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Abstract

Based on a survey we conducted among domestic workers in Tunisia, we find that slightly more than half are younger than 18 years old. Most live with their employer and have their wages remitted directly to their parents. We define such remittances as *compulsory* as opposed to *voluntary*, and establish that having more young sisters means a higher likelihood of observing compulsory remittances, but that voluntary remittances increase with the number of young brothers. Parents who own some farm assets, or their house, can extract more compulsory remittances from their daughters than other parents. Older domestic workers face lower compulsory remittances, and voluntarily remit less. Finally, we reject the standard tobit model in favor of a type-2 tobit or Gragg's specification.

JEL Classification: R23, J12 and 015.

Keywords: Domestic Workers, Child Labor, Compulsory and Voluntary Remittances, Tunisia.

1 Introduction

The International Labor Organization (ILO) defines child domestic workers as children under the age of 18 who do domestic chores in households other than their own. Child domestic workers are predominantly females, and many of them live with their employer. There is much evidence that domestic work is the largest employment category for girls under 16 worldwide (ILO (1996)). Some fraction of the wages they receive is sent directly to their parents by their employer (Innocenti Digest 1999). We define the wages which are paid directly to a domestic worker's parents as *compulsory* remittances, and any other amount which the domestic worker sends herself as *voluntary* remittances. Our objective is to contrast the determinants of these two types of remittances. Until now the remittances literature has dealt solely with voluntary remittances because of its focus on adult migrants. By studying domestic workers we can contrast the determinants of compulsory and voluntary remittances in a group of workers who perform similar tasks. To the best of our knowledge, we are the first to address this question.

The phenomenon of child domestic workers arises for two main reasons. First, the increased labor market participation of urban adult females feeds the demand for domestic workers who are a low cost substitute for female household heads who usually perform household chores (Pradhan 1995, Sharma, Thakurathi, Sapkota, Devkota and Rimal 2001). Second, the pool of young domestic workers which meets this demand arises because many poor parents send their children to do chores in other households. These parents send their children either to earn wages to supplement the household's income, as in the case of other forms of child labor, or in exchange of room and board which reduces the household's expenses (Innocenti Digest 1999).

Given the paucity of data on domestic workers, we conduct a survey among domestic workers in Tunisia where we are able to document the well organized informal market for such occupations. Focusing on Tunisian domestic workers allows us to study the determinants of compulsory and

voluntary remittances in a group where there are many young females. We collected detailed information on 500 domestic workers, the characteristics of the households where they grew up, and their wages. We find that slightly more than half of the domestic workers in our sample meet the ILO definition of child domestic workers. Moreover, at least 75 per cent joined the labor market before they turned 16. A domestic worker in our survey earns on average less than two-thirds of the official minimum wage. Note however, that all young workers receive non-monetary benefits such as room and board, health services, and on occasion, her employer sends gifts to her parents. Gifts or money are especially sent to the domestic worker's parents for the Eid festival where it is customary for a household to sacrifice a sheep.

Forty per cent of domestic workers have all their wages paid directly to their father, or their eldest brother if the latter is dead, and those with disposable income voluntarily remit 40 per cent of it. Compulsory and voluntary remittances average 68 per cent of a domestic worker's wages. Our estimates of the determinants of *aggregate* remittances are similar to those reported in the remittances literature, except that our estimates of the sender's income elasticity of remittances is higher. This difference arises for two possible reasons. First, many domestic workers are young, and have weak (or no) bargaining power vis-a-vis their parents who can extract a large share of their wages. Second, many domestic workers receive non-monetary benefits which implies that we underestimate their income by using their reported wages.

While compulsory remittances are chosen by the parent, and remitted directly by the employer to the parent, voluntary remittances are chosen, and sent, by the domestic worker herself. We therefore estimate the determinants of each type of remittances separately. It is of interest to note that, unlike most of the remittances literature, our empirical model allows the determinants of the decision to remit and the amount remitted to differ. We reject the standard tobit specification which is used in the literature to estimate the determinants of remittances. We find that failure to

allow for these differences would overestimate the domestic worker's income elasticity of voluntary remittances, but underestimate the elasticity for compulsory remittances.

When we estimate the determinants of compulsory and voluntary remittances separately, we establish the following results. First, the gender of a domestic worker's siblings matter in explaining those two types of remittances. On the one hand, the number of young sisters in the family increases the likelihood of observing compulsory remittances, but has no effect on the likelihood of voluntary remittances. One possible explanation for this difference is that young females who live with their parents do not participate in the labor market and this generate no income, while young boys do. On the other hand, domestic workers with more young brothers send higher voluntary remittances but are not subjected to higher compulsory remittances. The number of young brothers is not a determinant of the likelihood of either type of remittances. This asymmetric effect may arise because after the father's death, a domestic worker expects to have access to an insurance scheme provided by her brothers, but not by her sisters.

Second, we find that parents who own some farm assets or their house can extract more compulsory remittances from their daughters than other parents. Such parents are in a better bargaining position and can credibly ask for a higher share of their daughter's wage. Third, our estimates indicate that older domestic workers face lower compulsory remittances, and voluntarily remit less. They are also less likely to face compulsory remittances and to voluntarily remit. This occurs presumably because of weaker family ties. Finally, as one would expect, *ceteris paribus*, a married domestic worker sends lower voluntary remittances to her parents and siblings.

It is of interest to note that, unlike most of the remittances literature, our empirical model allows the determinants of the decision to remit and the amount remitted to differ. We reject the standard tobit specification which is used in the literature to estimate the determinants of remittances. We

find that failure to allow for these differences would overestimate the domestic worker's income elasticity of voluntary remittances, but underestimate the elasticity for compulsory remittances.

The remainder of the paper is as follows. We briefly review the child domestic worker and remittances literatures in section 2. We set up a simple two-stage model in section 3 to derive the determinants of compulsory and voluntary remittances. Section 4 describes the market for domestic workers and the main characteristics of the survey in Tunis. We discuss the remittances specifications which we use to test the implications of our model in section 5. The estimates of the wage equation, as well as the aggregate, compulsory and voluntary remittances are discussed in section 6. Finally, section 7 concludes. All estimation procedures, tables and figures are in the appendix.

2 Literature review

Our analysis is related to the (i) child domestic workers, and (ii) intra-family remittances literatures. Many theoretical (Basu and Van 1998, Basu 1999) and empirical (Bhalotra 2003, for example) studies have investigated the reasons why children work. We show in section 2.1 that child domestic workers share many common characteristics. However some characteristics of child domestic workers in Tunisia are similar to other forms of child labor in that a large share, if not all, of their wages accrue to their parents either through compulsory or voluntary remittances as explained in section 2.2.

2.1 Child labor literature

The child labor literature provides empirical evidence that credit-constrained parents send their children to work so as to supplement household income. In this case, the decision to send a child

to work is taken by the parents, and the child's income is pooled with that of other household members.[1] Many children work in the informal sector which includes domestic work. A large literature documents child domestic work as being a common feature in most developing countries (Innocenti Digest 1999).

A few stylized facts on child domestic work hold across these countries. First many child domestic workers live with their employer. This is reflected, for instance, by the names used for child domestic workers in different countries. For example, they are known as *bonnes couchantes* (french for sleep-in maids) in Tunisia, *rest avek* (creole for stay with) in Haiti, *Bandha* (tied down) in Bangladesh, *vidomegon*[2] in Benin (a Font word for a young female who lives with family members), and *puerta cerrada* (Spanish for closed door servant) in the Dominican Republic.

Second, most child domestic workers are females: 83 per cent in Bangladesh, 95 per cent in Togo and 100 per cent in Latin America (Innocenti Digest 1999). One exception to this is Nepal where Sharma *et. al.* (2001) find more male than female child domestic workers in Kathmandu. The demand for child workers arises mainly in urban regions, and most child domestic workers migrate from poor rural regions to large cities to find employment. For example, Pradhan (1995) reports that 19 per cent of urban Nepalese households employ a child domestic worker, many of whom are rural migrants. Similarly, Bangkok is the main destination of child economic migrants in Thailand (Phlainoi 2002).

Third, child domestic workers are compensated in a number of ways: cash, accommodation, or rations (Budlender and Bosch 2002). Summarizing many small surveys on child domestic work, the Innocenti Digest (1999) documents that: (i) in Kenya, 78 per cent of child domestics were only paid in kind, (ii) in Haiti it is legal for a child to receive room and board in exchange of domestic work to a household, (iii) in Bangladesh about 25 per cent of domestic workers received no wages, and (iv) 45 per cent of Bangladeshi domestic workers had their wages given over to their parents

or guardians. Hence, many child domestic workers either receive no wages, or a share of their wages is paid directly to their parents by their employer, which we view as compulsory remittances. Moreover, in addition to compulsory remittances, a domestic worker may elect to voluntarily remit part of her disposable income.

2.2 Remittances literature

The motives for voluntary private remittances, and that they account for a large share of household incomes in developing countries (see Table 1), are well documented in the literature. In developing countries private voluntary remittances usually flow from the young to the elders.[3] The motives for such remittances span old age security (Cox and Jimenez, 1990), health services (Kochar 1999), education of younger siblings, investment or access to capital (Adams 1998, Rozelle, Taylor and deBrauw 1999), insurance or inheritance (de la Brière, de Janvry, Lambert and Sadoulet 1997) and altruism (Becker 1993). Another example of risk pooling *cum* migration are marriages between members of villages who face uncorrelated weather patterns so as to allow for consumption smoothing (Rosenzweig and Stark 1989).[4]

A test of insurance and inheritance motives for remittances is provided by de la Brière, de Janvry, Lambert and Sadoulet (2002). On the one hand, they predict that the migrant's and family's relative risk is what matters when remittances arise for insurance motives. On the other hand, migrants are motivated by inheritance if their remittances increase with their parents' wealth, the probability of inheriting, and the migrants' wealth. However, a migrant's income and remittances are also positively correlated if the migrant is altruistic. The authors acknowledge this identification problem citing data limitation as a reason why they cannot discriminate between altruism and insurance motives (de la Brière et al. 2002, footnote 1, p.310).

Except in the case of altruism, intra-family transfers may arise because of incomplete markets, or as payment for services where the family has a comparative advantage over the market (Ray 1998). For example, in many developing countries public health services are usually of poor quality and only a few can afford expensive private health care. Similarly, credit market constraints, especially in rural regions, can be alleviated by intra-family transfers from urban migrants (Gersovitz 1988), a group which includes many child domestic workers. These remittances allow many rural farms to accumulate assets (Adams 1998).

The determinants of remittances among child workers include reasons as why parents send their children to work, the bargaining power (if any) of their children, and all the common motives for private remittances. The evidence about compulsory remittances (Innocenti Digest 1999) suggests they depend on the income of the domestic worker's parents, the number of siblings in the family, and the characteristics of the region from which the domestic workers migrated. For example in Rwanda, a child domestic wage is generally sent home to pay for her siblings school fees. The next section sets up a simple two-stage model to solve for compulsory and voluntary remittances.

3 The model

We set up a simple model to derive testable hypothesis about the determinants of voluntary and compulsory remittances among female domestic workers in Tunisia. Consider a parent who enters in an contract with an employer for his daughter to work as a domestic worker. The contract specifies: (i) room and board is provided free of charge to the domestic worker by the employer, (ii) the domestic worker's gross wage w is specified, (iii) an amount ρ, from that wage is remitted directly to the parent by the employer, and (iv) the remainder $w - \rho \equiv \tilde{w}$ is paid directly to the domestic worker. The girl then works as a domestic worker and she can voluntarily remit some amount from $\tilde{w}$ to her parents if she can afford to do so. We proceed backwards by first solving for

the optimal voluntary remittances r. Given this solution, we then characterize the determinants of compulsory transfers ρ.

3.1 Voluntary remittances

Assume a domestic worker derives utility from her own consumption c_d and that she is potentially altruistic towards her family members who consume c_f. More formally her utility is as follows:

$$u(c_d, f(c_f)) \tag{1}$$

where the function u is twice differentiable and concave in its arguments. An altruistic daughter may voluntarily send r from her net wages $\tilde{w}$ to her parents. Bearing in mind that she receives free room and board, which is equivalent to a consumption of $\underline{c}$, at no cost from her employer, her budget constraint is:

$$c_d = \underline{c} + \tilde{w} - r. \tag{2}$$

Consequently, a parent with a household income of y_f and whose daughter is working as a domestic worker faces the following budget constraint:

$$c_f = y_f + \rho + r. \tag{3}$$

Note that the parent's income is augmented by both compulsory and voluntary remittances. Substituting (2) and (3) into (1) and maximizing with respect to r gives the marginal utility from voluntary remitting:

$$\Delta(r) \equiv u_2(c_d, f(c_f)) f_1(c_f) - u_1(c_d, f(c_f)), \tag{4}$$

where c_d and c_f are given by (2) and (3). The next proposition characterizes the optimal voluntary remittances function r^*.

Proposition 1 (Voluntary Remittances) *There exists a voluntary remittances function* $r^*(\tilde{w}, \rho, y_p)$ *which is such that:*

i) a daughter sends no remittances voluntarily ($r^* = 0$) *either if her net wages equal 0 or* $\Delta(0) < 0$.

ii) the daughter voluntarily remits all her net wages ($r^* = \tilde{w}$) *if* $\Delta(\tilde{w}) \geq 0$.

iii) a daughter with positive net wages $\tilde{w}$ *voluntarily remits part of it* ($r^* > 0$) *if* $\Delta(0) > 0$ *and* $\Delta(\tilde{w}) < 0$. *In this case,* r^* *is increasing in a domestic worker's net wages, but decreasing in compulsory remittances and in the parent's revenue.*

Proof of Proposition 1: see the Appendix

The intuition behind Proposition 1 is as follows. It is clear that a domestic worker sends no remittances if she has no disposable income (Proposition 1-i) or if her marginal utility is negative when it is evaluated at zero remittances. By the same token, if the marginal utility from sending all her disposable income exceeds the marginal disutility, she voluntary remits all her disposable income to her parents (Proposition 1-ii). In all other cases we obtain an interior solution where remittances are increasing in the domestic worker's net wages but decreasing in the recipient's income. The properties of voluntary remittances as established in Proposition 1 are a standard result in household models where remittances arise because of altruism (Park 2003).

3.2 Compulsory remittances

Next, we substitute the voluntary remittances function $r^*(w, \rho, y_f)$, (2) and (3), into (1) to obtain a domestic worker's indirect utility as:

$$v(w, y_f, \rho) = u(\underline{c} + w - \rho - r^*, f(y_f + \rho + r^*)). \tag{5}$$

Assume a domestic worker enjoys a reservation utility $\underline{v}$ which is a function of her characteristics $\boldsymbol{d}$, such as her age. The parent then chooses ρ such that:

$$v(w, y_f, \rho) \geq \underline{v}(\boldsymbol{d}). \tag{6}$$

We next characterize the properties of optimal compulsory remittances.

Proposition 2 (Compulsory Remittances) *There exists a compulsory remittances function $\rho^*(w, y_f)$ which is such that:*

i) There exists a minimum reservation utility

$$v_{\min} = u(\underline{c}, f(y_f + w)), \tag{7}$$

such that compulsory remittances are equal to the domestic worker's gross wages whenever the daughter's reservation utility is smaller than $v_{\min}$.

ii) Let $r_0 = r^*(w, 0, y_f)$. There exists a maximum level for the reservation utility

$$v_{\max} = u(\underline{c} + w - r_0, f(y_f + r_0)) \tag{8}$$

such that compulsory remittances equal zero if the daughter's reservation utility exceeds $v_{\max}$.

iii) If the daughter's reservation utility is between $v_{\min}$ *and* $v_{\max}$, *the compulsory remittances function is such that (6) holds with equality. In this case, compulsory remittances are increasing in wages, the parents' revenue and non-monetary services received by the domestic worker.*

Proof of Proposition 2: see the Appendix

The intuition behind Proposition 2 is as follows. If a domestic worker has a very low reservation utility, then her parent will extract all her wages. Otherwise, compulsory remittances are adjusted to make the girl indifferent between accepting to work as a domestic worker or taking her alternative. If the parents control both the girl's reservation utility and what she earns as a domestic worker, then they will extract all her wages. Clearly this is the case for very young girls whose unique alternative may be to live with their parents. Moreover, parents who are not too poor are susceptible to provide the young domestic worker's with either some insurance scheme if she were to loose her job for instance. In this case, the utility from paying the compulsory remittances are higher for domestic workers who come from less poor families, and the parent should be able to extract more compulsory remittances.

However, as the girls becomes older, the value of her options increase and the parent has to take this into account. Hence, compulsory remittances should decrease as the girls' reservation utility increases. For instance, it seems reasonable to assume that the girl may have access to outside options as she becomes older, in which case here reservation utility increases. Hence, *ceteris paribus*, we can expect older domestic workers to face lower compulsory remittances. We now describe the sample of domestic workers who were interviewed and which allows us to estimate the determinants of compulsory and voluntary remittances.

4 Domestic workers in Tunis

We start by outlining the market for domestic workers in Tunisia (4.1). We describe in section 4.2 some key variables in the survey which was conducted by the second author from February to April 1998 in Tunis (Tunisia). Given the constraints faced to interview the domestic workers, we discuss issues related to potential non-randomness of our sample in section 4.3 and compare some characteristics of our survey with other surveys of child domestic workers.

4.1 The market and implementation of the survey

Recruitment methods differ for child versus adult domestic workers. Adults are Tunis-based and seek to work during the day. They usually find employment through a previous employer, or by going door to door to propose their services. Young domestic workers are recruited: (i) through a *samsar* (arabic for intermediary), (ii) through a *cheikh*, or (iii) by visiting villages and scouting for an employee. Using a *samsar* is the most common method of finding a child domestic worker in Tunis. The second method is through a *cheikh*, a village elder who knows which families are seeking employment for their daughters. The cheikh acts as an intermediary between an urban prospective employer and the domestic worker's family.[5]

Once the employer and the child's family agree on the terms of the contract, the child moves to her employer's house. In almost all cases she is provided with room, board, and wages, in exchange of household services. The latter range from domestic chores to grocery shopping and nanny services. Although there is no written contract, it is observed that the terms of the contract are enforced by the family and the employer. If the employer defaults on his engagement, the domestic worker returns to live with her family.

The questionnaire was implemented in local arabic. Each domestic worker was interviewed at her employer's residence and her answer concerning only her wages which the employer remits to the parents were checked for consistency with the employer. It was not possible to use random sampling techniques for two main reasons. First, child domestic work is illegal in Tunisia where by law children younger than 16 must attend school. Employers are therefore extremely reluctant to give access to such employees, especially the very young ones. This prevents us from visiting a representative sample of households. Second, there is no documentation on the population of domestic workers in Tunisia. Employers do not register their domestic workers with an agency and there is no record of domestic workers' employment history. Hence, we conducted door-to-door interviews starting with domestic workers whom the interviewers knew beforehand. Afterwards the employers, or the domestic workers, referred the interviewers to other domestic workers.

It is likely that this interviewing technique yields employers who share similar characteristics. However, as will be clear in what follows, the data fit both our expectations of the market for domestic workers in Tunis, and have similar characteristics to those gathered in other countries. We discuss any issues related to potential non-randomness of our sampling technique in Section 4.3.

4.2 Analysis of the survey

We collected detailed information on 500 domestic workers in Tunis, their background and employment conditions. Tunis is the largest city (second column of Table 2) and attracts many rural migrants (Hay 1980). The areas surveyed are: Cité Olympique, El Manar, El Menzah V and VI, La Marsa and Notre-Dame. Some domestic workers who work in Carthage, which is located 30 kilometers from Tunis, and is one of the wealthiest residential area of the country, were also interviewed. Internal migration is relatively easy in Tunisia because of short distances (last column of Table 2) and a well-developed transportation network. Given the nature of the study, we focused

on residential areas in Tunis. Most domestic workers in our sample migrated from the north west of Tunisia (Table 3). This region is the poorest region of the country; it has the lowest percentage of households linked to the public water supply system (Table 2).[6]

Table 4 reports some statistics on our sample of domestic workers. Although the average domestic worker is 19 years old, and the median worker is 18, 25 percent of them are under 14 years old. More than 75 per cent of all domestic workers held their first full-time job by age 16, while 40 per cent were already domestic workers by age 12. Hence, more than 75 per cent of our sample were at one time child workers. Given this, it is clear that they either never attended, or dropped out of, school at an early age, which in turn explains why 67 per cent of them are illiterate. Their young age also explains their marital status: 81 per cent are single. Those who are married report participating in the labor marker to supplement their husband's income. All single domestic workers, and half of those who are married, have no children.

A domestic worker's average monthly gross wage, defined as the wage bill paid by her employer excluding non-monetary benefits, equals 95 Tunisian Dinars (TD). This number is lower than the three minimum wages which were in place in Tunisia at the time of the survey.[7] However, 80 per cent of domestic workers live with their employer where they receive room and board. Moreover, almost all domestic workers have their medical expenses covered by their employer, which is not the case for casual, or even permanent, workers in the Tunisian private sector. Once these other benefits are taken into account there is reason to believe that a domestic worker is not worse off than a minimum-wage worker. As can be seen in Table 4, a domestic worker's average wage is increasing in her age indicating that experience is remunerated.

One interesting characteristic of many domestic workers' employment contracts is that part of their gross wages is paid directly to their parents. It is important to note that once the wage share which must be paid to a domestic worker's parents is agreed upon, the employer either sends it

directly to them, or a family member collects it from the employer. To some extent compulsory remittances are akin to a payroll tax which in this case, however, accrues to the domestic worker's family. Compulsory monthly remittances average 43 TD per domestic worker, or 51 per cent of a domestic worker's gross wages. However, a better picture is provided by the fact that the full gross wages of 39 per cent of all domestic workers are paid directly to their parents, 15 per cent receive between 50 to 100 per cent of their gross wages (with the rest paid directly to their parents), and 43 per cent of them are paid their gross wage. As expected, compulsory remittances are decreasing in the domestic worker's age (Table 4).

A domestic worker earns 52 dinars on average net of compulsory remittances. Some choose to voluntarily remit part of their net wages to their parents. Twenty-five per cent of domestic workers with positive disposable income voluntarily remit all of it. Consequently, when one aggregates compulsory and voluntary remittances, we find that slightly more than 60 per cent of all domestic workers have all their gross wages transferred to their parents. On average, domestic workers with positive disposable income remit 38 TD per month, which is, as expected, less than compulsory remittances. There are only 3 domestic workers with positive net wages who do not send voluntary remittances. However, in each case, both of their parents are deceased, and they all face compulsory remittances which accrue to their brothers.

When we consider the aggregate of compulsory and voluntary remittances, a domestic worker remits on average 61 TD, or 68 per cent of her wages. This number is more than twice as high as in other studies (Table 1). The relative importance of such transfers may arise because many domestic workers receive free room and board and do not incur health or clothing expenses. Moreover, many are too young to have direct dependents which is not the case in other remittances studies which consider adult migrants. Finally, close to half of the domestic workers reported finding employment through their parents or their brother or sister. Given the role played by the *samsar*, this must be

taken to mean that the domestic worker's employment contract was negotiated by these individuals. Given the characteristics of the domestic workers in our survey, we next address any issues which may arise because of the non randomness of our sampling technique.

4.3 Potential non randomness of our sample

An important issue is the degree to which our survey is informative of child domestic workers' remittances because the illegal nature of the work prevents us from using a random sampling technique. We wish to emphasize that it is extremely difficult to obtain such data (in any country) because most employers would simply refuse access to young child domestic workers. These differ from other child workers because most live with their employers. In almost most cases the interview can take place only if the employers give permission to enter their premises. Random anonymous demands for access to the employer premises are met with a high rejection rate and the resulting sample will be non random.[8] In designing and implementing the survey, we did not ask any questions about the young girl's working conditions or mistreatment at the hands of the employer which, although of great interest, is not the subject of this paper. Such questions would have further reduced an employer's incentives to allow us to interview a young domestic worker.

One potential consequence of our survey technique is that we may have sampled siblings. This may be an issue because the determinants of transfers may not be independent among some of the respondents. We checked for such potential cases by first identifying all domestic workers who come from the same village, and then checking whether there is anyone, within that village, with identical family background. Among the criteria to check for siblings we use the age of the mother and father, the number of brothers and sisters, and age of the siblings. We found only two such cases and all our results are invariant to excluding those two observations. We can assert that any possible coordination of remittances among household members is not relevant in this study.

However, in spite of its limitations, our survey shares similar characteristics with other surveys of child domestic workers. We can compare our survey with one which was carried in Casablanca, Morocco, in 2001 on a sample of girls younger than 18 (UNICEF 2001). In Morocco, young overwhelmingly rural girls are recruited by formal (here also through the *samsar* as in Tunisia) or informal means. The report finds that more than 80 percent of child domestic workers in Casablanca never attended school. In the Moroccan sample, the wages of 77% of child domestic workers are paid to one of their family members, while the comparative figure in our survey is 70% (among those not older than 18). However, no information is provided on voluntary remittances among child domestic workers in the Moroccan sample.

Another survey on child domestic workers in El Salvador (Human Rights Watch 2004) found that 95% of the respondents are girls. In our survey in Tunisia, we did not encounter a single male child domestic worker. Moreover, just as in Tunisia, many of the children in El Salvador originate from rural areas and live in the homes where they work. Hence, to a large extent, our survey fits the main stylized facts about child domestic workers reported elsewhere.

In any case, for the sampling technique to introduce biases in the estimation results, one has to believe that those in our sample share an unobserved component that affects both remittances and one of the explanatory variables (for example wages). We feel confident that given the comparison with other surveys, and the sample size, there is no reason to believe that this is the case. Hence, we think that our results can shed light on the issue of remittances sent by child domestic workers. The next section derives specifications for the two types of remittances while controlling for the censored nature of the data.

5 Specification of the remittances functions

Propositions 1 and 2 mean that the determinants of compulsory and voluntary remittances differ because the parent is the one to choose in the first case, while the domestic worker chooses the second type of remittances. For instance, for reasons given in section 3, while a parent can increase the wage share which accrues directly to him if he becomes marginally richer, an altruistic domestic worker will reduce the amount which she voluntarily remits if the parent's income increases marginally. Moreover, the marginal effects of the different explanatory variables on compulsory and voluntary remittances are not necessarily the same. Consequently, it seems inappropriate to aggregate voluntary and compulsory remittances together and this precludes us from using the usual (log) transfers function. The kernel estimates of the distributions of compulsory and voluntary remittances, as illustrated in Figure 1, also militate against using the same specification to analyze both types of remittances as the former looks like a truncated normal density.

There is one additional problem in estimating the determinants of remittances because, under the conditions given in Propositions 1 and 2, compulsory or voluntary remittances can equal 0. In other words, we need to allow for corner solutions when estimating the determinants of those two types of remittances. Indeed, zero compulsory *or* voluntary remittances are quite common in our data because only 8% of domestic workers in our sample report sending both types of remittances. The usual solution to empirical problems exhibiting corner solutions is to use a tobit model.

We first briefly present the standard tobit specification in section 5.1 where we highlight the restrictions which it imposes on the decision and the amount remitted. We then present two specifications which overcome those restrictions in section 5.2.

5.1 Standard tobit specification

Let R_i^* denote the benefits which domestic worker i derives from sending remittances. These benefits differ if remittances are compulsory (CR_i^*) or voluntary (VR_i^*). As is standard in the remittances literature, we assume that the benefits which domestic worker i derives from remittances is a linear function of a vector of exogenous variables $\mathbf{X}_i$ and some measure of the wage rate w_i (Lucas and Stark 1985). Hence, the empirical counterpart to remittances function in Proposition 1 and 2 is

$$\mathrm{R}_i^* = \mathbf{X}_i\beta_\mathrm{r} + \delta_\mathrm{r} w_i + \varepsilon_{\mathrm{r}i} \tag{9}$$

where $\varepsilon_{\mathrm{r}i}$ is an $\mathrm{IIN}(0, \sigma_\mathrm{r}^2)$ error term, β_r is a vector of parameters and δ_r is a parameter. It is important to note that the sequential nature of the decision process implies that the measure of wage to use is different depending on whether transfers are voluntary or compulsory. In the case of voluntary remittances, Proposition 1 suggests we use net wage, whereas Proposition 2 allows compulsory remittances to depend on gross wages. Since we do not observe the benefits from sending remittances but only zero or positive remittances, we use a tobit model where observed remittances are specified as follows:

$$\mathrm{R}_i = \begin{cases} \mathrm{R}_i^* & \text{if} \quad \mathrm{R}_i^* > 0 \\ 0 & \text{if} \quad \mathrm{R}_i^* \leq 0 \end{cases} \tag{10}$$

It is straightforward to estimate the parameters $(\beta_\mathrm{r}, \delta_\mathrm{r}, \sigma_\mathrm{r}^2)$ by maximum likelihood.

Limitations of the standard Tobit specification include (i) the marginal effects of a change in an explanatory variable on the probability of observing positive remittances and the amount remitted are of the same sign, and (ii) the relative partial effects of any two continuous explanatory variables on the conditional probability that remittances are positive and the expected remittances

conditional on remittances being positive are equal.[9] Those assumptions may not be appropriate for the study of compulsory and voluntary remittances.

Indeed, Proposition 1 and 2 imply that the determinants of the probability of sending remittances may differ from the determinants of the level of remittances. For example, on the one hand, voluntary transfers may equal zero if the child domestic worker has no disposable income. On the other hand, the optimal amount of voluntary remittances of a domestic worker with positive disposable income will also depend on the child's originating-household income. In fact, both propositions imply that zero-solutions must be treated differently from positive remittances. More intuitively, suppose we are interested by how age affects compulsory remittances. As a domestic worker becomes older, this may have opposite effects on the probability of observing compulsory remittances and the amount of compulsory remittances. On the one hand, a domestic worker has more bargaining power vis-a-vis her parents, and is less likely to send compulsory remittances. On the other hand, she acquires experience which increases her wages, which is in turn remitted in full to her parents.

We next present two specifications which relax the restrictions discussed above: the type 2 tobit model, which we use to explain compulsory remittances, and Cragg's (1971) model which we use for voluntary remittances.

5.2 Alternative remittances specifications

Proposition 2, and our empirical evidence, suggest those with compulsory remittances can be viewed as a selected sample of the larger sample of domestic workers. This is because parents will be able to extract compulsory remittances only from selected daughters based on their reservation utility level. The type 2 tobit model is an appropriate specification of compulsory remittances because it accounts for sample selection (Wooldridge 2002, p. 562). We augment (10) by a dummy variable

D_i^* which captures the decision to remit:

$$\mathrm{D}_i^* = \mathbf{X}_i\beta_\mathrm{d} + \delta_\mathrm{d} w_i + \varepsilon_{\mathrm{d}i}, \tag{11}$$

where β_d is a vector of parameters, δ_d is a parameter, and $\varepsilon_{\mathrm{d}i}$ is a mean-zero normally distributed error term with variance σ_d^2. Consequently the observation rule is as follows:

$$\mathrm{R}_i = \begin{cases} \mathrm{R}_i^* & \text{if } \mathrm{D}_i^* > 0 \\ 0 & \text{if } \mathrm{D}_i^* \leq 0 \end{cases} \tag{12}$$

D_i^* is the latent variable for the selection rule.

The model is estimated by maximum likelihood, and as (9) and (11) contain the same explanatory variables, this means that the parameters are identified through non-linearities in the likelihood function. Hence, our results are conditional on the correct distributional assumptions. Typically, the explanatory variables in (9) could be chosen to be a subset of those in (11). However, as no restrictions naturally appear in the theoretical model, we choose to rely on the distributional assumption to separately identify the parameters in (9) and (11) (Wooldridge p.564).

Turning to voluntary remittances, we see from Proposition 1 that zero voluntary remittances is a corner solution of the problem faced by a domestic worker who decides to send remittances (see also Figures 1A and 1B). If the benefits from doing so are too low, she may choose, for example, not to purchase insurance from her family or not to increase her likelihood of obtaining an inheritance. The type 2 model is inappropriate because it does not generate corner solutions for optimal remittances. However, Cragg's (1971) two-tiered model involves no sample selection, or selectivity bias, but generates zero as a corner solution. We therefore use it as the appropriate modelling tool for voluntary remittances. Although the decision to remit is still given by (11), Cragg's specification differs from the type 2 tobit as it is characterized by the following observation

rule for voluntary remittances:

$$\mathrm{VR}_i \quad = \quad \begin{cases} \mathrm{VR}_i^* & \text{if } \mathrm{D}_i^* > 0 \text{ and } \mathrm{VR}_i^* > 0 \\ 0 & \text{if } \mathrm{D}_i^* \leq 0 \end{cases} \tag{13}$$

Note that we observe $\mathrm{VR}_i = \mathrm{VR}_i^*$ only if both (i) the domestic worker wants to remit ($D_i^* > 0$), and (ii) those remittances are positive ($\mathrm{VR}_i^* > 0$). Condition (ii) emphasizes that Cragg's two-tiered model is appropriate for situations with corner solutions (Blundell and Smith 1994). We show in appendix A that Cragg's model imbeds the standard tobit model.[10]

6 Results

We first discuss the wage equation estimates (Table 5) in order to identify the characteristics which are valued by employers of domestic workers. We next study the determinants of the aggregate compulsory and voluntary remittances which we compare to the remittances literature. We estimate the determinants of compulsory and voluntary remittances separately and report the results in panels B and C of Table 6 respectively. We also report the marginal effects of each explanatory variable for each model in Table 7.

6.1 Wage equation

We specify a Mincerian log-wage equation with exogenous variables that measure a domestic worker's skills and experience, as well as account for other employment benefits (Mincer 1974).[11] We proxy a domestic worker's experience by her age or her tenure with her employer. We cannot include both explanatory variables because most maids are in their first job. A domestic worker's tenure captures household specific capital which may be important for domestic work. For example,

a domestic worker with tenure may earn a premium because she can be trusted with tasks such as grocery shopping. Furthermore, the domestic worker may be allocated more tasks once her ability is revealed. If this is the case, a domestic worker's wages should increase with her tenure if she is paid at her marginal product.

As is mentioned in section 4, many domestic workers enjoy non monetary benefits, such as room and board, in addition to their wages. Moreover, 89 per cent report that their employers pay for their health expenses. We therefore also include: (i) a dummy variable which equals 1 if the domestic worker lives with her employer, and (ii) a dummy variable which equals 1 if the employer sends gifts to domestic worker's parents in the log-wage equation. *Ceteris paribus*, a domestic worker's wages should be lower (i) when she lives with her employer than when she pays for her own housing, and (ii) when her employer sends gifts to her parents.

Table 5 reports the estimates of the two specifications. These estimates are consistent with most of the theoretical predictions discussed above. The model fits the data well with an adjusted R-square of 0.52 and 0.61 for the specifications which respectively use age or tenure as explanatory variables. Wages are concave in a domestic worker's age, or tenure, indicating that experience is remunerated at a diminishing rate. Also, a domestic worker who voluntarily decided to work earns a lower wage than a domestic worker who is forced to work by her parents.

Surprisingly, the literacy variable has a negative effect on wages in the both specifications, but it is only weakly significant in the second specification. This result contradicts the theory that human capital is positively remunerated. This counter intuitive may reflect the nature of domestic work which is not human capital intensive. Illiterate domestic workers may have acquired more valuable skills for household chores (e.g. cooking) than those who are literate and who attended school.

We also find that wages do not depend on whether or not the employer sends gifts to the domestic worker's parents. This result may arise for the following reason. Most of the time, gifts are monetary and intended for the purchase of a sheep for the Eid festival. This is a non negligible expense as, at the time of our survey, the market price for a sheep was around 300 dinars, i.e. more than three times a domestic worker's average wage. We may conjecture that this gift is sent if the domestic worker exerts an effort which is above what is normally expected from her. In this case, the gift is similar to overtime wages and is not a substitute to her monthly wages. Finally, as expected, in the second specification, a domestic worker's co-residence with her employer has a negative impact on her wages.

6.2 Aggregate remittances

For the sake of comparison with the remittances literature we begin by investigating the determinants of the sum of compulsory and voluntary remittances. As these are positive for all domestic workers in our sample, we can specify a log-linear aggregate remittances equation as in Lee, Parish and Willis (1994). The explanatory variables include a domestic worker's wages, proxies for her family's needs, as well as a measure of her independence from her family as discussed in section 2.

Panel A in Table 6 gives the ordinary least squares estimates of the aggregate remittances equation. As expected, the domestic worker's income elasticity of remittances is positive and statistically significant. This estimate equals 0.92 which is higher than in previous studies of voluntary remittances. For instance Lucas and Stark (1985) report elasticity estimates of 0.25 to 0.73 depending on the sender's income. Our estimate of the income elasticity of remittances may be higher for a number of reasons. First, more than 50 per cent of our sample may be considered as child domestic workers whose wages are remitted directly to their parents. Second, we underestimate many domestic workers' income by using their wages because many receive non-

monetary benefits. Third, most domestic workers have no direct dependents and thus may afford to remit a large share of their wages.

Our estimates indicate that aggregate remittances decrease with a domestic worker's age.[12] This finding is consistent with the well-documented result that remittances in developing countries flow from the young to the old. Remittances are also lower if the domestic worker decided to seek employment herself. This indicates that a domestic worker who is relatively autonomous from her family remits less. Married domestic workers also remit less. This could arise because either a married domestic worker has access to other insurance mechanisms or she must incur additional household expenses which reduce her disposable income. Moreover, our estimates indicate that aggregate remittances are increasing in the number of sisters' younger than 18, but is independent of the number of brothers in the same age category. We will discuss this result in the next section.

We also find that aggregate remittances are higher for those whose parents own their house or have farm assets. This result is consistent with the view that remittances are either used to invest or that such parents are in a better position to bargain for higher remittances. As in Agrawal and Horowitz (1999), the relative poverty of the region from which the domestic worker migrated is not statistically significant.

6.3 Determinants of compulsory remittances

The estimates of the standard tobit and type 2 tobit are reported in panels A and B of Table 6 respectively. As implied by Proposition 2, compulsory remittances are a function of gross wages. We use the method proposed by Scott and Garen (1994) to test the tobit model versus the type 2 tobit (see appendix A.4). With a calculated F-test of 94.10, we reject the restrictions embodied in the standard Tobit model. For this reason we focus on the estimates of the Type 2 tobit model

but, for the sake of comparison with the literature, we also provide some discussions of the tobit estimates.

First, in line with Proposition 2, we find that domestic workers with higher wages face higher compulsory remittances. Not surprisingly, the marginal effect of an increase in wages is much higher (0.98) than what is usually estimated in the remittances literature where individuals choose the amount they want to remit. In this case, it is not surprising that the parent is able to extract each additional dinar which the domestic worker earns. This would indicate that such domestic workers have a very low reservation utility and that as in Proposition 2-i) the parent can extract all additional income which she earns. This confirms the fact that a parent can extract more from such workers until they are driven to their reservation utility.

Second, male and female siblings, who are younger than 18, differ in their impact on compulsory remittances. The presence of young males in the family has no effect on either the probability of observing compulsory remittances or the amount remitted. However, the number of sisters who are younger than 18 increases compulsory remittances in the standard Tobit specification. The type 2 Tobit estimates suggest that the number of sisters who are younger than 18 increases the likelihood of compulsory remittances, but does not affect the amount remitted. This result is consistent with parents being more likely to send one of their daughters to work as a domestic worker when there are many other young female siblings in the household. One possible explanation is that young girls who stay with their parents contribute less to household income than their male counterparts. Consequently, they must be supported either directly or indirectly by the head of the household.[13] In this case, they have a very low reservation utility and the parents can extract a large part of their wages. However, young men may be able to both live at home and contribute to household income by finding paid employment in their village. Or parents may be more willing to accept sons

who do not contribute, relative to daughters, because of perceived future benefits of keeping them at school.

We find that a domestic worker who originates from the poorest part of the country faces lower compulsory remittances although she is not less likely to do so. Similarly, parents who own farm assets, as well as those who own their house, are more likely to extract compulsory remittances from their daughter.[14] These results are consistent with our model. Parents who live in poor regions cannot extract a large share of wages because the net benefits from not respecting the contract for the domestic worker and defaulting are high. The opposite hold for parents who have some assets and can provide some credible threat to their daughters.

Both the amount of compulsory remittances, and the likelihood of observing such remittances, are decreasing with age. Older domestic workers are more likely to have greater bargaining power, i.e. a higher reservation utility, and consequently they have a greater say in the allocation of their wages. Furthermore, family ties may weaken over time. Some domestic workers also report saving part of their income for expenses incurred when they get married.

We also find that a domestic worker's relative independence, as measured by whether or not she is the one who decided to seek employment, has a negative effect on the probability of observing compulsory remittances, but does not affect the amount remitted. This indicates that domestic workers who have a greater bargaining power relative to their parents cannot be compelled to remit their wages. This explanation is consistent with the estimate that she is less likely to face compulsory remittances if she found work through friends.

6.4 Determinants of voluntary remittances

As suggested by our model in section 3, we include a domestic worker's net wages as an explanatory variable of voluntary remittances. The estimates of both the standard tobit and Cragg's models are reported in Panel C of Table 6. We use the Lin and Schmidt (1984) likelihood ratio statistic to test the standard tobit specification against Cragg's model. Using the log likelihood estimates reported in Table 6, we obtain a likelihood ratio of 114.12 and strongly reject the standard tobit model.[15] Hence, while most of the remittances literature uses a tobit specification, Cragg's specification appears more appropriate in our case. For this reason we focus on the estimates of Cragg's specification in what follows.

We establish the following results. First, domestic workers who earn higher net wages increases both the likelihood of voluntarily remitting and of sending more remittances voluntarily. The marginal effects reported in Table 7 imply that, ceteris paribus, a domestic worker whose net wages increase by one dinar, voluntarily remits about half of it. Using these estimates we obtain a sender's income elasticity of voluntary remittances of 0.87 in the standard tobit, and 1.33 in Cragg's model. These estimates are higher than those reported in the literature for the same reasons as those given in section 6.2. As we strongly reject the standard tobit model, we conclude that not allowing the determinants of the decision and the amount to remit to differ underestimates the sender's income elasticity of remittances.

Second, in Cragg's specification, the amount which is voluntary remitted is independent of the number of young sisters the domestic worker has, but increases in the number of young brothers. Recall that the opposite holds for compulsory remittances. One possible explanation is that a domestic worker chooses the amount of voluntary remittances herself, while compulsory remittances are decided by her parents. The domestic worker may voluntary remit more when she has more young brothers because they may help her when they grow up or when their parents pass away.

We investigated if the inclusion of the number of brothers older than 18 as an explanatory variable of compulsory remittances affect our estimates. The variable is not statistically significant, and the interpretation and statistical significance of the estimates do not change in any specification. This may arise because domestic workers who face compulsory remittances are quite young, and may have closer ties with younger, rather than older, brothers. Moreover, *ceteris paribus*, older brothers are expected to die earlier than young ones. In this case, the positive link between voluntary remittances and the number of young brothers may arise for insurance motives.

Third, a domestic worker who reports that she is the one who decided to join the labor market, rather than being forced to work by her parent, voluntarily remits less. Such a domestic worker may have weak ties with her family. Note that estimate of a worker's decision to work is not statistically significant in the standard tobit model. This happens because the effect of that variable on likelihood of remitting and the amount remitted are forced to be equal. The negative relation between the domestic worker's decision to work and voluntary remittances is confirmed by the fact that the domestic worker sends less remittances voluntarily as she gets older.

Note that the increasing likelihood of voluntarily remitting as the domestic worker becomes older occurs because older domestic workers are less likely to face compulsory remittances, they control their wages - or at least a greater share of it - and then choose to remit some of it. Finally, as expected, married domestic workers are both less likely to remit voluntarily, and those who do remit send smaller amounts.

7 Conclusion

Using data from a unique survey which we conducted on 500 domestic workers in Tunisia, this paper contrasts the determinants of compulsory remittances, defined as the domestic worker's wage which

the employer sends to the employee's parents, and voluntary remittances. We find that all domestic workers in our sample are females and that close to half of them are younger than 18, and therefore meet the International Labor Organization child domestic workers criteria. Unlike child domestic workers in other countries (Innocenti Digest 1999) all those in our sample are remunerated. When we aggregate both voluntary and compulsory remittances, a domestic worker remits an average of 68 per cent of her wages. Moreover, 40 per cent of domestic workers have their wages remitted directly to their parents.

Our estimates indicate that the gender composition of the domestic worker's originating family has an asymmetric impact on compulsory transfers which are levied by the parents and voluntary remittances which are sent by the domestic worker. On the one hand, the likelihood of facing compulsory remittances is increasing in the number of young females in the domestic worker's family but is independent of the number of young brothers. On the other hand, the amount which is voluntary remitted is increasing in the number of young brothers and independent of the number of young sisters. We also find evidence that parents who are less poor can extract ask for higher compulsory remittances. This is consistent with such parents being able to provide access to better services if the young domestic worker looses her job.

Moreover, we find that the determinants of the likelihood of observing compulsory or voluntary remittances differ from the amount which is remitted. For instance, a domestic worker who decided herself to work is not more or less likely to send remittances voluntarily, but ceteris paribus, she sends smaller sums of money. Using the standard tobit model, would have led us to conclude that the domestic worker's decision has no explanatory power for voluntary remittances. Consequently using a standard tobit model to study voluntary remittances will lead to biased estimates.

Notes

[1]See for instance Basu and Van (1998), (Basu 1999), Ranjan (2001), and Dessy and Vencatachellum (2003).

[2]Vidomegons are not, strictly speaking, child domestic workers. They are rural young females who live and work with urban relatives because of their parents are poor.

[3]See for instance Knowles and Anker (1981) and World-Bank (1994). Since Lucas and Stark (1985), empirical studies of the determinants of remittances include Stark and Lucas (1988) for Botswana, and Cox, Eser and Jimenez (1998) for Peru. Some studies concern industrialized countries where private transfers account for a smaller share of household income than in developing countries (Cox 1987).

[4]See also Paulson (1996) for another study of migration *cum* insurance.

[5]The cheikh used to play an important mediation role which has weakened with urbanization.

[6]The public water supply company is the Société Nationale d'Eau (SONEDE). Households which are not connected to the water supply system are usually poor because the water distribution system is quite extensive and affordable in Tunisia. Only those who cannot afford the connection will choose not to.

[7]There were three minimum wages at the time when the survey was implemented in Tunisia. They were: (i) 170.352 TD per month for a work-week of 48 hours, (ii) 149.237 TD per month for a work-week of 40 hours, and (iii) a minimum daily wage of 5.061 TD for agricultural workers. In 1998 one tunisian dinar was worth one U.S. dollar. One Tunisian Dinar is divided into 1,000 *millimes*.

[8]In fact we did try to visit a random sample of households but they either denied they had a child domestic worker or refused to answer questions.

[9]Let x_i denote one explanatory variable for individual i. Then, more formally, these two conditions mean that $\text{sign}[\partial\ \text{proba}(\text{R}_i > 0|\mathbf{X}_i)/\partial x_i] = \text{sign}(\partial\ \text{E}(\text{R}_i|\ \mathbf{X}_i, \text{R}_i^* > 0)/\partial x_i)$. For any two continuous variables x_m and x_s Wooldridge (2002) shows that these partial effects are equal to the ratio of the parameters $\beta_\text{m}/\beta_\text{s}$.

[10]There is a long running debate on the relative merits of the type 2 tobit and Cragg's specification by using Monte Carlo methods (Leung and Schmidt 1996, for example). We do not perform a Monte Carlo study of both models, but argue in favor of one or the other specification depending whether the remittances are compulsory or voluntary.

[11]See Michaud and Vencatachellum (2003) for a recent study.

[12]Using the parameter estimates for the quadratic specification of the wage variable reported in Table 6, we find that aggregate remittances would start increasing for domestic workers who are older than 50 years. In our sample there are only two such domestic workers. However, only the one who is 51 years old can be used in the estimation because there are missing observations for the other one. Given the confidence interval around the estimates, we conclude that aggregate remittances are decreasing in a domestic worker's age in our sample.

[13]An important question is which child in the household is sent to work. Our data does not allow us to answer this question which is left for future research.

[14]It could be argued that wealthier parents can obtain higher wages for their daughters. However, when we estimate a domestic worker's wages by including a measure of parents' assets as an explanatory variable it is never statistically significant.

[15]The restricted log likelihood is from equation (19) in the appendix and equals -795.68. The unrestricted likelihood is the sum of the likelihood for the probit estimates of voluntary remittances coded as a binary variable, and the likelihood for the truncated regression model of positive voluntary remittances fitted separately (Greene 2000, p.915). This sum equals $-12.39 + -726.24$. The likelihood ratio test follows directly. The critical value equals 14.7. See Fortin, Lacroix and Montmarquette (2000) for a recent example of this test.

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A Appendix

A.1 Proof of Proposition 1

The proof of i) is trivial as, by definition, the domestic worker has no disposable income to send when $\tilde{w} = 0$.

The proof of ii) follows from evaluating the first order condition (14) at $r = 0$. In that case, it must be that $\rho = w$. Given that the utility function is strictly concave in its arguments, $\Delta > 0$ guarantees that $r^* = w$.

Assuming $\tilde{w} > 0$ then the choice of r is relevant. If the budget constraints are binding, and assuming an interior solution, the first order condition for maximizing the domestic worker's utility is:

$$-u_1 + u_2 f_1 = 0. \tag{14}$$

Let $\theta \in \{y_f, w, \rho\}$ and $h(r, \theta) = -u_1 + u_2 f_1$. The implicit function theorem applies because $h_r \neq 0$ and therefore there exists an implicit function $r(y_f, w, \rho)$ which verifies the first order condition (14). Totally differentiating h with respect to r and θ, under the assumption that the utility function is strictly concave, we obtain that $\partial r^*/\partial\theta$ is of the same sign as h_θ. Totally differentiating (14) with respect to each element of θ we obtain:

$$h_{y_f} = -u_{12} f_1 + u_{22} f_1 + u_2 f_{11} < 0 \tag{15}$$

$$h_{\tilde{w}} = -u_{11} > 0 \tag{16}$$

$$h_\rho = -u_{12} f_1 + u_{22} f_1 + u_2 f_{11} < 0 \tag{17}$$

which completes the proof. Note that $h_{y_f} = h_{\tilde{\rho}}$ because compulsory remittances is identical to an increase in the parents' income.

A.2 Proof of Proposition 2

The function $v(w, y_f, \rho)$ is the value function associated to the domestic worker's problem. Bearing in mind that $v(w, y_f, \rho)$ is decreasing in ρ, and applying the envelope theorem, we have that

$$\frac{\partial v}{\partial \theta} = \frac{\partial u}{\partial \theta}. \tag{18}$$

where $\theta \in \{w, y_f, \underline{c}\}$. Differentiating the right hand side of with respect to θ we obtain: $\frac{\partial U}{\partial \underline{c}} = \frac{\partial U}{\partial w} = u_1$, and $\frac{\partial U}{\partial y_f} = u_2 f_1$. Both of those derivatives are unambiguously positive.

A.3 Likelihood functions

Tobit The likelihood function for (10) has the familiar discrete and continuous parts:

$$\mathrm{L_{Tobit}} = \prod_{0} [1 - \Phi((\mathbf{X}_i\beta_\mathrm{r} + \delta_\mathrm{r} w_i)/\sigma_\mathrm{r})] \prod_{1} \sigma_r^{-1} \phi\left[(\mathrm{R}_i - \mathbf{X}_i\beta_\mathrm{r} - \delta_\mathrm{r} w_i)/\sigma_\mathrm{r}\right] \tag{19}$$

where Φ and ϕ are the standard normal cumulative and probability density functions respectively.

Cragg two-tiered model Assume that the probability a domestic worker decides not to remit is given by a probit with parameters $(\beta_\mathrm{d}, \delta_\mathrm{d})$, and a variance which is normalized to 1:

$$\mathrm{Proba}(\mathrm{R}_i = 0) = 1 - \Phi(\mathbf{X}_i\beta_\mathrm{d} + \delta_\mathrm{d} w_i). \tag{20}$$

Assume also that the probability of the amount remitted, conditional on it being positive, is given by a normal distribution $N(X_i\beta_\mathrm{r}, \sigma_\mathrm{r})$ truncated at zero. Under those two assumptions, and using (9), (11), and (13), the likelihood function for Cragg's two-tiered model equals:

$$\begin{aligned} \mathrm{L_{Craag}} &= \prod_{0} \mathrm{proba}(\mathrm{R}_i^* < 0) \prod_{1} \mathrm{proba}(\mathrm{R}_i^* | \mathrm{R}_i^* > 0) \mathrm{proba}(\mathrm{R}_i^* \geq 0) \\ &= \prod_{0} [1 - \Phi(\mathbf{X}_i\beta_\mathrm{d} + \delta_\mathrm{d} w_i)] \prod_{1} \frac{\sigma_\mathrm{r}^{-1} \phi[(\mathrm{R}_i - \mathbf{X}_i\beta_\mathrm{r} - \delta_\mathrm{r} w_i)/\sigma_\mathrm{r}]}{\Phi[(\mathbf{X}_i\beta_\mathrm{r} + \delta_\mathrm{r} w_i)/\sigma_\mathrm{r}]} \Phi(\mathbf{X}_i\beta_\mathrm{d} + \delta_\mathrm{d} w_i) \end{aligned} \tag{21}$$

Following Greene (2000, p. 770), (19) equals (21) if:

$$\beta_\mathrm{d} = \beta_\mathrm{r}/\sigma_\mathrm{r}, \tag{22}$$

$$\text{and } \delta_\mathrm{d} = \delta_\mathrm{r}/\sigma_\mathrm{r}. \tag{23}$$

These two restrictions provide a straightforward test of the tobit versus Cragg's model.

Type 2 Tobit Using (9), (11) and (12), the likelihood function of the type 2 tobit equals:

$$\begin{aligned} \mathrm{L}_{\text{type2}} &= \prod_0 \text{proba}(D_i^* \leq 0) \prod_1 \text{proba}(R_i | D_i^* > 0) P(D_i^* > 0) \\ &= \prod_0 \left[1 - \Phi(\mathbf{X}_i \beta_d + \delta_{\mathrm{d}} w_i)\right] \prod_1 \left[\sigma_{\mathrm{r}}^{-1} \phi\left((R_i - \mathbf{X}_i \beta_{\mathrm{r}} - \delta_{\mathrm{r}} w_i)/\sigma_{\mathrm{r}}\right) \Phi(\mathbf{X}_i \beta_{\mathrm{d}} + \delta_{\mathrm{d}} w_i)\right]. \quad (24) \end{aligned}$$

A.4 Test of the standard tobit versus a type 2 tobit

1. We obtain a consistent estimate of the ratio of parameters $\beta_{\mathrm{d}}/\sigma_{\mathrm{d}}$ by estimating a probit on the whole sample of domestic workers where those who are subjected to compulsory remittances are coded as 1, and the others are coded as 0.

2. Estimate a remittances equation on only domestic workers who send compulsory remittances:

$$\begin{aligned} \mathrm{E}(R_i | D_i = 1) &= \mathbf{X}_i \beta_{\mathrm{r}} + E(u_{\mathrm{r}i} | u_{\mathrm{d}i} > -\mathbf{X}_i \beta_{\mathrm{d}}) \\ &= \mathbf{X}_i \beta_{\mathrm{r}} + \sigma_{\mathrm{rd}} \frac{\phi(z_i)}{\Phi(z_i)} \end{aligned} \quad (25)$$

where β_{r} is a vector of parameters, $\sigma_{\mathrm{rd}} = \mathrm{cov}(u_{\mathrm{r}i}, u_{\mathrm{d}i})$, and $z_i = \mathbf{X}_i \frac{\beta_{\mathrm{d}}}{\sigma_{\mathrm{d}}}$. If the tobit model is valid, then the parameters β_{Tobit} in the tobit specification (19), are such that:

$$\beta_{\text{Tobit}} = \frac{\beta_{\mathrm{r}}}{\sigma^2}. \quad (26)$$

where β_{r} is from (25), and σ^2 is the standard deviation of the error term of the regression model (25).

Table 1. Some stylized facts on remittances

Country	Remittances as a percentage [1] of the income of the		Year of survey	Source
	Recipient	Sender		
Mexico	33-39%	n.r. [3]		Stark, Taylor and Yitzhaki (1988)
El Salvador	14-22%	n.r.		Funkhouser (1992)
Pakistan	5-12%	n.r.		Adams (1998)
Kenya	n.a.	21%	1971	Johnson and Whitelaw (1974)
Nicaragua	$US 56-79	n.r.	1989	Funkhouser (1992)
Dominican Republic [2]	n.r.	n.r.	1994	de la Brière et. al. (1997, 2002)
Males	n.r.	33	"	"
Females	n.r.	22	"	"
Western Kenya	n.r.	7	1988	Hoddinott (1994)
India (Delhi)	n.r.	n.r.	1975-76	Banerjee (1984)
Urban migrants	n.r.	14	"	"
Rural migrants	n.r.	23	"	"

Notes

[1] Numbers are rounded to the closest integer. Remittances are percentages unless otherwise specified

[2] The percentages are calcules using information provided on page 10 of de la Brière et al (2002).

[3] n.r.: Not reported

Table 2. Descriptive statistics of the Tunisian population from the 1994 census

Province / District	Population share	Household share connected to public water supply [1]	Household share connected to electricity [2]	Distance from Tunis in Kms
Tunis	10	93	96	…
Ariana	6	86	92	… [3]
Ben Arous	4	85	90	… [3]
Tunis	21	89	94	not applicable
Nabeul	7	64	88	67
Zaghouan	2	47	63	57
Bizerte	6	66	82	64
North-East	14	63	83	not applicable
Beja	3	51	78	105
Jendouba	5	36	75	139
El Kef	3	46	72	175
Seliana	3	40	69	140
North-West	14	43	74	not applicable
Sousse	5	84	92	140
Monastir	4	89	94	165
Mahdia	4	48	77	160
Sfax	8	65	89	270
East-Central	21	71	88	not applicable

Source: Recensement général de la Tunisie (1994)

Notes

[1] Water is supplied by the Société Nationale de l'Eau (SONEDE) throughout the country

[2] Electicity is provided by the Société Tunisienne d'Electricite et de Gaz (STEG), a state firm.

[3] Ariana and Ben Arous are in the suburbs of Tunis.

Table 3. Descriptive statistics on the sample of domestic workers in Tunisia

Age group	Number	Share	Literacy rate	Av. Num of below 18 Brothers	Av. Num of below 18 Sisters
[9,15]	156	31%	21%	0.84	0.90
[16,18]	111	22%	32%	0.76	0.62
[19,29]	201	40%	53%	0.36	0.50
Over 30	30	6%	5%	0.03	0.07
Whole sample	498	100%	33%	0.58	0.62

Age group	Average Wage [1]	Num of dom. workers with 0 net wages [2]	Share of DW who remit all their wages	Compulsory Remittances: Average in TD	Compulsory Remittances: share of wages	Voluntary Remittances: Average in TD	Voluntary Remittances: share of net wages
[9,15]	77	132	85%	68	89%	45	60%
[16,18]	90	42	38%	47	53%	43	47%
[19,29]	104	21	10%	28	28%	36	38%
Over 30	146	0	0%	5	6%	32	22%
Whole sample	95	195	39%	43	51%	38	40%

Average age		19
Median age		18
Share of maids who are literate		33%
Average monthly aggregate remittances (compulsory and voluntary)		Tunisian Dinar
	Whole sample	61
	For those who face compulsory remittances	82
	For those who face voluntary remittances	39
	Conditional on positive net wages	38
	For those who face compulsory remittances	79
Number of domestic workers with positive net wages who do not voluntarily remit		0

Notes

[1] Average monthly gross wages in Tunisian dinars

[2] Net monthly wages equals gross monthly wages minus compulsory monthly remittances

Table 4. Descriptive statistics on the domestic worker's family

Province [3] (Gouvernorat) / District	Number of domestic workers	Percentage of domestic worker's family who: own their house	Live in a shack [1]	are connected to the water supply [2]	Agriculture	Number of children per family
Tunis	12	42	17	25	8	4.3
Ariana	32	59	0	56	25	4.0
Ben Arous	12	50	0	92	33	4.3
Tunis	56					
Nabeul	34	62	6.7	65	21	4.1
Zaghouan	41	61	20.5	78	17	4.1
Bizerte	18	61	0	44	11	4.1
North-East	93					
Beja	57	61	15.2	63	10	3.8
Jendouba	109	60	16.3	69	14	4.5
El Kef	63	62	16.4	75	11	4.1
Siliana	28	0.4	10	71	27	4.0
North-West	257					
Sousse	7	43	0	57	27	not available
Monastir	4	25	0	75	0	4.0
Mahdia	4	50	0	75	0	3.3
Sfax	0	0	0	0	0	0
East-Central	15					
Tunisia	453	59	12.4	66	16	4.2

Notes

[1] A shack is called a Gourbi in Tunisia. Although the house is of poor quality, it is usually, at least partly, built in cement

[2] Water is supplied by the Société Nationale de l'Eau (SONEDE) across the country

[3] Tunisia is divided in 4 districts and 14 provinces which are called gouvernorats.

Table 5: Determinants of a domestic worker's wage [1]

Dependant variable: Logarithm of monthly wages		
Explanatory variables	Model (1)	Model (2)
Human Capital		
Age	0.04 ***	
	(6.21)	
Age squared divided by 100	-0.02 *	
	(1.74)	
Years of tenure with current employer	Excluded	0.08 ***
		(13.5)
Years of tenure squared divided by 100	Excluded	-0.2 ***
		(6.31)
Dummy variable equals 1 if the domestic worker is literate	-0.08 ***	-0.04 *
	(3.45)	(1.83)
Domestic workers autonomy		
Dummy variable equals 1 if the domestic worker decided to work	-0.10 ***	-0.03
	(3.42)	(1.04)
Help in finding employment		
Siblings	0.03	0.02
	(1.28)	(0.80)
Other relatives	0.02	0.00
	(0.80)	(0.01)
Friends	0.06 *	0.06 **
	(1.72)	(1.97)
No one but herself	-0.04	0.11 **
	(0.66)	(2.27)
Non monetary benefits		
Dummy variable equals 1 if the domestic worker lives in the employer's house	-0.02	-0.06 ***
	(0.84)	(2.60)
Dummy variable equals 1 if the employer sends gifts to the maid's family	0.00	-0.01
	(0.19)	(0.53)
Constant	3.9 ***	4.3 ***
	(47.5)	(136.2)
Number of observations	348	348
R-Square	0.52	0.61
Adjusted R-Square	0.51	0.59

Notes

[1] Absolute T-ratios corrected for heteroscedasticity are in parenthesis under the point estimate. A (*) (**) and (***) indicates the coefficient is significantly different from 0 at the 1%, 5% and 10% level respectively

[2] The reference category are domestic workers who were helped by their parents in finding employment.

Table 6: Determinants of remittances

Panel A: Aggegate remittance	Panel A	Panel B			Panel C		
Dependent variable	Log of	Compulsory remittances			Voluntary remittances		
	aggregate	Standard	Type II Tobit		Standard	Cragg	
Explanatory variables	remittances	Tobit	Probit	Continuous	Tobit	Probit	Truncated
Human capital							
Age	-0.066***	-6.714**	-0.301***	1.311	0.468	0.879**	-3.809**
	(3.10)	(2.18)	(4.21)	(1.14)	(0.44)	(2.09)	(2.40)
Age squared divided by 100	0.042	4.512	0.506***	-10.028***	-5.464***	-2.427**	3.687
	(0.97)	(0.59)	(3.51)	(2.95)	(2.76)	(2.41)	(1.27)
Domestic worker's autonomy							
Dummy variable equals 1 if the domestic worker							
Is married	-0.772***	-51.544***	-0.995***	8.717	-21.753***	-2.707*	-25.221***
	(7.87)	(3.69)	(3.23)	(1.22)	(5.51)	(1.94)	(4.49)
Decided to work	-0.403***	-50.617***	-0.857***	-11.749*	-2.367	-1.936	-12.722***
	(4.39)	(4.02)	(3.17)	(1.78)	(0.66)	(1.34)	(2.72)
Found work through her siblings	-0.048	-9.368	-0.289	-1.485	0.768	-0.450	1.715
	(0.65)	(1.16)	(1.30)	(0.60)	(0.21)	(0.41)	(0.33)
Found work through other relatives	-0.068	-15.179	-0.495*	3.471	2.916	0.774	3.464
	(0.75)	(1.54)	(1.91)	(1.08)	(0.67)	(0.58)	(0.59)
Found work through friends	-0.196*	-27.045**	-0.681**	-7.753	1.920	-0.858	2.365
	(1.85)	(2.07)	(2.25)	(1.57)	(0.42)	(0.77)	(0.39)
Found work by herself	-0.050	-21.011	-1.075*	19.694*	18.038**	5.702	8.571
	(0.27)	(0.86)	(1.91)	(1.86)	(2.42)	(1.61)	(0.85)
Does not know whether she will inherit from her parents	0.041	-12.847*	-0.397*	1.184	7.327**	0.154	12.866**
	(0.59)	(1.74)	(1.85)	(0.54)	(2.09)	(0.17)	(2.48)
Recipients' need							
Number of the domestic worker's brothers who are younger than 18	0.071	0.522	0.048	-0.100	3.883*	0.375	6.823**
	(1.58)	(0.11)	(0.34)	(0.07)	(1.79)	(0.51)	(2.12)
Number of the domestic worker's sisters who are younger than 18	0.117***	16.717***	0.446***	1.688	3.626	0.966	2.526
	(2.68)	(3.59)	(3.25)	(1.15)	(1.57)	(1.47)	(0.71)
Dummy variable equals 1 if the domestic worker's parents live in the North	-0.016	6.153	0.259	-4.157*	0.006	-0.481	-0.994
West district of Tunisia	(0.26)	(0.91)	(1.47)	(1.88)	(0.00)	(0.60)	(0.26)
Dummy variable equals 1 if the maid's parents own their place of residence	0.140**	7.472	0.123	1.850	4.842	3.565**	1.002
	(2.03)	(1.00)	(0.57)	(0.81)	(1.37)	(2.15)	(0.19)
Dummy variable equals 1 if the domestic worker's parents have	-0.004	-6.452	0.104	-7.102*	-2.873	-2.170	-0.398
water	(0.04)	(0.54)	(0.33)	(1.85)	(0.65)	(1.61)	(0.07)
Dummy variable equals 1 if the domestic worker's parents have	-0.063	-5.236	-0.117	1.127	3.190	1.349	0.020
other assets	(0.90)	(0.67)	(0.58)	(0.45)	(1.01)	(1.46)	(0.00)
Dummy variable equals 1 if the domestic worker's parents have	0.280***	28.642***	0.578***	2.461	-0.865	0.332	2.281
farm assets	(3.52)	(3.06)	(2.59)	(0.72)	(0.25)	(0.27)	(0.52)
Income							
Logarithm of monthly wages	0.922***						
	(5.40)						
Gross monthly wages		0.285	-0.007	0.983***			
		(1.37)	(1.26)	(13.82)			
Net monthly wages					0.803***	0.140***	0.457***
					(16.80)	(3.16)	(4.95)
Constant	0.627	92.416***	4.388***	-1.828	-39.135***	-15.753**	43.549**
	(0.85)	(2.64)	(4.63)	(0.16)	(2.83)	(2.37)	(2.00)
Number of observations				348			
Number of domestic workers with positive voluntary remittances				174			
Number of domestic workers with positive compulsory remittances				188			
Number of domestic workers with compulsory and voluntary remittances				14			
R-square	0.48						
Adjusted R-square	0.45						
Log likelihood		-1105	-902		-795	-738	

Notes

(1) Absolute T-ratios corrected for heteroscedasticity are in parenthesis under the point estimate. The critical T at

(2) A (*) (**) and (***) indicates the coefficient is significantly different from 0 at the 10%, 5% and 1% level respectively

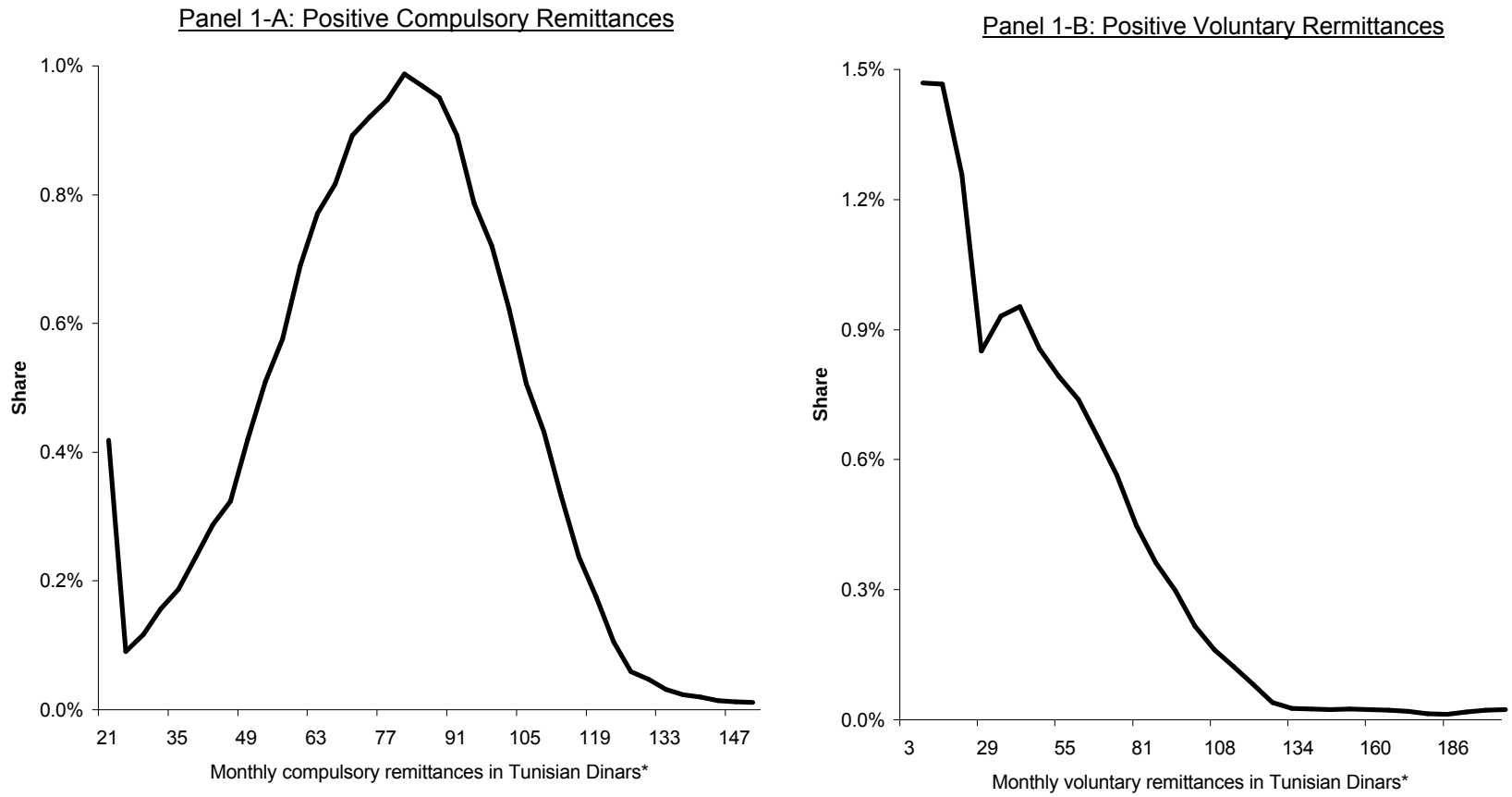
Table 7: Marginal effects

	Panel B Compulsory remittances				Panel C Volontary remittances			
	Standard Tobit		Type II Tobit		Standard Tobit		Cragg	
Explanatory variables	Probit	Continuous	Probit	Continuous	Probit	Continuous	Probit	Truncated
Human Capital								
Age	-0.048**	-2.984**	-0.118***	1.332	0.010	0.175	0.136**	-3.809**
	(2.18)	(2.18)	(4.26)	(1.10)	(0.44)	(0.44)	(2.09)	(2.40)
Age squared divided by 100	0.032	2.005	0.199***	-10.063***	-0.112***	-2.041***	-0.376**	3.687
	(0.59)	(0.59)	(3.53)	(2.86)	(2.76)	(2.76)	(2.41)	(1.27)
Domestic workers autonomy								
Dummy variable equals 1 if the domestic worker								
Is married	-0.373***	-18.756***	-0.374***	8.795	-0.398***	-6.451***	-0.795*	-25.221***
	(3.69)	(3.69)	(3.80)	(1.26)	(5.51)	(5.51)	(1.94)	(4.49)
Decided to work	-0.366***	-18.967***	-0.330***	-11.683*	-0.048	-0.864	-0.544	-12.722***
	(4.02)	(4.02)	(3.48)	(1.79(	(0.66)	(0.66)	(1.34)	(2.72)
Found work through her siblings	-0.067	-4.099	-0.114	-1.464	0.016	0.288	-0.077	1.715
	(1.16)	(1.16)	(1.30)	(0.59)	(0.21)	(0.21)	(0.41)	(0.33)
Found work through other relatives	-0.110	-6.383	-0.195*	3.508	0.059	1.123	0.084	3.464
	(1.54)	(1.54)	(1.94)	(1.10)	(0.67)	(0.67)	(0.58)	(0.59)
Found work through friends	-0.199**	-10.751**	-0.265**	-7.701	0.039	0.734	-0.199	2.365
	(2.07)	(2.07)	(2.47)	(1.58)	(0.42)	(0.42)	(0.77)	(0.39)
Found work by herself	-0.155	-8.407	-0.390**	19.781*	0.321**	8.698**	0.122	8.571
	(0.86)	(0.86)	(2.47)	(1.89(	(2.42)	(2.42)	(1.61)	(0.85)
Does not know whether she will inherit from her parents	-0.090*	-5.752*	-0.155*	1.211	0.149**	2.712**	0.024	12.866**
she will inherit from her parents	(1.74)	(1.74)	(1.88)	(0.55)	(2.09)	(2.09)	(0.17)	(2.48)
Recipients' need								
Number of the domestic worker's brothers who are younger than 18	0.004	0.232	0.019	-0.104	0.079*	1.451*	0.058	6.823**
	(0.11)	(0.11)	(0.34)	(0.07)	(1.79)	(1.79)	(0.51)	(2.12)
Number of the domestic worker's sisters who are younger than 18	0.118***	7.430***	0.175***	1.656	0.074	1.354	0.150	2.526
	(3.59)	(3.59)	(3.26)	(1.15)	(1.57)	(1.57)	(1.47)	(0.71)
Dummy variable equals 1 if the domestic worker's parents live in the North	0.044	2.722	0.102	-4.175**	0.000	0.002	-0.072	-0.994
West of Tunisia	(0.91)	(0.91)	(1.47)	(1.90)	(0.00)	(0.00)	(0.60)	(0.26)
Dummy variable equals 1 if the maid's parents own their place of residence	0.053	3.290	0.048	1.841	0.099	1.779	0.793**	1.002
	(1.00)	(1.00)	(0.57)	(0.81)	(1.37)	(1.37)	(2.15)	(0.19)
Dummy variable equals 1 if the domestic worker's parents have	-0.046	-2.796	0.041	-7.109*	-0.059	-1.040	-0.643	-0.398
water	(0.54)	(0.54)	(0.33)	(1.85)	(0.65)	(0.65)	(1.61)	(0.07)
Dummy variable equals 1 if the domestic worker's parents have	-0.037	-2.315	-0.046	1.135	0.065	1.203	0.189	0.020
other assets	(0.67)	(0.67)	(0.58)	(0.45)	(1.01)	(1.01)	(1.46)	(0.00)
Dummy variable equals 1 if the domestic worker's parents have	0.210***	11.531***	0.227***	2.417	-0.018	-0.326	0.059	2.281
farm assets	(3.06)	(3.06)	(2.67)	(0.72)	(0.25)	(0.25)	(0.27)	(0.52)
Income effect								
Gross monthly wages	0.002	0.126	-0.003	0.983***				
	(1.37)	(1.37)	(1.26)	(13.83)				
Net monthly wages					0.016***	0.300***	0.022***	0.457***
					(16.80)	(16.80)	(3.16)	(4.95)
Number of observations	348		348		348		348	

Absolute T-ratios corrected for heteroscedasticity are in parentheses under the point estimate. (***) [**] and (*) indicates that the coefficient is statistically different from 0 at the 1%, 5% and 10% level respectively

Appendix A.6 Figures

Figure 1: Kernel density estimates of domestic workers'□
compulsory and voluntary remittances in Tunisia



*At the time of the survey in 1998, 1 tunisian dinar was worth 1$.

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