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# Crowding out of Solidarity? – Public Health Insurance versus Informal Transfer Networks in Ghana

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## Abstract

*This paper delivers empirical evidence on how informal transfers are affected by a formal and country-wide health insurance scheme. Using the fifth wave of the Ghanaian Living Standard Household Survey, we investigate the extent to which the exogenous implementation of the National Health Insurance Scheme affects the probability of making or receiving informal transfers and their monetary equivalents. Our findings suggest that there is a significant crowding out of informal transfers. Members of weak transfer networks and individuals that run an enterprise are inclined to reduce their amount of remittances. We conclude that the provision of formal health insurance can reduce covariate risk in weak transfer networks and support business owners that are confronted by strong sharing obligations.*

*JEL Classification: I13, I15, O12*

*Keywords: Public health insurance; informal transfer networks; crowding out; Ghana*

*July 2013*

1 *Florian Klohn, University Duisburg-Essen; Christoph Strupat, RWI and RGS econ.**– The authors would like to thank Martin Fischer, Gunther Bensch, Martin Karlsson, Michael Kind, Stefan Pichler, Colin Vance, Christoph M. Schmidt and participants of the Health Economics Research Seminar at University Duisburg-Essen for helpful comments. We also gratefully acknowledge the comments and suggestions of participants of the 6th RGS conference and the 2012 PEGnet conference.**– All correspondence to Christoph Strupat, RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, E-Mail: christoph.strupat@rwi-essen.de*

## 1. Introduction

In the developing world individual access to health services is largely determined by income. The 'cash and carry' system that is prevalent in most developing countries restricts medical access to the amount of money paid to the health care provider. In order to be able to afford treatment costs in the case of illness, many poor households rely on informal transfers within networks of relatives or neighbors. These support schemes are important and beneficial since the risk to become sick can be shared with other members of the network (FAFCHAMPS, 2008). Also in Ghana most of these informal insurance mechanisms serve as protection against health and other income shocks (GOLDSTEIN, 2004; UDRY AND CONELY, 2004). However, these mechanisms can provide inadequate protection if many members of such a network are also suffering from shocks or refuse to contribute because of personal conflicts (TOWNSEND, 1994; MORDUCH, 1999). Due to this covariate risk network members might fail to raise sufficient funds and, thus, cannot afford treatment costs with the consequence of remaining sick.

Furthermore, as networks of relatives or neighbors in developing countries are often characterized by strong sharing obligations, productive network members might be confronted with the legitimate demand for transfers by less productive fellows (PLATTEAU, 2000; HOFF AND SEN, 2005). This may imply that redistributive pressure can adversely affect incentives of network members that own an enterprise to invest in their business (GRIMM ET AL., 2013) or to save beyond a certain amount (DUFLO ET AL., 2009). Thus, adverse incentives

prevent members from improving their economic situation and may form an important obstacle in the process of economic transition.

In order to overcome the imperfections of informal insurance mechanisms and to help productive individuals such as enterprise owners to develop their full economic potential, formal health insurance schemes or micro-insurances are recognized as an important remedy (LANDMANN ET AL., 2012). In recent years, some developing countries (India, Ghana and Nigeria) introduced country-wide health insurance schemes, while in other developing countries many micro-insurance initiatives were launched with the aim to complement informal insurance mechanisms. While there is already some empirical evidence that suggests a crowding out of informal mechanisms after receiving public transfers (DERCON AND KRISHNAN, 2003; PAVAN AND COLUSSI, 2008; ORUČ, 2011), only few studies exist on the relationship between formal insurance and informal transfer networks. None of these studies have investigated the effect of formal health insurance.

ATTANASIO AND RIOS-RULL (2000) provide theoretical and empirical evidence that formal insurance crowds out informal insurance and potentially increases welfare in Mexico. LANDMANN ET AL. (2012) implement an experiment in the rural Philippines and show that formal insurance can lead to lower voluntary transfers among network members. In a laboratory experiment, LIN ET AL. (2011) find that the introduction of formal insurance significantly crowds out private transfers and reduces income inequality.

To the best of our knowledge, this paper delivers the first empirical evidence on whether informal transfers are affected by a formal and country-wide health insurance scheme. The launch of the Ghanaian National Health Insurance Scheme (NHIS) in 2003, coupled with differences in the date of implementation between local districts, makes Ghana an ideal setting for examining the relationship between formal health insurance and informal transfer networks.

Our study contributes to the literature in two ways. Firstly, while many studies on this topic use experimental methods that may have limited external validity, we use survey data which is representative for the entire population. Secondly, we look at an exogenous introduction of a public health insurance scheme using a quasi-experimental setup that allows us to evaluate the causal impact of a formal health insurance scheme on informal transfer behavior.

As the health insurance scheme has been implemented at different dates by most district authorities between 2005 and 2006, we use the fifth wave of the Ghanaian Living Standard Household Survey (GLSS) which was conducted during a survey period of 12 months (October 2005 to September 2006). The districts in this cross-sectional household survey contain enumeration areas[1] that were interviewed in different months during the survey period. We use this variation in interview dates for our identification strategy. In particular, we are able to identify those sub-districts that were interviewed before and after the implementation of the NHIS, as we use the exact implementation dates of the NHIS that vary at the district level. In addition, we also identify those

[1] As most enumeration areas are located in sub-districts, we define enumeration areas as sub-districts.

districts that implement the NHIS after the survey period. Thus, in our identification strategy we use a difference-in-difference framework comparing individuals at different points in time (interview months) that are living in districts where the NHIS is implemented with individuals where it is not.

Our empirical approach proceeds by first estimating a linear probability model to evaluate the extent to which the implementation of the NHIS influences the probability of making or receiving informal transfers. The econometric specification controls for district-specific unobserved characteristics (such as supply side factors of health care provision), and seasonality during the course of the year. In a second step, we implement a two part and quantile regression model to investigate the extent to which NHIS affects the amount of made and received transfers.

We find that the introduction of the formal health insurance scheme results in a lower probability of making transfers and also reduces the amount of remittances to other households. Especially, self employed individuals that run an enterprise and members of weak transfer networks reveal the highest crowding out effects.

The remainder of this paper is organized as follows. Section 2 introduces the theoretical framework of our study and presents the national health insurance scheme in Ghana. In section 3 we describe the data and give details on our estimation strategy. Section 4 presents the results and further robustness checks before section 5 concludes with a summary of the main findings and a research outlook.

## 2. Theoretical considerations and the National Health Insurance Scheme in Ghana

### 2.1 Theoretical framework

The individual engagement in an informal transfer network is usually determined by intrinsic motivation such as altruism and the extent of extrinsic incentives induced by social sanctions that cause costs for leaving a network (BARR AND GENICOT, 2008). Thus, the introduction of a formal insurance can reduce the willingness to participate in informal transfers in two ways.

Firstly, as documented by BOWLES (2008), several behavioral experiments have emerged in the economic and psychological literature showing a crowding out of altruistic behavior if formal insurance mechanisms are available. Instead of relying on payments based on intrinsically motivated solidarity, individuals may perceive the availability of an anonymous risk sharing mechanism (formal insurance) as a signal that 'buying' security is everyone's own responsibility (framing effect). In addition, if other people sign an insurance policy because they assess the formal insurance as to be better than the informal scheme, this might be interpreted by the remaining network members as a revelation of low commitment to the informal network which in turn will lead to a reduction of their remittances (information effect).

Secondly, the implementation of a formal insurance may reduce the extrinsic incentives by reducing social sanctions for leaving the informal network (GRIMM ET AL., 2013). This may depend on the dissemination of formal insurance and on the density of informal networks. A wide spread use of

formal insurance can result in lower redistributive pressure for individuals that provide resources to other network members. The network density is mainly determined by the number of network members and the relationship among individuals within a network, e.g. kinship networks, neighbor networks or religious networks (BARR AND GENICOT, 2008). As individuals in Ghana share money and goods among relatives beyond their own household (GOLDSTEIN, 2004), the number of extended family members such as siblings or cousins and their relationship determine the network density. A close relationship within the extended family suggests high costs if someone refuses to comply with the family's sharing obligations. In this context, the availability of a formal insurance may not fully reduce informal transfers.

### 2.2 The National Health Insurance Scheme in Ghana

The law on the National Health Insurance Scheme passed Ghanaian parliament in 2003 and was successively implemented at the district level until the end of 2006. The aim of the scheme was to provide health care services to a broad part of the population and to establish an alternative to the existing 'cash and carry' system. The insurance covers all basic outpatient, inpatient and dental health services such as x-rays, blood tests, malaria treatments, surgical operations and also maternity care services e.g. antenatal care, deliveries and postnatal care.

The membership in the health insurance scheme is voluntarily for all adults (age 14-69) that work in the informal sector such as self employed individuals, while for formal sector employees membership is mandatory and insurance premiums are deducted from their monthly payrolls. The income-related

insurance premium varies between a minimum of 7.2 Ghana Cedis (GHC) (US$3) and a maximum of 48.0 GHC (US$19) and must be paid on an annual basis.[2] All children less than 14 years whose parents have enrolled with the scheme and all people aged above 69 years are covered by the insurance but are exempted from paying premiums.

The NHIS is monitored and regulated by the National Health Insurance Authority (NHIA). Covered health services are mainly financed by a health insurance levy (a 2.5% addition to the value added tax), the payment of insurance premiums and allocated money from the government. The NHIA licensed District Mutual Health Insurance Schemes (DMHIS) that were established by the district authorities to collect a sufficient amount of insurance premiums in order to meet the expected health care claims within each district. After a DMHIS has paid two million GHC to the NHIA and health insurance cards have been distributed to the inhabitants that paid the insurance premium, the district health insurance scheme was officially launched and all basic health care services were covered by the insurance (ADJEI ET AL. 2011). As the financial ability of the district and the acceptance of the health insurance varied between districts, the health insurance scheme has been implemented at different dates, where most district authorities launched the scheme in 2005 and 2006.

[2] 1GHC=0.4US$

## 3. Data and estimation strategy

### 3.1 Data description

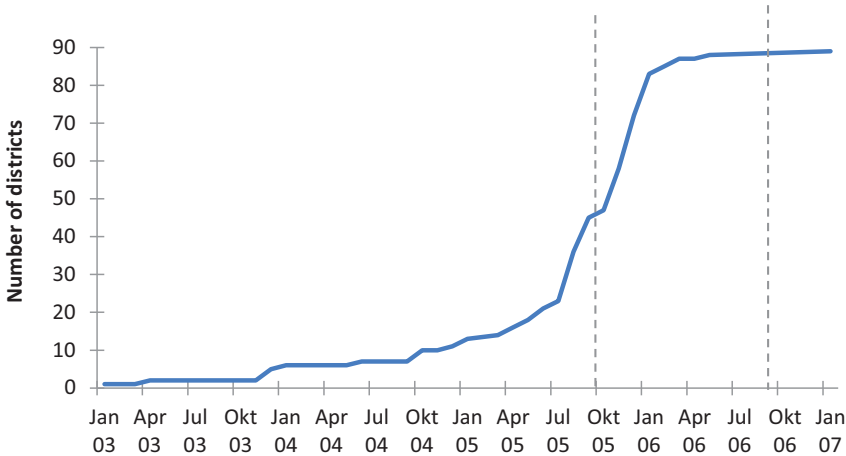
For our analysis we use the 5th wave of the Ghana Living Standards Survey (GLSS5), which is based on interviews conducted by the Ghana Statistical Office and the World Bank during the period from October 2005 until September 2006. This nation-wide survey contains socio-economic variables measured at the individual and household level, including information on informal transfer networks. It is the source for a nationally representative sample of 8,687 households living in 110 districts and 580 sub-districts, with 37,128 household members.

Our treatment variable is a binary indicator representing the availability of the NHIS in an individual's district. In order to construct this variable, we collect the exact implementation dates of the NHIS at the district level by contacting district officials and using district specific media reports about the health insurance[3]. Figure 1 shows how the NHIS implementation evolves over time and districts.[4] The two dashed lines indicate the start and the end of the survey period.

[3] These information are available upon request.

[4] We use 90 out of 110 districts for our analysis, as the district authorities provided the exact date of the NHIS implementation.

**Figure 1: Availability of the NHIS on the district level**




As measures for participating in informal transfer networks we define dummy variables that show whether household members make and receive transfers in the form of money or goods at least on a quarterly basis. In addition, we also use information on the amount of made and received transfers. These variables include no labor compensation for extended family members or neighbors that work in a business of the household. Although we analyze short run effects of the policy, we sum up the monetary values to an annual amount since it simplifies comparisons with other financial information that are provided on an annual basis. As 42 percent of all household members did not provide information on both transfer variables, we investigate the impact of the NHIS implementation on made and received transfers separately.

Thus, we focus in our analysis on all individuals who are not exempted from premium payments. 5,977 individuals living in 2,910 households gave

information on made transfers, while information on received transfers is available for 5,319 individuals in 2,611 households.

When estimating the effect of the NHIS implementation, we consider a range of variables that are typically used to control for socioeconomic characteristics such as the level of education, working status, age and sex. In addition, we include household expenditures, as an important control variable for the financial potential of a household (DEATON, 1997). Expenditures are corrected with a region-specific consumer price index and an equivalence scale, which reflects age- or sex-specific relative consumption needs (GSS, 2008). We include dummies that indicate whether the respondent lives in an urban coastal, urban forest or urban savannah sub-district. Thus, we also account for economic and cultural differences between the northern part of Ghana that is mostly characterized by a dry savannah and cities in the south that are located at the coast.

We also condition on certain variables that possibly determine the degree of informal risk sharing. These are household size, marital and migration status. For instance, a high number of household members increase the possibility to share risks within a family network. Migrant workers are also more inclined to engage in informal transfer networks as they probably rely heavily on the support of their families at home and vice versa. Also the information on whether the household uses a savings account or participates in a rotating saving and credit association (ROSCA) may indicate if the household has to rely fully on informal risk sharing mechanisms or can use savings in times of economic hardships. As a measure for individual health status we include an

indicator variable that captures whether someone receives medical treatment at a hospital within the last two weeks. Although this is not a perfect measure for health, it is the best information we have that accounts for the need to rely on informal transfers.

Table 1 displays descriptive statistics of the variables used in our econometric model for the sample of made transfers, distinguished by the availability of the NHIS (for received transfers, see Table A1 in the Appendix). Remitting money to other households is seen to be lower among respondents living in areas where the NHIS is available. Among the respondents that can use the NHIS, 41% remit money regularly, compared to 70% of individuals that live in areas without the NHIS. Moreover, the amount of made transfers are 43 GHC less among respondents from areas without the NHIS, which is equivalent to a reduction of 38 percent.[5] Some of the expenditure quintiles and education dummies do not differ significantly between the two groups. However, substantial differences in terms of usage of a saving account, working status and health status are noticeable.

[5] We also have information on the purposes of making transfers that are obtained by the question "What were the three main uses of made/received transfers? – Please rank". 58 percent indicate 'health' as one of the first two purposes for making transfers. However, as this question depends fully on the individual self-assessment relating the use of transfers and does not allow us to make precise quantitative statements, we stay with the general indicator.

**Table 1: Descriptive statistics**

| Variable | Total Mean | NHIS Mean | No NHIS mean | p-value (Diff.in means) |
|---|---|---|---|---|
| Made transfers (0/1) | 0.46 | 0.41 | 0.70 | 0.00 |
| Amount of made transfers | 75.97 | 68.75 | 111.57 | 0.00 |
| Household size | 5.29 | 5.17 | 5.88 | 0.00 |
| HH expenditures Quintile 2 (0/1) | 0.20 | 0.20 | 0.18 | 0.12 |
| HH expenditures Quintile 3 (0/1) | 0.19 | 0.19 | 0.20 | 0.57 |
| HH expenditures Quintile 4 (0/1) | 0.19 | 0.18 | 0.22 | 0.16 |
| HH expenditures Quintile 5 (0/1) | 0.22 | 0.21 | 0.30 | 0.00 |
| HH saving account (0/1) | 0.19 | 0.17 | 0.29 | 0.00 |
| Migrant (0/1) | 0.18 | 0.17 | 0.20 | 0.04 |
| Formal employment (0/1) | 0.12 | 0.13 | 0.22 | 0.00 |
| Informal employment (0/1) | 0.06 | 0.06 | 0.07 | 0.10 |
| Self employment (0/1) | 0.77 | 0.80 | 0.65 | 0.00 |
| Primary School (0/1) | 0.16 | 0.16 | 0.17 | 0.82 |
| Junior High School (0/1) | 0.17 | 0.18 | 0.15 | 0.03 |
| Secondary High School (0/1) | 0.27 | 0.27 | 0.25 | 0.32 |
| Technical School (0/1) | 0.05 | 0.04 | 0.08 | 0.00 |
| University (0/1) | 0.02 | 0.01 | 0.03 | 0.00 |
| Female (0/1) | 0.54 | 0.54 | 0.53 | 0.64 |
| Low health status (0/1) | 0.13 | 0.12 | 0.20 | 0.00 |
| Age | 37.04 | 37.17 | 36.39 | 0.11 |
| Married (0/1) | 0.61 | 0.61 | 0.62 | 0.78 |
| Urban coastal (0/1) | 0.14 | 0.11 | 0.24 | 0.00 |
| Urban forest (0/1) | 0.12 | 0.14 | 0.04 | 0.00 |
| Urban savannah (0/1) | 0.06 | 0.06 | 0.10 | 0.00 |
| Number of observation | 5,977 | 4,969 | 1,008 | |

### 3.2 Identification strategy

In order to investigate the relationship between informal transfer networks and formal health insurance our identification strategy is based on a quasi-experimental setup. We collect data on the exact implementation dates of the NHIS at the district level, i.e. on when health insurance coverage became available, and benefit from the fact that the district's sub-districts were surveyed at different points in time during the survey period between October

2005 and September 2006. As most districts introduced the NHIS during this survey period, we are able to use the variation in interview dates, by comparing different individuals that have been interviewed before and after the introduction of the insurance scheme. Contrarily, some districts did not implement the NHIS during the survey period or were entirely surveyed before the implementation. For instance, the Nkwanta district in the Volta region is divided into eight sub-districts, one half was surveyed in November 2005 and the other half was interviewed in March 2006, while the NHIS was introduced in January 2006. In comparison, the Nanumba district also consists of eight sub-district and was surveyed in the same months, but the NHIS was implemented later in July 2006.

Thus, in our identification strategy we use a difference-in-difference framework comparing individuals at different points in time (interview months) that are living in districts where the NHIS is implemented and where it is not, once conditioned on time- and district-specific confounders. In order to control for time-invariant district characteristics such as financial ability or health infrastructure that are likely to be correlated with both the timing of NHIS implementation and our dependent variables, we include district dummies into all our specifications. We also include interview month dummies in order to allow for changes in the macroeconomic situation during the course of the year that could bias our estimates. Therefore, the results we provide are based on variation which is orthogonal to the district- and time-specific part of our specification's error term. More formally, our estimates are based on the following equation:

$$y_{idt} = \beta_0 + \beta_1 NHIS_{idt} + \mu_d + \delta_t + \epsilon_{idt} \quad (1)$$

The dependent variable $y_{idt}$ indicates if respondent $i$ that lives in district $d$ and was surveyed in month $t$, makes (receives) transfers. This variable is regressed on the binary treatment variable $NHIS_{idt}$, which takes the value 1 if the respondent was surveyed after the district implemented the NHIS and 0 otherwise. $\beta_0$ is a constant, while $\mu_d$ represents a district fixed effect and $\delta_t$ interview month fixed effects.

In order to increase the precision of our estimates and to control for confounding factors that might be correlated with the introduction of the NHIS and the dependent variable, we furthermore include individual and household specific variables $X_{idt}$ in our specifications. Such variables reflect important socio-demographic differences but also indicate if the respondent is living in an urban or rural sub-district. Thus, we extend equation (1):

$$y_{idt} = \beta_0 + \beta_1 NHIS_{idt} + \beta_2{}' X_{idt} + \mu_d + \delta_t + \epsilon_{idt} \quad (2)$$

Our coefficient of interest is $\beta_1$, which represents an intention-to-treat effect (ITT) i.e. the effect of an offer to participate in the NHIS on the individual's transfer behavior. This parameter has a causal interpretation, if the sub-districts are randomly surveyed over time. If, for example, the date of the interview is driven by heterogeneity between sub-districts that also influence the potential outcomes of our analysis, this would bias our estimates of the NHIS implementation. In order to scrutinize the extent to which observed changes of the NHIS implementation is triggered by structural heterogeneity of sub-districts, we estimate both equations by using the 4th wave of the GLSS

(1998/1999). As this wave was conducted in the same manner and contains the same 110 districts, we can adapt the *NHIS* variable for that time and provide a placebo estimate. Thus, we can gauge whether a systematic relationship between the sub-districts interviewed at different points in time and the dependent variable would bias our estimate of $\beta_1$.[6]

Furthermore, we need to assume that there are no diverging trends between the treatment and control group within the survey period that cannot be traced back to the introduction of the NHIS. This common-time-trend assumption is not directly testable. However, in order to relax this assumption we include interview month dummies that control for national wide changes in the macroeconomic situation during the survey period, which likely affect indivduals in the treatment and control group similarly. In addition, as urban sub districts at the coast in comparison to sub districts from the north are probably differently affected by changes in the economic situation, we interact the interview month with the urban ecological area dummies allowing for additional time trends and to evaluate whether our findings are triggered by region specific changes.

### 3.3 Estimation methods

In a first step of our analysis we estimate a linear probability model (LPM), to evaluate whether the introduction of the NHIS influences the probability of a household to make transfers. In this setup our dependent variable $y_i$ is a dummy variable which takes the value 1 if the respondent transfers money or

[6] We will discuss the results in the next section.

goods to non-household members and 0 if no transfers take place. In addition, we employ the same model to examine whether someone receives transfers. The binary nature of the dependent variable would conventionally suggest the estimation of a probit or logit model. Binary choice models, however, can be problematic when applied using the least squares dummy variable approach because they suffer from the incidental parameters problem and a substantial loss of observations.

In a second step, we examine to which extent the amount of made or received transfers is affected by the implementation of the NHIS. Therefore, we estimate a regression model, with either the actual amount of made or received transfers as the dependent variable. One problem in our setup is the large amount of zeros in the monetary dependent variables. We overcome this problem, by using a two-part-model in order to evaluate the effect of the NHIS implementation for the part of the population which is actually transferring or receiving money (a sophisticated discussion of actual and potential outcomes is provided by DOW AND NORTON (2003). We implement the two-part-model as a combination of two linear regression models:

$$P[y_{idt} > 0 | NHIS_{idt}, X_{idt}, D_i, M_i] \cdot E[y_{idt} | y_{idt} > 0, NHIS_{idt}, X_{idt}, D_i, M_i] \quad (3)$$

where $D_i$ is a matrix with district-dummies and $M_i$ represents a matrix including interview month dummies. We do so because the usage of a nonlinear probability model in the first stage results in a substantial loss of degrees of freedom, hence, reducing efficiency as the estimates would exclusively be based on switchers in the dependent variable. We are aware of

the problem that, although the initial problem of zero inflation has been overcome, this model might still lack a causal interpretation. As shown by ANGRIST (2001) the marginal effects obtained by following this approach can include another selection bias. In our case this happens if the NHIS implementation changes the distribution of informal network participation. For instance, individuals formerly without the NHIS might stop transferring money after their district also implemented the scheme. As the sample of the two-part model is limited to the part of the population which is actually transferring/receiving money, such changes in behavioral patterns could not be accounted for and, thus, induce a new selection bias.

In order to avoid this problem, we implement in a third step a quantile regression model, considering the full distribution of our dependent variables and examine whether the implementation of the NHIS has different effects on different parts of the transfer distribution:

$$Q_\tau(y_{idt}|NHIS_{idt}, X_{idt}, D_i, M_i] \ ) = F_y^{-1}(\tau|NHIS_{idt}, X_{idt}, D_i, M_i] \ ) \qquad (4)$$

This might be important, because a crowding out in the lower or upper tail of the distribution obviously suggests a different pattern in crowding out of transfers as compared to an analysis based on averages. τ defines the conditional quantile which is described by the function $Q_\tau$.

## 4. Results and robustness checks

### 4.1 Empirical Results

Table 2 presents the estimation results from the linear probability model. In the first column we show the NHIS coefficient without including individual and household variables into the estimation model. We find a negative and statistically significant effect of the NHIS dummy. The implementation of the NHIS decreases the probability of transferring money to other households by 15 percentage points. If we include control variables the size of the coefficient remains similar (14 percentage points), which suggests that the implementation of the NHIS is random in terms of individual and household specific variables In addition, including control variables increases the precision of our estimates, as the NHIS coefficient turns to become significant at the 5 percent level. Furthermore, the inclusion of region specific time trends (column 3) indicates that our findings are not driven by regional changes during the survey period, as the effect of the NHIS implementation remains very similar in this specification.

The coefficients of individual and household control variables (see Table A2 in the Appendix) have signs that are consistent with our expectations. Variables representing economic potential like the five quintiles of household expenditures and higher education are positively associated with making transfers. In addition, using a saving account, household size and migrant status also reveal a positive coefficient.

**Table 2: Effect of the NHIS implementation on the probability of making transfers**

| | **LPM 1** | **LPM 2** | **LPM 3** |
|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent |
| NHIS | -0.147* | -0.139** | -0.134** |
| | (0.079) | (0.062) | (0.062) |
| N | 5,977 | 5,977 | 5,977 |
| adj. R-sq | 0.06 | 0.16 | 0.16 |
| District and interview month dummy variables | Yes | Yes | Yes |
| Individual and household control variables | No | Yes | Yes |
| Regional time trends | No | No | Yes |

Standard errors (in parenthesis) are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In Table 3 we show the estimation results from the two part model. The implementation of the NHIS leads to a significant crowding out of 33 GHC in the specification without control variables, while the effect turns to be slightly smaller (27 GHC) when these variables and regional specific time trends are included. If we put this effect in relationship to the average corrected household expenditures, the implementation of the NHIS reduces remittances to members of other households by 12 percent.

**Table 3: Effect of the NHIS implementation on the amount of made transfers**

| | **Two-part 1** | **Two-part 2** | **Two-part 3** |
|---|---|---|---|
| Variables | Marg. effect | Marg. effect | Marg. effect |
| NHIS | -33.50** | -26.60* | -23.34* |
| | (16.86) | (14.79) | (14.07) |
| N | 2,770 | 2,770 | 2,770 |
| District and interview month dummy variables | Yes | Yes | Yes |
| Individual and household control variables | No | Yes | Yes |
| Regional time trends | No | No | Yes |

Standard errors (in parenthesis) are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In order to avoid the above mentioned selection bias of the two part model, we present in Table 4 the coefficents of the 0.6, 0.7, 0.8 and 0.9 quantiles from a quantile regression model. Lower quantiles of the transfer distribution cannot be interpreted due to zero inflation in the dependent variable, but this estimation method allows us to consider the entire distribution of made transfers.

All coefficients of the quantile regression model suggest that the availability of the NHIS systematically crowds out informal transfers. Interestingly, the crowding out depends strongly on the amount of made transfers. Remittances of respondents in the 0.6 quantile decrease by 33 GHC, while individuals in the 0.9 quantile reduce their transfers by 62 GHC. If we include regional specific time trends the results remain similar (see Table A3 in the Appendix).

## Table 4: Quantile regression model of made transfers

| | Q 0.6 | Q 0.7 | Q 0.8 | Q 0.9 |
|---|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent | Coefficent |
| NHIS | -32.79*** | -26.26** | -29.91*** | -61.67** |
| | (7.663) | (10.83) | (8.714) | (29.21) |
| Household size | 0.93** | 1.72*** | 2.93*** | 2.22** |
| | (0.45) | (0.63) | (1.09) | (1.08) |
| HH expenditures Q2 | 2.61* | 5.62** | 11.60*** | 28.35*** |
| | (1.42) | (2.20) | (2.97) | (9.06) |
| HH expenditures Q3 | 5.34* | 13.49*** | 21.64*** | 53.85*** |
| | (2.84) | (4.11) | (6.27) | (12.40) |
| HH expenditures Q4 | 8.16** | 20.04*** | 34.16*** | 77.30*** |
| | (3.84) | (5.22) | (10.37) | (17.94) |
| HH expenditures Q5 | 48.27*** | 87.37*** | 137.21*** | 184.70*** |
| | (7.861) | (11.25) | (13.25) | (25.89) |
| HH saving account | 30.14*** | 42.37*** | 66.63*** | 95.29*** |
| | (4.83) | (7.101) | (10.76) | (13.29) |
| Migrant | 0.10 | 1.45 | 2.76 | 5.88 |
| | (0.90) | (1.91) | (3.46) | (8.47) |
| Formal employment | 53.00*** | 58.22*** | 74.01*** | 95.16*** |
| | (9.25) | (9.86) | (16.42) | (28.38) |
| Informal employment | 20.23** | 7.513 | 12.76 | 24.24 |
| | (8.99) | (12.30) | (8.30) | (17.10) |
| Self employment | 32.96*** | 29.97*** | 41.99*** | 88.84*** |
| | (7.16) | (11.16) | (9.44) | (21.16) |
| Primary School | -0.204 | -0.0703 | -0.984 | -0.384 |
| | (0.64) | (1.25) | (2.17) | (2.80) |
| Junior High School | 0.017 | 2.48 | 2.64 | 2.79 |
| | (0.86) | (1.66) | (3.42) | (4.94) |
| Secondary High School | 3.70* | 9.85** | 20.38** | 27.58*** |
| | (2.24) | (4.48) | (8.05) | (9.59) |
| Technical School | 27.73** | 24.86** | 35.14 | 96.55*** |
| | (13.53) | (12.31) | (21.92) | (32.95) |
| University | 120.60*** | 137.41*** | 183.01*** | 121.00* |
| | (39.00) | (32.78) | (64.19) | (66.28) |
| Female | -0.43 | -0.28 | -1.02 | -1.58 |
| | (0.57) | (0.86) | (1.64) | (2.15) |
| Low health status | 0.66 | 1.89 | 2.14 | 29.18 |
| | (0.815) | (3.20) | (5.44) | (19.50) |
| Married | 0.21 | 0.48 | 0.34 | 0.31 |
| | (0.77) | (1.03) | (2.01) | (3.69) |
| Age | 0.12 | 0.44* | 0.37 | 0.50 |
| | (0.17) | (0.25) | (0.34) | (0.33) |
| Age squared | -0.001 | -0.005* | -0.004 | -0.005 |
| | (0.002) | (0.003) | (0.004) | (0.004) |
| Urban coastal | -12.33* | -17.55** | -1.40 | 31.97 |
| | (7.28) | (7.95) | (15.81) | (25.44) |
| Urban forest | -14.04** | -17.33** | -20.24 | 0.73 |
| | (6.40) | (8.05) | (16.18) | (20.83) |
| Urban savannah | -1.84 | -6.58 | -0.95 | 39.11 |
| | (3.22) | (7.40) | (7.86) | (29.93) |
| N | 5,977 | 5,977 | 5,977 | 5,977 |

District and month dummies are included; Standard errors (in parenthesis) are clustered at the district level *$p$ <0.10 ** $p$<0.05

In order to make more precise claims about the importance of the crowding out and to compare our results with findings from the related literature, we compute the relative changes of made transfers (see Table 5). In detail, we follow an approach of ABADIE ET AL. (2002) and divide the coefficients of the NHIS variable for the two-part and quantile regression model by predicted values evaluated at the mean when the NHIS dummy is set to zero. The two-part-model reveals a reduction of made transfers by around 15 percent, while the coefficients in the quantile regression model imply a 42 percent reduction of transfers for the 0.6 quantile, followed by a 26, 25 and 22 percent crowding out in the subsequent quantiles.

**Table 5: Relative changes of made transfers due to the NHIS implementation**

| | **Two-part** | **Q 0.6** | **Q 0.7** | **Q 0.8** | **Q 0.9** |
|---|---|---|---|---|---|
| Variables | Percent | Percent | Percent | Percent | Percent |
| NHIS | -15.52 | -42.04 | -26.25 | -25.34 | -22.43 |

Source: Own calculations following an approach of ABADIE ET AL. (2002).

This is an interesting finding, which shows that although the absolute crowding out is higher in the upper quantiles, its relative importance seems to decrease. As we consider a wide range of observable household and individual specific characteristics, this finding might be explained by unobserved network characteristics such as the relationship among individuals within the network (e.g. kinship networks, neighbor networks) or the intensity of sharing obligations. Thus, it is possible that networks with stronger sharing obligation are prevalent in the top quantiles. Members of these networks are likely confronted with social sanctions if they refuse to share their resources and,

therefore, have lower incentives to reduce their transfers relatively to other households. Our findings are in line with evidence from experimental studies. LANDMANN ET AL. (2012) also find that a formal insurance induces a crowding out of 40 to 50 percent and that members of weak (strong) transfer networks are more (less) inclined to reduce transfers.[7]

In order to investigate if the reduction of made transfers is also followed by a reduction of received transfers, we turn to the estimation results with received transfers as the dependent variable. The results indicate a negative, but statistically insignificant relationship between the implementation of the NHIS and receiving transfers for all models (see Table 6 and Table A4 and A5 of the Appendix). This might be due to the fact that individuals living in regions where the NHIS is already available still receive private transfers from abroad or from people living in other districts that do not benefit from the new health insurance scheme at the time of interview.

For these individuals it may take some time to realize which members of their transfer network are covered by the insurance and do not fully rely on transfers anymore. This suggests that especially the above mentioned 'information effect' may influence transfer behavior only in the long run. Unfortunately, we cannot test these hypothesizes, as we do not observe the district of an individual's network partner in our data and also cannot estimate long run

[7] This result refers to the case where individuals do not have an option to save money. As 80 percent of the respondents in our sample also do not have a saving account or an equivalent option to save money, we think it is reasonable to compare our results with this finding. However, as LANDMANN ET AL. (2012) show average treatment effects, their findings are not directly comparable to our intention-to-treatment effects.

effects (more than 12 months) of the NHIS implementation. Still, our findings show that on average remittances to other households have decreased more than received transfers in the short run.

**Table 6: Effect of the NHIS implementation on the probability of receiving transfers**

| | **LPM 1** | **LPM 2** | **LPM 3** |
|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent |
| NHIS | -0.052 | -0.082 | -0.070 |
| | (0.097) | (0.095) | (0.098) |
| N | 5,319 | 5,319 | 5,319 |
| adj. R-sq | 0.04 | 0.09 | 0.10 |
| District and interview month dummy variables | Yes | Yes | Yes |
| Individual and household control variables | No | Yes | Yes |
| Regional time trends | No | No | Yes |

Standard errors (in parenthesis) are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In a next step we explore whether the impact of the NHIS implementation is perhaps mediated by the individual's working status. It is conceivable, for example, that the implementation of the NHIS affects especially the transfer behavior of formally employed individuals, as they are compulsory members of the NHIS. In addition, the NHIS may encourage in particular individuals that own an enterprise to reduce remittances, as they are probably more often confronted with strong sharing obligations (GRIMM ET AL., 2013).

We calculate interaction terms by multiplying the NHIS variable with variables that indicate if the respondent is formally employed, informally employed or self-employed with the reference group being unemployed respondents. The coefficents of these interaction terms in Table 7 show that especially employees working in the formal sector reduce their remittances across all quantiles. This finding exhibits the overall impact of the NHIS implementation on remittances

if insurance membership is mandatory. The coefficents of the interaction terms for informal employees and self-employed individuals that are voluntarily members of the NHIS are only statistically significant at the top quantiles.

**Table 7: Regression of made transfers controling for interaction effects**

| | **Q 0.6** | **Q 0.7** | **Q 0.8** | **Q 0.9** |
|---|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent | Coefficent |
| NHIS | -11.12 | 8.097 | 26.21 | 116.81** |
| | (21.60) | (19.10) | (28.22) | (52.61) |
| NHIS*Formal employment | -88.97*** | -106.65*** | -133.24*** | -217.15*** |
| | (30.21) | (29.34) | (25.32) | (57.92) |
| NHIS*Self employment | -10.22 | -30.38 | -62.49*** | -173.8*** |
| | (19.93) | (25.80) | (21.55) | (57.08) |
| NHIS*Informal employment | -2.134 | -32.48 | -43.88* | -155.11*** |
| | (22.56) | (26.21) | (26.19) | (53.64) |
| Formal employment | 121.1*** | 134.9*** | 175.9*** | 283.2*** |
| | (22.82) | (26.21) | (31.04) | (51.81) |
| Self employment | 31.54** | 50.04** | 94.86*** | 243.8*** |
| | (14.74) | (23.20) | (18.79) | (51.10) |
| Informal employment | 15.97 | 29.71 | 45.66* | 172.5*** |
| | (17.89) | (23.20) | (23.32) | (45.42) |
| N | 5,977 | 5,977 | 5,977 | 5,977 |

All control variables, district and month dummies are included; Standard errors (in parenthesis) are clustered at the district level, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Based on these estimates we calculate the marginal effects of the NHIS variable and find that formal employees reduce transfers by 17 GHC and 13 GHC in the 0.8 and 0.9 quantile, while self-employed individuals running an enterprise decrease transfers by 48 GHC and 44 GHC. If we turn to the relative changes, we find that similar to our results without interaction effects the relative crowding out decreases across the quantiles, as transfers of the self employed are reduced by 36 percent in the 0.8 quantile and 23 percent in the 0.9 quantile

(see Table 8). Formal employees exhibit a crowding out of 25 percent and 23 percent in the 0.6 quantile and the 0.7 quantile, while in the top quantiles transfers are reduced by 22 percent.

**Table 8: Relative changes of made transfers distinguished by working status**

| | **Q 0.6** | **Q 0.7** | **Q 0.8** | **Q 0.9** |
|---|---|---|---|---|
| Variables | Percent | Percent | Percent | Percent |
| Formal employment | -24.62 | -22.97 | -22.17 | -22.03 |
| Informal employment | n.s. | n.s. | -4.29 | -6.16 |
| Self employment | n.s. | n.s. | -35.82 | -20.01 |

Source: Own calculations following an approach of ABADIE ET AL. (2002). n.s.= coefficients not statistically significant

The comparision of the three employment groups across the quantiles exhibits that in particular, self-employed individuals in the 0.8 quantile decrease their remittances to other households after the NHIS has become available. These enterprise owners might be less confronted by strong sharing obligations than individuals in the 0.9 quantile and, thus, are more likely to be able to reduce informal network participation. We cannot state if this crowding out is due to lower pressure for remittances because most of the network members are covered by the NHIS or if it is due to the framing effect, as we do not observe the firm's network members in our data. However, the results show that especially some enterprise owners may benefit from the introduction of the NHIS.[8]

### 4.2 Robustness checks

In order to reveal if the interview dates are driven by heterogeneity between sub-districts, we estimate the same econometric specifications by using the 4th

[8] We do not find significant effects for NHIS if we use received transfers as dependent variable.

wave of the GLSS (1998/1999). As this wave was conducted in the same manner and contains the same 110 districts, we can adapt the *NHIS* variable for that time and provide a placebo estimate. The results show that the implementation of the NHIS has no effect on the probability of making or receiving transfers. The coefficient of the NHIS variable is small and statistically insignificant (see Table A6 of the Appendix). In addition, no significant effect can be found for the monetary equivalents. Thus, we conclude that our findings are due to the implementation of the NHIS and not driven by a systematic relationship between the sub-districts, interview dates and the transfer variables.

As a sufficient amount of insurance premiums had to be collected before the NHIS was officially launched in every district, most individuals had to pay premiums before they were actually able to benefit from insurance coverage. Thus, we explore whether individuals already changed their transfer behavior due to an anticipation of the offical launch of the health insurance scheme. If this would be the case our estimates could be biased. In order to investigate the presence of this bias, we `shift' our treatment indicator by 2 months `into the past'. The results indicate no significant changes in transfer behavior before the scheme was officially launched (see Table A7 of the Appendix). Thus, only at the time when district authorities officially launched the NHIS and health care services become freely available for premium payers a significant change in transfer behavior can be found. This also suggests that the respondents did not solely substitute premium payments by reducing remittance to other households.

## 5. Conclusion

In this paper we provided empirical evidence that a formal health insurance scheme crowds out informal transfers in Ghana. We analyze cross-sectional data from the fifth Ghanaian Living Standard Survey and benefit from the fact that the districts' sub-districts were surveyed at different points in time during the survey period. As most districts introduced the NHIS during this period, we compare different individuals that have been interviewed before and after the introduction of the insurance scheme. We apply a linear probability model, to evaluate whether formal insurance may result in a lower probability to participate in informal transfer networks. In addition, we also investigate the impact on monetary equivalents by implementing two-part and quantile regression models. Furthermore, we examine if our results are triggered by heterogeneity between the sub-districts.

Our findings suggest that there is indeed a crowding out effect, since the introduction of the formal health insurance scheme results in a lower probability of making transfers. Accordingly, the amount of remittances also decreases to a significant extent. Overall, we find that the higher the amount of remittances, the higher is the crowding out in absolute terms. Interestingly, this relationship is reversed if we look at the relative values, which might be explained by stronger networks in the top quantiles, as members of these networks are likely confronted with social sanctions if they refuse to share their resources.

Turning to the analysis of received transfers, we do not find a statistically significant effect of the NHIS implementation. This suggests that the amount of received transfers may not be affected by the implementation of the NHIS in the short run. As the NHIS was gradually disseminated, individuals that are already covered by the insurance probably still receive transfers from districts where the NHIS is not available. In addition, the amount of transfers from network members living abroad might be also not affected by the implementation of the NHIS. However, this could change in the future when remitters note that the recipients benefit from the NHIS. This suggests that the mentioned 'information effect' may influence transfer behavior only in the long run. Nevertheless, our findings suggest that on average remittances to other households have decreased more than received transfers in the short run.

Altogether, we interpret our results as an indication for the reduced willingness to contribute to transfer networks in the short run. The availability of the NHIS may have changed the view of how to deal with risks and probably signals that 'buying' security is everyone's own responsibility, which have resulted in the crowding out of informal transfers. In particular, this 'framing effect' seems to be most relevant for members of networks in the lower quantiles of our analysis, as they reveal the largest reduction of transfers in relative terms. Lower sharing obligations or less altruistic attitudes make it less costly for these network members to reduce transfer payments after the implementation of the NHIS. Furthermore, as the risk of default in times of financial hardship is probably higher in networks that are characterized by low sharing obligations, it is more beneficial for these individuals to reduce

transfers and to rely on formal insurance mechanisms. Thus, the implementation of the NHIS can lead to a reduction of covariate risks in weak networks and may improve the chance of their members to recover faster after being sick. Contrarily, as we do not find large relative crowding out effects in the top quantiles, we conclude that it probably takes more time to convince members of networks that are characterized by strong sharing obligations and low levels of covariate risks.

We also explore whether the impact of the NHIS implementation is perhaps mediated by the individual's working status. We find that formally employed individuals who are compulsary members of the NHIS reduce their remittances across all quantiles, whereas self employed individuals that run an enterprise decrease transfers only in the upper tail of the distribution. A comparison of the calculated marginal effects of both groups shows that self employed individuals reveal on average a higher crowding out in absolute and relative terms. This finding shows the potential of the public health insurance scheme to help enterprises that are probably suffering from strong sharing obligations and, thus, are not able to develop their full economic potential. Hence, policies intended to support enterprise owners in developing countries should consider this indirect effect of implementing a formal health insurance scheme.

As we observe changes in transfer behavior in the short run, we believe that effects of changes in investments or savings are likely to take more time to become apparent and, thus, are unlikely to trigger changes in transfer behavior in our study. However, from a policy perspective it would be of interest to

investigate such long run effects of the health insurance implementation. In particular, to investigate to which extent the crowding out of informal transfers is used for investments or consumption purposes in the long run by also considering direct costs (insurance premiums) and indirect costs (2.5% addition to the value added tax) of the NHIS. As the sixth round of the GLSS will be available in 2014, a promising avenue for future research would therefore be to examine if the implementation of the NHIS leads on average to a net gain or loss for covered individuals.

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## Appendix

**Table A1: Descriptive statistics (Received transfers)**

| Variable | Total mean | NHIS mean | No NHIS mean | p-value (Diff. in means) |
|---|---|---|---|---|
| Received transfers (0/1) | 0.39 | 0.36 | 0.50 | 0.00 |
| Amount of received transfers | 69.56 | 70.41 | 65.84 | 0.46 |
| Household size | 5.23 | 5.15 | 5.62 | 0.00 |
| HH expenditures Q2 (0/1) | 0.19 | 0.19 | 0.23 | 0.00 |
| HH expenditures Q3 (0/1) | 0.18 | 0.18 | 0.19 | 0.53 |
| HH expenditures Q4 (0/1) | 0.17 | 0.17 | 0.16 | 0.27 |
| HH expenditures Q5 (0/1) | 0.19 | 0.19 | 0.19 | 0.93 |
| HH saving account (0/1) | 0.24 | 0.24 | 0.24 | 0.79 |
| Migrant (0/1) | 0.18 | 0.18 | 0.18 | 0.60 |
| Formal Employment (0/1) | 0.10 | 0.09 | 0.12 | 0.02 |
| Informal Employment (0/1) | 0.07 | 0.07 | 0.05 | 0.02 |
| Self employment (0/1) | 0.79 | 0.80 | 0.77 | 0.11 |
| Primary School (0/1) | 0.16 | 0.16 | 0.15 | 0.37 |
| Junior High School (0/1) | 0.17 | 0.17 | 0.14 | 0.03 |
| Secondary High School (0/1) | 0.24 | 0.24 | 0.23 | 0.56 |
| Technical School (0/1) | 0.04 | 0.04 | 0.05 | 0.19 |
| University (0/1) | 0.01 | 0.01 | 0.02 | 0.03 |
| Female (0/1) | 0.55 | 0.55 | 0.55 | 0.74 |
| Low health status (0/1) | 0.12 | 0.11 | 0.17 | 0.00 |
| Married (0/1) | 0.61 | 0.62 | 0.59 | 0.15 |
| Age | 37.59 | 37.46 | 38.13 | 0.19 |
| Urban coastal (0/1) | 0.14 | 0.12 | 0.20 | 0.00 |
| Urban forest (0/1) | 0.10 | 0.11 | 0.08 | 0.00 |
| Urban savannah (0/1) | 0.06 | 0.06 | 0.04 | 0.08 |
| Number of observation | 5,319 | 4,328 | 991 | |

| **Table A2: Made transfers** | **LPM (1)** | **LPM (2)** | **LPM (3)** | **Two-part (4)** | **Two-part (5)** | **Two-part (6)** |
|---|---|---|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent | Marg. effect | Marg. effect | Marg. effect |
| NHIS | -0.147* | -0.139** | -0.134** | -33.50** | -26.60* | -23.34* |
| | (0.0790) | (0.0623) | (0.0625) | (16.86) | (14.79) | (14.07) |
| Household size | | 0.0178*** | 0.0178*** | | 5.15*** | 5.17*** |
| | | (0.00380) | (0.00379) | | (0.87) | (0.88) |
| HH expenditures Q2 | | 0.0807** | 0.0806** | | 36.95*** | 36.17*** |
| | | (0.0312) | (0.0312) | | (10.76) | (10.79) |
| HH expenditures Q3 | | 0.114*** | 0.114*** | | 60.36*** | 59.87*** |
| | | (0.0365) | (0.0366) | | (14.35) | (14.29) |
| HH expenditures Q4 | | 0.130*** | 0.130*** | | 78.40*** | 78.04*** |
| | | (0.0389) | (0.0389) | | (14.35) | (14.23) |
| HH expenditures Q5 | | 0.258*** | 0.259*** | | 141.08*** | 141.56*** |
| | | (0.0406) | (0.0407) | | (18.38) | (18.36) |
| HH saving account | | 0.136*** | 0.138*** | | 36.08*** | 35.70*** |
| | | (0.0224) | (0.0225) | | (6.64) | (6.80) |
| Migrant | | 0.0292 | 0.0292 | | 11.42 | 11.25 |
| | | (0.0222) | (0.0221) | | (7.99) | (7.87) |
| Formal employment | | 0.349*** | 0.349*** | | 121.05*** | 121.21*** |
| | | (0.0411) | (0.0409) | | (33.35) | (32.96) |
| Informal employment | | 0.103** | 0.100** | | 35.35 | 35.84 |
| | | (0.0434) | (0.0436) | | (24.03) | (23.83) |
| Self employment | | 0.217*** | 0.216*** | | 80.55*** | 80.77*** |
| | | (0.0279) | (0.0276) | | (17.42) | (17.34) |
| Primary School | | -0.00801 | -0.00729 | | -2.09 | -2.07 |
| | | (0.0226) | (0.0225) | | (5.45) | (5.43) |
| Junior High School | | -0.000311 | -0.000896 | | 5.15 | 4.70 |
| | | (0.0194) | (0.0192) | | (5.47) | (5.51) |
| Secondary High School | | 0.0285 | 0.028 | | 21.84*** | 21.73*** |
| | | (0.0173) | (0.0173) | | (5.64) | (5.61) |
| Technical School | | 0.0453 | 0.0465 | | 35.25*** | 34.95*** |
| | | (0.0314) | (0.0315) | | (9.77) | (9.96) |
| University | | 0.065 | 0.0656 | | 65.39*** | 65.41*** |
| | | (0.0420) | (0.0421) | | (14.71) | (14.87) |
| Female | | -0.0359*** | -0.0360*** | | -4.21 | -4.27 |
| | | (0.00943) | (0.00937) | | (2.78) | (2.82) |
| Low health status | | 0.0327 | 0.0317 | | 11.29*** | 11.39** |
| | | (0.0209) | (0.0210) | | (4.98) | (4.94) |
| Married | | 0.0429*** | 0.0417*** | | 3.19 | 3.13 |
| | | (0.0140) | (0.0138) | | (5.38) | (5.34) |
| Age | | 0.00434* | 0.00442* | | 0.83* | 0.82* |
| | | (0.00257) | (0.00255) | | (0.54) | (0.54) |
| Age squared | | -0.0000683** | -0.0000693** | | -0.01 | -0.012 |
| | | (0.0000287) | (0.0000284) | | (0.02) | (0.015) |
| Urban coastal | | -0.110* | -0.105 | | 9.20 | 7.13 |
| | | (0.0628) | (0.0640) | | (16.13) | (15.14) |
| Urban forest | | -0.138*** | -0.192* | | -20.15** | -31.18** |
| | | (0.0508) | (0.101) | | (10.29) | (15.68) |
| Urban savannah | | -0.0886** | -0.186*** | | -7.40 | 3.61 |
| | | (0.0427) | (0.0627) | | (15.09) | (17.02) |
| N | 5,977 | 5,977 | 5,977 | 2,770 | 2,770 | 2,770 |

District and month dummies are included into all specifications. Region specific time trends are only included in the third and sixth column. Standard errors (in parenthesis) are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

| **Table A3: Made transfers** | **Q 0.6** | **Q 0.7** | **Q 0.8** | **Q 0.9** |
|---|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent | Coefficent |
| NHIS | -28.80*** | -28.34* | -27.39* | -69.12** |
| | (7.735) | (14.54) | (16.43) | (33.50) |
| Household size | 0.845* | 1.686** | 2.832*** | 2.181* |
| | (0.452) | (0.761) | (1.081) | (1.255) |
| HH expenditures Q2 | 2.478 | 5.191** | 11.24*** | 20.58** |
| | (1.809) | (2.328) | (3.692) | (8.083) |
| HH expenditures Q3 | 4.796 | 12.94*** | 19.91*** | 49.26*** |
| | (3.049) | (4.506) | (7.614) | (17.93) |
| HH expenditures Q4 | 7.476* | 18.03*** | 32.31*** | 73.43*** |
| | (3.900) | (5.972) | (8.383) | (18.54) |
| HH expenditures Q5 | 49.67*** | 86.49*** | 136.9*** | 175.5*** |
| | (9.527) | (8.261) | (12.83) | (18.09) |
| HH saving account | 30.30*** | 43.32*** | 65.45*** | 94.50*** |
| | (4.813) | (8.579) | (11.27) | (14.94) |
| Migrant | 0.227 | 1.152 | 2.974 | 4.741 |
| | (0.707) | (2.018) | (3.001) | (13.53) |
| Formal employment | 53.47*** | 63.61*** | 73.81*** | 87.62*** |
| | (11.38) | (14.56) | (25.58) | (28.43) |
| Informal employment | 21.43** | 13.89 | 11.13 | 17.64 |
| | (10.45) | (12.96) | (17.97) | (23.61) |
| Self employment | 33.02*** | 36.53*** | 40.01** | 83.02*** |
| | (9.134) | (13.67) | (19.44) | (23.05) |
| Primary School | -0.333 | -0.151 | -1.18 | 0.091 |
| | (0.596) | (1.336) | (2.364) | (3.650) |
| Junior High School | -0.0312 | 2.248 | 2.167 | 4.226 |
| | (0.849) | (1.526) | (3.493) | (3.164) |
| Secondary High School | 3.681 | 9.670*** | 19.06*** | 24.88** |
| | (2.559) | (3.294) | (5.881) | (12.00) |
| Technical School | 31.32*** | 27.71* | 31.78** | 88.66** |
| | (8.633) | (16.44) | (14.75) | (44.29) |
| University | 116.5*** | 132.3*** | 164.7*** | 110.8* |
| | (32.27) | (47.20) | (61.84) | (62.20) |
| Female | -0.382 | -0.594 | -0.803 | -1.887 |
| | (0.486) | (0.790) | (1.585) | (2.342) |
| Low health status | 0.593 | 1.715 | 1.742 | 26.36* |
| | (0.980) | (2.359) | (8.251) | (15.88) |
| Married | 0.326 | 0.485 | 0.354 | 0.494 |
| | (0.625) | (0.906) | (1.664) | (1.760) |
| Age | 0.114 | 0.427*** | 0.412 | 0.508 |
| | (0.161) | (0.161) | (0.442) | (0.530) |
| Age squared | -0.00147 | -0.00503*** | -0.00471 | -0.00553 |
| | (0.00185) | (0.00187) | (0.00503) | (0.00615) |
| Urban coastal | -9.271 | -30.22 | 14.51 | 54.81 |
| | (10.74) | (22.21) | (24.40) | (37.19) |
| Urban forest | -32.45*** | -54.24*** | -64.36*** | -12.99 |
| | (10.12) | (14.09) | (14.57) | (50.44) |
| Urban savannah | 8.668 | 5.942 | 88.90 | 47.31*** |
| | (13.51) | (15.39) | (55.43) | (15.97) |
| N | 5,977 | 5,977 | 5,977 | 5,977 |

District and month dummies are included. Regional specific time trends are also included; Standard errors (in parenthesis) are clustered at the district level, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

| **Table A4: Received transf.** | **LPM 1** | **LPM 2** | **LPM 3** | **Two-part 1** | **Two-part 2** | **Two-part 3** |
|---|---|---|---|---|---|---|
| Variables | Coefficent | Coefficent | Coefficent | Marg. effect | Marg. effect | Marg. effect |
| NHIS | -0.0523 | -0.082 | -0.070 | -3.65 | -27.01 | -27.32 |
| | (0.0970) | (0.0955) | (0.0976) | (20.46) | (21.08) | (21.91) |
| Household size | | 0.00225 | 0.00218 | | 2.58** | 2.62** |
| | | (0.00422) | (0.00420) | | (1.09) | (1.13) |
| HH expenditures Q2 | | -0.00496 | -0.00564 | | 4.49 | 3.75 |
| | | (0.0363) | (0.0361) | | (8.61) | (8.63) |
| HH expenditures Q3 | | -0.0165 | -0.0166 | | 9.79 | 8.34 |
| | | (0.0342) | (0.0344) | | (12.20) | (12.32) |
| HH expenditures Q4 | | 0.0218 | 0.0204 | | 28.66** | 27.39** |
| | | (0.0363) | (0.0364) | | (13.31) | (13.40) |
| HH expenditures Q5 | | 0.0742 | 0.0754* | | 62.65*** | 62.43*** |
| | | (0.0451) | (0.0446) | | (16.15) | (16.27) |
| HH saving account | | 0.0233 | 0.0242 | | 28.81*** | 29.38*** |
| | | (0.0259) | (0.0260) | | (9.39) | (9.57) |
| Migrant | | -0.0502** | -0.0514** | | -19.24** | -18.94** |
| | | (0.0214) | (0.0215) | | (8.29) | (8.09) |
| Formal employment | | -0.331*** | -0.333*** | | -65.22*** | -64.81*** |
| | | (0.0521) | (0.0510) | | (18.75) | (19.69) |
| Informal employment | | -0.297*** | -0.296*** | | -52.85*** | -53.10*** |
| | | (0.0577) | (0.0583) | | (17.57) | (17.78) |
| Self employment | | -0.286*** | -0.288*** | | -80.88*** | -80.50** |
| | | (0.0494) | (0.0490) | | (27.30) | (28.22) |
| Primary School | | 0.00177 | 0.000553 | | -1.48 | -1.10 |
| | | (0.0202) | (0.0200) | | (5.53) | (5.41) |
| Junior High School | | 0.0314 | 0.0314 | | 10.68 | 10.36 |
| | | (0.0226) | (0.0232) | | (9.48) | (9.47) |
| Secondary High School | | 0.0212 | 0.0193 | | 32.60*** | 31.91*** |
| | | (0.0257) | (0.0261) | | (9.4) | (9.44) |
| Technical School | | 0.0633 | 0.0613 | | 41.06*** | 40.42** |
| | | (0.0434) | (0.0430) | | (15.83) | (15.90) |
| University | | 0.0656 | 0.0659 | | 134.95*** | 134.88** |
| | | (0.0452) | (0.0458) | | (45.32) | (44.50) |
| Female | | 0.0682*** | 0.0682*** | | 32.55*** | 32.37*** |
| | | (0.0134) | (0.0138) | | (6.16) | (6.30) |
| Low health status | | 0.0202 | 0.0182 | | 2.37 | 2.11 |
| | | (0.0210) | (0.0208) | | (7.37) | (7.38) |
| Married | | -0.0578*** | -0.0578*** | | -3.73 | -4.07 |
| | | (0.0162) | (0.0162) | | (5.93) | (5.98) |
| Age | | -0.0116*** | -0.0115*** | | -8.98*** | -8.82*** |
| | | (0.00299) | (0.00296) | | (2.93) | (2.91) |
| Age squared | | 0.000171*** | 0.000169*** | | 0.020 | 0.020 |
| | | (0.0000352) | (0.0000350) | | (0.012) | (0.012) |
| Urban coastal | | -0.0706 | 0.00876 | | -8.00 | -21.77 |
| | | (0.0594) | (0.106) | | (26.46) | (34.01) |
| Urban forest | | 0.017 | 0.0496 | | 12.11 | 8.67 |
| | | (0.0533) | (0.110) | | (16.29) | (25.54) |
| Urban savannah | | 0.0326 | 0.0161 | | -17.12 | -16.70 |
| | | (0.0708) | (0.145) | | (16.01) | (25.78) |
| N | 5,319 | 5,319 | 5,319 | 2,065 | 2,065 | 2,065 |

District and month dummies are included into all specifications. Region specific time trends are only included in the third and sixth column. Standard errors (in parenthesis) are clustered at the district level. * $p < 0.10$, ** $p < 0.05$, *** $p<0.01$

| **Table A5: Received transfers** | **Q 0.7** | **Q 0.8** | **Q 0.9** |
|---|---|---|---|
| Variables | Coeff. | Coeff. | Coeff. |
| NHIS | -5.24 | 5.01 | 7.21 |
| | (8.688) | (13.73) | (23.19) |
| Household size | -0.0563 | 0.653 | 1.214 |
| | (0.139) | (0.555) | (0.952) |
| HH expenditures Q2 | -0.153 | -0.669 | -1.277 |
| | (0.719) | (2.891) | (5.167) |
| HH expenditures Q3 | -0.608 | -0.623 | 9.728 |
| | (1.354) | (3.016) | (11.80) |
| HH expenditures Q4 | 0.0663 | 3.566 | 25.63*** |
| | (1.178) | (5.603) | (9.933) |
| HH expenditures Q5 | 23.79** | 50.56*** | 109.7*** |
| | (10.92) | (11.17) | (20.92) |
| HH saving account | 0.981 | 7.502** | 49.84*** |
| | (1.624) | (3.292) | (18.04) |
| Migrant | -1.802 | -9.262*** | -25.81*** |
| | (1.345) | (3.093) | (6.961) |
| Formal employment | -180.1*** | -236.9*** | -295.6*** |
| | (29.06) | (63.12) | (47.21) |
| Informal employment | -177.7*** | -230.2*** | -269.2*** |
| | (29.38) | (66.55) | (62.00) |
| Self employment | -177.4*** | -228.9*** | -270.6*** |
| | (28.86) | (63.88) | (50.49) |
| Primary School | -0.31 | -0.351 | 5.459 |
| | (0.680) | (1.759) | (7.714) |
| Junior High School | 0.34 | 0.0615 | 15.26 |
| | (0.507) | (2.295) | (9.644) |
| Secondary High School | 0.742 | 5.911** | 27.72*** |
| | (1.282) | (2.854) | (10.51) |
| Technical School | 8.818 | 15.75 | 67.4 |
| | (7.305) | (16.74) | (54.01) |
| University | 25.93 | 40.81 | 148.2 |
| | (42.73) | (57.41) | (218.8) |
| Female | 1.751 | 8.922*** | 24.23*** |
| | (1.291) | (2.301) | (7.353) |
| Low health status | 1.824 | -0.375 | -6.414 |
| | (1.277) | (2.612) | (6.454) |
| Married | -0.401 | -2.599 | -6.09 |
| | (0.631) | (2.212) | (5.987) |
| Age | -0.803* | -2.055*** | -2.701** |
| | (0.428) | (0.792) | (1.113) |
| Age squared | 0.0116* | 0.0285*** | 0.0391*** |
| | (0.00603) | (0.0104) | (0.0145) |
| Urban coastal | 0.839 | -3.874 | -41.89** |
| | (2.937) | (6.746) | (21.07) |
| Urban forest | 2.678 | 24.93** | -4.218 |
| | (5.038) | (10.38) | (29.55) |
| Urban savannah | 14.56 | 28.63*** | 38.16*** |
| | (12.00) | (10.99) | (10.79) |
| N | 5,319 | 5,319 | 5,319 |

District and month dummies are included. Standard errors (in parenthesis) are clustered at the district level,
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

| Table A6: Placebo effects | Dep. var.: Made transfers | | | Dep. var.: Received transfers | | |
|---|---|---|---|---|---|---|
| | **LPM** | **Two-part** | **Q 0.9** | **LPM** | **Two-part** | **Q 0.9** |
| Variables | Coefficent | Marg. effect | Coefficent | Coefficent | Marg. effect | Coefficent |
| NHIS | -0.005 | 1.79 | -1.086 | 0.107 | 1.16 | -9.086 |
| | (0.0821) | (2.91) | (5.008) | (0.0753) | (3.34) | (6.214) |
| Household size | 0.0216*** | 0.63*** | 0.126 | 0.000103 | 0.52** | -0.0102 |
| | (0.00494) | (0.15) | (0.173) | (0.00347) | (0.23) | (0.0155) |
| HH expenditures Q2 | 0.0601** | 3.02* | 0.254 | -0.0113 | 0.32 | -0.00602 |
| | (0.0260) | (1.78) | (0.339) | (0.0272) | (1.39) | (0.0577) |
| HH expenditures Q3 | 0.127*** | 5.60** | 0.774 | -0.00829 | 1.71 | -0.0151 |
| | (0.0304) | (2.17) | (1.176) | (0.0315) | (1.36) | (0.0620) |
| HH expenditures Q4 | 0.178*** | 7.80*** | 1.242 | -0.0122 | 0.16 | -0.0581 |
| | (0.0338) | (2.43) | (1.322) | (0.0297) | (1.57) | (0.0641) |
| HH expenditures Q5 | 0.241*** | 11.92*** | 15.55*** | -0.0292 | 3.15 | 0.00922 |
| | (0.0412) | (2.84) | (2.111) | (0.0346) | (2.11) | (0.106) |
| HH saving account | 0.140*** | 3.68*** | 10.35*** | 0.0282 | -0.87 | -0.0206 |
| | (0.0262) | (1.11) | (2.377) | (0.0194) | (1.01) | (0.0789) |
| Migrant | 0.0327* | -0.92 | -0.0281 | -0.0389** | -2.66*** | -0.135 |
| | (0.0186) | (0.72) | (0.0636) | (0.0165) | (0.82) | (0.232) |
| Formal employment | 0.133*** | 3.84 | 9.060*** | -0.312*** | -10.33*** | -56.62*** |
| | (0.0473) | (3.05) | (2.915) | (0.0767) | (3.33) | (12.64) |
| Informal employment | 0.145** | 2.24 | 4.022 | -0.311*** | -11.20** | -56.64*** |
| | (0.0689) | (4.83) | (8.092) | (0.0804) | (4.61) | (12.68) |
| Self employment | 0.0939** | 1.21 | 0.161 | -0.255*** | -12.43*** | -56.53*** |
| | (0.0359) | (1.19) | (0.542) | (0.0760) | (4.14) | (12.72) |
| Primary School | 0.0825*** | 2.99*** | 0.253 | 0.0145 | 0.71 | 0.0224 |
| | (0.0181) | (0.85) | (1.366) | (0.0158) | (0.70) | (0.0336) |
| Jun. High School | 0.0614*** | 1.92** | 0.212 | 0.0282* | 1.56** | 0.0104 |
| | (0.0190) | (0.70) | (0.454) | (0.0142) | (0.75) | (0.0852) |
| Sec. High School | 0.0700** | 4.41*** | 3.26 | 0.0339 | 1.94 | 0.0875 |
| | (0.0329) | (1.29) | (3.378) | (0.0277) | (1.27) | (1.698) |
| Technical School | 0.181*** | 9.21*** | 17.50** | 0.0183 | 1.32 | 0.0501 |
| | (0.0415) | (2.18) | (7.302) | (0.0319) | (2.27) | (0.113) |
| University | 0.000125 | 3.50 | 6.316 | 0.0176 | 2.39 | -0.0105 |
| | (0.0449) | (2.57) | (8.131) | (0.0422) | (3.38) | (1.666) |
| Female | -0.0284*** | -8.56*** | -0.0232 | 0.0513*** | 2.45*** | 0.116 |
| | (0.00944) | (0.42) | (0.0926) | (0.00813) | (0.64) | (0.181) |
| Low health status | 0.000999 | -0.16 | 0.0109 | 0.0273** | 0.57 | 0.0511 |
| | (0.0134) | (0.64) | (0.193) | (0.0131) | (0.65) | (0.0725) |
| Married | -0.00319 | -0.003 | -0.0442 | -0.0364** | -0.89 | -0.136 |
| | (0.0163) | (0.82) | (0.0833) | (0.0146) | (0.64) | (0.0945) |
| Age | 0.00990*** | 0.15 | 0.00847 | -0.00804*** | -0.50 | -0.0467 |
| | (0.00224) | (0.12) | (0.0293) | (0.00223) | (0.36) | (0.127) |
| Age squared | -0.000113*** | -0.006*** | -0.0000867 | 0.000124*** | 0.003 | 0.000804 |
| | (0.0000275) | (0.002) | (0.000335) | (0.0000283) | (0.002) | (0.00201) |
| Urban coastal | 0.294*** | 19.32** | 40.34*** | 0.196** | 1.91 | 9.82 |
| | (0.0657) | (7.74) | (9.524) | (0.0818) | (1.87) | (15.08) |
| Urban forest | -0.0921* | 1.18 | 0.191 | 0.0413 | 5.27** | 10.10 |
| | (0.0483) | (1.10) | (2.488) | (0.0412) | (2.49) | (5.47) |
| Urban savannah | 0.121 | 1.51 | -0.0964 | 0.00949 | -0.73 | -0.98 |
| | (0.0861) | (1.11) | (2.234) | (0.0395) | (1.86) | (1.59) |
| N | 5,741 | 1,501 | 5,741 | 5,924 | 947 | 5,924 |

District and month dummies are included. Standard errors (in parenthesis) are clustered at the district level, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

| **Table A7: NHIS shift** | **Dep. var.: Made transfers** | | **Dep. var.: Received transfers** | |
|---|---|---|---|---|
| | **LPM (t-2)** | **LPM (t-1)** | **LPM (t-2)** | **LPM (t-1)** |
| Variables | Coeff. | Coeff. | Coeff. | Coeff. |
| NHIS | -0.0332 | -0.100 | 0.0218 | -0.0847 |
| | (0.0954) | (0.101) | (0.122) | (0.146) |
| Household size | 0.0822*** | 0.0802** | -0.00205 | -0.0051 |
| | (0.0311) | (0.0311) | (0.0355) | (0.0359) |
| HH expenditures Q2 | 0.116*** | 0.115*** | -0.0141 | -0.0167 |
| | (0.0360) | (0.0362) | (0.0339) | (0.0341) |
| HH expenditures Q3 | 0.132*** | 0.130*** | 0.0233 | 0.0217 |
| | (0.0383) | (0.0385) | (0.0365) | (0.0365) |
| HH expenditures Q4 | 0.257*** | 0.256*** | 0.0750* | 0.0735 |
| | (0.0397) | (0.0400) | (0.0450) | (0.0449) |
| HH expenditures Q5 | 0.0421*** | 0.0429*** | -0.0574*** | -0.0572*** |
| | (0.0138) | (0.0140) | (0.0161) | (0.0165) |
| HH saving account | 0.135*** | 0.135*** | 0.0211 | 0.0215 |
| | (0.0221) | (0.0221) | (0.0253) | (0.0256) |
| Migrant | 0.0182*** | 0.0180*** | 0.00263 | 0.00225 |
| | (0.00383) | (0.00382) | (0.00432) | (0.00425) |
| Formal employment | 0.0342 | 0.0338 | 0.021 | 0.0193 |
| | (0.0207) | (0.0209) | (0.0206) | (0.0205) |
| Informal employment | 0.00274 | 0.00138 | -0.0469** | -0.0498** |
| | (0.0216) | (0.0217) | (0.0222) | (0.0221) |
| Self employment | 0.346*** | 0.349*** | -0.334*** | -0.329*** |
| | (0.0406) | (0.0408) | (0.0506) | (0.0509) |
| Primary School | 0.0994** | 0.102** | -0.299*** | -0.296*** |
| | (0.0428) | (0.0432) | (0.0566) | (0.0570) |
| Jun. High School | 0.210*** | 0.214*** | -0.291*** | -0.287*** |
| | (0.0262) | (0.0268) | (0.0478) | (0.0489) |
| Sec. High School | -0.0074 | -0.0078 | 0.00181 | 0.00156 |
| | (0.0227) | (0.0226) | (0.0202) | (0.0201) |
| Technical School | -0.00189 | -0.00123 | 0.0309 | 0.031 |
| | (0.0194) | (0.0194) | (0.0228) | (0.0226) |
| University | 0.0286 | 0.0284 | 0.0208 | 0.0215 |
| | (0.0173) | (0.0173) | (0.0260) | (0.0257) |
| Female | 0.0465 | 0.0457 | 0.0613 | 0.0629 |
| | (0.0313) | (0.0313) | (0.0441) | (0.0435) |
| Low health status | 0.0678 | 0.0673 | 0.0656 | 0.0652 |
| | (0.0419) | (0.0422) | (0.0451) | (0.0458) |
| Married | 0.0362*** | 0.0360*** | -0.0674*** | -0.0680*** |
| | (0.00935) | (0.00938) | (0.0135) | (0.0134) |
| Age | 0.00426 | 0.00422 | -0.0116*** | -0.0116*** |
| | (0.00257) | (0.00259) | (0.00301) | (0.00301) |
| Age squared | -0.0000676** | -0.0000670** | 0.000170*** | 0.000171*** |
| | (0.0000288) | (0.0000289) | (0.0000354) | (0.0000353) |
| Urban coastal | -0.0972 | -0.105* | -0.0585 | -0.0692 |
| | (0.0632) | (0.0631) | (0.0577) | (0.0582) |
| Urban forest | -0.146*** | -0.144*** | 0.0147 | 0.0198 |
| | (0.0502) | (0.0504) | (0.0514) | (0.0507) |
| Urban savannah | -0.0893** | -0.0938** | 0.034 | 0.0272 |
| | (0.0428) | (0.0422) | (0.0717) | (0.0715) |
| N | 5,997 | 5,997 | 5,319 | 5,319 |

District and month dummies are included. Standard errors (in parenthesis) are clustered at the district level, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$