Net versus Gross Measure of Monetary Transfers in Intergenerational Exchange Studies[1]

Olena Nizalova

CHSS/PSSRU/School of Economics, University of Kent
Global Labor Organization

E-mail: O.Nizalova@kent.ac.uk

October 16, 2019

[1]The author is thankful to Jeff Biddle for valuable suggestions.

Abstract

This paper investigates whether the choice of the net versus gross measure of monetary transfers from adult children to their elderly parents can explain the differences in the estimates of the wage effect on money transfers found in earlier studies. It carefully documents the transfer pattern and points to the limitations of the OLS specification in the analysis of either gross out-transfers from adult children to elderly parents or net transfers. A four-part model is offered as a better alternative for the analysis of intergenerational monetary exchange. This model consists of two Cragg's double hurdle models for out-transfers and in-transfers. The results from estimating this model uncover the following empirical regularities. First, wages of adult children play an important role in the determination of the transfers at the extensive margin: adult children with higher wages are more likely to give to their elderly parents and less likely to receive. Second, among those who participate in the exchange process wages have no effect on the amount of transfer given to parents, while having a positive effect on the amount of transfer received from parents. Finally, it has been found that certain characteristics have similar effect on both probability of being a a giver and a recipient. These features provide a useful guideline for future theoretical research. One of the possible theoretical models that possesses such features is outlined in this paper.

Introduction

Decreased provision of informal care to elderly parents in response to increasing wages of adult children may translate into a significant cost to the society unless compensated in some way within the families. According to Nizalova's (2012) findings, a 10% increase in wages leads to an 18% decrease in average informal care provided by males and a 36% decrease in average informal care provided by females. One of the potential counter effects of increased wages is increased financial assistance provided to elderly parents. However, evidence on these effects is mixed and scarce. Nizalova (2012) finds close to zero effect of wages on monetary transfers while earlier literature documented a negligible wage elasticity of informal care supply and a considerable wage effect on monetary transfers. The difference in findings could be explained by the wage endogeneity addressed in Nizalova (2012). However, it turns out that this is not the only methodological difference among the earlier studies.

In addition to employing an instrumental variable approach to deal with wage endogeneity, Nizalova (2012) uses the net measure of monetary transfers and estimates average effects in the population by OLS. Earlier studies use gross transfers to elderly parents and adopt Tobit specifications. Thus, it is not clear what is responsible for the observed differences in the estimated effects.

The current paper represents a first attempt at systematic analysis of the choice of the transfer measure, focusing on the literature that studies the effect of wages on monetary transfers to elderly parents. The paper does not aim to establish the superiority of one measure over the other. Rather the goal is to show the importance of this choice and the circumstances when one would be more appropriate than the other, and to emphasize the consequences that the choice may have for the conclusions. In addition, the paper addresses the difficulty related to the empirical analysis of net monetary transfers and, by means of a four-part empirical model, uncovers important features of the reality. The overall effect of

higher wages on net transfers, defined as tranfers given by adult children to elderly parents minus transfers received from parents, is positive. So, children do compensate parents with higher monetary transfers as their wages increase. However, most of the effect is coming from the extensive margin, with females having twice larger impact on the probability of being a giver in response to the same increase in wages compared to males (0.25 vs. 0.12). Interestingly, among both males and females the probability of receiving monetary transfers decreases with higher wages, but among those who do receive money from their parents, higher wages are associated with larger transfer amount, providing some support to the exchange transfer motive.

The paper is organized as follows. Section 1 provides the background and documents the coexistence of the different measures of transfers in the literature on intergenerational exchange. In addition, this section provides a detailed review of results from the studies that focus on the effect of wages on monetary transfers to elderly parents. Section 2 provides empirical evidence that the differences in the earlier studies are attributable to the choice of the transfer measure. Actual transfer patterns and limitations of OLS specification are discussed in Section 3 as possible sources of the difference in the wage effects. Section 4 outlines a four-part empirical model for the study of net monetary transfers and presents empirical results. Finally, Section 5 discusses the existing theoretical model of intergenerational exchange and outlines a new model that incorporates the findings from the current paper.

1 Background

This paper focuses on the effect of individuals' wages on intergenerational monetary transfers between them and their elderly parents. In the related literature and the broader intergenerational exchange literature two measures of transfers are used: gross and net. Table 1 shows different measures of transfers used in the empirical literature where the adult child is the

unit of analysis. Thus, gross transfers received (in-transfers or downstream transfers) are defined as flows of money to adult children from their elderly parents. Gross transfers given (out-transfers or upstream transfers) are flows of money to elderly parents from their adult children. Net transfers are defined as the difference between gross out-transfers and gross in-transfers. Therefore, net transfers can be thought of as a balance, or outcome, of the two processes of giving and receiving in the exchange between a generation of adult children and a generation of their elderly parents. Negative /positive net transfers refer to the flows of money received /given by adult children over and above what they have given /received themselves.

There exist circumstances when one measure would be preferred over the other, depending on the research and policy questions that are being analyzed. For example, if one is interested in the effect of a tax reform on gifts and inter-vivos transfers, then the gross measure of transfers given should be studied. Also, if the question is how an individual adjusts his/her support to elderly parents in response to a change in the opportunity costs of time then again the gross measure of transfers is the right measure to analyze, as the focus here is on the process of giving itself. However, if one seeks to evaluate costs of a policy reform to the whole society, e.g. to find out whether decreased provision of informal care is compensated by an increase in the financial assistance received by the elderly, as in Nizalova (2012), then the analysis of the gross flow of money from the younger generation to the older generation is not sufficient. If the gross transfer measure is analyzed in search for such compensatory effects, both those who do not give any money and those who receive money from their parents are treated as non-contributors to that gross flow. This may overestimate the wage effect if some of the parents will actually increase their transfers to adult children in response to the increased opportunity cost of their children's time. It is also possible that the analysis of the gross transfer measure may provide some insight as to the net transfer measure and vice versa. But this question has not been directly addressed in the literature.

The literature studying the role of wages in intergenerational exchange is very scarce. Thus it is beneficial to consult first with the more developed literature on transfer motives. Keeping in mind that net transfers in the transfer motivation literature are net transfers received, this literature can be classified along several dimensions: (i) the origin of the data (developed and developing countries), (ii) the choice of the transfer measure (net transfers received, positive net transfers received, or gross transfers received[1]), (iii) the use of econometric technique (OLS, Tobit, Cragg's (1971) two-part model).

1.1 Intergenerational Transfer Motives Literature

Net transfers tend to be used more often in the studies on developing countries - the setting in which intergenerational exchange is much more prevalent (Kuhn and Stillman, 2004; Frankenberg and Kuhn, 2004; Cox, Eser, and Jimenez, 1998; Cox, Hansen, and Jimenez, 2004; Kazianga, 2003; Cox, Jimenez, and Okrasa, 1997). These studies usually use OLS specifications. A few studies (Cox, 1987; Cox and Rank,1992) use net transfer measure with the US data. However, they define their measure of transfer as positive net transfer received, thus assigning a status of non-participants to net givers. They follow Cragg's (1971) two-part specification consisting of one equation for the decision to transfer (either probit or logit) and one selectivity-corrected OLS equation estimated on the sample with non-zero positive transfers. The rest of the literature uses the gross measure of transfers in either OLS or Tobit specifications with the data from the United States (McGarry and Schoeni, 1995; McGarry, 1999; Schoeni, 1997). Two papers by Lillard and Willis (1997) and Frankenberg, Lillard, and Willis (2002) stand apart from this classification. They both apply two-part models to study the gross measure of transfers given by respondents to their children and transfers received by respondents from their children in the context of Malasiya and Indonesia.

[1]Positive net transfers received and gross transfers received treat net givers and givers respectively as non-contributors to intergenerational exchange.

Several papers have footnotes or short comments about the choice of the transfer measure. For instance, Schoeni (1997) makes his choice based on the argument that a child (or a parent) can only make his/her own decision and cannot force the other party to make a transfer no matter how negative the desired amount of transfer may be. Cameron and Cobb-Clark (2002) provide a footnote where they mention that empirical estimation using a net measure of transfers does not give the same statistical power as estimation using a gross measure, thus explaining their choice of the gross measure.

What adds to the confusion about the appropriateness of gross versus net measure of transfers is the use of different measures by the same author(s). This can be illustrated by the following example. Cox and his coauthors (Cox, 1987; Cox and Rank, 1992; Cox, Eser, and Jimenez, 1997) mostly analyzed the positive net monetary transfer measure from parents to their adult children in a two-part specification.[2] However, Cox, Hansen, and Jimenez (1999) use the full net transfer measure for the analysis instead with no justification for the switch from the positive net transfer measure. A possible explanation for this may be related to the choice of an empirical approach. The authors estimate a regression with an endogenous spline. This task may not be technically feasible with a two-part model.

Another possible explanation for the observed pattern of the use of different measures of transfers and different econometric techniques may be the prevalence of participation in intergenerational exchange. With the low prevalence of exchange, the distribution of net monetary transfers possesses very undesirable features that create difficulties for econometric modeling and further estimation. So, the larger is the prevalence of exchange, as for example in developing countries,[3] the more likely it is that the net transfer measure will be used in the

[2]The word "elderly" is omitted here because these studies include a wide range of ages on the side of givers and the side of recipients.

[3]For example, 80% of Filipino households (Cox, Hansen, and Jimenez , 2004) 25-50% of Bangla and 70-79% of Indonesiona households (Frankenberg and Kuhn, 2004) are involved in intergenerational exchange, while this number varies from 15 to 25 % in the United States.

analysis. On the contrary, studies based on the Health and Retirement Study data (HRS), which has lower prevalence of non-zero transfers, usually rely on the gross measure of transfers and adopt either OLS or Tobit specifications (McGarry and Schoeni, 1995; McGarry, 1999; Schoeni, 1997; Pezzin and Schone, 2000; McGarry, 2003).[4]

1.2 Literature on the Wage Effect on Intergenerational Transfers

There are only five studies of the wage effects on intergenerational transfers that the author is familiar of (Sloan et al., 2002; Zissimopoulos, 2001; Ioannides and Kan, 1999; Sloan et al., 1997; Couch et al., 1999; Nizalova, 2006). All of them use data from the United States, but they differ in their choice of the transfer measure and their empirical approach. The studies that utilize data from the Panel Study of Income Dynamics (PSID) and the National Survey of Families and Households (NSFH) include much younger children than do those based on the Health and Retirement Study, thus the adjective "elderly" is omitted in this discussion. Table 2 contains a summary of these studies. It includes the estimated wage effects and the wage elasticities of monetary transfer calculated where possible.

Couch, Daly, and Wolf (1999), using data from the 1988 wave of the PSID, estimate a system of four Tobit equations for *gross* money transfer to parents, time transfer to parents, labor market time, and housework time simultaneously. Subsamples of coupled households, households headed by unmarried men, and households headed by unmarried women are considered separately. They find that a 1% increase in wages is associated with a 1.44% increase in the amount of money transfered by adult married males to their elderly parents, and a 2.44% increase in the gross money transfer to elderly parents originating from single females. The response to a 1% increase in female wages in a coupled household and in wages of single males is found to be about 0.4%.

Similar to Couch et al. (1999), **Ioannides and Kan (2000)** use PSID data but study

[4]A small share of non-zero transfers leads to noisy estimates in the second part of the model.

two-directional transfers using both univariate Tobit models and bivariate Probit models for different combinations of *gross* transfers to and from parents. They find that higher wages of children are associated with more money being transfered to parents and with less money being received from parents. However, the estimated effect on transfers received is not precise. As could be seen from Table 2 their estimates are quite modest in comparison to those from Couch et al. (1999).

Zissimopoulos (2001) studies the existence of a substitution between time and monetary transfers from the perspective of elderly parents. She estimates separate Tobit equations for *gross* monetary transfers measured in logarithms finding a small but significant positive effect of wages.

Sloan, Zhang, and Wang (2002) use a two-part model consisting of a logit for the probability of giving a transfer and OLS for the logarithm of the actual amount given to explain the decisions of adult children - HRS respondents. They find significant positive effect of wages on *gross* monetary transfers to elderly parents, at both extensive and intensive margins. The estimated elasticity at the extensive margin is quite high, making the overall wage elasticity estimate close to 3.

Finally, **Nizalova (2012)** uses data from the 1998 HRS wave and estimates OLS and a two-stage least squares model for *net* monetary transfers. This paper finds no evidence of positive effect of wages on net financial flows from adult children to their elderly parents. Moreover, the two-stage least squares estimate of the wage effect on the net monetary transfer given by female children is negative.

To summarize, the wage elasticity of gross transfers to elderly parents is always positive and in most cases statistically significant, but this is not found in studies that use the net transfer measure. The hypothesis explored in this paper is that the differences in the earlier results are mainly due to the choice of the transfer measure. Alternatively, those differences

may be explained by the data used or the choice of the empirical methods. Therefore, this study will focus on a single data set offering a new empirical approach which has a potential of reconciling theoretical arguments with the estimates from empirical literature.

2 Empirical Test

2.1 Data

The analysis in this paper relies on the data from the Health and Retirement Study (HRS). The Health and Retirement Study is a national longitudinal survey representing a rich source of information on the lives of older Americans, their health and economic status. It also includes extensive data on intergenerational transfers and characteristics of parents and children. The Study consists of people born in 1947 and earlier, totaling to more than 21000 respondents.[5]

The analysis covers the period 1992-2008 and focuses on HRS respondents with at least one living parent linked to the information on all living parents as a group. Information on transfers is taken from the next wave survey. Since transfer variables are based on a two-year recall period, this information is linked to the information on respondents and parents available at the previous wave. Thus it is assumed that individuals made transfer decisions during the wave i to *(i+1)* based on the information available at wave i (Sloan, Zhang, and Wang 2002). The analysis is implemented separately for men and for women. The samples contain 4041 males and 4462 females with 11,387 and 13,275 observations respectively. Table 3 presents summary statistics for the two samples. For details on sample restrictions see Nizalova (2012).

[5]HRS started in 1992 with the cohort of individuals born in 1931-1941, and AHEAD started in 1993 with the cohort of individuals born in 1923 and earlier. The survey of those cohorts continued every two years till 1998 when both surveys were combined into one and two other cohorts, Children of Depression Age (CODA) cohort born in 1924-1930 and War Babies (WB) cohort born in 1942-1947, were added.

2.2 Nonparametric Evidence

Figure 1 depicts the non-parametric estimation[6] of the wage effect on monetary transfers using different measures separately for men and women. The first and the second columns of the graph show that the association between the wage and the transfers differs depending on which measure of transfers is used. While the effect of wages on gross out-transfers is clearly positive for most of the wage range, it slopes negatively for the net out-transfer measure for a certain range of wages. Although the non-parametric analysis does not take into account many other factors it indicates the importance of being careful with the choice of the measure, as this choice may have important effects on the conclusions.

2.3 OLS Estimation Results

To supplement the non-parametric evidence, Table 4 presents the results from the multivariate OLS regressions.[7] As could be seen from columns (1)-(2) and (4)-(5), the estimates of the coefficients on wages differ depending on the measure of transfers used. This exercise suggests that the use of different transfer measures and not the use of different data sets (and/or different econometric techniques) is responsible for the differences found in the estimates of the wage effects. Up to this point, the objective has been to document the existence of the difference between the wage effects on net versus gross transfers, controlling for other possible contributors to the difference, such as the data set and the empirical specification. The next section is devoted to the discussion of possible sources of the difference in the estimates.

[6] Locally weighted smoothing (lowess) kernel estimator using the ksm routine in STATA with a bandwidth setting of 0.4.

[7] Justification for this specification including discussion of the control variables can be found in Nizalova (2012).

3 Possible Explanations for the Difference in the Wage Effects

As the previous section has shown, the difference in the estimated wage effects does seem to stem from the choice of the transfer measure. In this case two issues deserve investigation. On the one hand, net transfers and gross transfers may be totally different variables for each particular observation and this may be the primary reason for the differences in the results. On the other hand, the degree of possible inconsistency in two measures maybe different. As Wooldridge (2002, p.524) shows, the OLS estimates for censored outcome are inconsistent since the relationship between dependent and independent variables is non-linear.[8] Nothing is known about the possibility of inconsistency for the dependent variables similar to the net transfer measure, but by analogy one may suspect presence of inconsistency in these estimates as well. This section will consider these two issues in turn.

3.1 Transfer Pattern

The upper part of 3 describes the pattern of intergenerational transfers as observed in the HRS data. As can be seen, the transfer incidence is quite low - slightly more than 20% of individuals engage in intergenerational exchange of money with their parents.[9] Although the percentage of givers is higher than the percentage of recipients in the generation of adult children (13% versus 5%), conditional on the transfer status, the amount of money given is considerably smaller than the amount of money received (about $1500 versus $4700).

Another interesting observation in the transfer pattern is that less than 1% of individuals engage in both giving and receiving at the same time.[10] So for the majority of the participants

[8] Wooldridge also shows that the estimates are inconsistent by the same multiplicative factor, so that the relative effects can effectively be recovered from the regression.

[9] Prevalence of monetary transfers between younger children and their parents is somewhat higher and their pattern is different in HRS. For example, Ioannides and Kan (2000) numbers from the Panel Study of Income Dynamics are the following: 4.1% of children's households give monetary transfers and 22% receive them. However, the average age of children in the PSID is 36, while in the HRS it is about 55 years old. So, this age difference may explain the reverse pattern of transfers in the HRS compared to the PSID.

[10] This number would have been even smaller if the data were organized at the level of child-parent dyads as in some

in intergenerational exchange the actual magnitude of transfers is the same whether one considers the gross or the net measure. Then the only difference between the gross and the net measure of transfers is the way in which the net recipients are treated. When the gross measure is considered individuals who are receiving transfers from their parents are treated as non-participants in the process, while the net measure differentiates them from non-participants.

Assuming no overlap between gross givers and gross recipients (which is close to the observed pattern), it is possible to derive an algebraic relationship for the estimates of marginal effects and elasticities for the two transfer measures. Appendix A presents the calculations documenting this relationship. Intuitively, the relationship between the estimates of the wage effect on gross versus net transfers depends on the relationship between wages and transfers among the recipients. By replacing negative transfers with zeros the distribution of the dependent variable is suppressed. So, if higher wages are associated with less transfers being received by the recipients then the estimated coefficient on net transfers is larger in magnitude than the estimated coefficient on gross transfers, and then the latter represents the lower bound of the effect on net transfers. If, on the contrary, higher wages lead to higher transfers from parents, as in the case of the exchange motive, then the wage effect on gross transfers is smaller than that on net transfers. Finally, if there is no relationship between wages and transfers for recipients, then the estimated coefficients should be the same:

$$\beta_{Net} = \beta_{Gross} + \beta_{Neg} P(y < 0) \frac{Var(x|y < 0)}{Var(x)} \tag{1}$$

Also, as is obvious from the formula, the difference between the estimates depends on the relative variation in wages among the recipients and in the population as a whole: a larger

of the early studies on the topic. As the data in the current study links the information on an individual to the data on all related parents (including in-laws) as a group, this explains the existence of the small group of simultaneous givers and recipients.

spread of wages among the recipients increases the gap between the effects estimated for net versus gross transfers.

As the results in Table 4 confirm, the relationship between wages and transfers among recipients is different from that among givers. However, as mentioned earlier both estimates may have different asymptotic biases. The next subsection discusses the implications of that.

3.2 OLS Shortcomings

Although the OLS estimates approximate the effect of x on $E(y|x)$ when x is near its population mean (Wooldridge, 2002, p. 525) no matter what the distribution of y is, there exist two significant shortcomings that have implications for the parameter estimation. These shortcomings become especially important in the context of the net monetary transfers.

First, the distribution of net transfers has considerable concentration of mass on zero. The majority of the population chooses not to participate in intergenerational exchange of money and the OLS does not account for this fact. The other has to do with the nature of the net transfer measure. It is an outcome of the two processes of giving and receiving, and arguably it would be too restrictive to assume that both processes are governed by the same mechanism. However, the OLS imposes this restriction by assuming that the effects of explanatory variables are the same throughout the net transfer distribution.

Comparison of Columns (2) and (3) ((5) and (6) for females) in Table 4 confirms the possibility of the existence of different effects for different parts of the net transfer distribution. Some of the factors have the opposite effect on gross in-transfers when compared to gross out-transfers, leading to canceling out of the effect on net transfers. Others work in the same direction, amplifying the effect on net transfers. Focusing only on the factors that are statistically significant in at least one of the equations reveals the following. More educated individuals both give less and receive less. Both non-whites and hispanic give more and receive

less. Married males are giving less with no difference from the base group in terms of receving, while the opposite is true for women - they receive less with no effect of transfers given. Having more older children is associated with greater amount of money received from elderly parents. Number of siblings of the same sex reduces the transfers received from parents. The number of parents is associated both with more money given and more money received. Moreover, the greater is the share of mothers among living parents the greater is the amount of transfer given with no effect on those received. Parents' age and education increases the amount of transfer received for both men and women, having no effect on transfer given. This may be suggestive of the effect of certain factors on the decision to participate in exchange, not on the amount of transfers, as the estimates shown in Table 4 combine both effects at the extensive and at the intensive margin.

To summarize, the OLS results mask some of the features of the intergenerational exchange that may be important for understanding the reality. Taking into account all of the mentioned considerations, an empirical model that would overcome these difficulties should provide for the following: (i) the existence of the differential effect of wages on net transfers depending on whether it is a negative or a positive part of the net transfer distribution, (ii) the separation of the effect at the extensive and intensive margins. The next section will be devoted to an exploration of a four-part model as an alternative in estimating the wage effect on net monetary transfers.

4 Four-part Model as a More Flexible Estimation Strategy for the Analysis of Net Transfers

One of the possible models that possesses the features described in the previous section could be a variation combining two Cragg's (1971) two-part models. It consists of an equation(s) describing the decision to participate in exchange (either give or receive transfers) and two

separate OLS equations for the amount of positive net transfers given conditional on giver status and for the amount of negative net transfers conditional on recipient status.

4.1 Model Description

Assume that the transfer is determined in two stages. In the first stage an individual decides which transfer status to assume and then in the second stage the amount of the transfer is determined. There exist three possibilities $j = 1, 2, 3$ with one corresponding to a status of the net recipient, two to a status of the non-participant, and three to a status of the net giver. Adopting Dow and Endersby's (2004) approach, assume that an individual i's utility in case he/she chooses status j is U_{ij}. It is a function of both child's (X_i^C) and parent's (X_i^P) characteristics and its parameters may differ depending on the chosen status. Also, for simplification, this utility function can be thought of as a weighted sum of the utilities of both the child and the parent. Thus,

$$U_{ij} = \beta_j log\ w_i + (X_i^C, X_i^P)\gamma_j + \epsilon_{ij} \tag{2}$$

It is assumed that individuals are utility maximizers and after calculating values of the utility function in three different cases they choose the transfer status that gives them the highest utility. Therefore, the probability that the individual i will choose to be, for example, a net recipient is the following:

$$P_{i1} = P(U_{i1} > U_{i2}, U_{i1} > U_{i3}) \tag{3}$$

So, for any m in the transfer status set:

$$P_m = P\left[\epsilon_{im} - \epsilon_{ij} < (\beta_j log\ w_i + (X_i^C, X_i^P)\gamma_j) - (\beta_m log\ w_i + (X_i^C, X_i^P)\gamma_m), j \neq m\right] \tag{4}$$

It is assumed that the errors are distributed multivariate normal with mean zero and a symmetric covariance matrix.

Although this model has its own important limitations, like, for example, the assumption of a multivariate normal distribution of errors, it offers several significant advantages for the study of net monetary transfers. First of all, it tackles the highly skewed distribution of net transfers by disaggregating analysis into several pieces. This strategy has a potential of producing more consistent results by allowing for non-linearity of the effects. Second, by separating the intensive and extensive margins it sheds some light on where the effect of the wage change comes from: whether more people quit taking money from their parents and start giving back to them or whether those people who are already providing financial assistance start to transfer larger amounts. A third advantage is that it allows for heterogeneous effects. For example, people with certain characteristics (e.g. more or less educated, married, or those having more parents) are simply more likely to participate in any exchange (either giving or receiving). Finally, it does allow for differences in the parameters depending on the transfer status. All the listed advantages bring a better understanding of how the net transfers are determined and thus may provide further guidance for theoretical modeling.

4.2 Results

Tables 5–6 show the results from the estimation of a four-part model which is a combination of two Gragg's (1971) double-hurdle models for out-transfers and in-transfers.

As could be seen from the results on out-transfer status for males (see Columns (1) and (3) in Table 5), wages have unambiguously positive effect on the probability of being a net giver and negative effect on the probability of being a net recipient. At the same time the amount of the transfer given is not affected by wages in a statistically significant way, while the amount of transfer received for the net recipients is positive and significant (see Columns (2) and (4)

in Tables 5). For females (see Table 6) the situation is qualitatively similar, although the relationship between wages and the in-transfer both at the extensive and intensive margins is a only significant at 10% level.

An interesting feature is that some of the variables have similar effects on both net recipient and net giver status, thus affecting the probability of engagement in any exchange. Wealthier males are more likely to be involved in exchange, as are those with greater number of parents, especially in case they have parents who are single. The latter applies to females as well.

Table 7 summarizes the elasticities from the four-part model at the extensive and intensive margins for net recipients and net givers. They correspond to four parts of the following equation[11]:

$$\begin{aligned} \frac{\partial E(y|x)}{\partial x_j} &= \frac{\partial P(y<0|x)}{\partial x_j} * E(y|x, y<0) + P(y<0|x) * \frac{\partial E(y|x,y<0)}{\partial x_j} + \\ &+ \frac{\partial P(y>0|x)}{\partial x_j} * E(y|x, y>0) + P(y>0|x) \frac{\partial E(y|x,y>0)}{\partial x_j} \end{aligned} \tag{5}$$

In terms of the wage elasticities, the lower part in Table 7 shows the estimates of the wage elasticity at the extensive and intensive margin as well as those for net givers and net recipients. The overall elasticity of net monetary transfers with respect to wages is given by the following formula:

$$\begin{aligned} \epsilon_{net} &= (\epsilon_{NegExt} + \epsilon_{Neg}) * \frac{P(y<0|x) * E(y|x,y<0)}{E(y|x)} + \\ &+ (\epsilon_{PosExt} + \epsilon_{Pos}) * \frac{P(y>0|x) * E(y|x,y>0)}{E(y|x)}, \end{aligned} \tag{6}$$

where $NegExt$ and $PosExt$ refer to the elasticity for negative transfers and positive transfers respectively at the extensive margin.

Table 7 shows the decomposition of the marginal effects and elasticities for a 1% increase in wages at both extensive and intensive margins. Estimates in this table imply that the overall wage effect is to a great extent coming from the changes in the transfer status: higher wages

[11] Derivation of the marginal effect and the elasticity for the net monetary transfers is given in Appendix B.

induce more individuals to quit the net recipient status and convert to the net givers status by either increasing their own monetary transfer to parents or receiving less money from parents. At the same time, there is no effect on the intensive margin of net givers status, while the effect on the intensive margin of net recipents is positive, which goes in line with the exchange motive discussed earlier.As the upper panel in Table 7 shows, the overall wage elasticity of net transfers calculated using results from the four-part model is smaller in magnitude than the one calculated from the OLS results.

5 Implications for Further Theoretical Development

As the above empirical analysis suggests, explaining net monetary transfers in a theoretical model is not a trivial exercise. This section will consider the theory used to model time and monetary transfers between adult children and their elderly parents. Then a sketch of a theoretical model based on the results from the previous section will be offered.

Discussion of the existing model

Three of the five studies reviewed earlier build their analysis on a theoretical model of informal care and monetary transfers from adult children to elderly parents (Nizalova, 2012; Zissimopoulos, 2001; Sloan et al., 2002[12]) with slight modifications.

It is a simple model that involves a giver and a recipient, with an adult child assumed to be a giver and an elderly parent a recipient. The giver obtains utility from own consumption, leisure, and utility of the recipient. The giver's time endowment is allocated between care, work, and leisure; and his/her labor and non-labor income is spent on consumption goods and monetary transfers to the recipient. Monetary transfers can be positive as well as negative. Utility of the recipient, in turn, depends on own consumption and care, which is produced

[12]Sloan, Zhang, and Wang (2002) assume non-negative transfer from children to their parents in the theoretical model.

with only the input of time of other people (market-purchased time or time provided by the giver), and is subject to the budget constraint.

In this model a non-negativity constraint is not placed on the amount of monetary transfers. So, monetary transfer can be thought of as an auxiliary mechanism equalizing the marginal utility of consumption of the giver to that of the recipient after all other decisions have been made. The likelihood of observing positive net transfer from an adult child to his/her elderly parent is greatest when the time in caregiving is zero. This happens when the wage rate is higher than the price of formal care adjusted for the differences in productivity of hired help compared to that of an informal care giver. As the wage rate decreases, the model predicts more time devoted to care giving, and thus a smaller monetary transfer from the giver to the recipient to adjust for the differences in marginal utilities of consumption. As the wage rate decreases further, the time in caregiving increases and net monetary transfer decreases. This potentially leads to a reversal of the net monetary flow, i.e. to the negative net monetary transfer. Some individuals would essentially be paid for their caregiving services to parents when their wages are too low and/or their productivity in caregiving is too high compared to the price of formal care.

The decision to participate in intergenerational exchange as well as the amount of transfers received is solely governed by the comparison of the productivity adjusted wages with the price of formal care faced by an individual. No utility is derived directly from time or money transfers given or received. For instance, parents' preferences for caregiving may be biased towards the provision of informal care (e.g., when the parents place additional value on the time spent with their own children rather than with a stranger). This may actually make parents give more money to their children to induce caregiving as the children's cost of time increases.

Although this approach presents a simple way of modeling net transfers and allows for the

existence of negative net monetary transfers, it has some important limitations. First of all, the major criticism is that there is no mechanism in place for the parent to be willing to make a transfer. As the child makes all the decisions, he/she cannot force the parent to provide the money no matter how negative the desired monetary transfer may be. Another limitation is that it does not explain the existing pattern of transfers, in particular, the mass at zero in the distribution of net transfers is not explained by the model. Finally, it treats net transfer as being a single choice while it is actually a variable that describes an outcome of the two processes originating from two parties. Hence, it is not capable of explaining the heterogeneous effect of wages on transfers in the subpopulations of net givers and net recipients.

The simplest way to incorporate the high concentration of probability mass on zero into a theoretical model is to allow for fixed costs of monetary transactions and/or of providing informal care. Low liquidity of assets may explain the low probability of observing close to zero transfers in theory. However, this will not ensure either the mechanism for the parent to be willing to make a transfer or the differences in the wage effects for net givers and net recipients. Another possibility would be to use a bargaining model. Failure to reach a mutually beneficial agreement on the amount of time and monetary transfers would explain in this case the high probability of observing zeros in the empirical data (e.g. divorce threat or separate spheres type bargaining model), and at the same time may allow for the heterogeneous wage effects.

Sketching a new theoretical model

Although the development of a theoretical model is not the focus of the current paper, a sketch of a model that potentially describes the existence of the documented transfer pattern and the relationships between wages and net transfers estimated is presented here. The model suggested is an extension of a bargaining model to a two-stage decision-making process. At first it is decided which roles with respect to monetary transfer the parties will assume. The

outcome of this stage would be to assign the status of either a giver, or a recipient[13], or neither. The choice of a transfer status defines "separate spheres" (Lundberg and Pollak, 1993): only the giver is unilaterally deciding on the amount of monetary transfer. Separate spheres bargaining seems a more natural way to model an adult child-parent relationship since the "divorce" option does not seem credible between the two. In this type of bargaining models a solution to the noncooperative game is used as a threat point in the cooperative game.

The preferences of an adult child are represented by a utility function $U^C(X_C, l_C, U^P)$, where X_C is the child's consumption, l_C = leisure, and U^P = utility of the parent. The preferences of the parent are to some extent symmetric with the only difference being that the recipient requires care produced with the help of other people: $U^P(X_P, Z_P, U^C)$, where X_P is consumption, and Z_P is care. The following equations represent the time and budget constraints as well as the production function for care:

$$X_C = I_C + wt_w - (D_C - D_P), \tag{7}$$

$$X_P + p_t t_m = I_P + D_C - D_P, \tag{8}$$

$$t_g + t_w + l_C = T \tag{9}$$

$$Z_P = \gamma t_m + Z^P(t_g), \tag{10}$$

where t_w is working time, t_g = time provided by the child to the parent, w = the child's hourly wage rate, p_t = price of market-purchased time t_m; I_C, I_P = the child's and parent's non-labor income respectively. Note that the net transfer is modeled as an outcome of the two processes here to allow for the differences in the determinants of positive versus negative

[13]Remember that the transfer pattern suggests that the net and gross monetary transfer are only different in magnitude for less than 1% of the population, i.e. for the most part a giver is the same as a net giver, and a recipient is not different from a net recipient.

transfers: D_C = transfer from the adult child to the elderly parent, and D_P = transfer from the elderly parent to the adult child.

If the child has the status of a giver (which means that there is no monetary transfer from the parent), in a noncooperative game he/she is deciding unilaterally on the amount of money transfered to parents and the amount of time provided, taking into account the amount of help purchased by the parent in the market. In this case the parent is assigned the status of a recipient and decides unilaterally on the amount of formal care purchased from the market. If instead the child is assigned the status of a recipient and the parent that of a giver, then the child is deciding unilaterally only on the amount of time transfer, and the parent is deciding unilaterally on the amount of money transfer and the amount of market-purchased help taking as given the child's informal care provision. If they are deciding not to participate in any kind of monetary exchange, then the child is only deciding on the amount of informal care provided, and the parent is deciding on the amount of formal care purchased. In either case, Cournot equilibrium will produce the indirect utility functions T^G and T^R that are then considered as threat points in the cooperative Nash bargaining framework:

$$max(U^G - T^G)(U^R - T^R) \tag{11}$$

To connect this theoretical model with an empirical four-part model described earlier, suppose $U_{ij} = max(U^G_{ij} - T^G_{ij})(U^R_{ij} - T^R_{ij})$ is a Nash social welfare function evaluated at the optimal allocation for the adult child - elderly parent pair i under the j's assignment of transfer status. j can take values of different transfer status as described in Section 4. The model is solved backwards. First, the parties calculate the product of their utility surpluses over the separate spheres outcomes for different assignments of monetary transfer status. After that they compare the corresponding values of the Nash social welfare function and choose the assignment of transfer status that produces the maximum welfare.

As could be seen, the model allows for a separate decision rule at the extensive versus intensive margin by modeling the choice of transfer status explicitly. After the decision on the transfer status is made, the amount of the transfer is chosen by the giver accounting for both the giver's and the recipient's characteristics. This allows for a possibility of heterogeneous effects for negative and positive parts of the net transfer distribution.

Conclusions

This paper has undertaken a systematic evaluation of the choice of the net versus gross measure of monetary transfers in intergenerational exchange. The main finding is that the results of the empirical analysis are very sensitive to the choice of the transfer measure and thus this matter calls for special attention in the analysis design. It is shown that the wage effect is much larger in magnitude when estimated using the gross measure of transfers compared to the net measure of transfers. This happens mostly because net recipients are treated as non-participants in exchange, and the wage effect is different for that part of the population.

To relax the restrictions placed on the analysis by the OLS specification, an alternative four-part empirical model is proposed to analyze the effect of wages on net monetary transfers. This model allows for a separate treatment of the transfers at the extensive and intensive margins as well as for the differences in the process of giving compared to that of receiving. It consists of two Gragg's double-hurdle models. The estimates of the wage effects at the intensive margin show that conditional on net giving status wages do not affect the amount of money transferred to their parents. At the same time, conditional on net receiving status, high wage individuals tend to receive more money from their parents.

Combining the estimates of the wage effects from all the parts of the model allows for a comparison with the OLS estimates using net monetary transfers. It appears that the OLS in general overestimates the marginal effect of wages on net monetary transfers. Most of the

effect stems from the extensive margin: as their wages go up individuals are more likely to stop getting money from their parents and more likely to start giving money to their parents. There is also a significant positive effect of wages on transfers received from to parents among the net recipients with that being small in magnitude and statistically insignificant among the net givers. In addition to providing more consistent estimates of the wage effects, the estimation of the four-part model uncovers other important features of the underlying processes: some of the characteristics have similar effects on both probability of being a net recipient and probability of being a net giver, which can be interpreted as a probability of participation in intergenerational exchange. Among these are wealth (wealthier male children are both more likely to get transfers and more likely to give transfers), the number of parents (more parents living - more chances to either giver or receive), and an indicator for having a single parent. Overall, empirical findings suggest that the theoretical models used to explain transfers in the literature on the wage effects on intergenerational exchange do not fully describe the reality. Therefore, this paper concludes with an outline of a new theoretical model that is potentially capable of explaining the documented patterns and relationships. The model suggested in the paper is a two-stage game-theoretic model based on the Lundberg and Pollak's (1993) separate spheres bargaining framework.

References

Altonji, J. G., F. Hayashi, and L. J. Kotlikoff. 2000. The effects of income and wealth on time and money transfers between parents and children. *in A. Mason and G. Tapinos (eds.), Sharing the Wealth: Intergenerational Economic Relations and Demographic Change.* New York and Oxford: Oxford University Press

Cameron, L. and Deborah Cobb-Clark. 2001. Old-Age Support in Indonesia: Labor Supply, Intergenerational Transfers and Living Arrangements. *Australian National University - Center for Economic Policy* Papers 429

Baker, Michael and Dwayne Benjamin. 1999. How Do Retirement Tests Affect the Labour Supply of Older Men? *Journal of Public Economics* 71(1): 27-52

Burtless, Gary and Robert A. Moffitt. 1984. The Effect of Social Security Benefits on the Labor Supply of the Aged in *Retirement and Economic Behavior*, Edited by H. Aaron and G. Burtless. Washington: The Brookings Institution.

Couch, Kenneth, Mary Daly, and Douglas Wolf. 1999. Time? Money? Both? The Allocation of Resources to Older Parents. *Demography* v36, n3: 219-232

Cox, Donald, 1987. Motives for Private Income Transfers. *Journal of Political Economy* vol. 95(3), pages 508-46

Cox, Donald, Zekeriya Eser, and Emmanuel Jimenez. 1998. Motives for private transfers over the life cycle: An analytical framework and evidence for Peru *Journal of Development Economics* vol. 55(1), pages 57-80

Cox, Donald, Bruce E. Hansen, and Emmanuel Jimenez. 2004. How responsive are private transfers to income? Evidence from a laissez-faire economy. *Journal of Public Economics* vol. 88(9-10), pages 2193-2219

Cox, Donald, Emmanuel Jimenez, and Wlodek Okrasa. 1997. Family Safety Nets and Economic Transition: A Study of Worker Households in Poland. *Review of Income and Wealth* vol. 43(2), pages 191-209

Cox, Donald and Mark Rank. 1992. Inter-vivos Transfers and Intergenerational Exchange. *The Review of Economics and Statistics* vol. 74(2), pages 305-14

Cragg, J. 1971. Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods. *Econometrica* 39: 829-44

Dow, Jay and James Endersby. 2004. Multinomial Probit and Multinomial Logit: A Comparison of Choice Models for Voting Research. *Electoral Studies* 23: 107-22

Frankenberg, Elizabeth and Randall Kuhn. 2004. The Role of Social Context in Shaping Intergenerational Relations in Indonesia and Bangladesh. *In M. Silverstein (ed.), Intergenerational Relations Across Time and Place: Annual Review of Gerontology and Geriatrics, Vol. 24. New York: Springer*

Frankenberg, Elizabeth, Lee Lillard, and Robert J. Willis. 2002. Patterns of Intergenerational Transfers in Southeast Asia. *Journal of Marriage and Family* 64, p. 627-41

Friedberg, Leora. 2000. The Labor Supply Effects of the Social Security Earnings Test. *The Review of Economics and Statistics* 82(1): 46-63

Gruber, Jonathan and Peter Orszag. 1999. What to do About the Social Security Earnings Test. *Center for Retirement Research, Boston College.*

Haider, Steven and David Loughran. 2005. Do the Elderly Respond to Taxes on Earnings? Evidence from the Social Security Retirement Earnings Test. *Unpublished manuscript.* Accessed at http://www.msu.edu/ haider on 06/19/2005

Ioannides, Yannis and Kambon Kan. 1999. The Nature of Two-Directional Intergenerational Transfers of Money and Time: An Empirical Analysis. *Tufts University Discussion Paper 99-17*

Kazianga, Harounan. 2004. Motives for Household Private Transfers in Rural Burkina Faso Forthcoming *Journal of Development Economis*

Kuhn, Randall and Steven Stillman. 2004. Understanding Interhousehold Transfers in a Transition Economy: Evidence from Russia. *Economic Development and Cultural Change* 53(1): 131-156

Lillard, L. E., and R. J. Willis. 1997. Motives for intergenerational transfers: evidence from Malaysia. *Demography* vol. 34, No. 1 (February), pp. 115-134

Lundberg, Shelly and Robert Pollak. 1993. Separate Spheres Bargaining. *Journal of Political Economy* Vol. 101, No. 6 (December), pp. 988-1010

McGarry, Kathleen. 1999. Inter vivos Transfers and Intended Bequests. *Journal of Public Economics* 73 (3):321-351

McGarry, Kathleen. 2003. Dynamic Aspects of Familial Transfers (formerly entitled, Testing Parental Altruism: Implications of a Dynamic Model) submitted to *Economic Journal*

McGarry, Kathleen and Robert F. Schoeni. 1995. Transfer Behavior in the Health and Retirement Study: Measurement and the Redistribution of Resources within the Family. *The Journal of Human Resources* 30 : s184-s226

Nizalova, Olena. 2006. The Wage Elasticity of Informal Care Supply: Evidence from the Health and Retirement Study. *Unpublished manuscript*

Pezzin, L. E. and B. S. Schone. 2000. Examining the motives for intergenerational transfers: A new test based on siblings behavior. *Johns Hopkins University School of Medicine, Baltimore, Maryland* Mimeo

Schoeni, Robert F. 1997. Private Interhousehold Transfers of Money and Time: New Empirical Evidence. *Review of Income and Wealth* vol. 43(4), pages 423-48

Sloan Frank A., Gabriel Picone, and Thomas J. Hoerger. 1997. The Supply of Children's Time to Disabled Elderly Parents. *Economic Inquiry* v.XXXV: 295-308

Sloan, Frank, Harold Zhang, and Jingshu Wang. 2002. Upstream Intergenerational Transfers. *Southern Economic Journal* v69, n2: 363-80

Zissimopoulos, Julie. 2001. Resource Transfers to the Elderly: Do Adult Children Substitute Financial Transfers for Time Transfers? *RAND Working Paper 01-05*

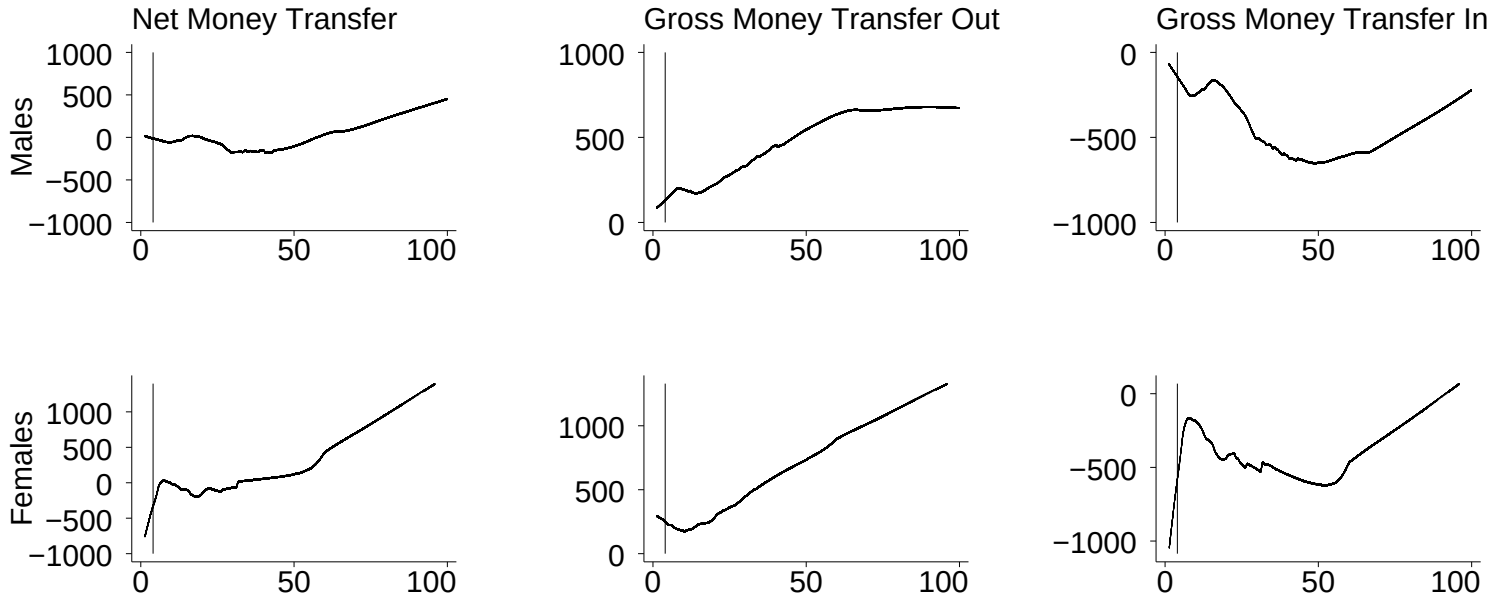

Figure 1: Monetary Transfers by Hourly Wage Rate

Table 1: Examples of Monetary Transfer Measures Used in Empirical Research

Unit of analysis - adult child:		
1. Gross Transfer received	y>0	Actual amount of transfer received for those who received any money from parents
	y=0	Zero transfer for those who: – neither gave nor received any money – gave money to parents, but did not receive any money
2. Gross Transfer given	y>0	Actual amount of transfer given for those who gave any money to parents
	y=0	Zero transfer for those who: – neither gave nor received any money – received money from parents, but did not give any money
3. Positive Net Transfer received	y>0	Transfers received minus transfers given, for those who received more than gave
	y=0	Zero transfer for those who: – neither gave nor received any money – those who gave more money to parents than received from parents
4. Net Transfer received	y>0	Transfers received minus transfers given, for those who received more than gave
	y=0	Zero transfer for those who: – neither gave nor received any money – gave exactly the same amount of money to parents as was received from parents
	y<0	Transfers given minus transfers received, for those who gave more than received
5. Net Transfer given		Is the opposite of net transfer received

Table 2: Summary of the Studies of Wage Effect on Monetary Transfers

	Wage Effect		Wage Elasticity		Uncensored	
Couch et al. (1999), 1988 PSID, Children HHs, gross						
Linear-log simultaneous Tobit	Married couples	Single	Married couples	Single	Married couples	Single
male	1994**	1075+	1.17**	0.40+	4.57%	3.72%
female	722+	1309**	0.42+	2.44**		3.69%
Zissimopoulos (2001), 1994 HRS, Parents' HHs, gross						
Log-log separate Tobit	Has sibling	No sibling	Has sibling	No sibling		
from any child	0.28*		0.04*		15.00%	
from male child	0.33	0.56	0.05	0.09	16.00%	
from female child	0.15	0.12	0.02	0.02	15.00%	
Sloan et al. (2002), 1992 HRS, Children, gross						
Cragg's two-part	Probit	OLS	Extensive	Intensive		
from any child	0.27**	0.27**	2.60	0.27	11.00%	
Ioannides and Kann (1999), 1988 PSID, Children HHs, gross						
Separate Tobit						
Given:						
Husband wage	49*		0.33*		4.10%	
Wife wage	63*		0.17*			
Received:						
Husband wage	-21		-0.11		22.41%	
Wife wage	-10		-0.02			
Nizalova (2012), 1998 HRS, Children, net						
Linear-log						
males						
OLS			0.30			
IV			3.00			
females						
OLS			1.59			
IV-1			-19.85+			

Table 3: Sample Description, HRS, 1992-2008

	Males			Females		
Variable	Mean	SD	Median	Mean	SD	Median
Number of cases	11,387			13,275		
Transfers:						
Recipients	6.09%			6.53%		
Net recipients	5.95%			6.29%		
Givers	15.35%			15.15%		
Net givers	15.18%			15.00%		
Net Transfer	-66.89	(3775.74)		-56.28	(3734.28)	
Gross unconditional received	-359.86	(3496.74)		-343.10	(3414.16)	
Gross conditional received	-5782.68	(12820.33)	-2094.36	-5121.39	(12183.12)	-1579.78
Gross unconditional given	292.97	(1504.97)		286.82	(1499.19)	
Gross conditional given	1865.53	(3379.12)	871.66	1858.53	(3397.27)	871.66
Net unconditional received	-349.85	(3448.94)		-333.77	(3399.72)	
Net conditional received	-5856.39	(12891.73)	-2145.06	-5282.76	(12475.28)	-1778.65
Net unconditional given	282.96	(1470.71)		277.49	(1483.76)	
Net conditional given	1863.53	(3352.18)	871.66	1857.54	(3420.17)	871.66
Income:						
Non-labor income ($1K)	10.95	(39.86)		14.48	(45.92)	
HH wealth ($100K)	3.35	(6.13)		3.56	(7.60)	
Hourly wage rate	24.25	(14.80)		17.98	(10.90)	
Other characteristics:						
Age	57.12	(4.99)		54.48	(5.51)	
Education	13.04	(3.16)		13.19	(2.60)	
If non-white	14.43%			17.66%		
If hispanic	10.06%			8.05%		
If married	91.90%			79.22%		
If poor health	13.28%			11.53%		
Number of children (0-5)	0.05	(0.27)		0.05	(0.27)	
Number of children (6-18)	0.30	(0.69)		0.26	(0.64)	
Number of own sisters	1.49	(1.49)		1.56	(1.57)	
Number of own borthers	1.45	(1.47)		1.49	(1.44)	
Number of spouse's sisters	1.43	(1.56)		1.15	(1.45)	
Number of spouse's brothers	1.39	(1.44)		1.11	(1.41)	
Parents' characteristics:						
Number of living parents	1.66	(0.80)		1.59	(0.76)	
Maximum age	81.81	(6.63)		81.88	(6.50)	
Percent of mothers	73.49%			74.11%		
Parents' education	11.95	(3.40)		11.93	(3.23)	
If at least one parent						
- single	77.77%			76.94%		
- needs care	28.26%			27.01%		
- cannot be left alone	18.63%			17.41%		
- homeowner	74.97%			73.65%		
- poorer	44.13%			41.37%		
- richer	41.08%			41.76%		

Table 4: Results from OLS Estimation

	Males			Females		
	(1) OLS-NGive	(2) OLS-GGive	(3) OLS-GRec	(4) OLS-NGive	(5) OLS-GGive	(6) OLS-GRec
Log wage	0.2754**	0.1301*	-0.1309**	0.3629**	0.2700**	-0.0815+
	(0.0814)	(0.0613)	(0.0494)	(0.0803)	(0.0625)	(0.0473)
Age	0.0128	0.0589	0.0432	0.0879	0.0226	-0.0691
	(0.0880)	(0.0740)	(0.0473)	(0.0812)	(0.0600)	(0.0520)
Age sq	0.0001	-0.0004	-0.0005	-0.0007	-0.0002	0.0005
	(0.0008)	(0.0006)	(0.0004)	(0.0007)	(0.0005)	(0.0005)
Educ	0.0174	-0.0721	-0.1064**	-0.1381	-0.2056*	-0.0770**
	(0.0609)	(0.0543)	(0.0245)	(0.0902)	(0.0848)	(0.0258)
Educ sq	0.0003	0.0051*	0.0055**	0.0051	0.0095**	0.0047**
	(0.0026)	(0.0022)	(0.0013)	(0.0036)	(0.0032)	(0.0013)
Non-labor inc	0.0027*	0.0024*	-0.0003	0.0010	0.0013+	0.0002
	(0.0012)	(0.0010)	(0.0005)	(0.0008)	(0.0007)	(0.0004)
HH wealth	0.0079	0.0160*	0.0077	0.0022	0.0004	-0.0012
	(0.0093)	(0.0068)	(0.0050)	(0.0043)	(0.0038)	(0.0019)
Nwhite	0.9998**	0.7522**	-0.2394**	0.6197**	0.4897**	-0.1332*
	(0.1271)	(0.1149)	(0.0470)	(0.1142)	(0.0968)	(0.0572)
Hisp	0.6440**	0.4753**	-0.1572**	0.6450**	0.6302**	-0.0371
	(0.1728)	(0.1607)	(0.0559)	(0.1904)	(0.1719)	(0.0701)
Married	-0.3104*	-0.3796**	-0.0801	0.2232*	-0.0784	-0.3247**
	(0.1472)	(0.1296)	(0.0853)	(0.1107)	(0.0858)	(0.0662)
Poor health	-0.0069	0.0406	0.0520	-0.0710	0.0845	0.1645**
	(0.1004)	(0.0801)	(0.0576)	(0.1052)	(0.0844)	(0.0590)
Children (0–5)	-0.1143	-0.0376	0.0835	0.0154	-0.0310	-0.0397
	(0.1293)	(0.0927)	(0.0825)	(0.1083)	(0.0919)	(0.0561)
Children (6–18)	-0.1533*	-0.0320	0.1166**	-0.1228+	-0.0113	0.1015*
	(0.0675)	(0.0513)	(0.0400)	(0.0652)	(0.0487)	(0.0407)
N of own sis	-0.0388	-0.0311	0.0098	0.0632*	-0.0008	-0.0510**
	(0.0281)	(0.0221)	(0.0152)	(0.0250)	(0.0208)	(0.0121)
N of own bro	0.0514+	0.0228	-0.0270+	0.0099	-0.0128	-0.0206
	(0.0268)	(0.0223)	(0.0138)	(0.0271)	(0.0224)	(0.0138)
N of spouse sis	0.0115	-0.0176	-0.0275*	-0.0105	0.0042	0.0197
	(0.0270)	(0.0221)	(0.0136)	(0.0277)	(0.0226)	(0.0146)
N of spouse bro	0.0052	0.0026	0.0002	0.0247	0.0168	-0.0091
	(0.0311)	(0.0252)	(0.0159)	(0.0292)	(0.0246)	(0.0141)
N of parents	0.2854**	0.3605**	0.0725*	0.2085**	0.2918**	0.0849*
	(0.0621)	(0.0469)	(0.0367)	(0.0625)	(0.0466)	(0.0367)
Mothers/parents	0.2108+	0.2918**	0.0499	0.2833*	0.3428**	0.0369
	(0.1190)	(0.0862)	(0.0772)	(0.1119)	(0.0799)	(0.0753)
Parents' age	-0.0137*	-0.0052	0.0076*	-0.0088	0.0022	0.0096*
	(0.0067)	(0.0056)	(0.0036)	(0.0068)	(0.0055)	(0.0038)
Parents' educ	-0.0619**	-0.0140	0.0437**	-0.0506**	-0.0064	0.0444**
	(0.0168)	(0.0139)	(0.0080)	(0.0158)	(0.0128)	(0.0083)

Continued on next page

Table 4 – Continued

	Males			Females		
	(1) OLS-NGive	(2) OLS-GGive	(3) OLS-GRec	(4) OLS-NGive	(5) OLS-GGive	(6) OLS-GRec
At least one parent						
- single	0.2178*	0.3229**	0.1104+	0.1486+	0.2837**	0.1480**
	(0.0945)	(0.0706)	(0.0575)	(0.0873)	(0.0668)	(0.0524)
- needs care	0.0447	-0.0174	-0.0586	0.0251	0.0068	-0.0297
	(0.0892)	(0.0735)	(0.0459)	(0.0857)	(0.0694)	(0.0466)
- cannot be	0.0740	0.1054	0.0193	-0.0068	-0.0029	0.0188
left alone	(0.0981)	(0.0797)	(0.0511)	(0.0913)	(0.0733)	(0.0499)
- homeowner	-0.0436	0.0117	0.0492	0.0185	0.0415	0.0276
	(0.0957)	(0.0814)	(0.0448)	(0.0897)	(0.0745)	(0.0461)
- poorer	0.8224**	0.7197**	-0.1096*	0.8435**	0.6969**	-0.1552**
	(0.0828)	(0.0671)	(0.0434)	(0.0798)	(0.0668)	(0.0397)
- richer	-0.9860**	-0.4509**	0.5021**	-1.0081**	-0.4896**	0.4862**
	(0.0851)	(0.0636)	(0.0525)	(0.0805)	(0.0590)	(0.0495)
Observations	11,387	11,387	11,387	13,275	13,275	13,275
R-squared	0.0956	0.0875	0.0570	0.0929	0.0819	0.0555

Notes: 1.Sample includes working, non-self-employed individuals who have at least one parent (or parent-in-law for married individuals) alive. For the details on the construction of the sample see Nizalova (2012). Additional covariates include year dummies. Standard errors are cluster robust. 2. OLS-GGiv refers to gross out-transfers and OLS-GRec – to gross in-transfers the HRS respondents give to or receive from their elderly parents respectively. 3. Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%.

Table 5: Double Craggs Model Estimates, Males 1992-2008

	Craggit-Out Transfer		Craggit-In Transfer	
	(1)	(2)	(3)	(4)
	P(Give)	Amount	P(Receive)	Amount
Predicted P(outcome)	0.1290		0.0395	
Log wage	0.0842*	0.0677	-0.1615**	0.2624**
	(0.0400)	(0.0498)	(0.0485)	(0.0935)
Age	0.0598	-0.0709	0.0740	0.1671
	(0.0534)	(0.1008)	(0.0632)	(0.1707)
Age squared	-0.0005	0.0006	-0.0008	-0.0013
	(0.0005)	(0.0009)	(0.0006)	(0.0015)
Education	-0.0369	-0.0811*	-0.0367	0.0855
	(0.0305)	(0.0340)	(0.0484)	(0.1388)
Education squared	0.0028*	0.0044**	0.0029	-0.0013
	(0.0013)	(0.0015)	(0.0019)	(0.0054)
Non-labor income	0.0010*	0.0011*	-0.0004	0.0007
	(0.0004)	(0.0005)	(0.0006)	(0.0023)
Total hh wealth	0.0061*	0.0087*	0.0051+	0.0255**
	(0.0027)	(0.0036)	(0.0031)	(0.0081)
If non-white	0.4255**	0.1396*	-0.3749**	-0.5884*
	(0.0578)	(0.0678)	(0.0908)	(0.2720)
If hispanic	0.2891**	0.0323	-0.3687**	-0.6149*
	(0.0853)	(0.0922)	(0.1282)	(0.2437)
If married	-0.2455**	-0.1861+	-0.0994	0.1020
	(0.0816)	(0.0951)	(0.0967)	(0.1833)
If poor health	0.0200	0.0774	0.0792	-0.0903
	(0.0542)	(0.0671)	(0.0768)	(0.1760)
Children (0-5)	0.0118	-0.2390**	0.0931	0.0896
	(0.0614)	(0.0601)	(0.0843)	(0.1876)
Children (6-18)	-0.0207	0.0014	0.1094**	0.0978
	(0.0319)	(0.0323)	(0.0325)	(0.0680)
N of own sis	-0.0107	-0.0558**	0.0018	0.0111
	(0.0140)	(0.0170)	(0.0205)	(0.0403)
N of own bro	0.0173	-0.0284	-0.0296	-0.0615
	(0.0141)	(0.0193)	(0.0200)	(0.0396)
N of spouse sis	-0.0073	-0.0200	-0.0414*	-0.0316
	(0.0141)	(0.0184)	(0.0209)	(0.0384)
N of spouse bro	0.0053	-0.0147	-0.0023	0.0222
	(0.0157)	(0.0210)	(0.0199)	(0.0441)

Continued on next page

Table 5: Double Craggs Model Estimates, Males 1992-2008

	Craggit-Out Transfer		Craggit-In Transfer	
	(1)	(2)	(3)	(4)
	P(Give)	Amount	P(Receive)	Amount
Number of parents	0.2366**	0.1242**	0.0704*	0.0283
	(0.0289)	(0.0406)	(0.0348)	(0.0739)
Mothers/parents	0.2270**	0.2183*	0.0359	0.1901
	(0.0704)	(0.0939)	(0.0874)	(0.1681)
Parents' age	-0.0037	0.0000	0.0100*	0.0159
	(0.0036)	(0.0045)	(0.0044)	(0.0104)
Parents' education	-0.0073	0.0056	0.0547**	-0.0011
	(0.0083)	(0.0105)	(0.0107)	(0.0214)
If at least one parent				
single	0.2295**	0.0040	0.1247*	-0.0462
	(0.0536)	(0.0722)	(0.0617)	(0.1466)
needs care	0.0075	-0.0024	-0.0782	-0.0316
	(0.0449)	(0.0564)	(0.0576)	(0.1262)
cannot be left alone	0.0541	0.1644*	-0.0310	0.2823+
	(0.0471)	(0.0639)	(0.0620)	(0.1480)
homeowner	-0.0089	0.0537	0.0846	0.2688+
	(0.0489)	(0.0581)	(0.0655)	(0.1380)
is poorer	0.4616**	-0.0240	-0.1097*	-0.0473
	(0.0406)	(0.0566)	(0.0541)	(0.1322)
is richer	-0.3434**	-0.0765	0.5345**	0.2652*
	(0.0457)	(0.0600)	(0.0566)	(0.1225)
Sigma	0.8784**		1.1999**	
	(0.0179)		(0.0312)	
Observations	11,387		11,387	
R-squared/Chi2	539.61		425.78	

Notes: 1. Marginal effects are reported. 2. dy/dx for dummy variable is an effect of discrete change from 0 to 1.

3. See Notes to Table 4.

Table 6: Double Craggs Model Estimates, Females 1992-2008

	Craggit-Out Transfer		Craggit-In Transfer	
	(1)	(2)	(3)	(4)
	P(Give)	Amount	P(Receive)	Amount
	Craggit-Out Transfer		Craggit-In Transfer	
	(1)	(2)	(3)	(4)
	P(Give)	Amount	P(Receive)	Amount
Predicted P(outcome)	0.1287		0.0440	
Log wage	0.1670**	0.0669	-0.0822+	0.1754+
	(0.0405)	(0.0558)	(0.0469)	(0.1014)
Age	0.0035	-0.0212	-0.0680	-0.0580
	(0.0420)	(0.0507)	(0.0459)	(0.1024)
Age squared	-0.0000	0.0002	0.0005	0.0005
	(0.0004)	(0.0005)	(0.0004)	(0.0009)
Education	-0.0887*	-0.1358**	0.0492	0.1848
	(0.0391)	(0.0340)	(0.0634)	(0.2273)
Education squared	0.0043**	0.0064**	-0.0001	-0.0057
	(0.0015)	(0.0015)	(0.0024)	(0.0083)
Non-labor income	0.0005	0.0016**	0.0003	0.0012
	(0.0003)	(0.0005)	(0.0004)	(0.0016)
Total hh wealth	0.0002	0.0015	-0.0016	0.0232*
	(0.0022)	(0.0043)	(0.0028)	(0.0113)
If non-white	0.3052**	0.0507	-0.1798*	-0.2796*
	(0.0541)	(0.0639)	(0.0800)	(0.1393)
If hispanic	0.3753**	0.1098	-0.1003	0.2039
	(0.0848)	(0.0827)	(0.1036)	(0.2760)
If married	-0.0590	-0.0669	-0.3769**	0.1940
	(0.0576)	(0.0787)	(0.0659)	(0.1297)
If poor health	0.0491	-0.0194	0.2274**	-0.3171**
	(0.0527)	(0.0632)	(0.0638)	(0.1198)
Children (0-5)	0.0032	-0.1520**	-0.0649	-0.0848
	(0.0565)	(0.0586)	(0.0882)	(0.2067)
Children (6-18)	-0.0088	0.0012	0.1022**	0.0437
	(0.0301)	(0.0335)	(0.0326)	(0.0744)
N of own sis	0.0036	-0.0212	-0.0768**	-0.0356
	(0.0130)	(0.0157)	(0.0185)	(0.0352)
N of own bro	-0.0063	-0.0200	-0.0350*	0.0438
	(0.0144)	(0.0172)	(0.0175)	(0.0431)
N of spouse sis	0.0081	-0.0202	0.0205	-0.0233

Continued on next page

Table 6: Double Craggs Model Estimates, Females 1992-2008

	Craggit-Out Transfer		Craggit-In Transfer	
	(1)	(2)	(3)	(4)
	P(Give)	Amount	P(Receive)	Amount
	(0.0140)	(0.0176)	(0.0185)	(0.0435)
N of spouse bro	0.0100	-0.0294	-0.0095	-0.0491
	(0.0155)	(0.0199)	(0.0190)	(0.0445)
Number of parents	0.1974**	0.1552**	0.1062**	-0.0405
	(0.0290)	(0.0396)	(0.0349)	(0.0737)
Mothers/parents	0.2845**	0.0801	0.0149	0.0755
	(0.0659)	(0.0914)	(0.0854)	(0.1384)
Parents' age	0.0016	-0.0024	0.0104*	0.0086
	(0.0035)	(0.0045)	(0.0043)	(0.0095)
Parents' education	-0.0069	0.0226**	0.0520**	0.0212
	(0.0079)	(0.0087)	(0.0098)	(0.0189)
If at least one parent				
single	0.2030**	0.1946**	0.1778**	0.0935
	(0.0513)	(0.0662)	(0.0557)	(0.1148)
cannot be left alone	0.0121	0.0526	-0.0555	0.2936*
	(0.0427)	(0.0541)	(0.0522)	(0.1164)
needs care	-0.0155	0.1579**	-0.0186	0.1947
	(0.0450)	(0.0602)	(0.0563)	(0.1333)
homeowner	0.0206	-0.0591	0.0586	0.1521
	(0.0458)	(0.0567)	(0.0608)	(0.1166)
is poorer	0.4308**	-0.0400	-0.1821**	-0.0222
	(0.0396)	(0.0536)	(0.0520)	(0.1180)
is richer	-0.3838**	-0.0649	0.4814**	0.3525**
	(0.0428)	(0.0582)	(0.0506)	(0.1107)
Sigma	0.8957**		1.2204**	
	(0.0176)		(0.0248)	
Observations	13,275	13,275	13,275	13,275
R-squared/Chi2	675.33		481.03	

Notes: 1. Marginal effects are reported. 2. dy/dx for dummy variable is an effect of discrete change from 0 to 1.

3. See Notes to Table 4.

Table 7: Estimates of the Wage Elasticities

Estimated	Males		Females	
	4-part model	OLS	4-part model	OLS
E	***0.2521** (0.0549)***	***0.2754** (0.0814)***	***0.3151** (0.0519)***	***0.3629** (0.0803)***
Egive	0.1347*		0.2555**	
	(0.0426)		(0.0463)	
Ereceive	-0.1173*		-0.0596+	
	(0.0365)		(0.0316)	
Egiv_ext	0.1243*		0.2454**	
	(0.0418)		(0.0444)	
Egiv_int	0.0104		0.0101	
	(0.0076)		(0.0073)	
Erec_ext	-0.1333**		-0.0711*	
	(0.0353)		(0.0315)	
Erec_int	0.0403**		0.0266*	
	(0.0166)		(0.0133)	

Appendix A

Assuming that the net transfers are nothing else but the combination of gross transfers in different directions and there is zero probability of having one individual to be a giver and a recipient, the following exercise can be carried out. Suppose the data can be divided into three subsamples: one for positive values of net transfers, one for zero net transfers, and one for negative, as shown on Figure 2.

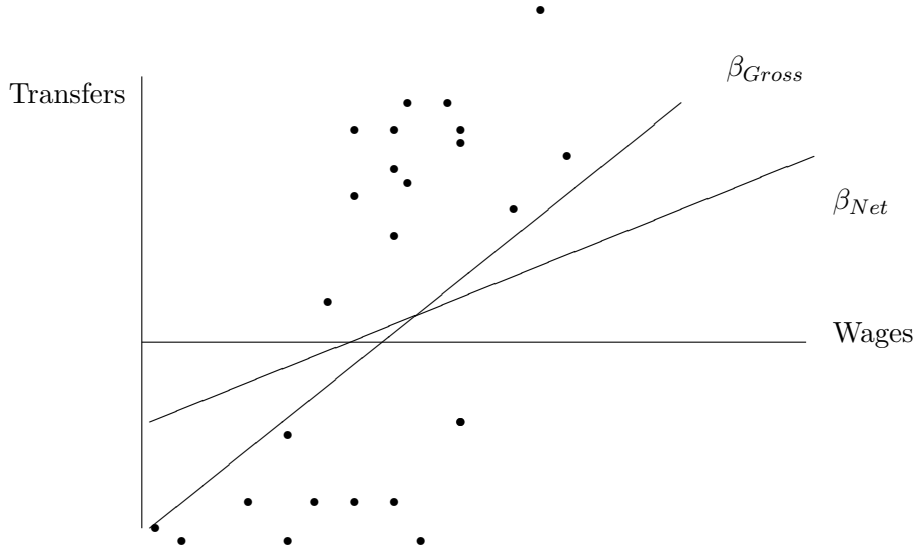

Figure 2: Graphical Representation of the Relationship Between β_{Net} and β_{Gross})

Suppose that $y - positive$ represents observations with positive transfers and $y - negative$ represents observations corresponding to negative transfers, and β_{Net} and β_{Gross} are the estimates of the effect of wages on net and gross transfers respectively. y_{gross} represents observations on the dependent variable with all the negative values replaced by zeros. Then, the following formula would provide least squares estimate of the coefficients on net transfers:

$$\begin{aligned} \beta_{Net} &= \frac{\sum (x-\overline{x})(y-\overline{y})}{\sum (x-\overline{x})^2} = \frac{\sum (x-\overline{x})(y-\overline{y_{gross}}+\overline{y_{gross}}-\overline{y})}{\sum (x-\overline{x})^2} = \\ &= \frac{\sum_{y-positive} (x-\overline{x})(y-\overline{y_{gross}})}{\sum (x-\overline{x})^2} + \frac{\sum_{y-negative} (x-\overline{x})(y-\overline{y_{gross}})}{\sum (x-\overline{x})^2} \end{aligned} \tag{12}$$

$$\begin{aligned}\beta_{Gross} &= \frac{\sum (x-\overline{x})(y-\overline{y_{gross}})}{\sum (x-\overline{x})^2} = \\ &= \frac{\sum_{y-positive} (x-\overline{x})(y-\overline{y_{gross}})}{\sum (x-\overline{x})^2} + \frac{\sum_{y-negative} (x-\overline{x})(0-\overline{y_{gross}})}{\sum (x-\overline{x})^2}\end{aligned} \tag{13}$$

So,

$$\beta_{Net} = \beta_{Gross} + \frac{\sum_{y-negative} (x-\overline{x})(y-\overline{y_{gross}})}{\sum (x-\overline{x})^2} \tag{14}$$

which means that the coefficient on net transfers differs from the coefficient on gross transfers by the term the sign of which is defined by the coefficient from the model estimated using only observations with negative dependent variable. Summarizing:

$$\begin{array}{lll}\beta_{Net} > \beta_{Gross} & if & \beta_{Neg} > 0 \\ \beta_{Net} = \beta_{Gross} & if & \beta_{Neg} = 0 \\ \beta_{Net} < \beta_{Gross} & if & \beta_{Neg} < 0\end{array} \tag{15}$$

Given that

$$\beta_{Pos} = \frac{\frac{1}{n_{positive}} \sum_{y-positive} (x-\overline{x})(y-\overline{y_{gross}})}{\frac{1}{n_{positive}} \sum_{y-positive} (x-\overline{x})^2} \tag{16}$$

$$\beta_{Neg} = \frac{\frac{1}{n_{negative}} \sum_{y-negative} (x-\overline{x})y}{\frac{1}{n_{negative}} \sum_{y-positive} (x-\overline{x})^2} \tag{17}$$

β_{Gross} and β_{Net} can be represented as follows:

$$\begin{aligned}\beta_{Gross} &= \beta_{Pos} \frac{n_{positive}}{n} \frac{Var(x|y>0)}{Var(x)} \\ &= \beta_{Pos} P(y>0) \frac{Var(x|y>0)}{Var(x)}\end{aligned} \tag{18}$$

$$\begin{aligned}\beta_{Net} &= \beta_{Pos} \frac{n_{positive}}{n} \frac{Var(x|y>0)}{Var(x)} + \beta_{Neg} \frac{n_{negative}}{n} \frac{Var(x|y<0)}{Var(x)} = \\ &= \beta_{Pos} P(y>0) \frac{Var(x|y>0)}{Var(x)} + \beta_{Neg} P(y<0) \frac{Var(x|y<0)}{Var(x)}\end{aligned} \tag{19}$$

Appendix B

Similar to Cragg (1971) the expected net monetary transfer conditional on explanatory variables can be formulated as follows:

Given that

$$E(y|x) = P(y < 0|x) * E(y|x, y < 0) + P(y = 0|x) * 0 + P(y > 0|x) * E(y|x, y > 0) \quad (20)$$

Differentiating this expression with respect to x_j produces the following expression for calculation of the marginal effects:

$$\begin{aligned} \frac{\partial E(y|x)}{\partial x_j} &= \frac{\partial P(y<0|x)}{\partial x_j} * E(y|x, y < 0) + P(y < 0|x) * \frac{\partial E(y|x,y<0)}{\partial x_j} + \\ &+ \frac{\partial P(y>0|x)}{\partial x_j} * E(y|x, y > 0) + P(y > 0|x) \frac{\partial E(y|x,y>0)}{\partial x_j} \end{aligned} \quad (21)$$

Alternatively,

$$\begin{aligned} \frac{\partial E(y|x)}{\partial x_j} &= \frac{\partial P(y<0|x)}{\partial x_j} * E(y|x, y < 0) + P(y < 0|x) * \beta_{Neg} + \\ &+ \frac{\partial P(y>0|x)}{\partial x_j} * E(y|x, y > 0) + P(y > 0|x) * \beta_{Pos} \end{aligned} \quad (22)$$

As is evident from the formula, the overall effect of changes in an explanatory variable can be represented as a summation of the effects on the probability of observing a certain transfer status as well as changes in the amount of transfers for those who remain in the givers' or recipients' categories.

To derive the formulas for the wage elasticities, it is useful to recall that $x_j = log(wage)$ and thus $\epsilon_{yx} = \frac{\partial E(y|x)}{\partial x_j} * \frac{1}{E(y|x)}$. So the four wage elasticities that will be useful in calculating the wage elasticity of net monetary transfers are the following:

$$\epsilon_{NegExt} = \frac{\partial P(y < 0|x)}{\partial x_j} \frac{1}{P(y < 0|x)} \quad (23)$$

$$\epsilon_{PosExt} = \frac{\partial P(y > 0|x)}{\partial x_j} \frac{1}{P(y > 0|x)} \quad (24)$$

$$\epsilon_{Neg} = \beta_{Neg} \frac{1}{E(y|x, y < 0)} \tag{25}$$

$$\epsilon_{Pos} = \beta_{Pos} \frac{1}{E(y|x, y > 0)}, \tag{26}$$

where β_{Neg} and β_{Pos} represent the coefficients from the estimating the wage effects for the population of net recipients and net givers respectively.

Combining this elasticities leads to the following expression:

$$\begin{aligned} \epsilon_{Net} &= (\epsilon_{NegExt} + \epsilon_{Neg}) * \tfrac{P(y<0|x)*E(y|x,y<0)}{E(y|x)} + \\ &+ (\epsilon_{PosExt} + \epsilon_{Pos}) * \tfrac{P(y>0|x)*E(y|x,y>0)}{E(y|x)}, \end{aligned} \tag{27}$$