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Anti-Poverty Transfers and Spatial Prices in Tunisia

Christophe Muller

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Christophe Muller*

Abstract

In this paper, the role of price deflation in estimating the impact of price subsidies and anti-poverty cash transfer schemes on poverty in Tunisia is studied. Three types of price corrections are considered: (a) no corrections; (b) living standards deflated by spatial Laspeyres price indices; and (c) living standards deflated by true price indices that are estimated from a quadratic almost ideal demand system. Distinguishing these corrections and using data from Tunisia, the effects of the price deflation and the demand system estimation on poverty and budget leakage estimates are analyzed. These effects can intervene at two stages of the estimation: (a) the calculation of transfer levels for each household; and (b) the estimation of post-transfer social statistics. Results show that price correction, whatever its form, may have only limited importance for the assessment of anti-poverty policy in Tunisia. Correcting or not for spatial price differences, or for consumption substitution does not modify the performance ranking of the studied policies. This is at odds with other findings in the empirical literature that price differences may be important for poverty monitoring.

أثر دعم الأسعار والتحويلات النقدية على مكافحة الفقر في تونس

كرستوف مولر

ملخص

تدرس هذه الورقة دور تكميش الأسعار في تقدير آثار دعم الأسعار ومخططات التحويل النقدي لمكافحة الفقر على الفقر في تونس. وقد تم الأخذ في الاعتبار ثلاثة تصحيحات للأسعار: الأول: بدون تصحيحات، الثانيك تخفيض (تكميش) مستويات المعيشة بواسطة الرقم القياسي للاسبير، والثالث/ تقليص مستويات المعيشة بواسطة الرقم القياسي الحقيقي المقدر من نظام الطلب المثالي. وبالتمييز بين هذه التصحيحات، واستخدام بيانات من تونس، يتم تحليل الآثار المترتبة على الانكماش في الأسعار وتقدير نظام الطلب على الفقر وعلى تسرب الميزانية. ويمكن أن تدخل هذه التأثيرات في مرحلتين من التقدير: (1) حساب مستويات النقل لكل مسكن، و(2) التقدير لمرحلة ما بعد تحويل الإحصاءات الإجتماعية. تظهر النتائج أن تصحيح الأسعار، مهما كان نوعه، قد يكون ذات أهمية محدودة في تحديد سياسة مكافحة الفقر في تونس. وسواء كان هناك تصحيح أو لم يكن لفروق الأسعار المكانية، أو لإحلال الاستهلاك فإن ذلك لن يعدل ترتيب أداء السياسات المدروسة. وذلك على خلاف النتائج الاخرى في الأدبيات التجريبية القائلة بأهمية فروقات الأسعار في رصد ومراقبة الفقر.

Introduction

Price deflation at individual level has been found important in poverty monitoring (e.g., in Muller, 2008). In principle therefore, price differences across households should be accounted for when designing and assessing anti-poverty policies.

Deflating seems particularly relevant where geographical price differences may be expected to be large between rural and urban, or between coastal areas and the interior as in Tunisia. Indeed, in this country, many households dwell long distances apart and in diversely dynamic economic areas. This situation may correspond to substantial price gaps.

The Tunisian government has implemented price subsidies and price controls for several decades. It it may be that the price leveling impact of these policies makes the price differences less important in Tunisia than expected when assessing alternative anti-poverty policies. In this paper, the importance of accounting is studied and tested for spatial prices for choosing between anti-poverty policies in Tunisia.

Different Stages of the Analysis

Cash transfer schemes and price subsidies ─ two major policies of poverty alleviation ─ are based on the assessment of household living standards and involve income transfers. One recurrent difficulty when assessing social policies is that households face different prices, in part because they live in different locations. Accordingly, price deflation may take place at two stages of the poverty monitoring procedure. Firstly, the estimation of the living standard predictions on which the calculation of transfer levels depends; and secondly, the estimation of post-policy social statistics. The first stage characterizes policy implementation, while the second stage is rather related to policy assessment. In this paper the importance of price deflation methods for selecting poverty alleviation programs in Tunisia is studied.

Diverse Price Indices

Accounting for price differences is important because spatial and temporal price dispersions may substantially change the way households spend their income. Firstly, the general level of prices directly affects household purchasing power. Secondly, the variations in individual prices may cause households to adjust their consumption basket in an attempt to reach better satisfaction from the same monetary income. Finally, the way the calculated transfers account for price differences also matters. Indeed, since only money is transferred, the purchasing power of this monetary amount is what ultimately delivers welfare improvement.

In this paper, three methods of price correction are considered: (a) No Correction at all; (b) Deflation based on Laspeyres Price Indices; and (c) Deflation based on 'True Price Indices' calculated from a demand system estimates. Then, mixing the two stages, nine distinct combinations of price correction methods may be obtained. These combinations constitute the situations analyzed for anti-poverty cash transfer schemes and price subsidies.

More generally, assessing price correction for poverty alleviation is important if credit is to be given to analyses neglecting price differences across households, the main set of results in the literature. The objective of this paper is to investigate the following questions by analyzing household survey data from Tunisia (descriptive statistics and preliminary analyses of this survey are available in République Tunisienne, 1993a and 1993b):

- Do price corrections make a difference for poverty-alleviating policies?
- For which price indices? and
- What are the direction, the magnitude and the consequences of the deviations caused by the price correction at each stage of the statistical procedure?

Anti-Poverty Transfer Schemes

The popular poverty measures of the Foster-Greer-Thorbecke (FGT) class are used (Foster et al., 1984) because of their attractive axiomatic properties:

$$P_\alpha(y, z) = \int_0^z \left(\frac{z-y}{z} \right)^\alpha f(y)\,dy,$$

Where z is a pre-specified poverty line, f is the p.d.f. of household living standard y and α is a poverty aversion parameter. The $P_\alpha(.)$ is the head-count ratio if $\alpha = 0$, the poverty gap index if $\alpha = 1$, and the poverty severity index if $\alpha = 2$.[1] This approach could easily be extended to other poverty measures. Once an anti-poverty budget has been decided, it remains to calculate and implement the transfers that allocate this budget across households.

Cash Transfers

The situation where the pre-transfer incomes are perfectly observed is first considered. In this case, the optimal allocation of benefits is the solution to the following program for finite population and is denoted as 'perfect targeting':

$$\underset{\{t^i\}}{\text{Min}} \quad P_\alpha \equiv \frac{1}{N} \sum_{i=1}^N \left(\frac{z-(y^i+t^i)}{z} \right)^\alpha I_{[y^i+t^i<z]}$$

subject to

$$\sum_{i=1}^N t^i = B, \qquad \text{with} \quad t^i \geq 0, \ \forall \ i,$$

where N is the population size, z is the poverty line, t^i is the non-negative income transfer to person i and y^i is the income. How the fixed budget B is funded is not taken into consideration.

Transfer schemes are often directed to households rather than individuals. Moreover, household living standards are generally used instead of incomes. Thus, one may account for differences in household composition and heterogeneity of individual and environment characteristics. The methods of this paper may be easily adapted to households and living standards instead of individuals and incomes. However, to simplify the notations, they are reported first for individuals and then incomes.

Bourguignon and Fields (1997) show that, under perfect observation of incomes, the optimal transfer scheme for the headcount ratio ($\alpha = 0$) corresponds to awarding transfers so as to lift the richest of the poor out of poverty:

$$t^i = z - y^i \text{ if } y_{min} \leq y^i < z,$$

where y_{min} is the threshold income required to be in the targeted group; $t^i = 0$ otherwise; and $\sum_{i=1}^{Np} t^i = B$. The sum runs up to N_p, which is the number of the served pre-transfer poor, while B is the budget to allocate. On the other hand, the optimal transfer for a FGT poverty measure satisfying the transfer axiom ($\alpha > 1$) is such that:

$$t^i = y_{max} - y^i \text{ if } y^i < y_{max},$$

where y_{max} is the highest cut-off income to be in the served group; $t^i = 0$ otherwise; and $\sum_{i=1}^{Np} t^i = B$. As the budget rises, y_{max} increases up to the poverty line. When enough funds are available, all the poor can be lifted out of poverty.

For the poverty gap ($a = 1$), both rules of transfer allocation are equivalent provided the poor incomes are never lifted strictly above the poverty line.

However, perfect targeting is not feasible because the income distribution cannot be perfectly observed. Nevertheless, since household living standards are correlated with some observable characteristics, denoted x, it is possible to use these characteristics to predict living standards using living standard survey data. Then, one can minimize poverty measures based on these predictions, or fitted values, subject to the available budget, i.e. the perfect targeting rules for calculating transfers are applied to the sample of predicted living standards. In

this case, the obtained transfer levels depend on the estimation method chosen for generating the predicted living standards. In particular, the deflation method used for the estimation should matter.

Many authors have studied how to target poor people when some individuals' characteristics can be observed, while income cannot.[2] Although living standards are measured in household surveys, they are generally badly known for households not included in the survey. In Ravallion and Chao (1989), the targeting problem is described as the minimization of some poverty measure subject to a given transfer budget, by using as sole information the location of individuals. In practice, anti-poverty targeting is implemented by using predictions of household living standards instead of true living standards. The predictions are obtained from regressing living standards on a set of household characteristics, e.g. Glewwe (1992).

Given a set of correlates x, a poverty measure, poverty line z, and a budget, the transfer solution is a function of: the chosen poverty measure, x, z and B. The predicted living standard, which is an estimated score calculated from the regression estimates, has three uses: (a) It helps to identify the poor by comparing the predicted living standard with the chosen poverty line; (b) It is used to calculate the transfer level, which is equal to the difference of the predicted income with a fixed amount (poverty line or highest cut-off living standard for the served households); and (c) It is used to rank households for being served, which determines the value of the highest cut-off living standard of the served households.

In the case of price subsidies, the true price index corresponding to each household accounts for the post-policy reduced prices and for substitutions in the household consumption basket. The subsidies improve household living standards in a way that may be described with an 'equivalent shadow cash transfer'. The true price index is defined as the ratio of cost functions associated with a demand system, which corresponds to the shadow transfer.

Equivalent-Income

The calculus of the equivalent-incomes is based on the estimation of a demand system. In the empirical part, it is assumed that households within the

same cluster face the same prices, a usual convention (Deaton, 1988). Before the implementation of the subsidy scheme, household h in cluster c has an exogenous nominal income y^h and faces an initial price vector $\mathbf{p}_c^o$. After implementation of the subsidies, household h has the same nominal income, while it faces a new price vector p^{ps}. The vector of the observed prices, p^{ps}, is equal to the vector of reference prices (prices without subsidies) minus the vector of subsidies for each good.

To compare the incomes of households facing different prices, a reference price vector is chosen, denoted by p^r. As advocated by King (1983), an equivalent-income is defined. Namely, let a given budget constraint be defined by the couple (p, y), where p is a price vector, and y is the household income. The household equivalent-income y_e is the income level which allows the households to reach the same utility level at the reference prices. Let v(.) be the household indirect utility function and $v(\mathbf{p}^r, y_e) = v(\mathbf{p}, y)$. Because p^r is fixed across all households, and y_e is an increasing monotonic transformation of v(.), variable y_e is a money-metric of the actual utility v(p, y). The equivalent-income function $y_e(.)$ may be expressed in terms of the expenditure function e(.) associated to the demand system:

$$y_e = e\left(\mathbf{p}^r;\ v(\mathbf{p},\ y)\right)\ = y_e(\mathbf{p}^r,\ \mathbf{p},\ y).$$

Therefore, the equivalent-gain of the subsidy program for household h is:

$$y_e(\mathbf{p}^r, \mathbf{p}_c^p, y^h) - y_e(\mathbf{p}^r, \mathbf{p}_c^0, y^h)$$

When direct transfers are awarded to households predicted poor after removing subsidies, the equivalent-gain for household h of moving from the reference situation is:

$$y_e(\mathbf{p}^r, \mathbf{p}_c^0, y_c^h + \hat{T}_c^h) - y_e(\mathbf{p}^r, \mathbf{p}_c^0, y_c^h)$$

where $\hat{T}_c^h$ is the estimated household transfer. Poverty drops following replacement of subsidies by cash transfers if and only if

$P_{\alpha}[z_e, y_e(\mathbf{p}^r, \mathbf{p}_c^0, y + \hat{T})] - P_{\alpha}[z_e, y_e(\mathbf{p}^r, \mathbf{p}_c^{ps}, y)] < 0$, where $\hat{T}$ is the vector of transfers, y is the vector of incomes and z_e is the equivalent-income function applied to the poverty line.

In this paper, the equivalent income y_e for each household from estimates of the QAIDS demand system of Banks et al. (1997) is calculated. The QAIDS estimates are shown in Bibi and Muller (2009).

Welfare Statistics

Assessing Policy Performance

The policy performance of alternative social programs in terms of poverty reduction for P_0, P_1 and P_2 is now assessed. For this, the price reference is p^r. The variation in measured P_{α} poverty following a cash transfer scheme is:

$\Delta P_{\alpha} = P_{\alpha}(Y + \hat{T}, z) - P_{\alpha}(Y, z).$

In the case of a subsidy program, the equivalent transfer ET of the subsidies scheme is computed such that: $y_e(\mathbf{p}^r, p_c^{ps}, Y) = Y + ET$, where the benchmark price vector, p^r, is the price vector before implementing the subsidies. The poverty measure under subsidies is:

$P_{\alpha}(y_e(p^r, p_c^{ps}, Y), y_e(p^r, p_c^{ps}, z)) = P_{\alpha}(Y + ET, z).$

The budget leakage of program benefits is also estimated. This is obtained by adding the transfers given to those whose pre-transfer living standard is above the poverty line and the transfers which, although received by pre-transfer poor, are unnecessary because the post-transfer living standards are lifted strictly above the poverty line.[3] The budget leakage ratio is obtained by dividing the budget leakage by the available budget.

Two Estimation Stages

As mentioned before, the choice of the deflation method can intervene at the two identified stages in estimating the policy performance: (a) The prediction of living standards for the transfer calculation; and (b) The estimation of poverty and budget leakage measures. In total, nine possibilities could arise from the choice of the deflation methods at each of these two stages since nothing implies that the same method should be used at both stages. For example, the calculus of the transfers based on predicted living standards may be done much before the assessment of the program performance, or the two stages can be based on different data.

Income Definition. The lines of the calculus are as follows. For each surveyed household, the nominal income level y* corresponding to the reference situation defined without transfers or subsidies (at prices p^r) is calculated. This is done by applying the estimated equivalent-income formula with $p^r = p^{ps} -$ unitary subsidies. In this way, the studied programs (cash transfers and subsidies) may be compared by putting them on the same stand.

The nominal income variable is then deflated. The three deflation possibilities correspond to the following definitions of real incomes:

- No Correction: y*;
- Laspeyres Index Deflation: y*/P, where P is the spatial Laspeyres Price Index describing the general level of local prices faced by the household;
- Equivalent-Income Deflation: $y_e(p^r, p_c, y^*)$, where p_c is the price vector observed in the cluster c of the considered household.

Transfer Calculation. Given these definitions of price-corrected living standards, two alternative social programs ─ cash transfers and subsidies ─ are considered. In the case of cash transfers, the algorithm of perfect targeting is applied to the sample of the predicted incomes obtained from the regressions of observed incomes y* on observed correlates x. This yields the vector of transfers t(x), denoted as $\hat{T}$. In the case of the subsidies, the equivalent transfer

is computed by using the y_e function: $y_e(p^r, p_c, y^*) = y^* + \hat{T}$, where $\hat{T}$ now denotes the estimated equivalent transfer.

It will be noted that for calculating actual transfers, one may use non-deflated incomes, Laspeyres-deflated incomes or equivalent-incomes. The post-transfer equivalent-income is calculated by first anchoring the equivalent-income function on the reference situation of prices without subsidies, and secondly, incorporating the transfer amount in the income in this situation. For example, for cash transfer schemes, the equivalent-income $y_e(p^r, p_c, Y)$ may be calculated, where p^r are the observed prices minus the subsidies. The perfect targeting transfer computation on the sample of equivalent-incomes may then be applied.

On the other hand, looking at the situation where only subsidies are applied, the equivalent-income is equal to $y_e(p^r, p^{ps}, Y) = Y + \hat{T}$, where $\hat{T}$ denotes the estimated transfer equivalent to the effect of subsidies. If instead of the equivalent-income, Laspeyres deflation (respectively no deflation) is used, then it is y^*/P before subsidies and $(y^*+\hat{T})/P$ after (respectively, y^* and $y^*+\hat{T}$). In all cases, $\hat{T}$ varies across households. Thus, transfer terms may be considered in the case of subsidies too, albeit only when equivalent-income is used for defining the living standard variable. It will also be noted that in practice, there is no need to calculate explicitly $\hat{T}$ since the social welfare statistics are based on $y_e(p^r, p^{ps}, Y)$.

Deflation When Estimating Welfare Statistics. The second stage consists of deflating the post-transfer incomes for the estimation of poverty and budget leakage. Again, there are the same three possibilities:

- No Correction: Sampling estimators of social welfare criteria are used based on the sample of $y + \hat{T}$.
- Laspeyres Correction: Sampling estimators are used based on the sample of $(y + \hat{T})/P$;
- Equivalent-Income Correction: Sampling estimators are used based on the sample of y_e.

The Complete Procedure. To sum up, the following procedure is used:

1. A sample of living standard predictions from household survey data is computed. These predictors are the basis of the transfer calculation.

Let Y be the n x 1 vector of observed living standards in the survey with n observations, and X be the n x k matrix of variables used for the prediction. Y can be diversely deflated, as discussed before. So, Y is a vector composed of indicators of the types y^*, y^*/P or $y_e(p^r, p_c, y^*)$. The prediction of Y is Y_hat = g(Y, X), where g is a function determined by the used statistical predictor. Usually, only linear predictors are used with the popular case of OLS predictor: Y_hat = $X(X'X)^{-1}X'Y$ = X b_{OLS}, where b_{OLS} is the OLS estimator of the coefficients in the regression of Y on X. If quantile regressions are used instead of OLS, as in Muller and Bibi (2008), Y_hat = X b_theta, where b_theta is the quantile regression estimator centered on quantile theta.

2. The transfers to implement for the studied sample are calculated. The calculus depends on: (a) the considered poverty indicator and (b) the considered policy (cash transfers or subsidies).

For calculating cash transfers, the vector Y_hat, which depends on X because of step 1, is incorporated in the optimization program (PB1) instead of the y's. The obtained solution yields the vector of transfers for cash transfer schemes.

When price subsidies are considered, the shadow transfer is calculated in applying the formula of the QAIDS equivalent income function to observed vector Y. That is, $y_e(p^r, p_c, Y)$ is calculated and the initial Y is subtracted. On the other hand, if the shadow transfer is calculated using a synthetic price index (i.e. Laspeyres Index), one obtains $Y/P_{post} = (Y+\hat{T})/P$, where P_{post} is the price index after the subsidies. Thus, for price subsidies, there is no need to use the ancillary variables X. The obtained transfer vector is called $\hat{T}$ in all cases .

3. Whatever the considered policy may be, a sample of post-transfer living standards is generated by implementing the calculated cash transfers and subsidies to each sampled household.

The post-transfer living standard is denoted Y_post (e.g. Y_hat + $\hat{T}$). In the case of price subsidies and equivalent-income, it becomes Y_post = y_e(p^r, p^{ps}, Y).

4. Post-program poverty and budget leakage measures are estimated, using sampling estimators and the sample of post-transfer living standards.

For example, P_α(y, z) is estimated by using price-deflated (or not) Y_post instead of Y in its formula of sampling estimator. Again, Y_post, Y_post/P or y_e(p^r, p_c, Y_post) may be used for the estimation of poverty and leakage measures.

The choices of the deflation methods take place in steps 1 and 4. The combination of deflation methods in Steps 1 and 4 yields diverse results for poverty and budget leakage measures.

Estimation Results

The Context and the Data

In Tunisia, basic foodstuffs have been under universal subsidy since 1970. The Tunisian Universal Food Subsidies Program (TUFSP) allows the government to redistribute income to the poor and preserve their purchasing power. However, even if beneficial to the poor, this program has been inefficient and costly. By 1990, subsidies accounted for 10% of total government expenditure. Moreover, the wealthier households which consume more food, benefited more from the program than the poor. With rising international food prices caused by the food crisis, subsidies are increasingly expensive, while their suppression may cause social unrest.

Substituting subsidies with cash transfers to the poor (Ahmad and Bouis, 2002) would reduce the large budgetary leakage of food subsidies to the non-poor. Also, direct cash transfers may reduce poverty at a lower cost. Reforms of Tunisian food subsidies and their impact on poverty have also been studied by Bibi (2003) and Audet et al. (2007).

The methodology presented above is applied to data from the 1990 Tunisian consumption survey conducted by the National Statistical Institute of Tunisia (République Tunisienne, 1993a, 1993b). The household survey provides information on expenditures and quantities for food and non-food items for 7734 households. The usual statistical information from household surveys is available such as the consumption of own production, education, housing, region of residence, demographic information and economic activities.

Various calculations and estimations have been discussed by referring to income variables only. In practice, household demographic composition must also be accounted for. For this, income per adult-equivalent is used instead of incomes. However, using arbitrary equivalence scales or estimating them is contentious (Pollak and Wales, 1979, Blundell and Lewbel, 1991). To avoid distorting the results by using special equivalence scales, and to concentrate on the issue of imperfect targeting, per capita total consumption expenditure is used as the indicator of household member's welfare.

The correlates of living standards used in the predictive regressions include: regional location of the households;[4] demographic information on households; characteristics of the household's dwelling; occupation and education level of the household's head. They are described by Muller and Bibi (2009).

Price Corrections

Each correction method for price dispersion has advantages and drawbacks. Obviously, non-correcting for price deflation does not treat price dispersion. However, this approach is not sensitive to measurement or design errors in the used price indices.

Price deflation based on Laspeyres Price Indices deals with price dispersion and is not sensitive to estimation errors in demand system estimation. However, it does not account for consumption substitution across goods.

Finally, correction may be based on estimated true price indices, which are ratios of equivalent-incomes. Here, they are derived from the estimation of a Quadratic Almost Ideal Demand System for Tunisia (as discussed in Bibi and

Muller, 2009). The true price indices account for diverse substitution behavior across households. However, they are sensitive to estimation errors of the demand system. Also, if market imperfections are important, approximating consumer decisions by assuming that households only face a budget constraint may be invalid.

Results

Muller and Bibi (2009) present detailed analyses of how targeting efficiency may be improved by using quantile regressions for predicting living standards. These results are based on income-equivalent measures derived from a first-stage estimation of a demand system. In this paper, the analysis has been extended to two additional types of price correction and has incorporated the poverty measures P_0 and P_1. Here, only the two living standard prediction methods are considered that provide the best performance with these data: OLS and quantile regressions centered on the first decile.

Tables 1 to 4 present the estimates of post-transfer poverty (respectively measured with Head Count Index — P_0; Poverty Gap — P_1; Poverty Severity Index — P_2) and budget leakage for different transfer and subsidy schemes. The poverty line is defined as Tunisian Dollar 280 per capita per year (TD1 = $0.77189 as of December 2009), which is close to usual values for poverty lines in Tunisia.[5]

Table 1. Head-Count Index (P_0, in percentages)

Correction Transfers	Correction P_0	No Price Correction	Laspeyres Index	Equivalent Income
No Price Correction	Subsidies OLS Quantile Regressions	12.79 6.36 6.75	12.00 5.84 6.06	12.48 6.25 6.16
Laspeyres Index	Subsidies OLS Quantile Regressions	12.79 6.59 6.86	12.72 6.33 6.51	
Equivalent Income	Subsidies OLS Quantile Regressions	13.87 6.96 7.36		13.86 6.79 6.89

N.B. 7734 observations. Author's estimates from the 1990 Tunisian National Budget Survey. Poverty line z = TD280.

The first column of Table 1 indicates the rows corresponding to the diverse price correction methods at the stage of transfer calculation, successively: No Price Correction, Laspeyres Index and Equivalent-Income. The first row indicates the columns corresponding to the price correction method at the stage of social welfare criteria estimation. The successive columns respectively show the estimates of the head-count index P_0, calculated with: 'No Price Correction', 'Laspeyres Index' and 'Equivalent-Income'. The second column shows the names of the three assessed social programs: Price Subsidies, Cash Transfers based on OLS predictions, Cash transfers based on quantile regression predictions. In this situation, the core of the Table shows the obtained estimates of P_0 for all the respective deflation methods at both estimation stages.

The other Tables have the same structure, while they show different social welfare criteria: respectively, Poverty Gap (P_1) in Table 2, Poverty Severity Index (P_2) in Table 3 and finally the Leakage Ratio in Table 4.

In the empirical results, the following combinations are not considered because they lack practical sense as explained below. Firstly the combination of Laspeyres Index Correction for living standard prediction and the True Price Index correction for poverty estimation) are dropped. This means dropping the case of two contradictory deflation methods at two distinct steps of the global procedure. Secondly, and for the same reason, the combination of the True Price Index correction for living standard prediction and the Laspeyres Index Correction for poverty estimation are also dropped. Indeed, these combinations have little sense. If a method of price correction is deemed to be useful for the prediction equations, the same method should also be adopted for estimating poverty. In contrast, due to data limitations, the absence of price correction at some stage could be justified and combined to any method of price correction at the other stage.

In Rwanda, Muller (2008) found that corrections for spatial price differences could substantially affect poverty estimates. However, it may be seen that such finding does not extend to Tunisia. It may also be noted that measured poverty is commented on rather than unobserved exact poverty level.

One major feature emerging from Table 1 is that much higher poverty rates are reached under price subsidies (about 12-14 %), as compared to the cash transfer systems (roughly half level of poverty rates, and 6-7 %). This result is confirmed for all combinations of price corrections applied to the two estimation stages. The same result is obtained with all methods ─ although the number of the poor under subsidies is rather small in Tunisia, using the subsidies budget to implement direct cash transfers can reduce this number by about half.

Comparing the two considered transfer schemes respectively based on OLS and first-decile regressions, could be trickier. This is because the corresponding estimates of poverty rates seem to be concentrated around similar levels. The assessment of what the best transfer scheme is ─ i.e. in terms of reduced head-count index ─ could depend on the used deflation method. The results show that in fact the deflation method does not change the ranking of transfer schemes in their capacity of reducing the head-count index. Whatever deflation method is used, the estimated poverty rate obtained from implementing OLS-based transfers is always lower than the estimated poverty rate obtained from implementing quantile regression-based transfers.

Nevertheless, choosing a given combination of deflation methods may slightly change the estimated poverty rates. That is, the ranking of policies is not affected, while the reached numerical poverty estimates are, albeit not enough to change policy ranks. For example, after OLS-based transfers, the poverty rates vary from 5.84 % up to 6.96 %, across deflation methods. Although such variations appear to be non-negligible, they are, in fact, not substantial as they merely describe statistical measurement decisions. For example, if at all stages one trusted better the use of equivalent-incomes than other methods of price correction, one would choose to measure the poverty rate as equal to 6.79 % after OLS-based transfers. In contrast, if it is believed that the price information is too imperfect to be used for price correction at any stage, the estimated poverty rate after OLS-based transfers would correspond to 6.36 %.

Turning to Poverty Gap estimates (P_1) in Table 2, and to Poverty Severity estimates (P_2) in Table 3, it confirms the general result that deflation does not affect the comparison of the considered policies. Under price subsidies, the estimated poverty gap (around 3 %) and the estimated poverty severity index

(around 1.2 %) are systematically much higher than under the two studied transfer schemes (respectively from 0.90 % to 1.25 %, and from 0.22 % to 0.37 %). All these estimates correspond to moderate levels of poverty. However, there is no question that cash transfers can massively reduce poverty as opposed to subsidies, whatever price correction methods are used at any stage.

Table 2. Poverty Gap (P_1, in percentages)

Correction Transfers	Correction P_1	No Price Correction	Laspeyres Index	Equivalent Income
No Price Correction	Subsidies	3.30	2.99	3.10
	OLS	1.16	1.07	1.11
	Quantile Regressions	0.99	0.90	0.92
Laspeyres Index	Subsidies	3.30	3.26	
	OLS	1.18	1.15	
	Quantile Regressions	0.99	0.94	
Equivalent Income	Subsidies	3.47		3.44
	OLS	1.25		1.22
	Quantile Regressions	1.06		1.01

N.B. 7734 observations. Author's estimates from the 1990 Tunisian National Budget Survey. Poverty line z = TD280.

Tablle 3. Poverty Severity Index (P_2, in percentages)

Correction Transfers	Correction P_2	No Price Correction	Laspeyres Index	Equivalent Income
No Price Correction	Subsidies	1.26	1.12	1.15
	OLS	0.35	0.32	0.32
	Quantile Regressions	0.25	0.22	0.23
Laspeyres Index	Subsidies	1.26	1.24	
	OLS	0.35	0.35	
	Quantile Regressions	0.25	0.24	
Equivalent Income	Subsidies	1.31		1.30
	OLS	0.37		0.36
	Quantile Regressions	0.26		0.25

N.B. 7734 observations. Author's estimates from the 1990 Tunisian National Budget Survey. Poverty line z = TD280

Again, and perhaps surprisingly, considering the proximity of estimates whether in terms of poverty gap (P_1) or poverty severity index (P_2), the ranking of the two studied cash transfer schemes, is not affected by selecting different deflation methods at any stage. Cash transfer based on first-decile regressions are always more efficient in alleviating poverty measured by P_1 and P_2 than OLS-based cash transfers. These results stand despite the fact that P_1 estimates and P_2 estimates are heterogeneous across price correction methods. Indeed, P_1 estimates vary from 1.07 % to 1.27 % under OLS-based transfers, and from 0.90 % to 1.06 % under quantile regression-based transfers. On the other hand, P_2

estimates spread from 0.32 % to 0.37 % under OLS and from 0.22 % to 0.26 % under quantile regressions.

Finally, Table 4 shows the estimated leakage ratios. Again, price correction does not change the comparison result of the considered poverty alleviation programs. This is not necessarily expected as this Table deals with different social indicators from poverty measures. It is observed that the calculation of the transfer amounts delivered to non-poor households would not lead to rank differently the considered policies.

Table 4. Budget Leakage Ratio (in percentages)

Correction Transfers	Correction Leakage	No Price Correction	Laspeyres Index	Equivalent Income
No Price Correction	Subsidies	90.86	91.47	91.02
	OLS	73.84	76.69	75.70
	Quantile Regressions	72.49	75.39	74.29
Laspeyres Index	Subsidies	90.86	90.90	
	OLS	73.98	74.84	
	Quantile Regressions	72.46	73.25	
Equivalent Income	Subsidies	90.05		90.07
	OLS	72.40		73.06
	Quantile Regressions	70.86		71.40

N.B. 7734 observations. Author's estimates from the 1990 Tunisian National Budget Survey. Poverty line z = TD280

In all cases, the share of the budget is wasted, because what is not directed towards the poor, is extremely high. This result has been found for most assessed transfer schemes in the world. The influences of the two correction stages are close. Finally, results with Laspeyres Price Indices and with Equivalent Incomes are close. As a matter of fact, the gap between estimated leakage from OLS-based transfers and quantile regression-based transfers is smaller than the variations caused by different types of price correction.

Again, price subsidies stick out as especially inefficient with estimated leakage ratios around 90 %, while both transfer schemes correspond to estimated leakage ratios from 70-9% up to 76.7 %, for the different price correction methods. A substantive share of the budget can be re-oriented towards its proper use by switching to cash transfers.

The comparison of the considered transfer schemes yields an unambiguous ranking, independent from the price correction methods. For all the considered schemes, using quantile regression-based transfers saves more of the budget than OLS-based transfers, albeit slightly so. Therefore, the method of price correction would not affect policy choice among the considered programs, even if the main choice criterion is to avoid budget waste.

In recapitulation of the results: firstly, using data from Tunisia 1990, it is observed that the used methods of price correction do not matter much. This is if the issue at hand is to choose between applying subsidies and direct cash transfers, whether the aim is to reduce poverty or to limit budget waste when fighting poverty. In all studied cases and for all considered deflation methods, cash transfers appear to be much more efficient than subsidies[6]. The differences found in poverty estimates between the cases of subsidies and transfers are so large that the used deflation methods are a minor concern for this comparison. This is true despite the range of poverty estimates being sometimes substantial across price correction methods.

Secondly, two types of cash transfer schemes were compared, respectively based on two living standard prediction methods: OLS vs quantile regressions centered on the first decile. Results show again that the choice between these transfer schemes does not depend on the considered deflation methods. In all

cases, the use of first-decile regressions yields better results. Moreover, the two deflation stages considered (firstly, for calculating transfers and secondly, for estimating post-policy poverty) have impacts of similar magnitude on poverty estimates. Solely deflating the poverty estimation stage would lead to slightly smaller measured poverty than solely deflating the living standard prediction stage, while the gap remains marginal.

Conclusion

This study focuses on the importance of correcting for price differences for policy comparisons of anti-poverty cash transfers schemes and price subsidy schemes. Price correction can intervene at two stages based on household survey data: when predicting unobserved living standards and calculating transfer amounts from the predictions; and when estimating poverty or budget leakage indicators. Three types of price correction were considered: (a) No Deflation; (b) Deflation based on Laspeyres Indices; and (c) Deflation based on 'True Price Indices' taken from an estimated demand system.

The results based on the 1990 Tunisian consumption survey, show that correcting for spatial price dispersion would have only insignificant effects on monitoring poverty policy in Tunisia. This is at odds with results found in other contexts like in Indonesia in Ravallion and van de Walle (1993) and in Rwanda in Muller (2008), where the design of poverty alleviation policies would be much affected by accurately accounting for spatial price dispersion for poverty monitoring. Results of this study show that the importance of spatial price deflation for poverty monitoring may be country-specific.

In Tunisia, estimation results based on using Laspeyres Price Indices are found very close to results based on using True Price Indices derived from an estimated quadratic almost ideal demand system. Therefore, the motivation for estimating such a demand system in Tunisia seems rather weak if the purpose of the estimation is to improve poverty alleviation policies. Moreover, even the complete absence of spatial price deflation is found acceptable for designing poverty alleviation in Tunisia at this period.

A few caveats need to be mentioned. Firstly, only food prices have been considered as it is not possible to define accurate prices for other consumption categories with the available data. As always, consumption data contamination may be an issue for such analyses, and there is no guarantee that the Tunisian data sets are devoid of it. Moreover, unit-values calculated from consumption records, have been used as price indicators rather than information from market price surveys. This may be an issue when some values or quantities of some products are systematically under- or over-estimated during the collection. Also, quality bias may occur in the case where wealthy households systematically consume higher qualities of some goods (which are often associated with higher prices).

Finally, Tunisia is characterised by publicly administered prices for a substantial section of the consumption of the poor (e.g. wheat for couscous). These prices are identical over the national territory for households surveyed at the same time, while they may change over time. This special situation could explain why spatial prices differences might matter less for poverty alleviating policies in Tunisia as compared to less developed countries with fully liberalized price systems.

On the whole, the above caveats and the specificity of the administered prices in Tunisia suggest that the policy conclusions of the present paper may not be easy to generalize to other countries. Deflating for spatial price differences should still be a general requirement of careful anti-poverty analysis, even if this study found it of little importance in Tunisia.

However, price deflation is time-consuming, requires spatial price data and is sometimes technically difficult when a flexible demand system has to be estimated to generate household-level price indices. Therefore, a methodical approach would be useful. A hypothetical example is proposed for such an approach. During the pilot survey that usually precedes fully-fledged household living standard surveys, one could collect price indicators for a small sub-sample of households. Thereafter, using this sub-sample, one could study the statistical correlation of prices and real living standards, as in Muller (2002). The result of this preliminary statistical analysis would indicate whether there is enough spatial price discrimination against (or in favour) of the poor to justify using sophisticated deflation techniques for the design of poverty alleviation policies. If

little correlation of prices and real living standards is found, as in Tunisia, then the policy design may proceed without excessive heed to spatial price differences.

Footnotes

(1) The FGT poverty measures satisfy the transfer axiom if and only if $\alpha > 1$, and the transfer sensitivity axiom if and only if $\alpha > 2$. All these measures satisfy the focus axiom and are decomposable. Focus axiom: The poverty index $P(y,z)$ is independent of the income distribution above z. Monotonicity: $P(y,z)$ is increasing if one poor has a drop in income. Transfer: $P(y,z)$ increases if income is transferred from a poor person to someone more wealthy. Transfer-sensitivity: The increase in $P(y,z)$ in the previous Transfer axiom is inversely related to the income level of the donator. Sub-group consistency: If an income distribution is partitioned in two sub-groups y' and y'', then an increase in $P(y'',z)$ with $P(y',z)$ constant, increases $P(y,z)$.

(2) See also Besley and Coate (1992), Glewwe (1992), Besley and Kanbur (1993), Datt and Ravallion (1994), Bourguignon and Fields (1997), Alderman and Lindert (1998), Chakravarty and Mukherjee (1998), Ahmed and Bouis (2002), Coady, Grosh and Hoddinott (2002, 2004), Coady and Skoufias (2004), Lindert et al. (2006), Muller (2005), Skoufias and Coady (2007), Muller and Bibi (2009).

(3) See also Besley and Coate (1992), Glewwe (1992), Besley and Kanbur (1993), Datt and Ravallion (1994), Bourguignon and Fields (1997), Alderman and Lindert (1998), Chakravarty and Mukherjee (1998), Ahmed and Bouis (2002), Coady, Grosh and Hoddinott (2002, 2004), Coady and Skoufias (2004), Lindert et al. (2006), Muller (2005), Skoufias and Coady (2007), Muller and Bibi (2009).

(4) For more information about regional targeting, see Ravallion (1992), Datt and Ravallion (1993), Baker and Grosh (1994) and Bigman and Fofack (2000).

(5) The lower poverty line estimated by the National Statistic Institute and the World Bank (1995). See also Ravallion and van der Walle (1993) which, on the basis of needs in food energy corresponds to TD 196. The poverty lines by Ayadi and Matoussi (1999) vary between TD 213 and 262, and the poverty lines by Bibi (2003) range from TD227 to 295. Poverty lines calculated by the World Bank for 1995 (The World Bank, 2000, Muller, 2007) are between TD252 to TD344. These diverse views correspond to slight variants in the estimation methodology. The value TD 280 is used because it corresponds to the more accepted methodology.

(6) Note again that when considering the effect of subsidies on the estimates of poverty and budget leakage, applying no price correction or using Laspeyres index correction for cash transfers yield exactly the same estimates (e.g., 12.79 % for P_0). This is because under subsidies, for which there is no actual cash transfer, the shadow transfers are calculated in a similar proportional way for all synthetic price indices. The calculus of shadow transfers depends on either using the equivalent-income function in calculating living standards, or adjusting proportionally living standards for general price changes. The equivalent-income correction affects the shadow transfer caused by the subsidies also by accounting for consumption substitution.

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