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Can informal redistribution withstand formal safety nets? Insights from urban-rural transfers in Burkina Faso

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Abstract: Households in rural areas still depend on informal transfers to meet subsistence needs and cope with shocks. Yet, to provide additional monetary support, formal safety nets are increasingly introduced in developing countries. However, it remains unclear whether such social protection policies will have the desired welfare effects. This article addresses this question by analyzing the private transfer response to changes in the income of rural recipients using novel data from Burkina Faso. We assume that the transfer-income relationship is a non-linear one where transfer motives, and therefore also transfer responses, vary with the recipient's position in the income distribution. Our findings support this view. We find a pronounced, negative private transfer response among the poorest of the poor. This observation has important policy implications, because those households that depend most on private transfers, would be most affected by crowding-out effects. In terms of transfer motives, the negative relationship for the lowest income class is consistent with transfers being altruistically motivated. With increasing income levels, transfers cease being altruistic at the margin and switch toward exchange motives. However, the observed transfer pattern is also indicative of an (informal) insurance role of private transfers. Rural households receive higher private transfers in response to negative shocks. These results can serve as a basis for the design of formal social protection mechanisms in a context where informal redistribution still plays an important role.

Key words: private transfers, crowding-out, sharing norms, informal insurance, Burkina Faso
***JEL* codes:** D64, H31, I30, O12

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1 Introduction

Since the turn of the century, social safety net programs expanded rapidly around the world. To date, they cover about 2.5 billion people in low- and middle-income countries. Yet, many of the poor in these countries still remain excluded. In low-income countries, formal safety nets reach only 20% of the poor (World Bank, 2018). The remaining share has to rely on their social network for support. Hence, informal transfers still play a key role in helping people to cope with shocks and provide income support to those that are far below subsistence. These informal transfers come mostly from families and friends (Fafchamps & Gubert, 2007; Fafchamps & Lund, 2003; Lucas & Stark, 1985). The literature shows that the motives for informal transfers are manifold and strongly intertwined. Theory differentiates between altruism (see Becker, 1974) and exchange (see Bernheim, Shleifer, & Summers, 1985; Cox, 1987). In practice, however, these motives might be difficult to disentangle. Especially, because we generally are not looking at one transfer in particular, but at repeated interactions over the course of an observation period. Irrespective of the transfer motive, the fundamental and more general question is if and how (overall) transfers respond to the recipient's income. This reaction, in the literature called the "transfer derivative", is an important factor for policy decisions. It provides information about how formal social safety nets could crowd out private transfers and in the extreme case offset their intended redistributive effects completely. This would leave the safety net without effect (Cox, Hansen, & Jimenez, 2004).

In this study, we investigate informal transfers in Burkina Faso. Burkina Faso provides an interesting case study, because it exemplifies the context described above. It is one of the poorest countries in the world, holding position 182 out of 189 in UNDP's Human Development Index ranking (Grimm, Wetta, & Nikiema, 2016; UNDP, 2019). Formal social safety nets in form of cash transfers or large-scale insurance schemes are still absent. Yet, a number of programs are currently piloted. The World Bank, for example, introduced a cash transfer program (social safety net project) and provides support to the pilot of a national health insurance scheme. Hence, the question whether there might be crowding-out between public and private transfers is of relevance in this context, as it is in many other countries that are in comparable economic conditions.

We contribute to a large body of research on the issue of crowding-out effects. The seminal work on the transfer-income relation and the possibility of crowding-out effects goes back to Becker (1974) and Barro (1974). The theoretical model by Becker (1974), for instance, predicts that an increase in household resources is met with a decrease in altruistically motivated transfers. Transfers given with the purpose to mitigate risk would follow the same qualitative pattern (Cox et al., 2004). The model developed by Cox (1987) introduces the motive of exchange to the discourse, where transfers can be both positively or negatively related to household resources. While empirical evidence suggests that crowding-out is less of an issue in developed

countries (see e.g., Altonji, Hayashi, & Kotlikoff, 1997; Cox & Jakubson, 1995), crowding-out effects are observed in studies from developing countries. However, there is no uniform conclusion, particularly when looking at these effects along the income distribution. The transfer-income relationship exhibits non-linearities, where different transfer motives co-exist. Thus, crowding-out effects depend on the recipient's position in the income distribution. In the Philippines, Cox et al. (2004) find strong negative transfer derivatives only among low-income households. A similar pattern prevails in the study by Jimenez and Brown (2012) from Fiji. By contrast, Kazianga (2006) finds no evidence of crowding-out for the lower tail of the income distribution in Burkina Faso, but rather for the middle-income group.

More recent literature moved away from studying the transfer derivative and turned to focusing on cases where formal transfers (e.g., insurance) were actually introduced, or at least offered, and investigated the reaction of private transfers to this institutional change (e.g., Attanasio & Ríos-Rull, 2000; Geng, Janssens, Kramer, & van der List, 2018; Jensen, 2003; Mobarak & Rosenzweig, 2013; Strupat & Klohn, 2018). Others have studied this issue using lab-in-the field experiments, where potential confounders can be better controlled for, but where the external validity, that is, the transferability of the findings to situations outside the lab, is often subject to debate (e.g., Cecchi, Duchoslav, & Bulte, 2016; Landmann, Vollan, & Frölich, 2012; Lenel & Steiner, 2017; Lin, Liu, & Meng, 2014). The evidence from these studies is mixed. A large body of research though confirms crowding-out effects for social security, pensions, food aid and conditional cash transfers (Attanasio & Ríos-Rull, 2000; Cox & Jimenez, 1992; Dercon & Krishnan, 2003; Jensen, 2003). Moreover, crowding-out of informal transfers is also observed for insurance instruments such as the national health insurance scheme in Ghana (Strupat & Klohn, 2018) and a weather insurance in rural India (Mobarak & Rosenzweig, 2013). Yet, some studies do not find crowding-out effects. In rural Kenya, for example, Geng et al. (2018) conclude that formal and informal insurances are complements. Dercon, Hill, Clarke, Outes-Leon, and Seyoum Taffesse (2014) also reject crowding-out. In Ethiopia, they argue that the provision of index insurance rather crowds in informal sharing arrangements. The rejection of crowding-out for insurances often comes with the argument that formal insurance increases the resources in the risk-pool of informal sharing networks, and therefore ultimately renders these systems more efficient. This applies mainly to responses to covariate shocks such as droughts or flooding, which typically affect entire communities (Berg, Quirion, & Sultan, 2009; Dercon et al., 2014; Mobarak & Rosenzweig, 2013). This argument also holds for the more qualitative sociological literature (e.g., Heemskerk, Norton, & de Dehn, 2004). Some studies suggest that formal insurance increases the cohesion (e.g., Edin & Lein, 1997; O'Connor, Orloff, & Shaver, 1999), whereas others tend to argue that it is rather detrimental to it (e.g., Dercon & Krishnan, 2003; Ligon, Thomas, & Worrall, 2002).

We contribute to the existing literature by taking a step back again, using an ex-ante perspective on planned social safety net interventions. We believe this is important and has been overlooked in recent studies. This approach will provide policy-makers searching for guidance

on effective policies with valuable and locally applicable insights and therefore offers a worthwhile complement to the existing ex-post evidence. Our data collected in the Central Plateau region of Burkina Faso is particularly suited to study this issue. First, our data set contains information about both ends of the transfer relationship. That is, for a sub-sample, we have information on both recipient and sender incomes. Especially the latter is often missing and may lead to a serious omitted variable bias. Second, our data follows the same households over time, which allows controlling for many other potential confounders. We use this data to model and estimate the transfer-income relationship similar to some of our predecessors in a non-linear way with spline specifications (see e.g., Cox et al., 2004; Kazianga, 2006). This allows us to explore not just whether crowding-out exists, but also how the income elasticity of transfers – or the transfer derivative – varies across the income distribution. This is particularly important for the targeting of social safety nets and the design of the transfer size relative to the recipient's income.

Our empirical results suggest that the relationship between the recipient's income and the transfer response is indeed non-linear. We find behavioral patterns that are theoretically consistent with altruism, effective risk-sharing, or both. Specifically, we observe a negative relation between the recipient's income and private transfers received for low-income households. This observation has important implications for the redistributive effectiveness of public transfers. It implies that attempts by the government or non-governmental organizations to redistribute income through formal interventions may potentially crowd out private responses. Especially poor households, which are also the ones that depend most on private transfers, would be most affected by crowding-out effects. This finding is in contrast to Kazianga (2006), who finds no evidence of crowding-out for the lower tail of the income distribution but rather for the middle-income group. Our results are robust to an instrumentation of the recipient's income. Moreover, our main findings also hold if we control for sender income in the transfer function to redress a potentially important omitted variable bias. Various papers raised the concern of a potential omitted variable bias in the transfer function due to missing information on sender income (Altonji et al., 1997; Cox & Jimenez, 1998; Cox & Rank, 1992; Kazianga, 2006). We can confirm that this bias is statistically relevant, yet, in our case the bias is quantitatively small.

Concerning the transfer patterns, we observe particularly high transfers in response to negative shocks, which also highlights the insurance role of informal transfers. When separating income into permanent and transitory components, we observe that (private) transfers only respond to transitory income. Assuming that our measure for transitory income is reliable, this would suggest that while formal insurance may imply crowding-out effects, other formal, more permanent forms of public transfers (such as cash transfers) might trigger another response.

The remainder of this paper is organized as follows. Section 2 presents the conceptual framework outlining the non-linear transfer response associated with different underlying motives. Section 3 describes the survey design and provides some details on the magnitude of transfers in our context. Section 4 outlines our empirical approach. The results as well as the robustness

checks are discussed in Section 5. Section 6 concludes.

2 Conceptual framework

We largely follow Cox et al. (2004) in providing a conceptual framework and making the following two main points: First, we imply a non-constant transfer derivative with the possibility of two theoretical motives – altruism and exchange – to co-exist. Second, we acknowledge that the predictions for altruistically motivated transfers are analytically very similar to transfers for risk-sharing. Risk-sharing models, like the altruism-exchange framework can also imply non-linear transfer derivatives.

2.1 Altruism and exchange

In order to relate transfers received to recipient income, we apply a variant of the model by Cox (1987). This framework can also be used to display a non-linear pattern of received transfers in recipient income, where the pattern is determined by the motive prevailing at the margin. We believe altruism to operate at the margin when the recipient experiences financial hardship; that is, at very low levels of income with the donor not expecting any return. Empirically, this translates into a negative relationship between transfers received and recipient income. Thus, transfers are falling with increasing household resources. This prediction gives rise to the possibility that private transfers are crowded out by public ones, as the latter usually aim to increase household incomes experiencing financial hardship. According to the standard Becker-Barro model (1974), transfers would stop upon reaching the limits of altruism. In turn, the framework by Cox (1987) augments the altruistic model to include the possibility of inter-household exchange. It allows for transfers to cease being altruistic at the margin and to switch to exchange related transfers. This motive switch may occur after recipient income has risen to a certain, though mostly unknown threshold. In contrast to altruistically motivated transfers, transfers motivated by exchange do not need to have a strong (negative) transfer derivative – in fact, the transfer derivative might even be positive. Formally, we assume the following utility of the donor d:

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

where V represents the recipient's r utility function. Both the donor's and the recipient's utility function depends on the consumption C of an aggregate good and the amount of services s provided or consumed. The latter may stand for anything that the recipient provides to the donor such as help with home production or future financial transfers. It is assumed that these services have no market substitutes. The budget constraints for the donor and the recipient are $C_d = I_d - T$ and $C_r = I_r + T$, respectively, where I denotes pre-transfer incomes and T financial transfers given from the donor to the recipient. The utility expressed in Equation 1 captures

both motives. On the one hand, the donor cares about the recipient so that $\partial U_d/\partial V > 0$. On the other hand, the recipient must be compensated for any services provided, because $\partial V/\partial s < 0$. All other partial effects of the remaining arguments in Equation 1 are positive. In order to see when a transfer is altruistically versus exchange motivated, one has to look at the participation constraint in Equation 2, which states that the recipient entering in the transfer relationship must not lower utility:

$$V(I_r + T, s) \geq V_0(I_r, 0) \tag{2}$$

Cox (1987) shows that his model generates the two regimes of altruism and exchange, depending on whether the participation constraint is binding or not. First, if the constraint is not binding, transfers are altruistically motivated, and $\partial T/\partial I_r < 0$ (i.e., transfers decrease with recipient income). Second, if the constraint is binding, transfers are exchange-related and exactly compensate for provided services. When motivated by exchange, the relationship between I_r and T is different. Cox (1987) shows that transfers first rise and then fall, thus, generating an inverted U-shaped relationship (see also Cox et al., 2004, for an illustration). The participation constraint, moreover, provides ground to explain why altruism prevails when recipient income is low, because in this case the constraint is not binding. Donors maintaining a transfer relationship with a poor household make transfers with the sole motivation to raise the household's well-being. Typically, it is assumed that the financial position of the donor outweighs the financial position of the recipient. Only when the recipient household achieves a certain level of well-being – or income (i.e., making the participation constraint binding) – exchange becomes the operative motive at the margin. Thus, the altruistic motivation might vanish, even though transfers themselves might not. Empirically, the described relationship needs to be addressed in a transfer function, which is non-linear in recipient income. This allows to (ex-ante) assess the possibility of crowding-out of private transfers by public ones. In this case, it also allows seeing which part of the population will be affected most. In our empirical specification, the non-linearity will take the form of (connected) splines.

2.2 Risk-sharing and the insurance motive

Other commonly used models to investigate household transfers are risk-sharing models (Cochrane, 1991; Townsend, 1994). Also Becker (1974) notes that operative, altruistic transfers can imply effective risk-sharing between the transfer participants. However, altruism is not a necessary condition for such an informal insurance mechanism. Still, transfers related to altruism and risk-sharing are analytically very close, making their implications and empirical predictions very similar (see Cox et al., 2004). First, if transfers are used to cope with shocks that result in decreased household resources, then transfers and recipient income should be inversely related. Assuming that poorer households are more likely to experience negative income shocks and are more in need for (informal) insurance payments to cope, one would expect that transfers are

particularly responsive to income at low levels of recipient income under full risk-sharing. By contrast, households higher up in the income scale may also experience negative shocks, but are more likely to rely on savings, formal insurance or credit to cope. It follows that household risk-sharing models can also imply non-linear transfer responses. The possibility of crowding-out is just as relevant, considering that formal insurance or greater access to capital markets may interact with informal insurance payouts.

In our empirical analysis, following Kazianga (2006), we introduce permanent and transitory income in our transfer function. This specification allows us to explore the role of transfers in risk-sharing. If (full) risk-sharing is taking place, transfers should only be determined by the transitory part of income (Cochrane, 1991; Mace, 1991; Townsend, 1994).

Although transfer derivatives strongly depend on the transfer motive (which in turn depends on recipient income), our main goal is not to unambiguously identify the underlying transfer motives. We use the motives only to introduce predictions on the relationship between transfers received and recipient income. Finding that transfers respond negatively to the recipient's income is not enough to distinguish between altruism and risk-sharing. Moreover, the empirical identification of the exchange motive is particularly challenging when reciprocity is deferred in time, because then repeated observations of the same household over longer time periods are necessary and life-cycle considerations matter. This is, for example, the case for intergenerational exchange where parents support their children and the latter reciprocate when in adulthood to provide old-age support (Cox & Rank, 1992). An extreme case is "generalized reciprocity" (La Ferrara, 2003), where the offspring of the original benefactors is involved for reciprocity. An example would be young people receiving support from older relatives to finance their studies, whereas these young people in old age reciprocate by helping their younger relatives once they start earning money (La Ferrara, 2010).

3 Survey design and sample description

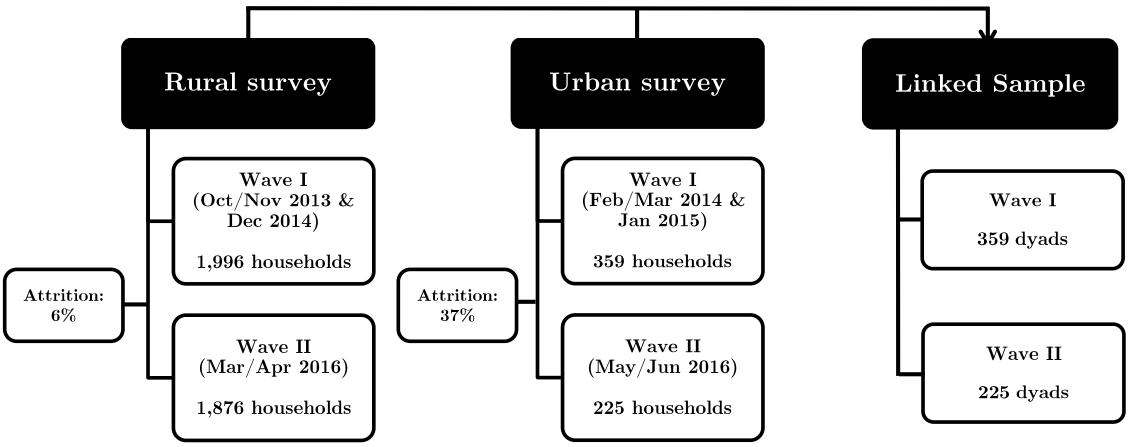
3.1 Survey design

The empirical analysis is based on two related sets of household panel data: rural and urban. The rural household data was collected among households in the community of Ziniaré, which is located in the Plateau Central region of Burkina Faso. The rural community spans over 48 villages and is home to a bit less than 6,800 households, most of them engaged in subsistence farming. Our sample covers 2,007 randomly selected households from 38 villages. The data represents 32% (i.e., 14,164 individuals) of the population living in the area.

The first wave of data collection was conducted in October and November 2013, where we interviewed 1,499 households. With additional financial resources becoming available, we extended the first wave by another 508 households in December 2014. From the 2,007 interviewed

households, we ended up having full information from 1,996 households. The survey included modules on socio-economic household characteristics, food and non-food consumption, shocks, and transfers given and received in the 12 months prior to the survey, including information on the respective transfer recipient and sender. In March/April 2016, we were able to re-interview 1,876 households for the second wave.[1]

Figure 1: Sampling



The urban household panel is linked to the rural household panel through the information about transfers received and given in the first wave of the rural household survey (2013/14). In that survey we collected detailed information on the amount, regularity and purpose of the transfer, and also personal characteristics of the sender (age, relationship, occupation, place of residence). Furthermore, we recorded if the sender was a business owner in an urban location in Burkina Faso. If this was the case, we asked for his or her contact details.[2] From the rural household survey, we collected information on 402 urban transfer sending households. We were able to trace and interview 359 of them in February/March 2014 and January 2015. The majority (85%) of them reside in the capital Ouagadougou. 95% of the senders are blood-related, being very often either a child or a sibling of the rural household head. In the second round of data collection in May/June 2016, we were able to re-interview 225 of the 359 households.[3] Figure 1

[1]The follow-up was planned for October 2015, but had to be postponed due to the political instability in the country. The attrition rate is 6%. We test for systematic attrition and find that the attrited households differ slightly in their demographic composition, female headship and chronic disease prevalence (for details see Appendix A). We account for these differences in all our regressions.

[2]The focus on business owners in the survey stems from the objective of the FIdES project, from which the data stems from. It had been developed with the objective of investigating the effects of transfer relationships on small and micro entrepreneurs.

[3]Attrition in the urban sample is with 37% relatively high. A test for systematic attrition shows that households that drop out differ in their demographic composition and are less likely to have suffered from

summarizes the composition of our samples across waves.

For the linked sample, we form dyads for both waves between the urban households and their rural transfer recipient. While we work with balanced panels for the descriptive and empirical analysis when looking at the rural and urban sample separately, we use an unbalanced panel in our empirical analysis with the linked sample (to not lose any observations and gain statistical power).

3.2 Sample description

We describe the rural and urban sample in Table 1. It becomes apparent that the rural households in our sample have on average a lower annual income and larger families than the urban households. The urban household heads have higher levels of education and around half own a business. However, when it comes to the households' vulnerability, both household samples seem comparable. Around 31% of the rural households have a chronically sick household member and with 26%, this share is only slightly smaller among urban households. In both samples, around 36% have experienced a negative shock in the 12 months prior to the survey conducted in the first wave. In the following, we take a closer look at the transfer behavior (i.e., transfers received and given) of both household samples.

We focus on transfers between households and ignore transfers within households. Transfers reported can be in cash or in-kind. In the following and in the empirical analysis we do not differentiate between both forms; in-kind transfers are assigned monetary values. Transfers were sent within a concentrated network, namely, largely among first- and second-degree relatives (parents, siblings, children). Only 9% of the transfers received and 12% of the transfers given came from or went to non-family members. This transfer pattern is in line with qualitative evidence from the anthropological literature. Hammond (1966) and Fiske (1990), for instance, stress the importance of "gift exchange" within the family as an integral part of the Mossi culture. We observe a similar concentration also in the urban sample. 92% of transfers given by urban households over the two survey waves went to first degree relatives, either from children to parents or vice versa. Yet, urban households reported a higher share (30%) of transfers received from donors outside of their family network.

Table 2 provides an overview of the transfer activity in our samples. More than half of the rural households do not take part in a transfer network. For those in transfer networks, we see that rural households are typically on the receiving side. By contrast, urban households are

a shock (for details see Appendix A). Our empirical analysis concentrates on the rural sample. Hence, the large attrition in the urban sample should not be a major concern. We test if rural households without a link in the second wave differ systematically from the other households. The results in Appendix A indicate no systematic differences with one exception: household heads in these households are slightly less likely to have secondary education. We control for this difference in our estimations with the linked sample.

Table 1: Summary statistics, rural and urban households

	Rural HHs		Urban HHs	
	(1) Mean	(2) SD	(3) Mean	(4) SD
Annual HH income (1,000 CFA F)	588.7	956.1	2,038.5	1,838.0
Livestock (TLU)	3.7	14.3		
Land owned (ha)	3.2	3.4		
HH size	7.2	3.6	5.6	3.1
No. children 0-5	1.3	1.2	1.0	1.0
No. children 6-18	2.7	2.1	1.8	1.7
No. adults 19-64	2.8	1.4	2.8	1.4
No. older adults 65+	0.3	0.6	0.1	0.3
Children/adult ratio	1.5	0.9	1.0	0.7
Age HH head (years)	48.5	14.8	41.7	12.0
HH head no schooling (=1)	0.720		0.405	
HH head primary school (=1)	0.118		0.222	
HH head secondary school (=1)	0.162		0.373	
Female HH head (=1)	0.060		0.040	
HH has business (=1)			0.524	
Chronically sick HH member (=1)	0.309		0.262	
Shock in past 12 month (=1)	0.365		0.360	
No. of HHs	1,876		225	

Note: Data from first wave. Annual (net) income is approximated with annual household consumption net of transfers received and given. The value of livestock is expressed in tropical livestock units with the following conversion factor: cattle=0.7, sheep=0.1, goats=0.1, pigs=0.2 and chicken=0.01. A shock is defined as an event that caused, according to the household, serious problems for the living conditions of the household.

Table 2: Participation in informal transfers in the 12 months preceding the two survey waves, rural and urban households

	Rural HHs		Urban HHs	
	(1) Wave I (%)	(2) Wave II (%)	(3) Wave I (%)	(4) Wave II (%)
Non-participants	53.2	52.3	11.6	15.1
Recipients only	36.6	27.7	0.4	1.3
Donors only	4.9	9.7	63.6	62.7
Both recipient and donor	5.3	10.3	24.4	20.9
No. of HHs	1,876	1,876	225	225

more likely to be donors only.[4] Table 3 presents the transfer amounts (in 1,000 CFA F) and

[4]The shares might be upward biased due to the sampling process. Also, note that some urban households reported not to have given transfers. This suggests a significant degree of misreporting from the urban or the rural side. Comola and Fafchamps (2017) and De Weerdt, Genicot, and Mesnard (2019)

variability over time. For this purpose, transfers were aggregated at the household level for cases where households reported more than one transfer given or received, respectively. In the first wave, 41.9% of the rural households received at least one transfer in the 12 months prior to the survey. The average transfer amounts to 72,100 CFA Franc (125.0 USD) or 12% of the average yearly household income. We see that transfer sizes are not stable over time; both transfers received and given are lower among the rural sample in the second wave. Moreover, the transfer amounts given and received by urban households are almost twice the amounts reported in the rural sample.

Table 3: Size of informal transfers received and given in the 12 months preceding the two survey waves, rural and urban households

	Wave I		Wave II	
	(1) Transfer size (1,000 CFA F)	(2) No. of HHs	(3) Transfer size (1,000 CFA F)	(4) No. of HHs
Rural HHs				
Annual transfers received	72.1	785	63.1	712
Annual transfers given	44.2	190	27.7	375
Total no. of HHs		1,876		1,876
Urban HHs				
Annual transfers received	46.3	56	34.1	50
Annual transfers given	113.6	198	137.9	188
Total no. of HHs		225		225

Note: Transfers received and given include all monetary and in-kind transfers that a household has received or given in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders or given to various recipients are aggregated. The mean values in Columns 1 and 3 are conditional on receiving/giving a transfer. 1 USD corresponds to approx. 577 CFA F.

In our analysis, we focus on the rural household sample. First, because the simple description demonstrates that transfers are mainly unidirectional, that is, urban households are donors and rural households are recipients.[5] This may suggest that most rural households are not actively engaged in exchange. Second, in the case of Burkina Faso, rural households are the obvious target population for social safety nets. Hence, an ex-ante assessment is highly relevant in this context. Yet, taking a closer look at the rural households reveals that the recipients of the transfers described above are not solely concentrated in the poorest quintile. Within each income quintile, a share of 34-46% received a transfer (see Appendix B for details). The only distinction is that average transfers in the poorest income quintile are around double in size of those in

made similar observations.

[5]A more detailed analysis of transfers received by rural households indeed confirms that a large proportion of transfers is coming from the urban area (see Appendix B). In the urban sample, a large share of reported transfers given are directed towards recipients living in the home village. In turn, urban households receive support largely from urban areas or abroad.

the other income quintiles. A fairly large amount of transfers received is in response to shocks, which points to the prevalence of risk-sharing. Around 50% of these negative shocks involve health shocks. Rural households also report to receive regular transfers; here, the prevailing reason is to meet subsistence needs (for further details see Appendix B).

4 Empirical strategy

In the empirical analysis, we estimate transfer response functions for the rural households, which relate transfers received to the income of the recipient household. As discussed in the conceptual framework, we assume that there is a non-linear relationship between transfer size and recipient income. We depict this non-linearity by using a regression spline model. It consists of continuous linear splines with four knots. The knots separate recipient income into income quintiles. Our approach differs from that of Cox et al. (2004), who only use one knot and treat this threshold level of income (where transfer behavior switches from altruistic to non-altruistic) as unknown. By contrast, Kazianga (2006) uses income quartile splines to depict the non-linearity, but he applies unconnected splines to do so. Our regression model takes the following form:

$$T_{ivt} = \sum_{k}^{5} \gamma_k I_{ivt} + \beta X_{ivt} + \alpha_t + \delta_v + u_{ivt}, \tag{3}$$

where T_{ivt} is the annual amount of transfers received by rural household i in village v in the 12 months preceding the survey at time t.[6] k indicates the income quintile, I_{ivt} is household i's annual (net) income at time t in linear spline k. The knots for creating the linear splines are specified to be placed at five percentiles of the income data. The interpretation of the coefficients γ_k is described in the following (income values in 1,000 CFA F – i.e., 1.73 USD):

$$\frac{\partial T_{ivt}}{\partial I_{ivt}} = \begin{cases} \gamma_1 \; if \; I_{ivt} < 214.1 \\ \gamma_2 \; if \; 214.1 \leq I_{ivt} < 357.7 \\ \gamma_3 \; if \; 357.7 \leq I_{ivt} < 540.1 \\ \gamma_4 \; if \; 540.1 \leq I_{ivt} < 875.2 \\ \gamma_5 \; if \; I_{ivt} \geq 875.2 \end{cases}$$

Since we imply knots and do not treat them as unknown, the model can be estimated using (pooled) ordinary least squares (pOLS). Considering that some households do not participate in any transfer activity as shown in Table 2, we estimate Equation 3 also with a Tobit model. We furthermore control for household head and household characteristics (X_{ivt}), and include wave (α_t) and village (δ_t) fixed effects. u_{ivt} is the error term. Standard errors are clustered at the

[6] In contrast to other studies, we do not take net transfers. However, we address the robustness of using net transfers in Section 5.2.

rural household level.

We proxy household income with the annual household consumption net of transfers received and given.[7] Furthermore, the income variable is decomposed into permanent and transitory components. We roughly follow Kazianga (2006) and predict permanent income using characteristics that are permanent to the household (possession of livestock, assets, land owned, access to electricity, village fixed effects) and characteristics that determine transitory income (occurrence of negative shocks and wave fixed effects). The residual depicts the "unexplained" part of income (Paxson, 1992).

The income measure we use in our analysis causes some empirical problems. One concern is measurement error, which we nevertheless tried to limit by ensuring a thorough data collection. Enumerators were carefully trained and according to best practices, consumption was asked by categories to reduce recall error. Another concern is the endogeneity of transfers and income that can stem from reverse causality and omitted variables. To mitigate these biases, we propose a new instrumental variable (IV) (see Section 5.2). Apart from using an IV in some specifications, we also exploit the panel structure of our data allowing to include wave fixed effects and village fixed effects, which can at least control for all time-invariant factors at the village level. We are refraining from using household fixed effects in our preferred specification, because we are interested in the effect of some time-constant covariates on transfer patterns besides the income effect. The effect of these covariates, for instance, head of household characteristics and household composition, allows us to derive further implications for the targeting of public transfer initiatives. Yet, we test the robustness of our transfer derivatives when including household fixed effects and find them to be very similar. However, other omitted variables, in particular sender income and other sender characteristics, may still bias the results. The linked sample does allow us to control for the sender's income and therefore to check the validity of our results, although with a smaller number of observations (see Section 5.2).

As mentioned above, we include other household characteristics besides recipient income in the transfer function. X_{ivt} is a set of variables that potentially affect transfers received such as household composition and age of household head. A significant effect for older adults would, for instance, indicate an old-age support role of transfers (Cox, Galasso, & Jimenez, 2006). We moreover include a dummy indicating whether the household head is female, because many studies on private transfers find a positive correlation between female headship and transfers received (e.g., Cox et al., 2006, 2004; Cox & Jimenez, 1992; Kazianga, 2006; Lucas & Stark, 1985).

[7] We take transfers received and given into account in order to reduce the endogeneity concern of taking household consumption as a proxy for household income. Household consumption is regularly used as a proxy for household income (Deaton, 1995). We find rural household consumption to be correlated with other income proxies such as livestock possession, land owned and the asset index. By using household consumption, we implicitly implicate the absence of access to credit and savings. Indeed, in a question on what measures rural households apply to cope with shocks (besides transfers), a share of below 0.1% reported using formal credit. A share of 2.5% reported using informal credit (from family or friends) as another measure and only 9.4% reported using savings.

Besides old-age and female support, transfers can also be explicitly motivated by support for chronically ill or in response to a shock, which is why we control for having a chronically sick person in the household and whether or not the household experienced a negative income shock in the past 12 months. Lastly, we also include the household head's level of education, where multiple interpretations have been put forward. On the one hand, it is correlated with lifetime resources, which may predict a negative effect on transfers. On the other hand, one may also expect a positive effect if it is correlated with past transfers, and thereby picks up the strength of parental altruism. A similar effect may show if education proxies for the recipient's ability to reciprocate (Cox & Fafchamps, 2007).

5 Results

5.1 Main results: Transfer response to income

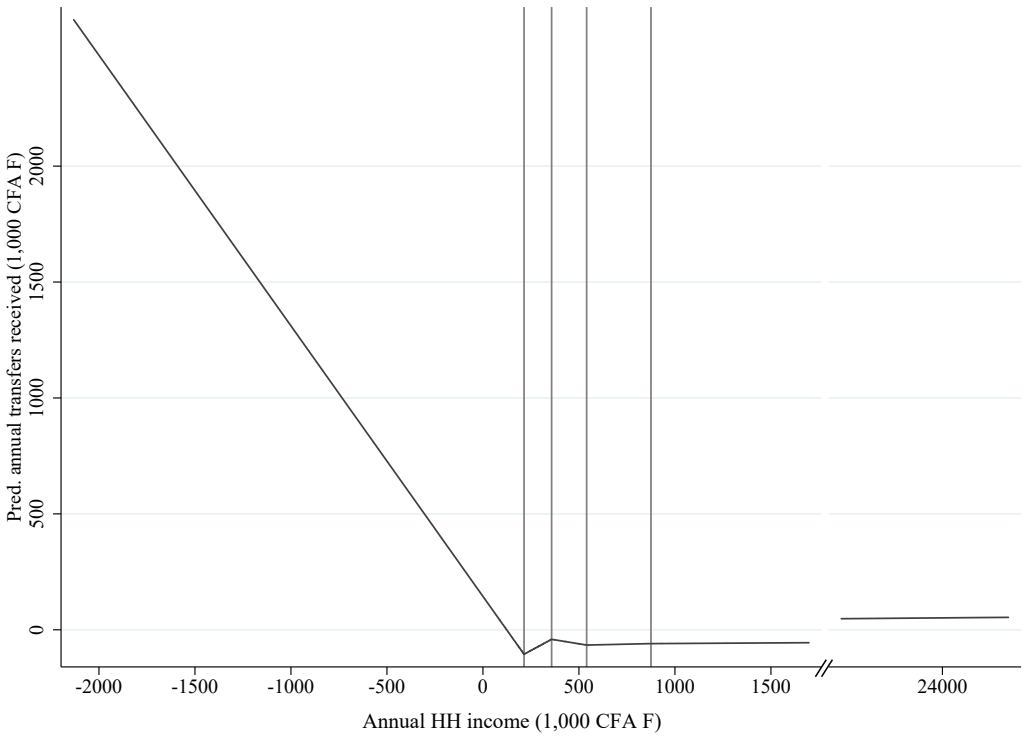
Table 4 reports the results of the estimated transfer functions. The observed patterns are used to learn about potential crowding-out effects ex-ante. In Columns 1, 3 and 5 we show the results of pooled OLS regressions. These ignore the censored nature of the dependent variable. To take this into account, we additionally use a Tobit model; the results are shown in Columns 2, 4 and 6. Addressing the non-linear transfer response, we first introduce income in exponential form (Columns 1 and 2). In Columns 3 and 4 we present the results of the continued spline specification as outlined in Equation 3 and in Columns 5 and 6 we further differentiate between permanent and transitory income splines.

The results shown in Columns 1 and 2 suggest a negative relationship between transfers received and the recipient's income. The coefficient estimates are small in size and even though the linear and squared income term are statistically significant, they are close to zero and economically negligible. Comparing the results of all specifications for the pooled OLS and Tobit estimations suggests that ignoring the censoring underestimates the effect associated with the recipient's income. Therefore, we focus our remarks on the results obtained by the Tobit model. Allowing the non-linear transfer response, by introducing continuous linear income quintile splines (see Columns 3 and 4), shows that the exponential form is a poor approximation of the relationship between transfers and income. The income splines are listed from lowest (poorest) to highest (richest). We still see a negative relationship between transfers and income, but only for the first and third income quintile. Particularly for the poorest households, this negative response is highly significant and sizeable. For this group, a 1,000 CFA Franc increase in income comes with a reduction in transfers by 1,170 CFA Franc. In contrast, for households in the second income quintile, a 1,000 CFA Franc increase in income comes with an increase in transfers by 450 CFA Franc. While the third income quintile displays again a negative relationship, the negative effect size is much smaller in magnitude to that of the first income

group. We do not observe a significant relationship for the upper two income classes. The results of the F-Test indicate that the responses of the five income categories differ significantly from each other.

Figure 2 illustrates the predicted transfer response for households in each income quintile. The response is based on the Tobit estimates presented in Column 4 of Table 4. The figure shows that the poorest households are the ones who depend the most on private transfers and due to their financial position, would in principle be the main target group of public transfer programs. The strong negative response to a rise in income among this group indicates that public transfers would overproportionately offset their redistributive intention and actually lead to a decrease in overall available income. However, the figures presented here disguise an important aspect, namely that there is important heterogeneity with respect to the exposure to informal transfers in this group. Only about half of the households in the poorest income quintile are actual transfer recipients. Thus, for those that do not participate in transfer relations, public transfers would have a positive (overall) effect on income. For those that received transfer, however, the results suggest that public transfers would crowd out private ones.

Figure 2: Predicted transfer response to recipient income, rural households



Note: The transfer response is predicted using the Tobit estimation in Table 4, Column 4, and holding all other regressors fixed at their sample means. The vertical gray lines delimit the income quintiles.

In line with the conceptual framework laid out in Section 2, the negative relationship between transfers and income for the lowest income class is consistent with transfers being altruistically

Table 4: Transfer response to recipient income, rural households

	Annual transfers received (1,000 CFA F)					
	(1) pOLS	(2) Tobit	(3) pOLS	(4) Tobit	(5) pOLS	(6) Tobit
Annual HH income (1,000 CFA F)	-0.022*	-0.040*				
	(0.013)	(0.023)				
Annual HH income sq. (/1,000)	0.001*	0.002*				
	(0.001)	(0.001)				
1st income spline			-1.065***	-1.167***	0.011	0.093
			(0.071)	(0.060)	(0.027)	(0.077)
2nd income spline			0.444***	0.448***	0.051	0.026
			(0.047)	(0.073)	(0.057)	(0.144)
3rd income spline			-0.102***	-0.136**	0.112	0.285*
			(0.025)	(0.057)	(0.073)	(0.163)
4th income spline			0.008	0.018	0.038	0.039
			(0.012)	(0.028)	(0.068)	(0.137)
5th income spline			0.004	0.005	0.057	0.114
			(0.003)	(0.005)	(0.039)	(0.076)
Negative transitory income spline					-0.443**	-0.975***
					(0.185)	(0.347)
Positive transitory income spline					-0.043*	-0.186***
					(0.025)	(0.071)
Unexplained income (1,000 CFA F)					-0.008*	-0.018
					(0.005)	(0.012)
No. children 0-5	-2.0	-3.3	-1.9	-2.4	-2.7	-5.2
	(2.3)	(4.6)	(2.0)	(3.6)	(2.3)	(4.6)
No. children 6-18	-1.8	-2.6	-0.4	-0.6	-3.5*	-6.8*
	(1.8)	(3.4)	(16.0)	(2.7)	(1.9)	(3.6)
No. adults 19-64	7.8**	10.6*	8.1***	10.5**	4.3	5.0
	(3.8)	(6.2)	(28.0)	(4.4)	(3.3)	(5.6)
No. older adults 65+	5.1	11.4*	2.8	6.8	3.4	8.9
	(3.4)	(6.7)	(25.0)	(4.8)	(3.4)	(6.7)
Children/adult ratio	3.5	-0.6	4.1	1.0	4.2	3.2
	(5.0)	(8.2)	(3.1)	(5.4)	(4.9)	(8.2)
Age HH head (years)	-0.3	0.4	-0.8	-0.6	0.1	1.2
	(0.8)	(1.5)	(0.6)	(1.2)	(0.8)	(1.6)
Age HH head sq.	0.005	0.007	0.007	0.010	0.002	0.001
	(0.007)	(0.013)	(0.006)	(0.011)	(0.007)	(0.014)
HH head primary school (=1)	4.1	16.9	4.7	13.6*	-0.7	6.0
	(4.9)	(11.4)	(3.6)	(8.0)	(4.7)	(11.1)
HH head secondary school (=1)	17.5**	36.3**	12.8**	24.5***	12.6	23.5*
	(8.7)	(15.4)	(5.0)	(8.9)	(8.1)	(14.1)
Female HH head (=1)	12.3	46.7***	-5.4	14.4	19.7**	65.1***
	(8.3)	(14.9)	(6.2)	(10.9)	(8.4)	(16.0)
Chronically sick HH member (=1)	3.3	17.6**	2.4	13.1**	-2.1	3.7
	(4.2)	(8.4)	(3.0)	(5.9)	(4.8)	(9.8)
Shock in past 12 month (=1)	19.6***	66.3***	13.6***	45.5***		
	(3.7)	(8.9)	(2.8)	(5.7)		
Constant	2.1	-183.8***	178.6***	70.8**	-22.9	-196.2***
	(19.7)	(46.4)	(20.3)	(34.7)	(23.2)	(59.2)
Village FE	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES
Observations	3,752	3,752	3,752	3,752	3,752	3,752
No. of HHs	1,876	1,876	1,876	1,876	1,876	1,876
R-squared	0.040		0.524		0.035	
F-Test p-value (quintiles)			0.000	0.000	0.003	0.007
F-Test p-value (positive/negative)					0.011	0.001

Note: Data from first and second wave. Robust standard errors in parentheses; standard errors are clustered at the household level. Transfers received include all monetary and in-kind transfers that a household received in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders are aggregated. Annual (net) income is approximated with annual household consumption net of transfers received and given. The reference category for the household head's education is "no schooling". A shock is defined as an event that caused, according to the household, serious problems for the living conditions of the household. The F-Test p-values result from tests of equality of the effects across the income quintile splines and of the coefficients associated with positive and negative transitory income components. *** indicates significance at 1%, ** at 5%, and * at 10%.

motivated. While the second income group depicts a positive relationship, the relationship between transfers and income turns negative again for the third income group. This pattern comes close to the inverted U-shaped relationship predicted by Cox (1987) and illustrated in Cox et al. (2004). That is, after the threshold where transfers cease being altruistic at the margin, transfers first rise and then fall. Though, in our sample the U-shape relationship only prevails between the second and third income group, whereas in Cox (1987) and Cox et al. (2004) this relationship spans over all upper income classes. Yet, we may interpret the income level between the first and second income quintile as the threshold where transfers switch to exchange related transfers. We cannot, however, conclude that altruistic or exchange related preferences actually exist. To further look into transfer motives, we can only draw upon qualitative evidence elicited from the urban households in our sample, which are often on the giving-side of the transfer relationship. Table 5 shows the share of urban households that agreed with different statements on sharing obligations. Almost all of the interviewed agree that, depending on the financial position, sharing is the norm (see Statements 1 and 2). In turn, Statements 3 and 4, which describe pure exchange relationships, meet little agreement. This could suggest that transfers in Burkina Faso are rather altruistically motivated, which is also what we observe empirically for our lowest income group. Furthermore, Statements 5 to 7 give an indication of how deep the expectations on giving are rooted in the households' social and traditional norms. While transfers might be altruistically motivated in the sense that they are reduced once the financial position of the recipient improves, partly the giving is also enforced through social pressure and individual guilt (Grimm, Hartwig, & Lay, 2017; Platteau, 2014).

Table 5: Attitudes towards sharing obligations, urban households

	Urban HHs	
Share that agrees with the following statements:	(1) Wave I (%)	(2) Wave II (%)
1. It is my duty to give to others as soon as I can.	91.9	94.1
2. My generosity depends on the financial burden at the moment they ask for my support.	85.4	76.9
3. I give to get something back.	10.1	4.1
4. If others give to me, I must return a gift of equal size to them.	11.0	5.0
5. I feel guilty if I do not give.	75.6	82.4
6. To have respect from your family, you have to support them financially or give gifts.	45.2	44.3
7. Whenever I have money, my spouse or other family members (in- or outside the household) request a share.	39.9	37.6

Yet, as described in Section 2, transfers related to altruism and risk-sharing are analytically very close, making their implications and empirical predictions very similar. We therefore probe

more closely into the possibility of risk-sharing by returning to Table 4. Columns 1 to 4 include household shocks in the transfer response function. The results suggest that households that have experienced a negative shock in the 12 months prior to the survey receive significantly higher transfers than those that have not. Around half of the negative shocks experienced by households in our sample are health-related shocks (for details see also Bocoum, Grimm, & Hartwig, 2018). The results suggest that the transfers received also have an insurance element. To further explore this question, we distinguish between permanent and transitory income in Columns 5 and 6. Permanent income enters in form of quintile income splines and transitory income enters the transfer function in form of a positive and negative transitory income spline. We observe that an increase in 1,000 CFA Franc in (positive) transitory income is associated with a 190 CFA Franc decrease in transfers. A decrease in transitory income, that is, an increase in negative transitory income, is associated with an increase of 980 CFA Franc. Consequently, in line with the effect of the (negative) shock dummy, rural households receive transfers in case of a negative income shock. In the presence of transitory income, we do not observe a significant relationship between transfers received and permanent income. Assuming that our permanent and transitory income measures are reliable, this could have important implications for the effectiveness of public transfers. While transfer types that affect the transitory component of household income (e.g., formal insurance) may crowd out private transfers, measures aiming at increasing permanent income may not. Hence, this could suggest that we do not observe crowding-out for regularly designed public transfers such as conditional or unconditional cash transfers.

So far, we mainly focused on the relationship between transfers and income. We now turn to the influence of other factors influencing transfers. This may allow us to derive further implications for the targeting of public transfer programs. Going back to Table 4, Column 4 (our preferred specification), we obtain statistically significant positive effects for the number of adults in the household, the presence of household members with chronic illness, and the education of the household head. Surprisingly, we do not observe a significant effect for the presence of older adults nor for female headship, although the sign of the effects is as expected. This is in contrast to evidence from other studies and with the anthropological literature on Burkina Faso, which describes a complex system of sharing norms that prescribe support of the elderly and less fortunate (see Fiske, 1990; Hammond, 1966; Saul, 1981, 1983). Hence, in terms of targeting, no clear suggestions can be derived for our sample.

5.2 Robustness checks

The results of the previous section suggest potential crowding-out effects for the poorest income group, particularly for formal instruments that aim at increasing transitory income. In this section, we test in various ways the robustness of these findings by addressing several potential econometric identification problems as briefly discussed in Section 4. We address two potential

endogeneity concerns that remain within our transfer response function: reverse causality and omitted variable bias. Concerning the former, we propose a new instrument. To control for sender income as one important source of omitted variable bias, we use data from the linked sample. In addition, we test for the robustness of our observed non-linear transfer response shown in Columns 3 and 4 in Table 4 for alternative specifications. The results are presented in Table C.1 in Appendix C. We find very similar patterns for using quartile instead of quintile income splines, for including household instead of village fixed effects and for using net transfers instead of gross transfers received.

Addressing reverse causality: IV estimation

To test whether our main results are robust to a possible endogeneity bias caused by reverse causality, we instrument income and re-estimate Equation 3 with an instrumental variable approach. Kazianga (2006) follows the approach of Paxson (1992) and instruments income using long-run regional rainfall data. Given the limited variation of rainfall within the community of Ziniaré, this is not a feasible option in our case. Our approach consists of using the household head's surname as an instrument for income. The underlying idea is that families that share the same surname are likely to belong to the same family dynasty and therefore are likely to have common determinants of intergenerational wealth. That is, some families are wealthier than others due to the accumulation of land, livestock and even political influence throughout generations. Hence, the surname provides informational content on long-term income of the respective family dynasty. It does not capture any short-term fluctuations and, thus, just yields a local average treatment effect (LATE) for longer term income.

In the rural sample, among the 1,876 households we have a total of 127 surnames in the first wave. The most common surname is shared by 19% of the household heads, the second most common by 7.1% and the third most common by 6.9%. On the other hand, 40 out of the 127 surnames are unique and hence carried only by one household head in the sample. The respective share of household heads is 2.1%. Furthermore, 31 of the surnames are shared by at least 10 household heads. The numbers are very similar in the second wave and suggest that there is enough variation to exploit the surnames as an instrument.

For the instrument to be relevant, we need the surnames to be sufficiently correlated with income. The first stage equation takes on the following form:

$$\sum_{k}^{5} I_{ivt} = \pi S_{ivt} + \beta X_{ivt} + \alpha_t + \delta_v + v_{ivt}, \tag{4}$$

which is estimated for each income quintile spline separately. Hence, we have to instrument for five endogenous regressors and end up with five first stages (i.e., one for each quintile spline). This furthermore rests on the assumption that our instrument performs well in predicting income within each income quintile. S_{ivt} represents the surname of household (head) i in village v at

time t. The instrument enters the first stages in form of an (unordered) categorical variable. Table 6 summarizes relevant first stage statistics for each endogenous regressor separately. We do not provide overall first stage statistics, because their validity rests on the linearity assumption, which is not given in this case. Due to our piecewise linear approach, the validity of the tests is only given within each income quintile spline. The statistics in Table 6 confirm that our first stages are strong. Next to the relevance criterion, our instrument also needs to meet the exclusion criterion. This means that the surname may only influence transfers received through the income channel. Namely, we need to exclude any direct relation between the surname and transfers received. A potential threat to this assumption is the existence of specific sharing norms within each family dynasty. However, we believe in line with the anthropological literature that sharing norms are unlikely to be specific to a family but are rather shared on a higher level such as ethnicity, which in our case is predominantly the Mossi culture (Fiske, 1990). Hence, the surname should have an impact on transfers received only through the recipient's income but not on transfers directly. Yet, we acknowledge that the exclusion restriction in our case can be debated. For instance, we cannot rule out that certain dynasties are in a better position than others to build up a high-quality risk-sharing network and this may of course have a direct impact on transfers paid. A similar issue arises in those cases where the donor and recipient share the same surname. We therefore see the IV estimate rather as a robustness check which may give us another bound, but not necessarily as an estimator that we prefer over our estimates above. Finding an IV for income is in general far from obvious and even using rainfall data, where this is possible, may suffer from selective migration and endogenous adaption to severe weather conditions.

Table 6: First-stage statistics for the income quintile splines

	Income splines				
	(1) 1^{st}	(2) 2^{nd}	(3) 3^{rd}	(4) 4^{th}	(5) 5^{th}
Shea R-squared	0.018	0.032	0.032	0.041	0.016
1^{st} stage F-statistic	780.6	1,059.2	410.8	536.1	417,217.0
p-value	0.000	0.000	0.000	0.000	0.000

Column 2 of Table 7 presents the results of the IV estimation. In Column 1, we also include the pooled OLS estimates of Table 4, Column 3, for comparison. For the sake of simplicity, we abstract from zero censoring in the IV approach and only test the robustness of our pooled OLS results from Section 5.1. It can be seen that the pattern observed in Table 4 remains; we still find a strong negative significant response to an increase in household income among the poorest households. The effect size when instrumenting for income is on average lower (in absolute terms), which means that we slightly overestimate the transfer response to income for the poorest income quintile when failing to adjust for the endogeneity bias.

Table 7: IV-estimation of transfer response to recipient income, rural households

	Annual transfers received (1,000 CFA F)	
	(1) pOLS	(2) IV
1st income spline	-1.065***	-1.000***
	(0.071)	(0.159)
2nd income spline	0.444***	0.537***
	(0.047)	(0.173)
3rd income spline	-0.102***	-0.116
	(0.025)	(0.131)
4th income spline	0.008	0.047
	(0.012)	(0.056)
5th income spline	0.004	0.003
	(0.003)	(0.012)
Recipient HH controls	YES	YES
Village FE	YES	YES
Wave FE	YES	YES
Observations	3,752	3,752
No. of HHs	1,876	1,876
R-squared	0.524	0.515

Note: Data from first and second wave. Robust standard errors in parentheses; standard errors are clustered at the household level. Transfers received include all monetary and in-kind transfers that a household received in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders are aggregated. Annual (net) income is approximated with annual household consumption net of transfers received and given. Income is instrumented with the rural household head's surname. *** indicates significance at 1%, ** at 5%, and * at 10%.

Addressing omitted variable bias: Controlling for sender income

In a next step, we use the linked sample to account for omitted variable bias, which may occur when failing to control for sender income in the transfer function. We do not have the information on sender incomes for the complete rural sample. This information is only available for the sub-sample of rural households for which we could also interview the urban households linked to them. This implies that this sub-sample is not necessarily representative for the total sample, yet, it can still serve to get an idea of the likely bias that occurs if the sender's income is not controlled and hence can serve as a sensitivity check of the robustness of the results in Section 5.1.[8] For the linked sample, Equation 3 is adjusted by including sender household income in

[8]We test for systematic differences between the linked rural sample and the full rural sample in Appendix D. This comparison shows that rural households of the linked sample own slightly less livestock, but in turn have higher land ownership. They are also more likely to have a chronically sick household member and to have experienced a shock in the 12 months prior to the respective survey. The latter is not surprising, because only those that have received a transfer - which is often a response to a negative shock - can end up in the linked sample. For this reason, we believe that our linked sample is at least

form of a linear and quadratic term. The dependent variable is restricted to only covering the transfer received by the rural household by the linked urban household. However, we control for whether the rural household has transfer relations with other households outside the linked sample and also whether the linked urban household gave transfers to other than the linked rural household in form of dummies. We moreover include urban household and household head characteristics.

Columns 1 and 2 in Table 8 show the transfer response to recipient income without controlling for sender income. In Columns 3 and 4 we control for sender income, and in Columns 5 and 6 we add further sender characteristics. The comparison of the results of Column 2 with Columns 4 and 6 suggests that failing to control for the sender's income slightly overestimates the transfer response at the lowest tail of the income distribution. The potential bias, however, is very small. This is also what Altonji et al. (1997); Cox and Jimenez (1998); Cox and Rank (1992) and Kazianga (2006) suggested previously. However, they were not able to test this empirically.[9] The bias suggests that poor recipients are supported by slightly richer donors compared to somewhat less poor recipients.

The point estimate of the coefficient associated with sender income (Columns 4 and 6 in Table 8) is positive and statistically significant. When the sender's income increases by 1,000 CFA Franc, transfers received increase only marginally by 16 CFA Franc with a decreasing rate as the sender's income increases. Together with the negative relationship between recipient income and transfers, which we already observed in the larger sample and which also holds in the sub-sample here, the observed pattern is again indicative of altruism or risk-sharing as the underlying transfer motive – at least for the poorest households. Moreover, for the linked sub-sample we can check whether the rural households actually transfer back. We find that rural households only report very few transfers to their linked urban counterparts. In the first wave, only 3% of the rural households report a transfer to the linked urban household. In the second wave, this share stands at 5%. Hence, immediate exchange does not seem to be the dominant motive in our context. Yet, we cannot exclude the possibility of deferred or generalized reciprocity.

6 Conclusion

In this study, we analyze transfer responses to income in a poor rural setting in sub-Saharan Africa. While we also investigate transfer motives in the course of our empirical analysis, we use the motives as a means to assess ex-ante the potential of crowding-out effects for private transfers when introducing formal safety nets. Our approach follows to a large extent those of other studies in the developing country context and considers a non-linear transfer response.

comparable to those households in the full sample that also received a transfer.

[9] We follow Kazianga (2006) and use Monte Carlo simulations to check how sensitive the bias is under different covariance levels between the recipient's and the sender's income. See Appendix E for details.

Table 8: Transfer response to income controlling for sender income, linked sample

	Annual transfers received from linked HH (1,000 CFA F)					
	(1) pOLS	(2) Tobit	(3) pOLS	(4) Tobit	(5) pOLS	(6) Tobit
1st income spline	-0.574***	-0.611***	-0.560***	-0.592***	-0.555***	-0.586***
	(0.148)	(0.150)	(0.152)	(0.156)	(0.153)	(0.156)
2nd income spline	0.175*	0.137	0.180*	0.155	0.160	0.122
	(0.106)	(0.137)	(0.107)	(0.139)	(0.107)	(0.136)
3rd income spline	-0.020	0.009	-0.034	-0.020	-0.032	-0.006
	(0.072)	(0.091)	(0.075)	(0.094)	(0.074)	(0.092)
4th income spline	0.041	0.023	0.041	0.025	0.044	0.027
	(0.058)	(0.072)	(0.057)	(0.070)	(0.057)	(0.069)
5th income spline	0.006	0.015	0.004	0.013	0.002	0.011
	(0.018)	(0.020)	(0.017)	(0.020)	(0.018)	(0.020)
Ann. sending HH inc. (1,000 CFA F)			0.010**	0.014**	0.009**	0.016***
			(0.004)	(0.006)	(0.004)	(0.006)
Ann. sending HH inc. sq. (/1,000)			-0.001**	-0.001**	-0.001**	-0.001***
			(0.000)	(0.000)	(0.000)	(0.000)
Sending HH size					1.2	1.0
					(1.3)	(1.7)
Age sending HH head (years)					0.1	0.2
					(1.1)	(1.5)
Age sending HH head sq.					-0.002	-0.005
					(0.010)	(0.014)
Sending HH head prim. school (=1)					9.5	15.0
					(10.9)	(13.3)
Sending HH head second. school (=1)					5.4	7.3
					(6.6)	(8.5)
Female sending HH head (=1)					-14.6	-24.0
					(13.6)	(18.9)
Sending HH head is related (=1)					21.0**	71.9***
					(8.3)	(19.6)
Constant	129.2**	99.7	108.7**	67.1	86.8	0.9
	(52.7)	(64.0)	(52.8)	(65.1)	(59.8)	(82.1)
Recipient HH controls	YES	YES	YES	YES	YES	YES
Village FE	YES	YES	YES	YES	YES	YES
Wave FE	YES	YES	YES	YES	YES	YES
Observations	580	580	580	580	580	580
No. of HHs	293	293	293	293	293	293
R-squared	0.270		0.281		0.289	
F-Test p-value (quintiles)	0.003	0.001	0.006	0.002	0.005	0.002

Note: Data from first and second wave. Robust standard errors in parentheses; standard errors are clustered at the household level. Transfers received include all monetary and in-kind transfers that a household received from the linked urban household in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Multiple transfers within one wave received from the linked urban household are aggregated. Annual (net) income is approximated with annual household consumption net of transfers received and given. The reference category for the household head's education is "no schooling". With respect to the transfer recipient and sender relation, the reference category to is "sending HH head is not related". Besides the recipient household controls (see Table 4), we also control for whether the household received transfer(s) from persons other than the linked urban household in the 12 months preceding the two survey waves. Moreover, we control for whether the linked urban household gave transfer(s) to other than the linked rural household in the 12 months preceding the two survey waves. The F-Test p-values result from tests of equality of the effects across the income quintile splines. *** indicates significance at 1%, ** at 5%, and * at 10%

We enrich the analysis by using novel data, especially data collected at both ends of the transfer relationship, and by using an innovative IV strategy.

Our results show that transfers overall decrease with recipient income and that this relationship is highly non-linear. The transfer response to income is very pronounced and negative at the low end of the income distribution (i.e., for the poorest of the poor). This is an already well-established finding. For example, Cox et al. (2004) find a similar pattern in the context of the Philippines and Maitra and Ray (2003) observe such replacement effects also in South Africa looking at public pensions to the poor. For the second income group, in turn, we observe a positive transfer derivative, which turns negative again for the third income group. This relationship, resembling the inverted U-shaped relationship predicted by Cox (1987), can be interpreted as the threshold where transfers cease being altruistic at the margin and switch to exchange related transfers. Despite the supporting qualitative evidence on sharing norms, we cannot, however, conclude from these findings that altruistic or exchange related preferences actually exist. Moreover, the observed transfer response at the lowest income group is also in line with predictions from risk-sharing models.

We show that our results regarding the relationship between recipient income and transfer size are robust to various alternative specifications and to the inclusion of sender income as a control variable, a potentially omitted variable most previous studies failed to control for due to data limitations. Furthermore, we propose a novel instrument for the recipient's income. While the existing literature uses rainfall as an instrument, which was not an option in our case given the limited geographical scope, we use family surnames as an instrument. We show that this instrument is relevant and also provide arguments that support the exclusion restriction. Even if not immune to criticism, we believe that it serves at least as a reasonable robustness check. The IV estimates suggest that our main results are robust with respect to the potential endogeneity of recipient income. In fact, not addressing endogeneity seems to lead to a slight overestimation of the negative transfer response among the poorest households.

Overall our results imply that the elasticity of transfers to recipient income is strongest for the poorest households, suggesting that the introduction of formal social protection would probably come with an overproportional crowding-out of private transfers. This is an important finding for the case of Burkina Faso, but also for many other poor rural settings within sub-Saharan Africa, as many countries in that region experiment, or at least think about the introduction of social protection policies. Yet, to a large extent, we find transfers to react particularly strong to an increase in transitory income. This would suggest that formal instruments that aim at increasing permanent income such as (conditional) cash transfers may not induce crowding-out of private transfers or only to a smaller extent.

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Appendix

Appendix A: Attrition

Table A.1: Test for systematic attrition between the first and second wave

	HH in both waves (=1)		
	(1) Rural sample	(2) Linked rural sample	(3) Urban sample
Annual HH income (1,000 CFA F)	-0.000*	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Livestock (TLU)	0.009	-0.026	
	(0.016)	(0.046)	
Land owned (ha)	0.090	0.016	
	(0.055)	(0.037)	
No. children 0-5	-0.178	0.002	0.414**
	(0.119)	(0.145)	(0.204)
No. children 6-18	-0.018	0.121	-0.085
	(0.100)	(0.098)	(0.132)
No. adults 19-64	0.244*	0.064	-0.022
	(0.127)	(0.135)	(0.130)
No. older adults 65+	0.003	0.118	-1.013**
	(0.207)	(0.211)	(0.398)
Children/adult ratio	0.399*	-0.037	0.098
	(0.213)	(0.227)	(0.345)
Age HH head (years)	-0.001	0.001	0.022
	(0.008)	(0.010)	(0.014)
HH head primary school (=1)	-0.179	0.241	-0.161
	(0.282)	(0.410)	(0.324)
HH head secondary school (=1)	0.005	-0.482	-0.382
	(0.274)	(0.295)	(0.286)
HH has business (=1)			-0.079
			(0.266)
Female HH head (=1)	-0.462	0.179	0.377
	(0.344)	(0.504)	(0.641)
Chronically sick HH member (=1)	0.405*	0.001	0.276
	(0.245)	(0.251)	(0.295)
Shock in past 12 month (=1)	0.183	-0.219	0.615**
	(0.212)	(0.236)	(0.272)
Annual transfers received (1,000 CFA F)	0.002	0.000	-0.002
	(0.002)	(0.001)	(0.002)
Annual transfers given (1,000 CFA F)	-0.001	0.071**	-0.000
	(0.001)	(0.034)	(0.000)
Constant	1.559***	0.023	-0.498
	(0.515)	(0.625)	(0.581)
Observations	1,996	359	359
No. of HHs	1,996	359	359

Note: Data from first wave. Logit estimates. Robust t-statistics in parentheses. Transfers received and given include all monetary and in-kind transfers that a household has received or given in the 12 months preceding the survey wave; all in-kind transfers are assigned monetary values. Transfers received from various senders or given to various recipients are aggregated. Annual (net) income is approximated with annual household consumption net of transfers received and given. The value of livestock is expressed in tropical livestock units with the following conversion factor: cattle=0.7, sheep=0.1, goats=0.1, pigs=0.2 and chicken=0.01. The asset index combines housing materials and the possession of durable consumption goods; it is calculated using factor analysis. The reference category for the household head's education is "no schooling". A shock is defined as an event that caused, according to the household, serious problems for the living conditions of the household. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix B: Transfer patterns

Table B.1: Annual transfers received for each income quintile, rural households

	Rural HHs				
	(1)	(2)	(3)	(4)	(5)
	Income quintiles				
	1st	2nd	3rd	4th	5th
Wave I					
Received informal transfer (%)	45.9	43.7	34.0	43.7	40.6
Annual transfers size (1,000 CFA F)	111.8	43.6	54.9	55.7	87.0
Wave II					
Received informal transfer (%)	49.8	40.2	33.8	35.1	33.6
Annual transfers size (1,000 CFA F)	114.2	51.0	40.0	44.3	57.2

Note: Transfers received include all monetary and in-kind transfers that a household has received in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders are aggregated. The mean annual transfer sizes within each income quintile are conditional on receiving a transfer. 1 USD corresponds to approx. 577 CFA F.

Table B.2: Size of informal transfers received and given in the 12 months preceding the two survey waves (detailed version), rural households

	Wave I		Wave II	
	(1) Transfer size (1,000 CFA F)	(2) No. of HHs	(3) Transfer size (1,000 CFA F)	(4) No. of HHs
Rural HHs; annual transfers received				
Total	72.1	785	63.1	712
Sender relation				
- Extended family	67.1	730	58.6	666
- Non-family	85.7	89	75.7	78
Sender location				
- Same village	34.6	85	31.8	85
- Other rural area	32.2	147	46.7	150
- Urban	72.1	615	51.5	514
- Abroad	90.1	51	89.3	98
Type				
- Shock	81.6	273	96.1	189
... Agricultural shock	64.3	46	41.7	20
... Accident/illness	81.4	134	91.3	105
... Death of family member	86.9	55	149.7	44
... Asset shock (loss/damage)	89.4	18	63.3	7
... Other	67.0	23	31.3	16
- Regular	58.6	586	44.6	600
... Subsistence needs	48.9	416	41.2	450
... Chronic illness expenses	58.4	49	26.9	15
... Child education	59.6	15	89.0	15
... Ceremony	23.3	45	18.0	61
... Other	70.8	130	43.9	99
Rural HHs; annual transfers given				
Total	44.2	190	27.7	375
Recipient relation				
- Extended family	46.0	162	28.4	344
- Non-family	26.4	36	14.0	43
Recipient location				
- Same village	49.3	35	21.2	97
- Other rural area	38.3	83	22.3	179
- Urban	40.7	83	27.8	134
- Abroad	36.1	3	36.0	17
Type				
... Subsistence needs	22.9	114	17.2	237
... Chronic illness expenses	23.9	11	55.0	10
... Accident/illness	125.9	12	28.3	21
... Child education	59.5	16	74.8	25
... Ceremony	28.1	8	11.4	48
... Other	70.8	40	49.6	55
Total no. of HHs		1,876		1,876

Note: Transfers received and given include all monetary and in-kind transfers that a household has received or given in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders or given to various recipients are aggregated. The mean values in Columns 1 and 3 are conditional on receiving/giving a transfer. 1 USD corresponds to approx. 577 CFA F. A shock is defined as an event that caused, according to the household, serious problems for the living conditions of the household.

Table B.3: Size of informal transfers received and given in the 12 months preceding the two survey waves (detailed version), urban households

	Wave I		Wave II	
	(1) Transfer size (1,000 CFA F)	(2) No. of HHs	(3) Transfer size (1,000 CFA F)	(4) No. of HHs
Urban HHs; annual transfers received				
Total	46.3	56	34.1	50
Sender relation				
- Extended family	107.0	41	115.0	36
- Non-family	98.0	22	92.2	17
Sender location				
- Home village	99.3	7	186.7	6
- Other rural area	40.0	6	129.0	3
- Urban	77.0	36	94.1	33
- Abroad	257.7	11	84.3	13
Type				
- Shock	99.7	26	131.2	13
... Business shock	10.0	1	0.0	0
... Accident/illness	77.4	19	47.5	8
... Death of family member	282.5	2	1,000.0	1
... Other	136.3	4	81.3	4
- Regular	109.8	36	95.3	42
... Subsistence needs	97.3	19	53.2	26
... Chronic illness expenses	52.5	2	226.7	3
... Child education	57.5	2	200.0	2
... Ceremony	306.7	3	62.5	2
... Other	64.3	15	157.2	9
Urban HHs; annual transfers given				
Total	113.6	198	137.9	188
Recipient relation				
- Extended family	102.6	195	135.2	186
- Non-family	118.9	21	40.8	19
Recipient location				
- Home village	99.5	180	107.7	181
- Other rural area	60.5	28	157.4	14
- Urban	89.4	31	129.4	30
- Abroad	36.7	3	67.6	5
Type				
... Subsistence needs	75.9	165	104.4	145
... (Chronic) illness expenses	166.2	28	161.8	20
... Child education	78.0	9	105.7	14
... Ceremony	63.5	5	72.9	20
... Other	110.2	39	148.7	31
Total no. of HHs		225		225

Note: Transfers received and given include all monetary and in-kind transfers that a household has received or given in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders or given to various recipients are aggregated. The mean values in Columns 1 and 3 are conditional on receiving/giving a transfer. 1 USD corresponds to approx. 577 CFA F. A shock is defined as an event that caused, according to the household, serious problems for the living conditions of the household.

Appendix C: Sensitivity analysis of main results

Table C.1: Robustness of transfer response to alternative specifications, rural households

	Annual transfers received (1,000 CFA F)							
	Quintile splines		Quartile splines		HH FE		Net transfers	
	(1) pOLS	(2) Tobit	(3) pOLS	(4) Tobit	(5) pOLS	(6) Tobit	(7) pOLS	(8) Tobit
1st income spline	-1.065***	-1.167***	-0.944***	-1.058***	-1.070***	-1.171***	-1.051***	-1.157***
	(0.071)	(0.060)	(0.092)	(0.078)	(0.099)	(0.073)	(0.074)	(0.065)
2nd income spline	0.444***	0.448***	0.340***	0.319***	0.375***	0.414***	0.430***	0.430***
	(0.047)	(0.073)	(0.045)	(0.058)	(0.076)	(0.113)	(0.048)	(0.076)
3rd income spline	-0.102***	-0.136**	-0.053***	-0.038	-0.094*	-0.164*	-0.108***	-0.136**
	(0.025)	(0.057)	(0.013)	(0.028)	(0.053)	(0.092)	(0.025)	(0.058)
4th income spline	0.008	0.018	0.004	0.005	0.004	0.009	-0.016	-0.005
	(0.012)	(0.028)	(0.003)	(0.005)	(0.026)	(0.047)	(0.013)	(0.029)
5th income spline	0.004	0.005			0.002	0.004	0.002	0.005
	(0.003)	(0.005)			(0.004)	(0.009)	(0.003)	(0.005)
Recipient HH controls	YES	YES	YES	YES	YES	YES	YES	YES
Village FE	YES	YES	YES	YES	NO	NO	YES	YES
HH FE	NO	NO	NO	NO	YES	YES	NO	NO
Wave FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3,752	3,752	3,752	3,752	3,752	3,752	3,752	3,752
Number of households	1,876	1,876	1,876	1,876	1,876	1,876	1,876	1,876
R-squared	0.524		0.481		0.777		0.490	
F-Test p-value (quintiles)	0.000	0.000			0.000	0.000	0.000	0.000
F-Test p-value (quartiles)			0.000	0.000				

Note: Data from first and second wave. Robust standard errors in parentheses; standard errors are clustered at the household level. Transfers received include all monetary and in-kind transfers that a household received in the 12 months preceding the two survey waves; all in-kind transfers are assigned monetary values. Transfers received from various senders are aggregated. Annual (net) income is approximated with annual household consumption net of transfers received and given. Further controls are equivalent to those in Table 4. The F-Test p-values result from tests of equality of the effects across the income quintile/quartile splines. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix D: The linked sample

Table D.1: Test for systematic differences between rural and linked rural sample

	(1) Linked sample (=1)
Annual HH income (1,000 CFA F)	-0.000
	(0.000)
Livestock (TLU)	-0.064***
	(0.021)
Land owned (ha)	0.037**
	(0.017)
No. children 0-5	0.014
	(0.076)
No. children 6-18	0.028
	(0.057)
No. adults 19-64	-0.006
	(0.080)
No. older adults 65+	0.056
	(0.123)
Children/adult ratio	0.012
	(0.131)
Age HH head (years)	0.006
	(0.006)
HH head primary school (=1)	0.063
	(0.216)
HH head secondary school (=1)	0.220
	(0.180)
Female HH head (=1)	0.044
	(0.277)
Chronically sick HH member (=1)	0.241*
	(0.145)
Shock in past 12 month (=1)	0.530***
	(0.135)
Annual transfers received (1,000 CFA F)	0.003***
	(0.001)
Annual transfers given (1,000 CFA F)	-0.002
	(0.003)
Constant	-2.528***
	(0.350)
Observations	1,876
No. of HHs	1,876

Note: Data from first wave. Logit estimates. Robust t-statistics in parentheses. Transfers received and given include all monetary and in-kind transfers that a household has received or given in the 12 months preceding the survey wave; all in-kind transfers are assigned monetary values. Transfers received from various senders or given to various recipients are aggregated. Annual (net) income is approximated with annual household consumption net of transfers received and given. The value of livestock is expressed in tropical livestock units with the following conversion factor: cattle=0.7, sheep=0.1, goats=0.1, pigs=0.2 and chicken=0.01. The asset index combines housing materials and the possession of durable consumption goods; it is calculated using factor analysis. The reference category for the household head's education is "no schooling". A shock is defined as an event that caused, according to the household, serious problems for the living conditions of the household. *** indicates significance at 1%, ** at 5%, and * at 10%.

Appendix E: Omitted variable bias

To explore whether our estimates are still affected by other unobservable factors that are correlated with both the recipient's and the sender's income, we follow Kazianga (2006) and use Monte Carlo simulations to check how sensitive the bias is under different covariance levels between the recipient's and the sender's income. The transfer function used in our data generating process is $T_i = \alpha_0 + \alpha_1 I_{ri} + \alpha_2 I_{di} + \epsilon_i$ with $\alpha_1 = -0.3$ and $\alpha_2 = 0.3$. We vary the covariance between the recipient's and the sender's income. In line with Kazianga (2006), we assume zero covariance and a covariance of 0.250, respectively. We also calculate the prevailing covariance between recipient and sender income in our linked sample, which is 0.141. Table E.1 reports the point estimates for different sample sizes, to vary the degree of precision, and estimations using OLS and fixed effects. Beneath the point estimates are the standard errors and the absolute deviation from the true value of -0.3. The simulations suggest that the bias is between 0.110 to 0.130 for an OLS and a fixed effects model, respectively. We see that the bias increases with the assumed covariance. For the covariance measured in our data, both models perform very similar.

Table E.1: Monte Carlo simulations to address omitted variable bias

	Cov(I_d, I_r)=0.000		Cov(I_d, I_r)=0.141		Cov(I_d, I_r)=0.250	
	(1)	(2)	(3)	(4)	(5)	(6)
Sample size	OLS	FE	OLS	FE	OLS	FE
100	-0.292	-0.330	-0.185	-0.167	-0.065	-0.106
	(0.006)	(0.024)	(0.009)	(0.031)	(0.009)	(0.042)
	[0.008]	[-0.030]	[0.115]	[0.133]	[0.235]	[0.194]
1000	-0.299	-0.300	-0.176	-0.175	-0.080	-0.079
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.001]	[0.000]	[0.124]	[0.125]	[0.220]	[0.221]
10,000	-0.300	-0.300	-0.176	-0.176	-0.079	-0.079
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.009)
	[0.000]	[0.000]	[0.124]	[0.124]	[0.221]	[0.221]

Note: Monte Carlo simulations to check how sensitive the bias is under different covariance levels between the recipient's and the sender's income. We assume zero covariance, a covariance of 0.250 and we calculate the covariance between recipient and sender income in our (linked) sample (i.e., 0.141). The table shows the point estimates for different sample sizes and estimations using OLS and fixed effects. Beneath the point estimates are the standard errors (in parentheses) and the absolute deviation from the true value of -0.3 [in brackets].

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