Food Subsidies and Poverty in Egypt: Analysis of Program Reform Using Stochastic Dominance

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Abstract

Throughout this article, consumption dominance curves were utilized, an instrument developed by Makdissi and Wodon (2002) to analyze the impacts on poverty brought on by changes in the food subsidy system in Egypt. Using the Egypt Integrated Household Survey (EIHS) of 1997, results show that changes brought to the list of subsidized food goods have not always been relevant as a tool for fighting poverty. It would be interesting in future works to study the entirety of the Egyptian price system paying attention to both general indirect taxes as well as regulated infrastructure prices.

الدعم الغذائي والفقر في مصر: تحليل برنامج الاصلاح باستخدام الهيمنة العشوائية

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بول مقدسي

ملخص

يستخدم في هذا البحث، منحنيات سيادة الاستهلاك التي طورها مقدسي و ووضون(2002) لتحليل الآثار المترتبة على تغيير نظام الدعم الغذائي على الفقر في مصر. وانطلاقا من المسح المتكامل لميزانية الأسرة التي أنجزت في مصر، خلص البحث إلى نتيجة مفادها أن التغييرات التي أحدثت ضمن قائمة المواد المدعمة لم تعمل دائما على الحد من أو محاربة الفقر.

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Introduction

In 1997 in Egypt, the food subsidy program alone represented 5.6% of total government expenditures. Numerous changes have been brought to this system to help alleviate budgetary pressure while maintaining affordable prices for primary food goods. In 2004-2005, the Egyptian government spent the equivalent of 2 billion US dollars on their food subsidy program (Rasromani, 2006). It is interesting to note that in 1997, the year the Egypt Integrated Household Survey (EIHS) was conducted,[(1)] the basket of subsidized goods had not yet been affected by the reforms. At the time of the survey, sugar, cooking oil, wheat and bread are subsidized goods.

In the early 2000s, the Egyptian government had decided to change the list of subsidized item for sugar, cooking oil, macaroni, lentils and beans. These changes were made with the idea of reducing the financial burden of the subsidy program while providing the poor with basic food goods at affordable prices. Therefore, it becomes appropriate to use this dataset to analyze in retrospect the desirability of the reform and analyze the impact on poverty[(2)]. This being said, the objective of the paper is to analyze the spending structure of Egyptian households to better understand whether this reform is adequate for fighting poverty.

According to Santoro (forthcoming), economic literature identifies three different approaches that may be used to analyze marginal tax reforms. The first type is based on the initial works of Ahmad and Stern (1984) who utilize a specific social welfare function. The second type of approach identifies avenues for tax reform based on the aversion to inequality and symmetry of the social welfare function. This approach is based on works by Yitzhaki and Thirsk (1990), Yitzhaki and Slemrod (1991) and Mayshar and Yitzhaki (1996). The third and final approach considers that marginal tax reforms may be used as instruments for reducing poverty. It is based on works by Makdissi and Wodon (2002), Liberati (2003) and Duclos, Makdissi and Wodon (forthcoming) and Bibi and Duclos (2007). The third approach is utilized in this paper.

Methodological Framework

This section presents the selected methodology to analyze the impacts on poverty brought on by changes in the food subsidy system in Egypt. Instead of choosing a specific poverty index and a specific poverty line, Makdissi and Wodon's (2002) method uses stochastic dominance techniques in order to assess the impact of the tax reform over a wide spectra of potential poverty indices and poverty lines. The objective of this section is to present in details Makdissi and Wodon's framework. This method is based on the comparison of consumption dominance curves (CD-curves). To highlight the theoretical implication underlying the comparisons of those curves, some theoretical concepts are introduced.

This concept of equivalent incomes has been introduced by King (1983). To account for the effect of different prices across households/ individuals, King uses the utility function of a reference household as a basis to define equivalent incomes. Let $v_l(y_l, q_l, t)$ the indirect utility of household l, endowed with exogenous income y_l, when facing prices q_l and tax system t. Next, consider a reference household noted R that faces prices q_R. Then King (op. cit) defines the equivalent income by the exogenous income $y_{l,t}$ that would allow the reference household facing prices q_R and tax system t to reach utility $v_l(y_l, q_l, t)$:

$$v_R(y_{l,t}, q_R, t) = v_l(y_l, q_l, t) \tag{1}$$

Thus, if t_1 and t_2 denote the pre-reform and post-reform tax systems, then $y_{l,t_1} - y_{l,t_2}$ may be considered as a money measure of the welfare change for household l of changing the tax system from t_1 to t_2.

Suppose that the government wishes to reduce an additive poverty index with an indirect tax reform, these types of indices have the following form:

$$P(F,z) = \int_0^a p(y,z)dF(y) \tag{2}$$

where y is the equivalent income, z; the poverty line defined in the equivalent income space.(3) F, the cumulative income distribution based on $[0,a]$ and $p(y,z)$ is a function which measures the share of total poverty belonging to an individual with an income of y.

In this paper, attention is not restricted to one particular poverty index. Instead, conclusions are drawn for a wide spectra of poverty indices. In order to do so, classes of poverty indices are defined and described. Duclos and Makdissi (2004) utilize the properties of this function $p(y,z)$ which allows them to define classes of poverty indices Π^s. These classes are defined by:

$$\Pi^s := \left\{ P \middle| p(y,z) \in C^s \text{ et } (-1)^i \frac{\partial^i p(y,z)}{\partial y^i} \geq 0 \ \forall i = 1,2,\ldots,s \right\} \tag{3}$$

where C^s represents the set of continuous functions s differentiable on $[0, a]$; when s=1, an increase in income of any one individual will reduce the poverty index.

This class of indices is Paretian which means that all things being otherwise equal, the increase of any one individual's income can not increase poverty. Moreover, these indices are symmetrical due to the fact that exchanging incomes between two individuals does not affect poverty. This type of income is said to satisfy the Pen principle (1971). The poverty indices included in P2 are also convex. This implies that they respect the Pigou Dalton principle which states that a transfer from one individual to a poorer individual will decrease poverty. Poverty indices belonging to P3 in addition to the prior stated principles, respect the Kolm principle (1976) which states that a transfer taking place at the bottom of the distribution has a greater impact on poverty than one taking place higher in the distribution.

Thus, a progressive transfer occurring in a low part of the distribution will reduce poverty even if it is accompanied by an equivalent regressive transfer higher in the distribution. Indices of this class with s greater then 3 may be interpreted ethically by using the generalized transfer principle proposed by Fishburn and Willig (1984). This principle states that the greater the order s, the greater is the sensibility of the index to transfers occurring in the lower part of the distribution. This principle implies that at the s=4 order, a pair of transfer combinations which satisfy the Kolm principle where one is progressive in the lower part of the distribution while another is regressive higher in the distribution, will reduce poverty.

Generalized higher-order transfer principles essentially postulate that, as s increases, the weight assigned to the impact of transfers occurring at the bottom of the distribution also increases. The Foster, Greer and Thorbecke (1984) indices are a particular example of additive poverty measures. Other examples of such indices are given by Chakravarty (1983) and Watts (1968). Theses indices are in fact a particular case of the second class of poverty indices proposed by Clark, Hemming and Ulph (1981).

Makdissi and Wodon (2002) use the fact that the above definitions are based on the sign of the successive derivatives of the poverty function.

Budgetary impact

Let it be assumed that the economy consists of K consumption goods. The government wishes to reduce poverty by marginally increasing the subsidy on good i and finance this increase by augmenting marginally the tax (or marginally reduce subsidy) on good j. This reform is therefore implemented within a balanced budget. Let R be denoted to indicate the total income incurred by the indirect tax reform. If the population is comprised of I individuals, the following is in order:

$$R = I\sum_{k=1}^{K} t_k X_k \tag{4}$$

where Xk re[illegible]age consumption of the good k and tk, the tax imposed on good k when $t_k > 0$ or the subsidy if $t_k < 0$. The impact of the marginal reform on total income is therefore:

$$dR = I\left\{\left[X_i + \sum_{k=1}^{K} t_k \frac{\partial X_k}{\partial t_i}\right]dt_i + \left[X_j + \sum_{k=1}^{K} t_k \frac{\partial X_k}{\partial t_j}\right]dt_j\right\} \tag{5}$$

Seeing how [illegible]e written that dR = 0. Integrating this into Equation 5 produces the following:

$$dt_j = -\gamma\left(\frac{X_i}{X_j}\right)dt_i \quad \text{où} \quad \gamma = \frac{1 + \frac{1}{X_i}\sum_{k=1}^{K} t_k \frac{\partial X_k}{\partial t_i}}{1 + \frac{1}{X_j}\sum_{k=1}^{K} t_k \frac{\partial X_k}{\partial t_j}} \tag{6}$$

Wildasin (1984) describes γ as the differential of the efficiency cost of obtaining one dollar (or any other currency) of public funds by taxing good j to subsidize good i. Yitzhaki and Thirsk (1990) and Yitzhaki and Slemrod (1991) argue that if γ is superior to one, it is impossible to have a second order dominant reform due to the increasing loss incurred by the reform. However, seeing that this is in a poverty analysis perspective, it is possible to have a reform that is dominant at all orders of stochastic dominance with a γ parameter superior to one if the loss cost is supported by the non poor.

Impact on Poverty

The impact a marginal change of fiscal reform will have on an individual's share of poverty with an income equal to y is:

$$dp(y,z)=\frac{\partial p(y,z)}{\partial y}\frac{\partial y}{\partial t_i}dt_i+\frac{\partial p(y,z)}{\partial y}\frac{\partial y}{\partial t_j}dt_j \tag{7}$$

Besley and Kanbur (1988) show that by using Roy's (1947) identity and the current price vector as the vector or reference prices, the change in equivalent income produced by a marginal change of tax on good k results in:

$$\frac{\partial y}{\partial t_k}=-x_k(y) \tag{8}$$

where xky is the Marshalli d k with the current price vector.[4] Introducing Equations 6 and 8 into Equation 7, the following is obtained:

$$dp(y,z)=-\frac{\partial p(y,z)}{\partial y}\left[\frac{x_i(y)}{X_i}-\gamma\frac{x_j(y)}{X_j}\right]X_i dt_i \tag{9}$$

To obtain the reform's impact on poverty, Equation 9 is integrated:

$$dP(F,z)=-X_i dt_i\int_0^a\frac{\partial p(y,z)}{\partial y}\left[\frac{x_i(y)}{X_i}-\gamma\frac{x_j(y)}{X_j}\right]dF(y) \tag{10}$$

Knowing that $\partial p(y,z)/\partial y\leq 0$ for all income levels (Equation 3); when xiy/Xi is greater at all points than $\gamma(x_j/X_j)$, there is an unequivocal reduction of poverty. Basing their argument on this premise, Makdissi and Wodon (2002) develop a method which allows for stochastic dominance test to be conducted on indirect tax reforms. They define consumption dominance as follows: [5]

$$CD_k^s(y)=\begin{cases}\dfrac{x_k(y)}{X_k}f(y) & s=1\\ \displaystyle\int_0^y CD_k^{s-1}(u)du & s>1\end{cases} \tag{11}$$

Int 10, the following is obtained:

$$dP(F,z)=-X_i dt_i\int_0^a\frac{\partial p(y,z)}{\partial y}\left[CD_i^1(y)-\gamma CD_j^1(y)\right]dy \tag{12}$$

Since X_i is positive, dt_i is negative and $\partial p(y,z)/\partial y$ is negative,

$CD^1_i(y) - \gamma CD^1_j(y) \geq 0$ implies $dP(F, z) \leq 0$. This is the first order of dominance result in Makdissi and Wodon (2002). Integrating part $\int_0^a \frac{\partial p(y,z)}{\partial y} CD^1_k(y)dy$:

$$\int_0^a \frac{\partial p(y,z)}{\partial y} CD^1_k(y)dy = \frac{\partial p(y,z)}{\partial y} CD^2_k(y)\Big|_0^a - \int_0^a \frac{\partial^2 p(y,z)}{\partial y^2} CD^2_k(y)dy \tag{13}$$

$CD^2_k(0)=0$ and $\partial p(a,z)/\partial y = 0$. The first term of the right hand side of the equation is thus nil. Consequently, Equation 13 may be rewritten as

$$\int_0^a \frac{\partial p(y,z)}{\partial y} CD^1_k(y)dy = -\int_0^a \frac{\partial^2 p(y,z)}{\partial y^2} CD^2_k(y)dy \tag{14}$$

Now assume that, for some [illegible], the following is obtained:

$$\int_0^a \frac{\partial p(y,z)}{\partial y} CD^1_k(y)dy = (-1)^{s-2} \int_0^a \frac{\partial^2 p(y,z)}{\partial y^2} CD^{s-1}_k(y)dy \tag{15}$$

Inte[illegible] Equation 15:

$$\int_0^a \frac{\partial p(y,z)}{\partial y} CD^1_k(y)dy = (-1)^{s-2} \frac{\partial^{s-1} p(y,z)}{\partial y^{s-1}} CD^s_k(y)\Big|_0^a - (-1)^{s-} \tag{16}$$

$CD^s_k(y)=0$ [illegible] and by the continuity assumption. This equation may be rewritten as:

$$\int_0^a \frac{\partial p(y,z)}{\partial y} CD^1_k(y)dy = (-1)^{s-1} \int_0^a \frac{\partial^s p(y,z)}{\partial y^s} CD^s_k(y)dy \tag{17}$$

Equa[illegible]5. If Equation 15 is true then, Equation 17 is also true. This implies that Equation 17 is true for all integer $s \in \{2,3,4,...\}$.

Introducing Equation 17 into Equation 12 results in:

$$dP(F,z) = -X_i dt_i \int_0^a \frac{\partial^s p(y,z)}{\partial y^s} \left[CD^s_i(y) - \gamma CD^s_j(y)\right] dy \tag{18}$$

Using the same reasoning as above, it may be concluded that $CD^s_i(y) - \gamma CD^s_j(y) \geq 0$ implies $dP(F , z) \leq 0$.

In their article, Makdissi and Wodon (2002) use this result to present the following proposition.(6) "A marginal reform, carried out in a balanced budget framework by marginally increasing the subsidy of good i and marginally increasing the tax on good j will reduce poverty for all indices where $P \in \Pi^s$ and all poverty lines where $[0, z^+]$ if and only if…"

$$CD_i^s(y) - \gamma CD_j^s(y) \geq 0 \quad \forall y \in [0, z^+] \tag{19}$$

Yitzhaki an od (1991) find that if γ is larger than one, a tax reform cannot be socially improving. However, in the poverty context, Duclos, Makdissi and Wodon (forthcoming) argue that a tax reform may, however, be poverty improving at any order even when $\gamma > 1$. In this context, the excess burden or economic efficiency cost of the reform then has to be paid by those households whose income is above the maximum poverty line z^+ and to whose change in well-being poverty analysts are ethically indifferent.

This raises an important question. In a context where an analyst searches for a complete ordering between tax reforms (this is not the case in this paper), if one compares two reforms that lead to the same impact on poverty, it is possible that the one which hurts more the non-poor will be chosen. Duclos and Makdissi (2007) explain this by the fact that social indifference hyper-surfaces are not strictly convex for poverty indices. If one wants to avoid such a situation, he may choose a lexicographic social objective for which the tax reform chosen first is that which reduces the most poverty. In the almost unprobable situation in which two reforms have exactly the same impact on poverty, then he computes the impact of both reform on the non-poor's welfare and chooses the tax reform for which the non-poor's welfare is higher.

Critical Poverty Line

If stochastic dominance tests fail at a certain order of dominance, the analyst must choose between two alternatives. Firstly, he may restrain the range of admissible poverty indices by increasing the order of stochastic dominance. Secondly, he could restrain the maximum poverty line to z^+. A way of limiting the maximum poverty line is to find the critical poverty line $z^s(\gamma)$ associated to order s and to one value of the economic efficiency parameter, γ. This value of $z^s(\gamma)$ is the maximum poverty line at which this specific stochastic dominance test is valid. The maximum poverty line is situated at the first intersection between both curves and is formally defined as:

$$z^s(\gamma) = \sup\{z \mid CD_i^s(y) - \gamma CD_j^s(y) \geq 0 \ \ \forall y \in [0, z]\} \tag{20}$$

Critical Efficiency Parameter

Duclos, Makdissi and Wodon (forthcoming) also introduce the concept of critical efficiency parameters when the value of γ is uncertain. If the condition of Equation 11 is satisfied at a certain order of dominance and at a certain value of γ_0, it becomes obvious that this will satisfy the equation for all parameter values inferior to γ_0. This being said, it is possible to define a critical value $\gamma^s(z^+)$ associated to the maximum poverty line, z^+. This critical value γ occurs when CD^s_i and γCD^s_j intersect at the maximum poverty line z^+. This is defined mathematically by:

$$\gamma^s(z^+) = \sup\{\gamma \mid CD_i^s(y) - \gamma CD_j^s(y) \geq 0 \ \ \forall y \in [0, z^+]\} \tag{21}$$

Analysis of Reforms Brought to the Food Subsidy Program

To help alleviate budgetary pressure, the Egyptian government is seeking ways to reduce spending on subsidy programs while maintaining affordable prices for primary food goods for the poor. The objective of this section is not to suggest solutions for the reduction of public spending but to analyze whether the reforms that have undergone the food subsidy program are coherent in a poverty alleviation framework. To do this, the data sets of the Egypt Integrated Household Survey (EIHS) for 1997 are used.(7)

The Food Subsidy Program(8)

It is interesting to note that in 1997, the year of the EIHS survey, the basket of subsidized goods had not yet been affected by the reforms. At the time of the survey, sugar, cooking oil, wheat and bread were subsidized goods. Today, the Egyptian government now subsidizes sugar, cooking oil, macaroni, lentils and beans. These changes were made with the idea of reducing the financial burden of the subsidy program while providing the poor with basic food goods at affordable prices. It therefore becomes appropriate to use this data set to analyze in retrospect the desirability of the reform and analyze the impact on poverty.(9)

The food subsidy program operates on the basis of ration cards. To have access to a monthly quota of subsidized sugar and cooking oil, an individual must have a ration card. There exist two types of ration cards: (a) green and (b) red. The green cards offer a higher rate of subsidy than the red cards. The idea behind the two cards system is to allow better targeting of the poor population.

Ahmed and Bouis (2002) show that an important proportion of rich Egyptians hold green cards while certain poor have none. On the average, 72% of the population holds green cards while 10% holds red cards. The rest of the population, 18%, does not hold any card. This distribution remains relatively unchanged regardless of income level. In a recent study by the United Nations World Food Program and the Ministry of Supplies and Internal Trade (WFP/ MOSIT, experts estimate that 7 million of the poor in Egypt do not have access to the subsidized food program (WTP/MOSIT, 2005). The Egyptian government is currently attempting to make the distribution of cards more equitable.

Methodology

In this paper, total household per capita expenditure is used as a proxy for individual permanent income. This variable is therefore constructed by adding all food and non-food expenditures, non-durable good expenditures, and the depreciation values of durable goods as well as the rental value for dwelling expenditures.(10) With regards to dwelling expenditures, to better compare households where individuals are owners with those who are tenants, a hedonic regression of rent is used to impute a value for dwelling expenditures for those who own their dwelling. As Datt, Jolliffe and Sharma (1998) have done, this value is derived by regressing dwelling characteristics on rent paid by tenants and then using the estimates on those who own their dwelling to identify an estimated rental value.

Table 6 of the Appendix presents the results of this regression. It shows that households living in urban areas pay higher rent then those living in rural areas. Moreover, the capital, Cairo, is shown to be the area where rent is the highest followed by the district of Menya. Northern districts, in particular Alexandria and Damietta, are those with the lowest rent when compared to the capital. With regards to household characteristics, the number of rooms, quality of walls, floors and roofs materials directly translate into higher rent prices.

The study proceeds by normalizing total household expenditures by a poverty line of 129.19 Egyptian pounds per month. As a result, an individual with a level of normalized total expenditures equal to 1 has a total expenditure equal to the poverty line. When the level of normalized total expenditures is equal to 0.5 or 2, the household is situated at 50% and 200% of the poverty line respectively. This normalization renders tables easier to interpret.

Table 1 presents the Foster, Greer and Thorbecke (1984) class of poverty indices P_0, P_1 and P_2 using the 129.19 Egyptian pounds per month poverty line for Egypt and its five regions.

Table (1) Poverty Levels by Region (%)

	P_0	P_1	P_2
Metropolitan	30.38 (4.38)	8.52 (1.66)	3.51 (0.86)
Urban Lower-Egypt (North)	25.46 (4.07)	6.27 (1.17)	2.27 (0.50)
Rural High-Egypte (North)	27.50 (2.55)	7.17 (1.19)	2.86 (0.68)
Urban High-Egypte (South)	18.32 (3.70)	4.55 (1.24)	1.74 (0.61)
Rural High-Egypte (South)	35.36 (3.23)	9.06 (1.09)	3.54 (0.54)
National	28.02 (1.62)	7.32 (0.60)	2.89 (0.31)

Source: EIHS, 1997
Authors' calculations.
N.B. Standard errors are in parentheses.
P_0, P_1 and P_2: Foster, Greer and Thorbecke (1984) class of poverty indices.

Thus, 28.02% of Egyptian households are considered poor. Both the capital and the rural southern regions have the greatest incidence of poverty, 30.38% and 35.36% respectively. The incidence of poverty in other regions is inferior possibly due, among other factors, to the government's resolve to develop these areas. Also, the northern and southern urban areas, followed by the northern rural area are shown to have the lowest levels of incidence. Similar results are observed on the depth and severity of poverty.(11)

Analysis of Changes Brought to the Subsidy Program

The various changes the Egyptian government has brought to the list of subsidized goods are now analyzed. To accomplish this, the CD curves of the newly subsidized goods are compared with goods that are no longer subsidized and then are verified if the reform evolves as predicted in the authors' methodology.

Table (2) Comparison of Macaroni and Tamwin Bread

Indirect taxation of Macaroni against Tamwin Bread Egypt, 1997		
Critical efficiency ratio "Gamma" for various poverty lines (Z+)		
	Z+ = 1	z+ = 2
Gamma2 z+	1.23	1.04
Gamma3 z+	1.49	1.13
Critical poverty lines "Z Gamma" for various efficiency parameters "gamma"		
	gamma = 1	gamma = 1.5
z2 gamma	2.57	0.5
z3 gamma	-	1

Source: EIHS, 1997
Authors' tabulation

Table 2 presents the results of the comparison between macaroni and tamwin bread. These results suggest that it would be appropriate to tax macaroni than increase subsidies on tamwin bread. Therefore, this modification to the list of subsidized food goods is not desirable even though the efficiency cost of taxing macaroni is 23% larger then that of tamwin bread. The increase of tax on macaroni would allow for an increased subsidy on tamwin bread which would result in a reduction of all poverty indices belonging to Π^2 and all poverty lines equal or inferior to the official poverty line. This result also holds true for all poverty lines inferior or equal to two times the official poverty line if the efficiency cost of taxing macaroni is 4% greater then that of taxing tamwin bread. In fact, if the efficiency costs of taxing both goods are equal, all poverty lines may be considered inferior to 2.57 times the official line.

It is important to note that this class of indices includes all indices that are Paretian, symmetrical and respect the Pigou-Dalton aversion to inequality. These three principles are generally accepted by a large majority of analysts. Therefore the results of this study are valid for a wide range of indices. If indices belonging to the Π^3 class were considered, the results are even more convincing. Even if the efficiency cost of taxing macaroni being 49% superior to that of taxing tamwin bread were to be considered, an increase in the taxation of macaroni

- which in turn would subsidize tamwin bread - would reduce poverty for all indices belonging to the Π^3 class and also for all poverty lines inferior or equal to the official poverty line. This result also holds true for all poverty lines equal to two times the official poverty line if the efficiency cost of taxing macaroni is 13% superior to that of taxing tamwin bread. In effect, if the efficiency costs of taxing both goods were equal, every imaginable poverty line up to the maximum income of a may be considered for this class of indices, seeing how both curves never intersect.

Table (3) Comparison of Kidney Beans and Tamwin Bread

Indirect taxation of Kidney Beans against Tamwin bread Egypt 1997		
Critical efficiency ratio "Gamma" for various poverty lines (Z+)		
	z+ = 1	z+ = 2
gamma2 z+	1.62	1.07
gamma3 z+	2.03	1.22
Critical poverty lines "Z Gamma" for various efficiency parameters "gamma"		
	gamma = 1	Gamma = 1.5
z2 gamma	-	1.06
z3 gamma	-	1.33

Source: EIHS, 1997
Authors' tabulation

Table (4) Comparison of Other Beans and Tamwin Bread

Indirect taxation of other Beans against Tamwin bread Égypt 1997		
Critical efficiency ratio "Gamma" for various poverty lines (Z+)		
	z+ = 1	z+ = 2
gamma2 z+	2.88	1.25
gamma3 z+	5.87	1.81
Critical poverty lines "Z Gamma" for various efficiency parameters "gamma"		
	gamma = 1	Gamma = 1.5
z2 gamma	-	1.63
z3 gamma	-	2.59

Source: EIHS, 1997
Authors' tabulation

Table 3 and Table 4 present the results of the comparison of beans and tamwin bread. These results suggest that it would be appropriate to tax beans than to subsidize tamwin bread. This change in the list of subsidized food goods is once again not a desirable choice since even if the efficiency cost of taxing kidney beans (resp. other beans) is 62% (resp. 188%) superior to that of taxing tamwin bread, an increase of taxes on beans which would allow for an increase in subsidy of tamwin bread would reduce poverty for all indices belonging to the Π^2 class and for all poverty lines equal or inferior to the official poverty line.

These results hold true for all poverty lines inferior or equal to two times the official poverty line if the efficiency cost of taxing kidney beans (resp. other beans) is 7 % (resp. 25%) superior to that of taxing tamwin bread. In fact, if the efficiency costs of taxing both goods were equal, all poverty lines imaginable up to the maximum income a could be considered, seeing how both curves never intersect for both types of beans. Now, if only indices belonging to the Π^3 class were considered, the results once again, are very convincing. Even with efficiency cost of taxing kidney beans being 103% (resp. 487% for other beans) greater then that of bread, an increase of taxes on beans to subsidize tamwin bread would result in a reduction of poverty for all poverty indices belonging to the Π^3 class and for all poverty lines equal or inferior to the official line. This result remains true for all poverty lines inferior or equal to two times the official poverty line if the efficiency cost of taxing kidney beans is 22% (resp. 81% for other beans) greater than taxing tamwin bread.

Table (5) Comparison of Tamwin Flour and Lentils

Indirect taxation of Tamwin flour against Lentils Egypt 1997		
Critical efficiency ratio "Gamma" for various poverty lines (Z+)		
	z+ = 1	z+ = 2
gamma2 z+	1.18	1.01
gamma3 z+	1.26	1.08
Critical poverty lines "Z Gamma" for various efficiency parameters "gamma"		
	gamma = 1	gamma = 1.5
z2 gamma	2.37	0.69
z3 gamma	-	0.81

Source: EIHS, 1997
Authors' tabulation

Table 5 presents the results of the comparison between tamwin flour and lentils. These results suggest that is would be appropriate to tax flour than to increase subsidies on lentils. This indicates that replacing tamwin flour with lentils in the list of subsidized food goods is a desirable decision if the objective is to reduce poverty. It may be noted that even if the efficiency cost of taxing flour is 18% greater then that of taxing lentils, a reduction of subsidies on tamwin flour to increase subsidies on lentils would reduce poverty for poverty indices belonging to the Π^2 class and for all poverty lines inferior or equal to the official poverty line. The results hold true for all the poverty lines inferior or equal to two times the official poverty line if the efficiency cost of taxing lentils is 1% greater then that of tamwin flour. In fact, all poverty lines inferior to 2.37 times the official poverty line can be considered if both cost efficiencies are equal.

If indices belonging to the Π^3 class are now considered, the results are once again very convincing. Even if the efficiency cost of taxing tamwin flour is 26% greater then that of lentils, a reduction of subsidies designated to flour diverted towards lentils would reduce poverty for all poverty indices belonging to the Π^3 class and for all poverty lines equal or inferior to the official poverty line. This remains true for all poverty lines inferior or equal to two times the official poverty line if the efficiency cost of taxing tamwin flour is 8% greater then that of taxing lentils.

Looking at these results, it may be concluded that the Egyptian government should have kept tamwin bread on the list of subsidized goods and should not have added beans and macaroni if it wished to alleviate poverty. However, replacing subsidies on tamwin flour by subsidies on lentils is a coherent policy in regards to poverty alleviation.

Conclusion

In this article, the impact of specific poverty food subsidy reforms that Egypt has implemented, is analyzed. It is concluded that the changes brought to the list of subsidized food goods have not always been relevant as a tool for fighting poverty. It would be interesting in future works to study the entirety of the Egyptian price system paying attention to both general indirect taxes as well as regulated infrastructure prices. To do this, we could use methodologies proposed by Makdissi and Wodon (forthcoming) who adapt the analysis of CD curves to the analysis of infrastructure sectors. It would also be interesting to study the targeting and allocation properties of current Egyptian poverty reduction policies with such tools as those developed by Duclos, Makdissi and Wodon (2005) who also adapt CD curves to this end.

Footnotes

(1) This survey is available for public use through the IFPRI web site.

(2) While this article was being written, the Egyptian government modified the food subsidy program's list of subsidized goods to exclude beans and lentils. As of now, sugar, oil, tea and rice make up the list of subsidized food goods.

(3) It is also possible to define the poverty line in the income space. However, it is more convenient to define it in the equivalent income space because the tax reform will not change the poverty line in this space.

(4) One may wonder if this result is valid in presence of rationed goods. Consider the following consumer problem

$$\max_x u(x)$$
$$\text{s.t.} \quad qx = y$$
$$x_i \leq \bar{x}_i \ \forall i \in \Xi$$

be the indirect utility function so that $v(y,q)$ is the set of rationed good. Let Ξ where

$$v(y,q)=\max_x u(x) + \lambda[y-px]+\sum_{i\in\Xi}\phi_i[x_i-\bar{x}_i]$$

we get $i \in \Xi$ Using the Envelop Theorem, and choosing a rationed good

$$\frac{\partial V(y,q)}{\partial p_i} = -\lambda x_i(p,y)$$

and

$$\frac{\partial V(y,q)}{\partial y_i} = -\lambda.$$

It is then straightforward to see that Roy's identity is also valid for rationed good because

$$\frac{\partial v(y,q)/\partial p_i}{\partial v(y,q)/\partial y} = -x_i(y,q).$$

(5) Multiplying by f y at the first order was introduced by Duclos, Makdissi and Wodon (forthcoming) to implement empirically Kernel estimations into consumption dominance curves of ordre 1 which wont be used in this paper.

(6) They also prove for necessity. Interested readers should refer to their paper.

(7) There exists a micro data survey for 1999 but this survey was done only on a sub-sample of

the 1997 survey. Moreover, it does not contain all the information required for this study. The data were obtained through the intermediary of the International Food Policy Research Institute (IFPRI).

(8) Gutner (1999) presents an overview of this reform all while presenting its advantages and inconveniences. Ahmed, Bouis, Gutner and Löfgren (2001) present a revue of all the works that have been done on the analyses of Egyptian subsidies. In their work, the reader will find a more detailed description of this system and the reforms it has undergone.

(9) It has come to attention of the authors that while this article was being written, the Egyptian government modified the food subsidy program's list of subsidized goods to exclude beans and lentils. As of now, sugar, oil, tea and rice make up the list of subsidized food goods.

(10) Refer to Appendix 2 of the paper by Datt, Jolliffe and Sharma (1998) for more details.

(11) For a detailed povery profile, see Datt, Jolliffe and Sharma (1998).

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Appendix

Table (6) Hedonic Regression of Rent for Egyptian Households

Dependent Variable: Log of Rent Variables		Coefficients (Standard error)
Urban		0.302** (0.038)
Government Districts (Ref :Cairo)	Alexandria	-0.617** (0.108)
	Suez	-0.318* (0.173)
	Damietta	-0.626** (0.110)
	Dakhalia	-0.043 (0.090)
	Sharbia	-0.266** (0.091)
	Kalyubia	-0.082 (0.082)
	Kuer	-0.386** (0.109)
	Gharbia	-0.358** (0.088)
	El Menuf	-0.146 (0.098)
	Behera	-0.657** (0.102)
	Ismailia	-0.203* (0.122)
	Giza	-0.001 (0.079)
	Benisuef	0.244* (0.118)
	Fayoum	-0.396** (0.095)
	Menya	-0.197** (0.087)
	Assiut	-0.261** (0.093)
	Souhag	-0.469** (0.093)
	Qena	0.035 (0.096)
	Aswan	-0.192 (0.162)
Number of Rooms		0.151** (0.009)
Material of Exterior Wall (ref : cement joined stone)	Joined stone earth	-0.253** (0.060)
	Wood/Branches	-1.274* (0.606)
	Cement	0.002 (0.042)
	Blanco	-0.415** (0.056)
	Others (Steel,…)	-0.304 (0.429)
Material of Floor (ref : earth)	Wood	0.319* 0.186)
	Brick/Stone	0.167 (0.117)
	Cement/Tiles	0.284** (0.041)
	Others	0.537** (0.132)

Dependent Variable: Log of Rent Variables		Coefficients (Standard error)
Material of Roofing (réf : straw)	Earth	0.078 (0.189)
	Wood/Branches	0.204** (0.061)
	Galvanized steel	0.595** (0.192)
	Cement	0.497** (0.066)
	Tiles/Slate	0.082 (0.126)
	Others	0.012 (0.107)
Constant		3.069** (0.097)
Number of Observations : 1716		
R-squared : 0.5107 ; Adjusted R-square : 0.5002		
(*) This table presents the estimated parameters of the regression. Parameters with no asterisks are not statistically significant. * Significant at the level of 10%. ** Significant at the 5% level. Standard errors are shown in parentheses.		

Source: EIHS, 1997.
Authors' tabulations