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Abstract

This paper investigates the association between gender and poverty in Tunisia based upon an empirical analysis of 1990 and 2000 household surveys. It also tests whether there is a widespread feminization of poverty. To achieve these goals, the paper suggests a theoretically sound method to compute expenditure-based incidence of poverty and tests for differences in headcount ratio between female- and male-headed households for a given period and whether this difference is increasing over time. Stochastic dominance tests are also performed to avoid arbitrary choices of poverty lines and indices. The results suggest that although the female headed households would be subjected unequal treatment in the labor market, they are not poorer than their male counterpart as they live with more active persons. However, as we increase the poverty line, the poverty difference between female and male headed households rises to the detriment of female-headed households and becomes statistically significant. But what is more disquieting is that this difference will increase over time due to the fall in both the level and the returns of the female assets.

ملخص

تناقش هذه الورقة العلاقة بين الفقر و النوع في تونس و ذلك بناءا علي التحليل التجريبي الذي اجري عام 1990 و المسح الأسرى الذي تم عام 2000 . كما تختبر الورقة أيضا ما إذا كان هناك تأنيثا واسعا للفقر. و لتحقيق هذه الأهداف، تقترح هذه الورقة طريقة نظرية لحساب معدلات حدوث الفقر القائم علي الأنفاق و الكشف عن نسبة الاختلاف بين الأسر التي يعولها رجل و تلك التي تعولها امرأة لفترة محددة، بالإضافة إلي تحديد ما إذا كانت هذه الاختلافات تزداد بمرور الوقت أم لا. كما تجري اختبارات إحصائية لتجنب الاختيارات التحكمية لخطوط الفقر و مؤشراته. أظهرت النتائج انه بالرغم من أن الأسر التي تعولها امرأة تكون عرضة للمعاملة بشكل لا يتسم بالمساواة في سوق العمل، إلا إنها لا تبدوا أفقر من نظيرتها التي يعولها رجل لأنها تعيش وسط أناس أكثر نشاطا. و مع ذلك، فإننا كلما رفعنا من خط الفقر كلما زاد فارق الفقر بين الأسر التي يعولها رجل و تلك التي تعولها أنثي علي حساب الأسر التي تعولها امرأة و تصبح مميزة إحصائيا. لكن ما يقلق أكثر هو أن هذا الفارق بين الأسرتين ربما يزيد مع مرور الوقت بسبب الانخفاض في مستوي و عائدات أصول الإناث.

1. Introduction

In the literature on poverty, the two frequently asked questions are: are women poorer than men and how this difference evolves over time? These are certainly issues on which much policy and academic debate has taken place recently. For instance, Buvinic and Gupta (1997) report that out of 61 studies on the relationship between female-headed households and poverty, 38 found that female-headed households are over-represented among the poor and 15 other studies found that poverty is associated with certain types of female heads or that the association emerged for certain poverty indicators. This is partly a reflection of the heterogeneous nature of female-headed households. For example, some of the households that are headed by women as a result of male migration may be relatively affluent if the remittances are high.

It has also been argued that it may be more meaningful to study *female-maintained* households as opposed to those headed by women (Gammage 1997). Female-maintained households are those in which women are the primary breadwinners of the household. In this study, we will adopt this route and, for short, we will use the concept of female-headed households to designate the female-maintained households.

In Tunisia, although different development strategies have been followed since 1960s, using economic growth to widen people's choices and fight poverty in all its aspects has always been a constant objective. Further, the development strategies were always anchored on human development and the promotion of gender equality. This was done through a large enrolment in basic school, the provision of basic health services, and the establishment of an important social security system.[1] Further, the active participation of women in the development process was ensured through the promulgation of the personal status code since 1956 which, in addition to prohibiting polygamy and repudiation, sets the rules for divorce as well as relations between ascendants, descendants and relatives to promote gender equality.

The human development approach followed by Tunisia since 1960s has yielded impressive results. Health levels improved, as the increase in life expectancy improved. Population growth also has been put under control following a family planning program undertaken in the early 1960s. Primary education for females and males became nearly universal and illiteracy is close to becoming eradicated among younger generations.[2] However, female illiteracy rates remain larger than their male counterparts. The UNDP (2003) reports that the illiteracy rate is 41 percent for women older than 15 years, while this rate stands only at 20 percent for the men of the same age group. As the households headed by an illiterate often hold the larger contribution to overall poverty, there are serious reasons to be concerned about the poverty status of female-headed households.

This paper tests then whether poverty rates for female-headed households are higher than those for male-headed households and whether gender poverty differences are stable, increasing, or decreasing over time. For this, it is important to identify the determinants of the poverty difference between the two household types. These determinants fall into two dimensions: those related to the endowments of the households and those related to the returns of those endowments. For instance, households with two or more active persons are less likely to fall into poverty than households with only one breadwinner. But if the female labor returns are lower than the male labor returns due to discrimination against the former in the labor market, female-maintained households will undergo a larger risk of poverty than their male counterpart. Thus, if the feminization of poverty is proven, it is important to know whether the forces behind these are related to the endowment level of the female-

[1] See Table 1 for more details on this.

[2] See the World Bank (1995, 2003) for more details.

headed households or to the unequal treatment they face. This is very policy relevant to set the appropriate reform in order to promote cost-effectively gender equality.

The methodology followed in this study is applied to data from the 1990 and 2000 Tunisian surveys about the budget and the consumption of households conducted by the National Institute of Statistics. These are multipurpose household surveys which provide information on expenditures and quantities for food items and expenditures for non-food items, as well as on many other dimensions of households behavior including consumption of own production, education, housing, region of residence, demographic information, and economic activities.

The rest of the paper is structured as follows. Section 2 presents the measurement techniques to infer the origins of poverty difference in gender poverty. Section 3 shows how to check for the ethical robustness of the poverty difference between at a given period and over time between female- and male-headed households. Section 4 applies the methodology to the 1990 and 2000 Tunisian Household Surveys, and Section 5 concludes.

2. The Methodology

The first issue which arises in addressing gender poverty is which poverty statistic should be used to test whether women are poorer or whether there is a feminization issue of poverty? The poverty index that has been largely used is the incidence of poverty, that is, the proportion of the population living with less than the poverty line. This index was criticized by Sen (1976) since it only captures the changes in the proportion of the poor but not the changes in the well-being of the poor. Since the precursory work of Sen (1976), a considerable amount of literature was developed about the measurement of poverty. We will start with the popular Foster-Greer-Thorbecke (1984) (FGT) family of poverty indices, although an important aim of this paper is rather to show how the use of these peculiar indices is also useful for predicting how many other indices will measure the poverty gap. Let z be a real poverty line. The FGT family is then defined as:

$$P_\alpha(z) = \int_0^{+\infty} \left(\frac{z-y}{z} \right)_+^\alpha dF(y) \qquad (1)$$

where $f_+ = \max(0, f)$ and $F(y)$ is the cumulative distribution function of y, the real *per capita* income for short, and α is a parameter that captures the "aversion to poverty" or the distribution sensitivity of the index. The FGT indices are averages of powers of normalized poverty gaps. As is well known, $P_0(z)$ is the incidence of poverty, $P_1(z)$ is the normalized average poverty gap measure (the "intensity" of poverty), and $P_2(z)$ is often described as an index of the "severity" of poverty – it weights poverty gaps by poverty gaps. For $\alpha > 1$, $P_\alpha(z)$ is sensitive to the distribution of living standards among the poor, and when α becomes very large, $P_\alpha(z)$ approaches a Rawlsian measure (see Rawls (1971)).

One typical feature of the FGT poverty indices is that they can be used to construct profiles of poverty, evaluate the extent of poverty within each subgroup of the population, and compute the poverty difference between subgroups. If we define each group by the gender of the household head, poverty differences between female- and male-headed households may be estimated as

$$\Delta P_\alpha(y, z) = P_\alpha^{female}(z) - P_\alpha^{male}(z). \qquad (2)$$

Further, applying equation (2) on two cross-sectional household surveys, one may test whether there is a feminization of the poverty issue:

$$P_{\alpha,t}^{female}(z) - P_{\alpha,t}^{male}(z) > P_{\alpha,t-1}^{female}(z) - P_{\alpha,t-1}^{male}(z) \qquad (3)$$

In reality, equations (2) and (3) can lead to a misleading appreciation of the gender poverty issue. An important reason for this is that female- and male-headed households often differ considerably from each other in many respects, including their endowments and the returns of their assets. For instance, to face a lower return of the labor endowment, female-headed households may be forced to increase their labor supply (by reducing child school attendance) to escape poverty. This behavior may yield lower female poverty as computed by equations (2) or (3) leading policymakers to wrongly believe the absence of any gender issue.

To better our understanding of gender poverty, one can follow for example the Blinder (1973) and Oaxaca (1973) approach by estimating a welfare model for men and women, separately. Then, the poverty difference between male and female can be decomposed into the contribution of pure discrimination effect and contribution of the difference in their endowments.

To see how this can be done, let X_h^g be a vector of characteristics (endowments) of a household *h* headed either by a woman (*g* = *female*) or a man (*g* = *male*). The easiest approach is to estimate a welfare model to predict the households' well-being using pertinent characteristics linked with gender issues, namely, the number of active persons by sex, the sector of activity of the household head, the region of residence, and the demographic structure of the households. This model should capture the contribution of each characteristic on the household welfare level:

$$y_h^g = X_h^g \beta^g + \varepsilon_h^g, \;\; h = 1,2,...,H; \;\; g = female, male. \tag{4}$$

where y_h^g is the *per capita* income of a household *h* headed either by a woman (*g* = *female*) or a man (*g* = *male*) and ε_h^g is a standard residual term.

Whenever no simultaneous effect of household's welfare on household's characteristics is assumed to be an acceptable assumption, so that all variables in X_h^g are exogenous, the model (4) enables to capture the net effect of each characteristic. Holding this assumption, a simple ordinary-least-squares (OLS) estimation of (4) is fitting. Yet, for the purpose of poverty analysis, model (4), and then OLS estimation, is not the optimal choice. Indeed, OLS estimation method is anchored on the mean of the distribution of the dependent variable and provides accurate predictions around this mean only, which is often much higher than the poverty line. Further, it is assumed within this framework that the marginal effect of a given household's characteristic, like the number of female breadwinners, is the same across the whole population, irrespective of the poverty status of each household. Model (4) is therefore not strictly appropriate to the problem posed in this study.

A suitable technique is available however if the aim is to explain the difference in the poverty rates between female- and male-headed households, in which case the *probit* (or the *logit*) regression is the relevant tool to tackle the link between gender and poverty. This requires the assumption that equation (4) is the correct welfare model for the poor and that the same set of explanatory variables determine whether a given female-headed household is poorer or not than her male counterpart. No assumptions are made about the welfare determinants of the non-poor; the process and the parameters could or could not be the same. The model sets any welfare level higher than the relevant poverty line equal to 0 and the welfare level of the poor equal to 1:

$$d_h^g = X_h^g \beta^g + \varepsilon_h^g, \;\; h = 1,2,...,H; \;\; g = female, male. \tag{5}$$

where d_h^g is a binary variable indicating whether or not household *h* is poor:

$$d_h^g = \begin{cases} 1 & \text{if} \quad y_h^g < z \\ 0 & \text{if} \quad y_h^g \geq z \end{cases}, \; h = 1,2,...,H; \; g = female, male. \tag{6}$$

The equation (6) is then estimated across all observations of each group and captures the probability to be poor conditional upon the household's characteristics:

$$\Pr(d_h^g = 1) = \Pr(y_h^g < z) = \Phi(X_h^g \beta^g) \tag{7}$$

where Φ(.) is the cumulative distributive function specified for the error terms ε_h^g.

In contrast to the OLS estimations, the coefficients of the *probit* model do not give the marginal effects of the variable in question on the probability to be poor. These however are readily computed by a standard transformation. Further, the likely presence of measurement errors has led several authors to substitute limited dependent variable models for the continuous welfare equations. In this respect, Gaiha (1988) used a binary *logit* model to predict the probability that a rural household in India would be poor and Rodgers (1994) used the *probit* model to explain why poverty rates for female-headed families are much higher than those for married-couple families and male headed families. In the line of Rodgers (1994), we suggest to decompose the difference in the predicted poverty rates between the female- and male-headed households into differences in conditional poverty function (that is, the return of characteristics) and differences in distribution of characteristics in the spirit of Oaxaca (1973) and Blinder (1973):

$$\begin{aligned}
&\Pr(y^{female} < z) - \Pr(y^{male} < z) \\
&= \Phi(\bar{X}^{female}\hat{\beta}^{female}) - \Phi(\bar{X}^{male}\hat{\beta}^{male}) \\
&= \underbrace{\left(\Phi(\bar{X}^{female}\hat{\beta}^{female}) - \Phi(\bar{X}^{female}\hat{\beta}^{male})\right)}_{D_1(z)} + \underbrace{\left(\Phi(\bar{X}^{female}\hat{\beta}^{male}) - \Phi(\bar{X}^{male}\hat{\beta}^{male})\right)}_{E_1(z)} \\
&= \underbrace{\left(\Phi(\bar{X}^{male}\hat{\beta}^{female}) - \Phi(\bar{X}^{male}\hat{\beta}^{male})\right)}_{D_2(z)} + \underbrace{\left(\Phi(\bar{X}^{female}\hat{\beta}^{female}) - \Phi(\bar{X}^{male}\hat{\beta}^{female})\right)}_{E_2(z)} \\
&= \underbrace{\frac{1}{2}\left(D_1(z) + D_2(z)\right)}_{\text{Pure descrimination effect}} + \underbrace{\frac{1}{2}\left(E_1(z) + E_2(z)\right)}_{\text{Endowment effect}} \\
&= D(z) + E(z)
\end{aligned} \tag{8}$$

Whenever the discrimination effect is positive (and statistically significant), more effort should be made to promote gender equality even if female-headed households are not poorer than their mail counterpart. Indeed, equal return of endowment can be argued to be an ethically more robust moral criterion than equality in endowment from the equality of opportunities perspective as long as the latter is only the result of individual freedom of choice.[3] In this perspective, justice is seen as requiring equality of endowment return, rather than equality of poverty rates.

It is also interesting to apply the model (8) on 1990 and 2000 household surveys in order to test whether there is a widespread feminization of poverty over time.[4] If so, model (8) will be very informative about the origins of this issue and, therefore, facilitate the choice of pertinent policies to fight efficiently female poverty.

[3] See Peragine (1999).

[4] See, among many others, Fuchs (1986) and Medeiros and Costa (2008).

3. Robustness Analysis

We have mentioned in the discussion done so far that there is pervasive uncertainty about possibly crucial aspects of the link between gender and poverty. There are likely to be errors in the living standards data, unknown differences in needs between households at different demographic composition, uncertainty and arbitrariness about both the poverty line and precise poverty measure. The first problem is tackled by modelling the welfare distribution using the *probit* instead of the OLS procedure. However, given the other issues, how robust are our comparisons between female and male poverty? Would they alter if we made alternative assumptions about cut-off point and poverty yardsticks?

Several research studies on poverty analysis have shown how to consistently address such questions.[5] Drawing on results from the theory of stochastic dominance, it is fortunately possible to curb such degrees of arbitrariness by looking at poverty difference between female- and male-headed households over a large range of poverty lines and for a class of "acceptable" poverty indices. The acceptability of poverty indices will depend on whether they meet normative criteria of some ethical order. Each order of normative criteria defines a class of poverty measures. As the ethical order increases, the criteria put increasingly stronger constraints on the way poverty indices should rank distributions of living standards. Thus, lower degree dominance usually entails higher degree dominance, but the converse does not necessary hold.

The application of well-known results from the stochastic dominance literature shows, that if $\Delta P_{\alpha,t}(z) = P_{\alpha,t}^{female}(z) - P_{\alpha,t}^{male}(z) > 0$ for a range of poverty lines that starts at 0 and extends to the upper limit z^+, then female poverty will necessarily be judged higher than male poverty for any choice of poverty line within $[0, z^+]$ and for any choice of poverty index within a class of ethical order α+1.

For $\alpha = 0$ (first-order dominance), the test simply involves for any period t differences between female poverty headcount and male poverty headcount, $\Delta P_{0,t}(z) = P_{0,t}^{female}(z) - P_{0,t}^{male}(z) > 0$.[6] The ethical principles which underline the first-order dominance are the *focus* and the *anonymity* axioms.[7] Note that if $\Delta P_{0,t}(z)$ switches sign over the specified range of poverty lines, then two avenues can be followed. The first is to reduce the size of the set of the potentially poor individuals by lowering z^+. The second avenue, which is not explored in this application, is to focus on classes of poverty indices of higher ethical orders simply by increasing the value of α and, hence, by putting more structure on poverty indices that enable robustly poverty comparisons.

Analogically, to check at any period t the sensitivity of $\Pr(y_t^{female} < z) - \Pr(y_t^{male} < z)$ to the choice of z, one can estimate the *probit* model given by (5) for different poverty lines starting from 0 to z^+ for both periods. This procedure enables also to test whether the discrimination effect $D_t(z)$, the endowment effect $E_t(z)$, and, if evidenced, the feminization of poverty $\Delta D_t(z) + \Delta E_t(z)$ and their components are sensitive to the somewhat arbitrary choice of the poverty line. This simply requires us to perform the decomposition described by equation (8) over the specified range of the poverty thresholds.

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[5] See Atkinson (1987), Davidson and Duclos (2000), and Zheng (2000).

[6] With the exceptions of the Sen (1976), Takayama (1979) and Kakwani (1980) indices, the first-order class includes basically all of the poverty indices that have been proposed and that are in use.

[7] See Zheng (1997) and Davidson and Duclos (2000).

4. Empirical Illustration to Tunisian Data

4.1. The welfare proxy

There are a number of issues which arise in any distributional analysis. The first one is whether poverty should be measured in terms of income, consumption, or expenditures. In the context of measuring welfare in developing countries, there are several reasons in favor of using an indicator based on expenditures rather than income. The main argument which underlines this preference is that, by the permanent income hypothesis, consumption is a better indicator of lifetime welfare than is current income. Since expenditures are usually considered as a better approximation of consumption than current income, it can be justified as a good indicator of individual's welfare.[8] Nevertheless, Deaton (1997) considers that this argument is much weaker than arguments based on practicality and data availability; and it is also for this last reason that in the present paper poverty is measured in terms of consumption expenditures.

The second issue is related to the treatment of household size and composition. As it is well known, household surveys typically collect data at the household level while distributional analyses often use the individual as the unit of analysis. Hence, distributional judgments require an appropriate basis for transforming resources of households into an individual standard through which one person's economic position can be meaningfully measured against another's. The easiest approach is to use total expenditures *per capita* as an indicator of individuals' welfare. This is not however, the best approach since expenditures may not be divided up equally among household members. Further, there are likely economies to scale in the intra-household consumption, so that larger households tend to have higher welfare levels than are indicated by total expenditures *per capita*. While the former problem is almost impossible to resolve with Tunisian households' surveys because they do not involve information on individual consumption, estimating equivalence scale can solve the latter. However, and as shown by Pollak and Wales (1979) and Blundell and Lewbel (1991), econometric equivalence scale cannot in general be identified from household data. In practice, they are identified by setting critical assumptions that could be deemed as arbitrary and controversial. In order to focus the present study on the issue of gender poverty, we assume that total expenditure *per capita* is an adequate indicator of each household member's welfare.

4.2. The poverty line

A cut-off point needs to be selected to serve as the poverty line across the distribution of real household expenditure *per capita*. We adopt the absolute poverty lines estimated by the World Bank (2003) following a version of the cost-of-basic-needs approach suggested by Ravallion (1998). This is a two steps approach based on the relation between the calorie requirements (norms) and the minimum non-food expenditures of individuals. The first step is to calculate the average cost to meet the energy requirements of individuals while at rest. The second step is to compute the lower bound of the poverty line, which is based on the typical value of non-food spending by households whose total expenditure is just equal to the food poverty line. It is also possible with this method to infer an upper bound of the poverty line, which corresponds to the minimum income required for individuals to meet their food needs.

This approach was applied by the World Bank (1995, 2003) for the rural and urban areas, separately using 1990 and 2000 household surveys. For reference, Table 1 in annex yields the different poverty lines estimated using the 1990 and 2000 household surveys. Further,

[8] See, among many others, Slesnick (1998) and Jorgenson (1998).

Table 2 provides the mean expenditure *per capita* in 1990 and 2000 by gender and over the urban and rural areas.

Temporal and regional consumer price indices (CPIs) arguably should be applied prior to any computation of poverty rates across gender groups. While temporal CPIs are available on an annual basis, Tunisian data do not provide such indices at the regional level. To get around this issue, the income distribution has been adjusted by the relevant poverty line. For expositional simplicity, the income distribution at date t is normalized by the pertinent poverty line so as $y^h_t = 1$ whenever the *per capita* income of the household h is exactly equal to the upper poverty line that prevails in his region of residence at date t.

4.3. Poverty profile

Tables 3 and 4 decompose the commonly used poverty indices, i.e., $P_{0,t}(z)$, $P_{1,t}(z)$, and $P_{2,t}(z)$, according to a number of variables related to gender, geographic area, and skills. In these tables, poverty indices have been multiplied by 100 for easier interpretation. On one hand, the different rows labeled "Mean" of Table 3 obviously show that households living in rural regions have higher poverty rates than their counterpart in urban regions. On the other hand, Table 3 reveals that households whose heads are agricultural laborers are the most poor while households headed by a skilled person are out of poverty.

Next, we test for significance of poverty differences between female-headed and male-headed households within geographic and socio-economic groups. Table 3 presents poverty comparisons by gender of household head within urban and rural areas. At first glance, poverty measures are often lower for female-headed households in 1990 but higher in 2000 both in rural areas and at the national level. Although these findings may reveal a feminization issue of poverty, the difference in the poverty statistics is often statistically not significant at the conventional 5% level. Further, and surprisingly enough, female poverty is even sometimes significantly lower than that of males in urban areas in 1990. A similar result is also revealed by Table 3 for agricultural laborers in 1990 with regards to the severity of poverty. These contrast with the first expectations, as in many developing and also developed countries, female-headed households are often poorer than those headed by males. Nonetheless, the picture seems to be worsened by 2000 since both Table 3 and 4 seem to show that the gender poverty gap evolves in the detriment of female-headed households. It is then important to check whether such results are related to the difference in the endowments of female-headed households. For instance, female-headed households may be less poor in 1990, not because they experience equal treatment in the labor market with their male counterpart or they are better skilled, but because they have less children and/or they live with more active persons. It is to these investigations that we turn now.

4.4. Estimation results of the probit model

Table 5 defines the correlates of living standards that we use in the prediction and the decomposition of poverty rates while Table 6 provides their mean and standard deviation. The explanatory variables included in X are related to the size of the households, the number of children, the age, occupation, and education level of the household-head, the type of dwelling, and the region of residence. The benchmark household in all the estimation procedures consists of skilled or self-employed and highly educated household heads living in the coast regions.

Separate estimations of (5) for men and women reveal that the difference between β_t^{female} and β_t^{male} is not statistically significant. Thus, it is not necessary to perform separate estimations for men and women. This is not a problem in our context as we use the concept of female-headed households to designate the female-maintained households, the discrimination effect

described by equation (8) will be determined by the difference between the impact of an additional active male and an additional active female.

Quantitative estimates of the probit model for the upper poverty line are presented in column 3 of Table 7 for 1990 data and in column 4 of the same table for 2000 data. The signs of most coefficient estimates correspond to what is expected for such equations and are statistically significant at the 5 percent level. *Ceteris paribus*, households living in west regions are poorer than those living in urban area. Concerning the demographic characteristics, households of large sizes and more children are likely to be poorer than households of smaller sizes and less children. Returns to activity are not the same for female and male work for both periods. As a matter of fact, an active male enables to reduce the probability to fall into poverty by 3.2 percentage points in 1990, but a female worker by only 2.3 percentage points. The female-maintained households run then a higher risk of being poorer than the male-maintained households. This may reflect the unequal wage treatment to the detriment of women in the labor market.

Although the pattern of determinants of poverty in the year 2000 is globally consistent with that of the year 1990, the contribution of an additional active female to the household's well-being appears to be decreasing over time. This result could be the main driver of the feminization of poverty suspected from the analysis of the poverty profile. To go a step further in checking this result, we have pooled the two household surveys to test whether the coefficients estimated over the 1990 data are equal to the coefficients estimated over the 2000 data. Column 4 of Table 7 displays coefficients of 1990 data while column 5 reports the crossed effects with a dummy variable which is equal to 1 for the observation of the year 2000 and 0 otherwise. Remarkably enough, the only coefficient of the 2000 data which is significantly different from that of 1990 data is the estimate of the return of the active females. These results confirm that while the contribution of the active males is stable over time, that of active females is both lower and decreasing over time.

4.5. The Oaxaca-Blinder decomposition

To see how these findings impact on the gender difference in poverty rates, we use the estimation results of both *probit* models to predict the difference in the probability to be poor between female- and male-headed households. Then, we decompose that difference into differences in conditional poverty function (that is, the return of characteristics) and differences in distribution of characteristics as described by equation (8). These predictions and decompositions are summarized in Table 8.

The predicted poverty rates confirm that the female-headed households ran a lower probability of being poor in 1990. Their poverty rate would have been even lower had they not be subjected to any discrimination effect. If female- and male-headed households enjoyed the same characteristics return in 1990, female poverty would have been lower by 5.44 points of percentage on average instead of the 3.63 points of percentage observed in reality. Thus the discrimination effect has lowered the ability of female-headed households to escape poverty by 1.81 points of percentage on average.

In 2000 however, female-headed households become poorer than their male counterpart. This yields empirical evidence of a feminization issue of poverty. In this respect, Table 8 reveals that the predicted difference in gender poverty rate is increased by 6.62 points of percentage between 1990 and 2000 and this rise is statistically significant at the conventional 5 percent level.

The factors responsible for the feminization of poverty are twofold: a rise in the discrimination against women and a fall in their endowment. On the one hand, the endowment superiority of women was decreasing while the discrimination they undergo was

on the rise. As these two effects have played in favor of the male-headed households during the same period, these led to a reversal of the situation from one where men bear a disproportionate burden of poverty in 1990 to another where women become poorer than men in 2000.

4.6. Robustness analysis

Obviously, the exact position of the poverty line may affect the results of poverty comparisons between female and male headed households. Although poverty profiles tend to be insensitive to movements in the poverty lines, several studies on poverty have shown that poverty measures are very sensitive even to fairly small movements of the cut-off point around the considered poverty threshold. Thus a sensitivity analysis with different poverty lines is needed to address robustly the gender poverty issue.

The left-hand side of Figure 1 displays the estimates of the gender difference in poverty headcounts for the periods 1990 and 2000. Fixing the upper limit (z^+) to 250 percent of the upper poverty lines displayed in Table 1, the left-hand-side curve of the year 1990 shows that as long as we ignore the sampling variability of $P_{0,1990}^{female}(z) - P_{0,1990}^{male}(z)$, i.e., $\Delta P_{0,1990}(z)$, lies nowhere below zero. Female-headed households first-order dominate then male-headed households in 1990. This means that female-headed households are less poor than male-headed households, no matter where one draws the poverty line within [0, z^+] or what poverty measure one uses which are members of the first ethical order class. This curve shows however that the differences in poverty rates are not statistically significant at the left tail of the 1990 distribution. This result may be explained by the limit number of observations at the bottom of the distribution. Therefore, these findings of first-order dominance are not robust enough to assert confidently that female-headed households are consistently better-off in 1990.

The curve of the year 2000 shows that for $\Delta P_{0,2000}(z)$ switches sign more than once preventing then first-order dominance. Further, $\Delta P_{0,2000}(z)$ is never statistically significant. Once again, the limit number of observations for female-headed households is the main driver of this result.

The right-hand side of Figure 1 tests robustly whether there is a feminization of poverty. It clearly shows that if we ignore the sampling variability of poverty difference by gender, the curve of $\Delta P_{0,2000}(z) - \Delta P_{0,1990}(z)$ lies nowhere below zero. On a priori grounds, this leads to believe that the poverty level among female-headed households is increasing over time compared to male-headed households. However, the difference between $\Delta P_{0,2000}(z)$ and $\Delta P_{0,1990}(z)$ is not statistically significant for low poverty lines. The time variability in $\Delta P_{0,t}(z)$ may then reflect more the sampling variability rather than real movement.

Turning now to sensitivity tests while controlling for characteristics which impact on the households' poverty status. For this, we re-estimate the probit model given by equation (5) for several poverty settings starting from 30 to 250 percent of the upper poverty line. Then, we use the estimation results at each poverty threshold to predict the difference in the probability to be poor between female- and male headed households, as described by equation (8).

Figure 2 displays on the left-hand side the estimates of $\Pr(y_t^{female} < z) - \Pr(y_t^{male} < z)$ for t=1990 and t=2000. Fixing the upper limit (z^+) to 2.5 times the reference poverty line, the results are very similar to those portrayed by Figure 1. The right-hand side of Figure 2 shows that the differences in the probability to be poor are increasing over time and this rise is

almost everywhere significant at the 5 percent level. The notable exception of this is observed at the left tail of the distribution when the well-being of persons living in female- and male-headed households does not differ significantly. This result may be explained by the limit number of observations at the bottom of the distribution.

Figures 3 and 4 summarize the sensitivity of the discrimination effect and the endowment effect to the choice of the poverty threshold. These figures confirm that the endowment advantage of female-headed households is decreasing over time while the discrimination effect is increasing. Although these findings are not statistically significant at the left tail of the distributions, these results call for active policies in order to promote gender equality in the labor market and prevent the likely risk of feminization of poverty.

5. Conclusion

The concern so frequently expressed for the feminization of poverty in the policy and academic debate derives from the fact that women are subject to discrimination in labor, credit and a variety of other markets and they own less property compared to men. Thus, female-headed households may constitute a disproportionate number of the poor, experience greater extremes of poverty than male-headed units, and this unequal distribution of poverty may be increasing over time.

The paper has proposed a simple method to test these arguments, in the sense of whether the concern for the feminization of poverty and its reasons would be sensitive to the somewhat arbitrary choice of the poverty thresholds. The general pattern of findings shows weak evidence that (i) female-headed households are overrepresented among the poor and (ii) that their contribution to overall poverty is increasing over time. The weak observations number concerning female-headed units included in the household surveys prevents a confident conclusion of which direction female poverty evolves.

Notwithstanding, there are serious reasons to be concerned about the welfare of the female-headed families. The Oaxaca-Blinder decomposition, which splits the difference in the predicted poverty rates between the female- and male-headed households into differences due to the return of characteristics and differences in the distribution of assets, unambiguously shows that the former are subject to discrimination in the labor market. The main driver of this is the lower return of the female-breadwinners than that of the male active persons. More seriously, this unequal treatment against female workers would be increasing over time. Nevertheless, despite the discrimination against female-breadwinners, the overall poverty difference is not large enough to declare confidently that there is a feminization of poverty. The greater number of active persons (the endowment effect) in the female-headed units compensates to some extent the discrimination effect against them. If this behavior is the result of a substitution between labor supply and child school attendance, it is certainly not the best way to fight female poverty.

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Figure 1: Robust First-order Tests of Gender Poverty Difference in 1990 and 2000 and Feminization of Poverty

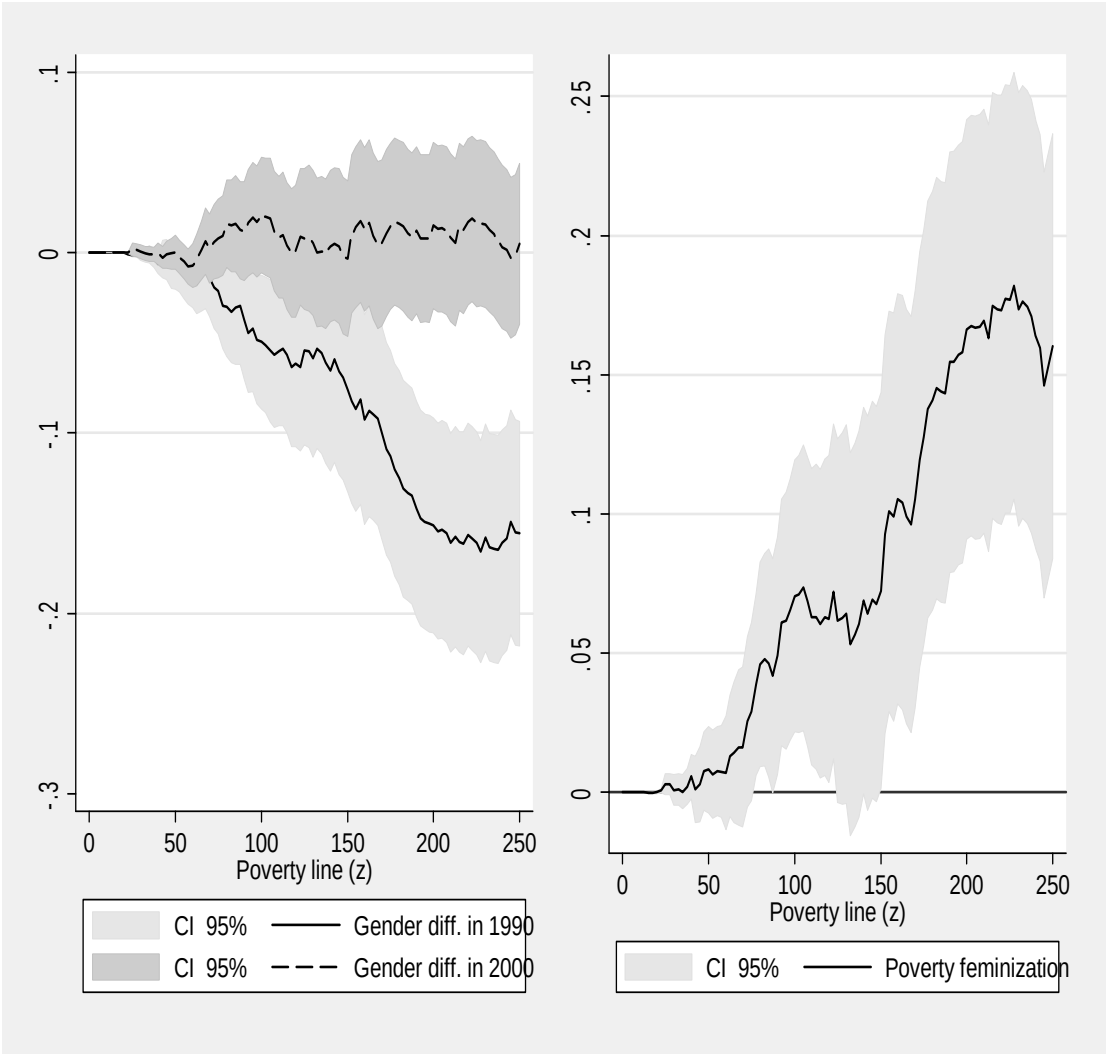

Figure 2: Sensitivity Analysis of Predicted Gender Difference in Poverty and Predicted Feminization of Poverty

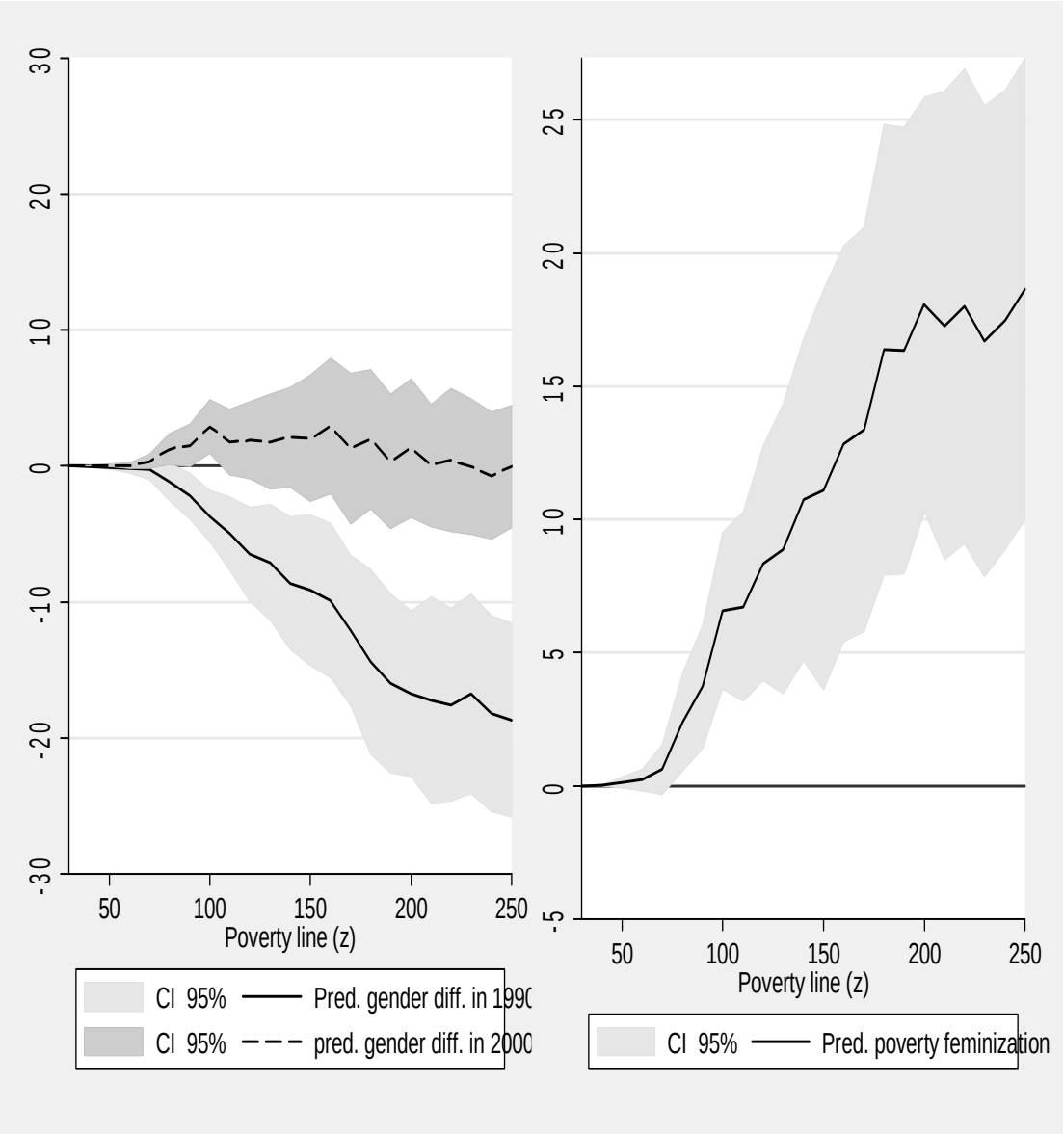

Figure 3: Sensitivity Analysis of the Discrimination Effect

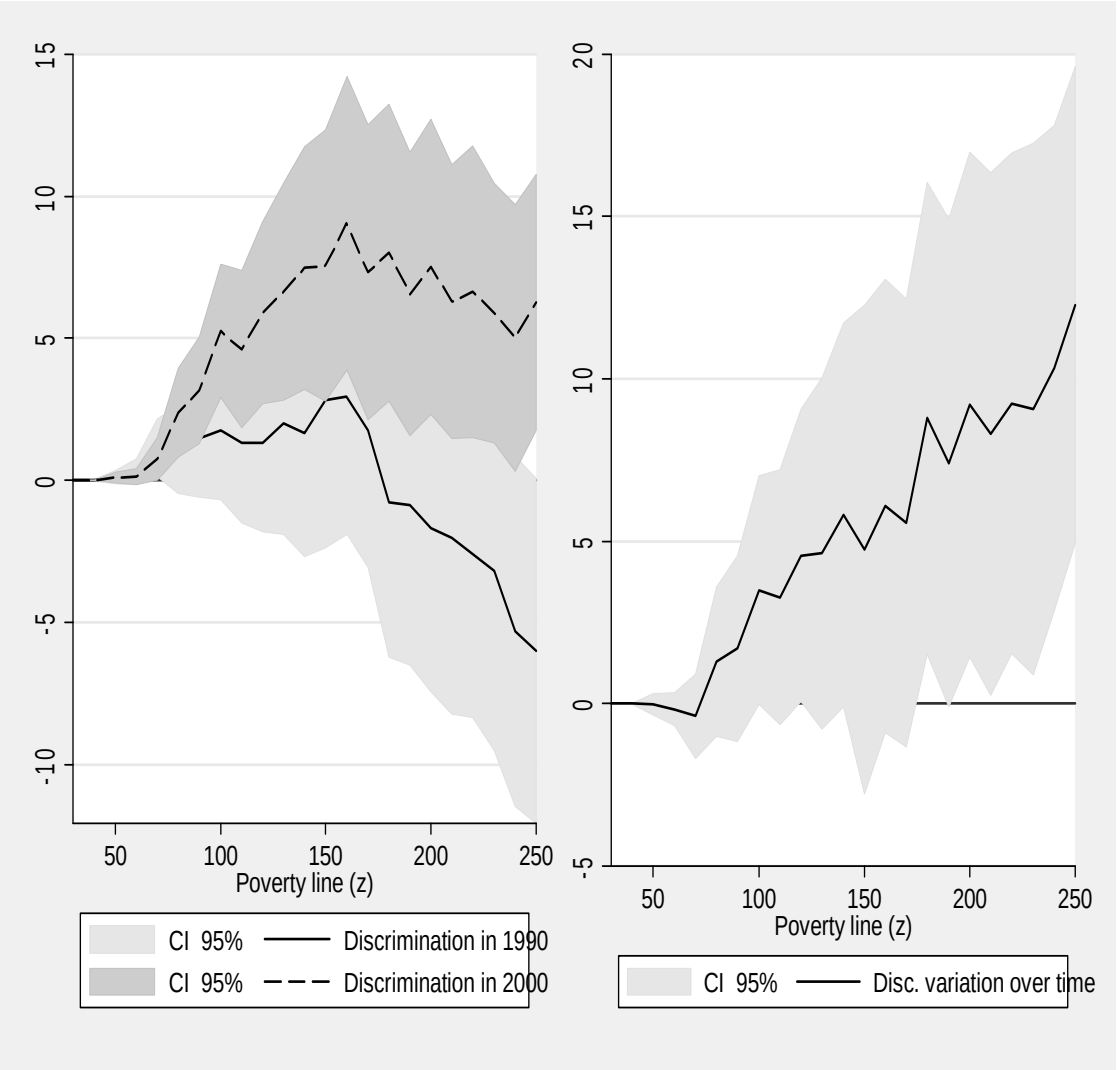

Figure 4: Sensitivity Analysis of the Endowment Effect

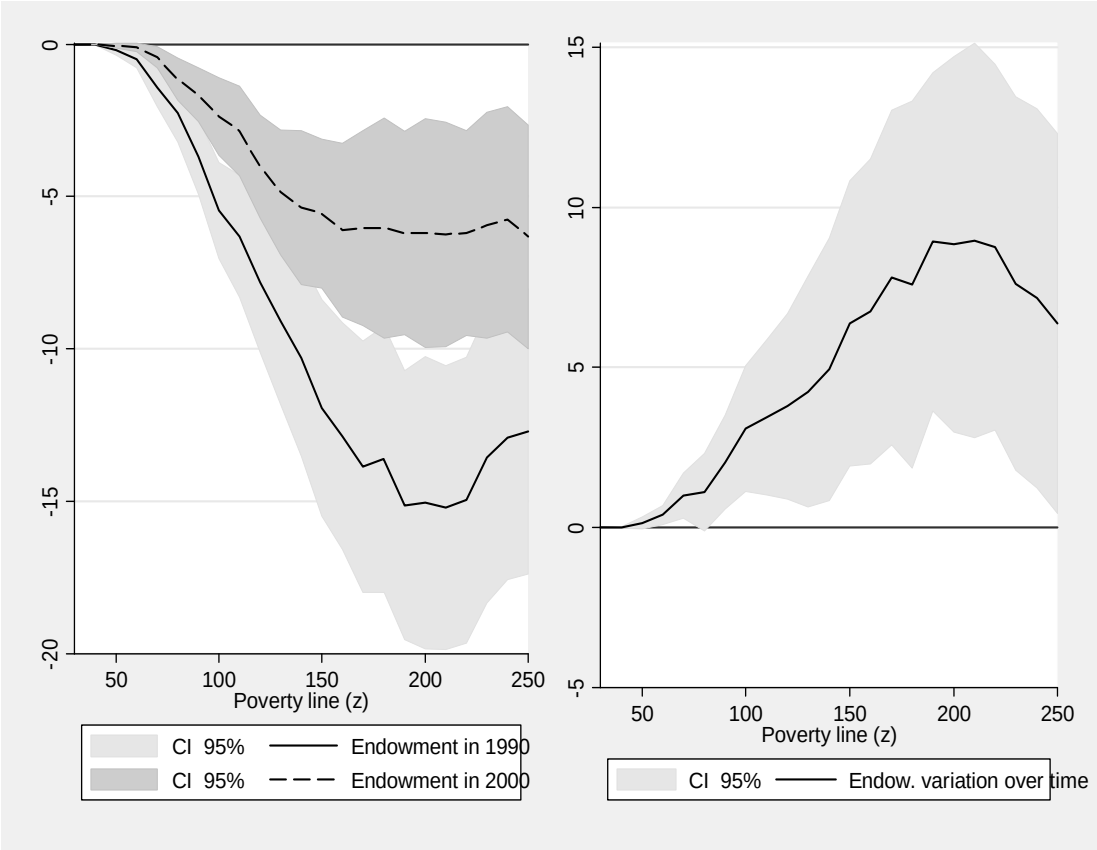

Table 1: Estimation of Food and Overall Poverty Line

Year	Food poverty line (z_f)		Overall lower poverty line (z_l)		Overall upper poverty line (z_u)	
	Rural	Urban	Rural	Urban	Rural	Urban
1990	134	170	185	218	240	305
2000	205	221	296	343	380	480

Sources: The World Bank (1995, 2003).

Table 2: Estimation of the Mean Expenditure *per capita* (in current prices)

Year	Female			Male			Both		
	Rural	Urban	National	Rural	Urban	National	Rural	Urban	National
1990	547	1160	597	454	874	705	460	890	716
	(444)	(1002)	(866)	(349)	(764)	(663)	(356)	(782)	(678)
2000	829	1693	1277	876	1534	1275	870	1548	1275
	(600)	(1423)	(1188)	(717)	(1734)	(1460)	(704)	(1708)	(1433)

Sources: Authors' calculation using 1990 and 2000 household surveys. Observations are weighted by their sample weights times household size. Values between parentheses stand for the standard deviations.

Table 3: Poverty Indices by Gender and Geographic Area

		1990			2000		
		$P_0(z)$	$P_1(z)$	$P_2(z)$	$P_0(z)$	$P_1(z)$	$P_2(z)$
Rural Zone	**Female**	19.2	4.83	1.83	18.95	4.46	1.66
		(3.72)	(1.16)	(0.55)	(2.6)	(0.8)	(0.39)
	Male	24.4	6.83	2.79	15.37	3.74	1.39
		(1.26)	(0.5)	(0.25)	(1.12)	(0.35)	(0.17)
	Diff.	*-5.2*	*-2.0*	*-0.96*	*3.58*	*0.72*	*0.27*
		(*3.79*)	(*1.19*)	(*0.56*)	(*2.76*)	(*0.87*)	(*0.43*)
	Mean	24.07	6.7	2.73	15.82	3.83	1.43
		(1.23)	(0.48)	(0.25)	(1.05)	(0.33)	(0.16)
Urban Zone	**Female**	4.73	1.29	0.51	7.47	1.59	0.43
		(1.37)	(0.39)	(0.19)	(1.65)	(0.4)	(0.12)
	Male	10.17	2.36	0.84	8.0	1.89	0.69
		(0.74)	(0.22)	(0.1)	(0.65)	(0.2)	(0.09)
	Diff.	-5.43	-1.07	*-0.34*	*-0.53*	*-0.3*	*-0.26*
		(1.4)	(0.4)	(*0.2*)	(*1.73*)	(*0.42*)	(*0.14*)
	Mean	9.86	2.3	0.83	7.95	1.86	0.67
		(0.72)	(0.21)	(0.1)	(0.62)	(0.19)	(0.09)
Tunisia	**Female**	10.95	2.81	1.08	12.99	2.97	1.02
		(1.85)	(0.56)	(0.26)	(1.55)	(0.44)	(0.2)
	Male	15.9	4.16	1.63	10.9	2.62	0.97
		(0.7)	(0.24)	(0.12)	(0.59)	(0.18)	(0.09)
	Diff.	-4.96	-1.35	-0.55	*2.09*	*0.35*	*0.05*
		(1.88)	(0.57)	(0.27)	(*1.63*)	(*0.47*)	(*0.22*)
	Mean	15.62	4.08	1.6	11.11	2.66	0.97
		(0.69)	(0.24)	(0.12)	(0.56)	(0.17)	(0.08)

Sources: Authors' calculation using the 1990 and the 2000 Household Surveys and the upper poverty lines estimated by World Bank (2003) and reported in Table 1. Observations are weighted by their sample weights times household size. The numbers between parentheses stand for the standard errors. Values in *italic* are not statistically significant at the conventional level of 5 percent.

Table 4: Poverty Indices by Gender and Skills

		1990			2000		
		$P_0(z)$	$P_1(z)$	$P_2(z)$	$P_0(z)$	$P_1(z)$	$P_2(z)$
	Female	23.39	6.18	2.18	42.13	9.12	2.51
Agricultural		(6.67)	(2.1)	(0.85)	(7.2)	(1.97)	(0.7)
laborer	**Male**	35.1	10.08	4.22	22.2	5.7	2.36
		(2.24)	(1)	(0.52)	(2.5)	(0.86)	(0.5)
	Diff.	*-11.71*	*-3.9*	-2.03	19.96	*3.42*	*0.14*
		(*7.1*)	(*2.3*)	(0.99)	(7.7)	(*2.17*)	(*0.8*)
	Mean	34.36	9.83	4.10	24.6	6.12	2.38
		(2.15)	(0.9)	(0.5)	(2.3)	(0.7)	(0.4)
	Female	12.52	3.17	*1.24*	10.7	2.55	*0.89*
Non		(3.7)	(1.31)	(*0.7*)	(3.3)	(1)	(*0.5*)
agricultural	**Male**	17.83	4.77	1.89	14.6	3.63	1.37
laborer		(1.1)	(0.4)	(0.2)	(1.2)	(0.4)	(0.2)
	Diff.	*-5.3*	*-1.6*	*-0.65*	*-3.9*	*-1.1*	*-0.49*
		(*3.7*)	(*1.3*)	(*0.68*)	(*3.5*)	(*1*)	(*0.5*)
	Mean	17.6	4.7	1.86	14.3	3.56	1.34
		(1.1)	(0.4)	(0.2)	(1.1)	(0.4)	(0.2)
	Female	9.1	2.8	1.06	11,57	2.38	*1.03*
Agricultural		(3.6)	(1.24)	(0.5)	(3.5)	(1.18)	(*0.57*)
farmer	**Male**	16.4	3.58	1.2	11.31	2.34	0.78
		(1.5)	(0.43)	(0.2)	(1.4)	(0.4)	(0.2)
	Diff.	*-7.3*	*-0.8*	*-0.14*	*0.25*	*0.05*	*0.24*
		(*3.75*)	(*0.63*)	(*0.5*)	(*3.7*)	(*1.2*)	(*0.6*)
	Mean	15.82	3.52	1.19	11.35	2.34	0.81
		(1.5)	(0.4)	(0.18)	(1.35)	(0.4)	(0.18)
	Female	21.47	3.75	1.37	11.7	*2.92*	*0.84*
		(8.2)	(1.7)	(0.8)	(5.8)	(*1.6*)	(*0.5*)
	Male	12.47	3.1	1.14	7.9	1.57	0.45
Non-farm self		(1.5)	(0.4)	(0.2)	(1.4)	(0.35)	(0.12)
employed	**Diff.**	*9*	*0.7*	*0.22*	*3.78*	*1.35*	*0.39*
		(*8.2*)	(*1.7*)	(*0.8*)	(*6*)	(*1.6*)	(*0.49*)
	Mean	12.85	3.1	1.15	8.2	1.67	0.48
		(1.5)	(0.4)	(0.2)	(1.4)	(0.5)	(0.12)
	Female	0	0	0	0	0	0
	Male	0	0	0	0	0	0
Skilled	**Diff.**	0	0	0	0	0	0
or manager	**Mean**	0	0	0	0	0	0
	Female						
	Male			**See Table 3**			
Tunisia	**Mean**						

Sources: Authors' calculation using the 2000 Household Survey and the lower and the upper poverty lines estimated by World Bank (2003). Observations are weighted by their sample weights times household size. The numbers between parentheses stand for the standard errors.

Table 5: Nomenclature of Variables Using 1990 and 2000 Household Surveys

Area	
East	1 if household lives in the east (coast), 0 otherwise.
West	1 if household lives in west, 0 otherwise.
Demographic information	
Nc06	Number of children in household old less than 6 years old.
Nc7-18	Number of children in household old between 7 and 18 years old.
Na19m	Number of adults in household old more than 19 years old.
Age	Age of the household head (HH).
Age2	Squared age of the household head (HH).
Type of dwelling	
Number-rooms-pc	Number of rooms *per capita*
Hovel	1 if household lives in a hovel, 0 otherwise.
Other	1 if household lives in a flat or a detached house, 0 otherwise.
Active members	
Active-female	The number of working women living in the household.
Active-male	The number of working men living in the household.
Occupation of HH	
Unemployed	Dummy variable for unemployed HH.
Agri-labourer	Dummy variable for agricultural labourer HH.
Not-agri-labourer	Dummy variable for not agricultural laborer HH.
Agri-farmer	Dummy variable for agricultural farmer HH.
Self-employed	Dummy variable for non farmer self employed HH.
Skilled	Dummy variable for skilled HH.
Schooling level of HH	
Illiterate	Dummy variable for illiterate HH.
Primary	Dummy variable for HH has a primary schooling level.
Secondary	Dummy variable for HH has a secondary schooling level.
Higher	Dummy variable for HH has a higher schooling level.
HH surveys	
T1990	Dummy variable for 1990 observations
T2000	Dummy variable for 2000 observation

Notes: Variables which are in *italic* have been omitted during estimations.

Table 6: Summary statistics

	1990 household survey		2000 household survey	
Variables	Mean	Std. Deviation	Mean	Std. Deviation
Female-headed household	0.061	0.24	0.11	0.31
Area				
East	*0.66*	*0.47*	*0.62*	*0.49*
West	0.34	0.47	0.38	0.49
Demographic information				
Nc06	0.93	1.11	0.60	0.88
Nc7-18	1.74	1.66	1.12	1.34
Na19m	*3.00*	*1.43*	*3.18*	*1.65*
Age	48.28	13.8	51.8	14.3
Type of dwelling				
Number-rooms-pc	2.65	1.29	2.88	1.44
Hovel	0.03	0.18	0.01	0.1
Other	*0.97*	*0.18*	*0.99*	*0.1*
Number of active members				
Active-female	0.30	0.62	0.44	0.7
Active-male	1.21	0.87	1.04	0.82
Occupation of HH				
Unemployed	0.13	0.34	0.01	0.11
Agri-labourer	0.09	0.29	0.07	0.26
Not-agri-labourer	0.31	0.46	0.25	0.43
Agri-farmer	0.14	0.34	0.12	0.33
Self-employed	*0.12*	*0.32*	*0.09*	*0.29*
Skilled	*0.11*	*0.31*	*0.10*	*0.30*
Schooling level of HH				
Illiterate	0.48	0.50	0.41	0.49
Primary	0.29	0.45	0.36	0.48
Secondary	*0.16*	*0.37*	*0.19*	*0.39*
Higher	*0.04*	*0.20*	*0.045*	*0.21*
Number of observations	7734		6010	

Notes: Variables which are in *italic* have been omitted during estimations. Observations are weighted by their sample weights.

Table 7: Estimation Results of the *probit* Models

	Un-pooled surveys		Pooled surveys	
	1990 HH survey	2000 HH survey	1990 estimates	Crossed estimates with T2000
Constant	-0.744	-1.42	-0.744	*-0.674*
	(-2.1)	(-2.9)	(-2.1)	(*-1.1*)
West	0.351	*0.102*	0.351	-0.248
	(5.6)	(*1.5*)	(5.6)	(-2.7)
Hovel	0.433	*0.311*	0.433	*-0.122*
	(3.9)	(*1.2*)	(3.9)	(*-0.44*)
Number-rooms-pc	-1.87	-1.82	-1.87	*0.051*
	(-9.6)	(-8)	(-9.6)	(*0.2*)
Nc06	0.157	0.196	0.157	*0.039*
	(6.8)	(5.3)	(6.8)	(*0.9*)
Nc7-18	0.094	0.143	0.094	*0.049*
	(6.1)	(5.7)	(6.1)	(*1.7*)
Age	*-0.016*	*0.003*	*-0.016*	*0.019*
	(*-1.3*)	(*0.2*)	(*-1.3*)	(*0.9*)
Age2	*0.0001*	*-0.000*	*0.0001*	*-0.0001*
	(*1.2*)	(*-0.0*)	(*1.2*)	(-0.7)
Active-male	-0.32	-0.344	-0.32	*-0.024*
	(-7.9)	(-6.6)	(-7.9)	(*-0.4*)
Active-female	**-0.232**	***-0.019***	**-0.232**	**0.213**
	(**-5.3**)	(***-0.5***)	(**-5.3**)	(**3.5**)
Unemployed	0.199	0.846	0.199	0.647
	(2.2)	(4.3)	(2.2)	(3)
Not-agri-labourer	0.252	0.405	0.252	*0.153*
	(3.5)	(5.3)	(3.5)	(*1.4*)
Agri-labourer	0.528	0.57	0.528	*0.042*
	(6.1)	(5.7)	(6.1)	(*0.3*)
Agri-farmer	*0.124*	0.218	*0.124*	*0.094*
	(*1.5*)	(2.2)	(*1.5*)	(*0.7*)
Illiterate	0.711	0.787	0.711	*0.075*
	(8.1)	(7.7)	(8.1)	(*0.6*)
Primary	0.358	0.473	0.358	*0.116*
	(4.1)	(4.9)	(4.1)	*(0.9)*

Notes: Values between parentheses indicate the *t* – ratio.

Table 8: Inference of the Probability to Be Poor

		1990			2000			Double
		F.	M.	Diff.	F.	M.	Diff.	Diff.
$\Phi(\bar{X}^j\hat{\beta}^j)$, *j = female, male.*		**4.81**	**8.44**	**-3.63**	**7.27**	**4.28**	**2.99**	**6.62**
		(1.1)	**(0.8)**	**(1.3)**	**(1.24)**	**(0.5)**	**(1.1)**	**(1.8)**
Discrimination Effect.	D_1	4.81	3.26	*1.55*	7.27	1.97	5.3	3.75
		(1.2)	(0.7)	(*1.25*)	(1.24)	(0.5)	(1.3)	(1.85)
	D_2	10.51	8.44	*2.07*	9.79	4.28	5.51	*3.44*
		(1.6)	(0.7)	(*1.6*)	(1.7)	(0.5)	(1.6)	(*2.4*)
	$0.5(D_1+D_2)$	**7.66**	**5.85**	***1.81***	**8.53**	**3.12**	**5.4**	***3.59***
		(1.4)	**(0.66)**	(***1.4***)	**(1.4)**	**(0.4)**	**(1.4)**	(***2.1***)
Endowment Effect.	E_1	3.26	8.44	-5.19	1.97	4.28	-2.31	2.88
		(0.7)	(0.8)	(0.7)	(0.5)	(0.5)	(0.4)	(0.8)
	E_2	4.81	10.51	-5.7	7.27	9.79	-2.52	3.18
		(1.2)	(1.6)	(1)	(1.2)	(1.7)	(1)	(1.4)
	$0.5(E_1+E_2)$	**4.03**	**9.48**	**-5.44**	**4.62**	**7.03**	**-2.41**	**3.03**
		(0.8)	**(1)**	**(0.8)**	**(0.7)**	**(0.9)**	**(0.7)**	**(1.1)**

Sources: Authors' calculation using the *probit* model for the upper poverty lines estimated by World Bank (2003). The numbers between parentheses stand for the standard errors.