investigates splined and other non-linear specifications of transfer functions, using small household micro-data sets collected in conjunction with a World Bank project on informal housing. For the Philippines, he finds that "The large and highly significant income coefficient... indicate(s) that the slope of the function is rather steep—and negative—at low income levels, and that the slope rapidly decreases as income increases" (Kaufmann, p. 172).

[30] The results discussed in this section are available upon request from the authors.

[31] For gross outflows from urban households, the income coefficients below versus above the knot point are similarly small: 0.0084 and 0.0077, respectively. The corresponding coefficients for rural households are 0.0127 and 0.0094. Unlike for urban households, the rural difference is statistically significant, but nonetheless is miniscule.

[32] Kaufmann postulates that private transfers targeted to a household's "basic needs" (e.g. basic food, health and shelter requirements) respond differently than other transfers.

Kaufmann's estimated tradeoff between transfers and income for low-income households, −0.625 of a peso, is well within the range of our estimates. And like us, he finds that a simple linear specification performs poorly relative to non-linear ones.

We think this evidence adds to a compelling case paying close attention to non-linearities in analyzing private transfer behavior. The spline specification implied by the theory necessitates a search for the knot point in the transfer–income relationship. Such searches introduce inference problems, but these can be addressed as shown by Hansen (1996, 2000). Future work on private transfers should focus on sharp non-linear relationships, preferably in settings where public transfers are small.

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Appendix A. The Bootstrap test for a spline

The Wald statistic for testing the hypothesis of a polynomial transfer function against the alternative hypothesis of a polynomial spline function (of the same order) is $W = n(S_0 - S_1)/S_1$, where S_0 is the sum of squared errors for the polynomial null model (calculated by OLS) and S_1 is the sum of squared errors for the spline model. To compute the bootstrap P-value, generate a sample of iid random variables drawn from the empirical distribution of the NLLS residuals, and repeat the above procedure, treating the generated data as the dependent variable. Store the resulting Wald statistics, and calculate the percentage which are larger than the actual Wald statistic in the sample. This is the bootstrap P-value.

Since calculation of the spline model involves a large number of regressions, each of which involves nearly 10 000 observations, we restricted the class of possible thresholds to 100 values consisting of equally spaced quantiles between the 5th and 95th quantiles.

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