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Estimating Poverty with Panel Data, Comparably

An Example from Jordan

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Abstract

Poverty estimates based on enumeration from a single point in time form the cornerstone for much of the literature on poverty. Households are typically interviewed once about their consumption or income, and their well-being is assessed from their responses. Global estimates of poverty that aggregate poverty counts from all countries implicitly assume that the counts are comparable. This paper illustrates that this assumption of comparability is potentially invalid when households are interviewed multiple times with repeat visits throughout the year. The paper provides an example from Jordan, where the internationally comparable approach of handling the data from repeat visits yields a poverty rate that is 26 percent greater than the rate that is currently reported as the official estimate. The paper also explores alternative definitions of poverty, informed in part by the psychological and biophysical literature on the long-run effects of short-term exposure to poverty or generally adverse environments. This alternative concept of poverty suggests that the prevalence of those who have been affected by poverty in Jordan during 2010 is more than twice as large as the official 2010 estimate of poverty.

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Estimating Poverty with Panel Data, Comparably
An Example from Jordan

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I. Introduction

The vast majority of the world measures poverty based on cross-sectional data that captures an estimate of income or consumption at a single point in time.[1] Typically, in rich countries, survey instruments ask a set of questions about income over the last 12 months.[2] In low-income countries, household surveys frequently inquire about how much the household has consumed in the last week, month, or quarter.[3] In almost all cases though, households are asked these questions about income and consumption during a single visit by the enumerator. Given that the household measure of wellbeing (whether measured by income or consumption) is assessed from a single visit, the time of the year when that visit occurs can be an important factor in the measurement of poverty.

Seasonality is observed in many dimensions and countries as a general phenomenon. In richer countries, consumption and employment spikes during the summer and holidays (Barsky and Miron, 1988);[4] and in poorer countries, consumption is typically much greater after harvest.[5] As one extreme example, D'Souza and Jolliffe (2012) note that independent sub-samples of households implicitly stratified on season reflect consumption patterns that are a third lower in the lean season as opposed to the post-harvest season. Khandker (2012) discusses the devastating

[1] For example, the global poverty estimates reported in World Bank (2014) are based almost exclusively on cross-sectional household surveys that collect information on consumption or income during one visit.
[2] For example, in the United States, the data that are used to produce the official estimates of poverty come from Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC). This supplement to the CPS is administered in March and asks about income from last year.
[3] The recall period typically varies by the type of item being discussed, with the recall for food frequently being 7 or 14 days, and the period for nonfood items frequently being one or three.
[4] This seasonality is often difficult to uncover since most macroeconomic data are released to the public after it has been adjusted to remove seasonality.
[5] See Carletto, Jolliffe and Banerjee (2014) for a discussion of the importance of small-scale agriculture to the wellbeing of the vast majority of the poor in sub-Saharan Africa.

effects of season-induced food deprivation in Bangladesh, locally known as *Monga*, which has historically been a cause of famines, particularly for rural households in the Rangpur region. While agriculture is the classic causal source of seasonality, even countries with relatively low levels of agricultural production experience seasonality (as indicated by Barsky and Miron for the United States). In the case of Jordan, the period of Ramadan is a time of increased consumption, with consumption levels that are 11 percent greater than the other periods of the year.

Seasonality in itself is not necessarily a problem for measuring poverty based on interviewing households about their consumption during a single visit. A common approach is to ask the household how much food they consumed during the last seven days and then multiply this value by 52 to get an annual estimate. Households interviewed during the lean season will appear to be poorer than they would seem if they had been interviewed after harvest, but if households are randomly interviewed during the year, these differences will average out for the national poverty rate. Grosh and Glewwe (2000) note that one reason a "prototypical LSMS [Living Standards Measurement Study] spreads fieldwork evenly over a 12-month period [is] … to study or even out seasonality effects" (p. 44). The underlying assumption to this approach is that single-visit interviews with short recall periods scaled up uniformly to annual estimates are expected to create type 1 errors (identifying someone as poor when they are not) and type 2 errors (failing to identify someone as poor when they are) in equal proportions, if fieldwork is randomly allocated over the year.

While the single-enumeration approach is by far the most commonplace, some countries do extract their official poverty estimates from data based on multiple visits. As one example, Niger

recently announced poverty estimates that come from asking households about their consumption during two visits at two distinct times of the year. These weekly estimates are then averaged and multiplied by 52 to get annual consumption. Similarly, in the case of Jordan, households are visited at least four times during the year and are asked about their consumption levels and patterns.[6] The estimated prevalence of poverty currently treated as the official Government of Jordan poverty rate is based on taking the average value of consumption from these four visits, annualizing the average, and then identifying a household as poor if their annualized average falls below the poverty line.

We argue that this approach is not comparable with the more commonplace approach based on the single-visit estimate of poverty. This lack of comparability matters in terms of forming public policy that addresses the volatility of consumption and it also matters when international organizations such as the United Nations and the World Bank produce global counts of the poor.[7] The remainder of this paper develops this argument and then proposes an alternative conceptual view of poverty that is more sensitive to the within year variation of wellbeing observed throughout much of the world. Section 2 provides a description of the data from Jordan that are used in our analysis, along with a discussion of the country context. Section 3 examines multiple ways of using poverty data from repeat visits and contrasts each with how the data are currently being used in Jordan (which we refer to as the status quo). A key finding in this section is that the estimated poverty rate based on an approach that is consistent with data from single visits is

[6] Households are asked about food consumption on a quarterly basis and nonfood consumption on a monthly basis.
[7] See World Bank (2014) for an estimated global count of the poor, and Jolliffe et al. (2014) for methodological details on how these estimates are produced and how sensitive they are to methodological differences across countries.

approximately 26 percent greater than the estimated poverty rate from the status quo approach. Section 4 concludes with some discussion of the policy implications for Jordan and some of the measurement implications for other countries that base their estimates on repeat visits.

II. Data and Country Context

We use the most recent round of Jordan's Household Expenditure and Income Survey (HEIS) in 2010, a nationally representative survey used to produce official poverty statistics. The HEIS has been carried out nine times since 1966, and every other year between 2006 and 2010. Besides household expenditures, it collects data on other household characteristics including demographics, employment, assets, and incomes. This survey's sampling frame comes from the 2004 Population and Housing Census and is divided into 89 strata (or sub-districts). The survey is usually administered over a 12 month period and follows a two-stage sampling design where census enumeration areas serve as primary sampling units (PSUs). For the 2010 survey round, 1,736 PSUs were selected in the first stage out of a total of 13,027 PSUs for the whole country using a systematic probability proportionate to size (PPS) sampling method. Within each selected PSU, 8 households were randomly selected in the second stage. The 2010 round of the HEIS collected consumption data for 11,223 households.

Structured more like a household budget survey, a key part of the survey is the food consumption section, which asks respondents about consumption of a broad range of 243 food items consumed over the previous week. This includes consumption through purchases from the market, from own production, as gifts, and eating outside the household. Food consumption data are collected from every household on a quarterly basis. Non-food data on the other hand are

collected on a monthly basis from each household. The list of non-food items is large as well, with 364 items being covered. In all, the survey collects information on 610 consumption items. Besides consumption data, the survey collected data on dwelling conditions, assets, education and employment as well at the beginning of the survey year.

In 2012, the Government of Jordan produced poverty estimates updating its previous methodology. The 2010 HEIS (Household Expenditure and Income Survey) was used to estimate a new national poverty line, following a 'cost of basic needs' (CBN) approach.[8] The poverty line was based on a common national caloric requirement of 2,347 calories per capita per day, and with a common food and non-food basket for all households. Since consumption habits of rich and poor households may differ greatly, the poverty line was based on the revealed consumption and expenditure patterns of the bottom 30 percent of the population (regarded as poor or near-poor) as reflected in the 2010 HEIS (World Bank, 2012). The estimated poverty line to meet basic needs was set at 813.7 JD per individual in 2010,[9] and the official estimated poverty rate based on this line was 14.4 percent.[10]

III. Measuring Poverty with Repeat-Visit Data

The previous section describes the measure of welfare (i.e. per capita consumption) and poverty line used to identify basic needs in Jordan. The next step is simply to identify who is poor by examining whether their individual measure of welfare falls below or above the poverty line. The

[8] See Ravallion (1998) for discussion of CBN and other methods.
[9] This line translates to 3.42 US Dollars per day in 2005 PPP terms, as measured by the World Bank.
[10] The 2010 poverty line was also 'back-casted' to 2008, based on official CPI deflators to maintain the real value of the line. The poverty rate in 2008 under this line was estimated at19.5 percent (World Bank, 2012).

interesting distinction with the data from Jordan is that there are now four observations of per capita consumption for each household in the sample, and how one uses these four observations on welfare matters for the measurement of poverty.

i. Measuring poverty based on four quarters – status quo and cross-section approaches

The current approach, which we refer to as the *status quo*, is to take the simple average for the household, scale this to an annual figure and assess whether the average is below the poverty line (z). More formally, the status quo defines a household *i* as poor if $\overline{y}_i < z, where\ \overline{y}_i = \sum_{q=1}^{4}(y_q/4)$ or the household's average value of consumption of the four quarters. If a household is poor in first three quarters out of four, but their consumption in the last quarter is large enough to bring their average over the poverty line, they are assessed as not poor. This averaging essentially dampens the volatility that is typically observed in consumption data, shortening and thinning the tails of the distribution.

If we contrast this with the one-visit approach, this household would have been classified as poor if it had been interviewed during any of the first three quarters, and it would have been classified as nonpoor if and only if it had been interviewed during the last quarter. In expectation then, the one visit approach would identify the household as poor, while the averaging method identifies it as nonpoor. Table 1 indicates that it is relatively rare for a household to be poor in three quarters, but have an average consumption level greater than the poverty line. This only occurs for about 1 percent of the population. Nonetheless, 1 percent is still about 61,000 people in the population. The only household type for which both methods would unambiguously assess a household as poor is if the household is poor in all four quarters. Table 1 reveals that this is the

case for less than half (45 percent) of the *status quo* poor.

[Insert Table 1 approximately here]

Any time the poverty rate for Jordan is compared to the poverty rate from some other country that measures poverty based on collecting consumption data at one point in time, the comparison will not be valid simply due to the decision to average the consumption spells. An approach that would result in a poverty estimate that would be comparable with the vast majority of countries (i.e. countries that base their estimate on the single-visit approach) would be to treat each of the four visits as four single-visit interviews to separate households. Conceptually, this is to say that the HIES sample of size n with four visits can be treated as a random sample spread out over the year with sample size $4n$ and a single visit to each household. The fact that the household is the same household has some implications for the standard error of the poverty estimate, but the estimated prevalence from this approach is conceptually identical to estimating poverty from a random sample of single-visit data of size $4n$. In this case, poverty is estimated for each household i in each quarter q, which we refer to as the *cross-section* approach, because we are handling the panel data as if it were cross-sectional data.

To understand whether the conceptual difference in these two approaches (status quo and cross-section) has any empirical implications, we consider three widely used measures of poverty—the headcount, poverty-gap, and squared poverty-gap indices. These measures belong to the Foster-Greer-Thorbecke (1984, hereafter referred to as FGT) family of poverty indices and

have been widely used in the international poverty literature.[11] The first is the headcount index, (P_0), which is the percentage of the population living in families with family income less than the poverty line. The second measure is the poverty-gap index, (P_1), defined by the mean distance below the poverty line (expressed as a proportion of the poverty line), where the mean is formed over the entire population and counts the nonpoor as having zero poverty gap. The third measure is the squared poverty-gap index, (P_2), defined as the mean of the squared proportionate poverty gaps. If we consider the *status quo* approach, these measures can be expressed as in (1) and the *cross section* approach as in (2):

$$P_{\propto} = \frac{1}{n}\sum_{i=1}^{n} I(\bar{y}_i < z)\left[{(z-\bar{y}_i)}/{z}\right]^{\propto} \tag{1}$$

$$P_{\propto} = \frac{1}{4n}\sum_{q=1}^{4}\sum_{i=1}^{n} I(y_{i,q} < z)\left[{(z-y_{i,q})}/{z}\right]^{\propto} \tag{2}$$

where n is the number of households, i subscripts the household, q identifies the quarter, $y_{i,q}$ is per capita consumption for household i in quarter q, $\bar{y}$ is per capita consumption averaged over the four quarters, z is the poverty line, and I is an indicator function which takes the value of one if the statement is true and zero otherwise. The headcount results when α=0, the poverty gap when α=1, and the squared poverty gap when α=2.

The value in examining these measures can be illustrated by considering a transfer of money

[11] The following all use these three measures: Jolliffe *et al.* (2004) for Egypt, Datt and Ravallion (1992) cover Brazil and India, Howes and Lanjouw (1998) use examples from Pakistan and Ghana, and Ravallion and Bidani (1993) examine Indonesia.

from a rich person to a poor person that is not large enough to push the poor person over the poverty line. This transfer has no effect on the headcount index, but the poor person is better off and this welfare improvement is reflected in a reduction of both the poverty-gap and squared poverty-gap indices. As another example, a transfer of income from a poor person to a poorer person will not alter either the headcount or the poverty-gap index, but it improves the distribution of income of the poor and this change is reflected by a reduction of the squared poverty-gap index. In essence, the headcount index fails to reflect any improvements or deteriorations in wellbeing of the poor, it only measures change if the household crosses the poverty line. Both the poverty gap and squared poverty gap reflect changes in the wellbeing of the poor, and the squared poverty gap places more emphasis on changes in extreme poverty.

In order to answer the question of whether poverty is higher under one approach relative to the other, or more generally any question regarding whether one of the poverty measures differ, estimates of the sampling variance for the indices are required. Both approaches pose some complications, but both also benefit from the FGT indices being additively decomposable. This property means that if the vector of per capita consumption, y, is decomposed into M subgroup vectors, $y^{(1)}$, ... , $y^{(m)}$, P_α can be expressed as the sum of the P_α values for each subgroup:

$$P_\alpha(y;z) = \sum_{j=1}^{M} (n_j / n)\, P_{\alpha,j}(y^j; z) \tag{3}$$

where n is the sample size, n_j is the size of each subgroup, and z is again the poverty line. This property can be extended to each observation and we can express P_α as the sum of the P_α values for each household. By treating each observation as a subgroup, the estimate of poverty is the

weighted mean of the household-specific measures of poverty and the sampling variance of the poverty measure is the variance of this mean, or:

$$P_\alpha = \sum_{i=1}^{n} P_{\alpha,i} / n \qquad \text{and} \qquad V(P_\alpha) = n^{-1}(n-1)^{-1} \sum_{i=1}^{n} (P_{\alpha,i} - P_\alpha)^2 \tag{4}$$

where i subscripts the household.

The next step is to incorporate the sample design information, in particular the sampling weights, and identifiers for the strata and PSUs. Howes and Lanjouw (1998) show that the estimated standard errors for the FGT poverty indices can have large biases when incorrect assumptions are made about the sample design. In particular, they show that if the sample design is multi-staged, but standard errors are derived based on the assumption that the design is a simple random sample (SRS), then the standard errors will significantly under-estimate the true sampling variance. The result of Howes and Lanjouw follows from the classic work of Kish who shows that the variance of an estimated mean typically increases when the sample is drawn from a multi-stage design rather than an SRS design. Kish (1965) provides an estimator for sampling variance of an estimated mean from a weighted, stratified, clustered sample. Because P_α is a weighted mean, we follow Kish to give the estimated variance of P_α from a complex sample design.[12]

Both approaches have remaining, minor complications. For the *status quo* approach, $\bar{y}$ is currently being treated as a single observation and not the mean of four observations. This means

[12] See Jolliffe and Semykina (2000) for details.

that our reported standard errors will slightly underestimate the true sampling variance (i.e. the standard errors are downward biased). The other slight complication is that we describe the *cross-section* approach as if the four observations from each household were independent draws from different households. While Table 1 shows that there is much variation across quarters for each household, it is of course the case that there is a significant level of intra-year correlation for household consumption. This issue though turns out to be easily addressed. Given that the households in our sample do not switch PSUs over the quarters, as soon as we correct the standard errors for the within-PSU correlation, we have also corrected for the within-year correlation effect.

The headline result from this analysis is that the approach that is more comparable with how poverty is measured in much of the world produces an estimated poverty rate that is 26 percent greater than the poverty rate currently viewed as the official rate (Table 2). The status quo poverty rate is 14.4 percent, while the cross-section estimate is 18.2 percent. This increase represents just under a quarter million (231 thousand) people who are identified as poor by the cross-section method and not poor in the status quo approach. This increase in estimated poverty is statistically significant with a p-value that is essentially zero.[13]

Figure 1 plots out the density (or distribution) of per capita consumption for each of the quarters and also for the average value of per capita consumption which is used in the status quo approach. Examining the range to the left of the poverty line (which represents poor people), the plots show that for three of the quarters, the quarterly density functions lie above the average-

[13] The estimated percent difference is more than six standard errors away from zero. The standard error for the difference is estimated as a second-order Taylor approximation. See chapter 6 of Wolter (1985) for discussion, and Jolliffe et al. (2005) for a similar example.

consumption density function. The implication of this is that in three of the four quarters, the headcount estimated by quarter is greater than the headcount estimated by smoothing out quarterly volatility. Table 3 also provides evidence of important differences in the quarterly distributions relative to the annualized, status quo distribution. The Theil index indicates a greater level of inequality in any given quarter as compared to the distribution which essentially annualizes the quarterly average value for each household.[14] This difference is statistically significant in three of the four quarters. An inference from these measures is that the status quo approach smooths away actual observed inequality in consumption outcomes.

[Insert Figure 1 approximately here]

[Insert Table 2 approximately here]

While the increase in the headcount is significant both qualitatively and statistically, the increase in the distribution-sensitive poverty gap and squared poverty gap measures is even larger. The cross-section poverty gap measure is 45 percent greater than the status quo measure, and the cross-section squared poverty gap is 62 percent greater than the current status quo. To a large extent, both gap measures are bigger because the headcount is larger, but this is not the only reason. One interpretation of the poverty-gap index is that it is equal to the product of the

[14] As a measure of inequality, the Theil index and the larger family of generalized Theil indices, have many desirable properties that are described in Foster (1983). In particular, Foster shows that an inequality index satisfies the axioms of symmetry, replication invariance, income-scale independence, decomposability, and the principle of transfers only if it is a positive multiple of the Theil index.

headcount index and the consumption gap, where the consumption gap is the average shortfall of the poor as a fraction of the poverty line. Using this interpretation, the status quo consumption gap is 19 percent, meaning that the average person identified as poor is consuming 19 percent less than the poverty line. The cross-section consumption gap is 23 percent.

If we consider a household with a small consumption gap in one quarter, they are assessed as poor by the cross-section approach, but may or may not be poor under the status quo approach. In fact, if the consumption gap were larger, the probability of being assessed as poor in the status quo approach is larger. Given this attribute, it is somewhat surprising that the consumption gap actually increases under the cross-section approach. The driving force behind this increase is that observations with the largest consumption gaps appear under the cross-section approach, but are reduced when averaged with less severe quarters under the status quo. Table 3 illustrates this by comparing the status quo estimates with poverty estimates by quarter. Focusing first on the measure that most closely corresponds to the consumption gap (i.e. the poverty gap index), we see that in three of the four quarters, the quarterly poverty gap is more than 40 percent greater than the *status quo* poverty gap index.[15] Moving to the index that is more sensitive to changes in extreme poverty (i.e. the squared poverty gap index), the differences with the status quo approach is even greater. The squared poverty gaps by quarter is on average more than 60 percent greater than the status quo poverty gap index, and this difference is statistically significant for each and every quarter. In short, the status quo approach of averaging wellbeing over the quarters makes consumption less volatile and thereby makes the population appear to be significantly better off, particularly under the squared poverty gap measure, than they actually

[15] This difference is statistically significant in the three quarters.

are in any quarter.

[Insert Table 3 approximately here]

ii. A Scarring View of Poverty -- Measuring poverty and the worst quarter

The comparison of the squared poverty gap measures under the status quo and the cross-section approach highlight an important difference in the view of both measures. The status quo view of the world is that the ups and downs in life are not what matter in terms of wellbeing, but rather the average wellbeing from these ups and downs. The cross-section approach treats all outcomes as relevant and does not view a good period as being able to offset the effects of a bad period. Nonetheless, even in the cross-section approach, the good periods matter and reduce the aggregate (not the household) level of poverty.

In this section we consider a view of poverty that places much more emphasis on the worst outcome. This view of poverty would not be compatible with how poverty is measured in most of the world, but does offer some interesting insights. One motivation for this view of poverty comes from the health and nutrition literature, which consistently finds that a relatively short period of exposure to negative nutritional events, during key periods of fetal and infant development in particular, can have long-run, negative effects (Barker, 1988; Godfrey and Barker, 2000, Barker, 2002). While the emphasis of this literature tends to be on early childhood development, the point we are building on is that one bad experience can have very long-run adverse effects. Early nutrition or health shocks, induced by adverse climatic or political events, can affect health and economic outcomes in both childhood and throughout adulthood.

Similarly, the psychology literature suggests that childhood socioeconomic status (SES) is associated with cognitive achievement throughout life (Hackman and Farah, 2009). As another example how exposure to a bad economic event can have long lasting effects, Malmendier and Nagel (2011) show that individuals who experience macroeconomic shocks after investing are less likely to continue investing and are more pessimistic about future returns in the capital market. Haushofer and Fehr (2014) argue that people living in poverty have been found to be more risk averse and more likely to discount future payoffs thereby lessening their ability to make the sort of long-run investments that can help extract them from the cycle of poverty. A common theme of this literature, is that exposure to a negative economic (or health) event, can have long-run adverse consequences.

With this literature as motivation, we explore two adaptations of equations (1) and (2) that aim to capture this notion that a single exposure to a spell of poverty can have a scarring effect and is therefore a policy relevant statistic in addition to the cross-section measure of poverty. The first adaptation is focused on the worst outcome over the four quarters for each household and is expressed as:

$$P_{\propto} = \frac{1}{n}\sum_{i=1}^{n} I\left[min_q\left(y_{i,q}\right) < z\right]\left[\frac{z - min_q(y_{i,q})}{z}\right]^{\propto} \tag{5}$$

where the only difference with equation (1) is that the indicator function, I, takes the value of one for household i if the worst quarter (not the average) for household i is less than the poverty line. Similarly, the proportionate gap between consumption and the poverty line is formed over the worst quarter. This derivation of the poverty measure evokes the spirit of the Rawlsian social

welfare function, which is sometimes portrayed as stating that a society is only as well off as its poorest individual. Equation (5) essentially states that each household is assessed by its worst quarter, and we therefore label this a *Rawlsian* view of the poverty measure. When α=0, equation (5) provides a measure of the percentage of people who were "ever poor" (i.e. poor in at least one quarter of the year). The corresponding poverty gap and squared poverty gap measures reflect the proportionate consumption gap only for the worst quarter.

We also consider in Table 4 a "mash-up" of equations (2) and (5), which we refer to as the *consumption gap* variant of the ever poor measure, and is estimated as follows:

$$P_{\propto} = \frac{1}{4n}\sum_{q=1}^{4}\sum_{i=1}^{n} I\left[min_q\left(y_{i,q}\right) < z\right]\left[\frac{I\left(y_{i,q}<z\right)\left(z-y_{i,q}\right)}{z}\right]^{\propto} \tag{6}$$

This is similar to equation (2) with a couple of important differences. One difference is that the first indicator function, I, takes the value of one for household i if the worst quarter for household i is less than the poverty line. The second difference is that in the numerator of the consumption gap is another indicator function that zeros out quarters where the quarterly consumption was above the poverty line. This measure follows equation (5) when α=0 and equation (2) for α>0. As such, it provides information on the percentage of people who were poor in at least one quarter, and for these poor, it estimates the poverty gap and squared poverty gap over all quarters (not just their worst quarter). This mash-up index therefore can provide information about the total consumption shortfall for those who were ever poor.

Table 4 reveals the striking finding that while the official poverty measure suggests that 14.4 percent of the population was poor in 2010, the *ever poor* measures indicate that one third of the

population was exposed to poverty in at least one quarter of the year. If policy makers view the poor just as the 14.4 percent who on average were poor over the year, they will greatly under-estimate the impact that poverty has on their populous. The difference between the status quo and our Rawlsian interpretation of the *ever poor* measure is even starker when considering the distribution-sensitive gap measures. The *ever poor* poverty gap is almost three times greater than the status quo poverty gap, and the squared poverty gap is more than three times greater than the *status quo* squared poverty gap index.[16]

[Insert Table 4 approximately here]

IV. Discussion

During the earlier part of the previous decade (from 2002 to 2007), Jordan experienced rapid economic growth accompanied by large reduction in poverty (Jordanian Department of Statistics and World Bank 2009, Mansour 2012). And while the rate of economic growth declined sharply between 2008 and 2010, the poverty rate is reported to have continued to fall by about 5 percentage points (World Bank 2012). Despite the reported progress in poverty reduction, popular perception of the overall level of poverty is significantly more pessimistic (Jordanian Department of Statistics and World Bank 2009, Mansour 2012).

The literature has attempted to explain the disconnect between data driven findings and popular perceptions using various channels. A joint Jordanian Department of Statistics and

[16] When considering the average shortfall of the poor from the poverty line (i.e. the ratio of the poverty gap to the headcount), we know from above the status quo shortfall is 19 percent. In contrast, the Rawlsian ever poor shortfall is 25 percent.

World Bank (2009) report argued that between 2002 and 2006 while real expenditures had grown strongly, real incomes had remained largely stagnant; moreover, income would have fallen for most Jordanians had transfer incomes not grown. Stagnant household incomes in an otherwise growing economy was likely to have put pressure on households. Also, perhaps the poverty line had been set too low and improvements in poverty statistics did not resonate with public perceptions. A more recent paper by Mansour (2012) revisited the paradox largely through the lens of a rise in inequality coupled with stagnant economic opportunities for the poor and the middle class. The post 2009 period saw economic activity slowdown considerably and unemployment remaining high; at the same time, the top five income deciles recorded much superior growth in consumption than the lower middle class and the poor.

This paper offers a different, and perhaps more direct, explanation for the public perception that poverty is worse than the reported estimates. Public perceptions may be more informed by exposure to poverty spells rather than being informed by average level of wellbeing. This paper illustrates that one approach to measuring poverty that focuses on actual poverty spells (i.e. "cross section" measure) rather than average consumption levels results in an estimate of poverty that is 26 percent greater than the officially reported poverty rate. Another approach to estimating poverty that focuses on whether a household has experienced a single spell of poverty in the last year (i.e. "ever poor" measure), is over two times higher than the status quo poverty measure. Because the status quo measure is based on the average consumption level of households, it reduces the volatility in consumption and thereby conceals the worst outcomes faced by households. Indeed these alternative metrics of poverty appear more in line with prevailing domestic perceptions and anxieties.

The cross sectional approach proposed in this paper has several attractive features, particularly in comparison to the status quo approach. It is easy to calculate, is potentially less affected by panel attrition,[17] and allows a relatively straightforward look at impact of shocks (especially short term shocks) on poverty and wellbeing. The cross section measure also aligns more closely with how most countries in the world measure poverty. In contrast, the advantage of the status quo approach is that average annual consumption may better reflect households' permanent welfare, and if it's presumed that households are able to perfectly smooth across quarters, this may be a policy relevant measure. Nonetheless, by averaging consumption, the status quo approach hides significant variation in wellbeing and portrays an evidently more optimistic picture of poverty undercurrents.

How poverty is measured has policy implications, especially for social programs of the government. For example, targeting based on average annual consumption would potentially exclude people with large poverty gaps in some parts of the year, who are on average (just) above the poverty line. Precisely because of volatility in wellbeing, one of the largest poverty-mitigation programs in the United States – the Supplemental Nutrition Assistance Program – defines eligibility based on monthly income (Jolliffe and Ziliak, 2008). In Jordan, income support to poor and vulnerable families is implemented mostly by the National Aid Fund (NAF), based on a mixture of categorical targeting and a partially-verified means test. Besides regular cash assistance, NAF also provides free health insurance coverage and emergency assistance. Because the program is designed in part to address fluctuations in wellbeing, targeting based on the cross-section

[17] The status quo approach relies on a balanced panel and therefore suffers greater levels of attrition relative to the cross-section approach. For the analysis in this paper though, our focus is strictly on the difference in the properties of the two measures and we have therefore chosen to restrict our analysis to the same sample for all measures.

measure rather than the status quo measure will be more effective in reaching those in need. In particular, targeting based on the cross sectional poverty-gap measure, would provide assistance to households that are unable to smooth consumption and are the most exposed to the depth of poverty. By definition, cross-sectional poverty gap based targeting would be equivalent to targeting based on the poverty gap of the 'ever' poor (as Table 4 points out).

While this paper has not discussed the implications of experiencing different spells of poverty in detail, the cross-section approach readily lends itself to distinguishing those who are poor temporarily from those who are chronically poor. This is a distinction which by construction is masked in the status quo approach. And policies targeting transitory poverty are typically assumed to be quite different from those focused on chronic poverty. Policies designed to address chronic poverty are generally more focused on increasing human capital through improving education, skills, health, and connectivity to the economy. These programs are designed to improve the long-run income earning ability of the program beneficiaries. In contrast, people that experience spells of poverty at certain periods of the year but overall have per capita consumption levels above the poverty line are likelier to be in need of consumption smoothing mechanisms, such as cash transfers, insurance or credit programs or schemes such as seasonal public works programs. Conceptually, the status quo approach is indifferent to this distinction.

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Table 1: Spells of Poverty in Jordan:
Population Facing Poverty by Number of Quarters

Number of quarters poor	Share of population	Share of Poor Population	Share of Non-poor Population
Never	67.0	0.0	78.3
1	12.5	1.0	14.4
2	7.7	16.8	6.2
3	6.3	37.4	1.1
4	6.4	44.8	0.0
Total	100.0	100.0	100.0

Source: Authors' estimates based on HIES data. Estimates are weighted to the population of individuals. Poor and non-poor reflect the *status quo* definitions.

Table 2: Status Quo versus Cross-Sectional Poverty Comparisons in Jordan

	P_0 Headcount			***P_1 Poverty Gap***			***P_2 Squared Poverty Gap***		
	Status Quo	Cross-Sectional	Difference	Status Quo	Cross-Sectional	Difference	Status Quo	Cross-Sectional	Difference
National	14.4	18.2	26***	2.8	4.1	45***	0.9	1.4	62***
	(0.54)	(0.49)	(3.6)	(0.14)	(0.15)	(4.2)	(0.06)	(0.07)	(5.2)
Rural	16.7	21.8	31***	3.6	5.3	46***	1.2	2.0	62***
	(1.22)	(1.09)	(6.8)	(0.31)	(0.35)	(7.3)	(0.14)	(0.17)	(8.9)
Urban	13.9	17.4	25***	2.6	3.8	44***	0.8	1.3	62***
	(0.61)	(0.56)	(4.4)	(0.15)	(0.17)	(5.1)	(0.07)	(0.08)	(6.3)
Amman	11.1	14.1	27***	1.9	2.9	50***	0.5	0.9	76***
	(0.68)	(0.64)	(6.0)	(0.15)	(0.17)	(6.6)	(0.06)	(0.07)	(7.7)
Rest	16.1	19.9	24***	3.2	4.5	41***	1.0	1.5	56***
	(0.93)	(0.84)	(5.8)	(0.24)	(0.26)	(6.8)	(0.11)	(0.12)	(8.5)

Note: Poverty indices are the Foster-Greer-Thorbecke P_α measures. Cross-Sectional are poverty measures after treating panel observations across different quarters as cross section data. The differences are (Cross-Sectional – Status Quo)/ Status Quo. Standard errors for the poverty measures are estimated following the sepov command in Stata as described in Jolliffe and Semykina (1999). Standard errors for the differences are second-order approximations by the delta method. Statistical significance indicated with *, **, or *** for p-values less than 0.1, 0.05, and 0.01, respectively.

Table 3: Status Quo (annual) versus Quarterly Poverty Comparisons in Jordan

	P_0 Headcount		***P_1 Poverty Gap***		***P_2 Squared Poverty Gap***		***Theil Index***
	Estimate	Difference from Status Quo (%)	Estimate	Difference from Status Quo (%)	Estimate	Difference from Status Quo (%)	
Status Quo (annual)	14.4		2.8		0.9		0.197
	(0.54)		(0.14)		(0.06)		(0.007)
Quarter 1	18.9	31***	4.1	48***	1.4	64***	0.236**
	(0.61)	(3.8)	(0.17)	(4.3)	(0.08)	(5.3)	(0.014)
Quarter 2	14.2	-1	3.0	7	1.0	15*	0.230***
	(0.51)	(5.2)	(0.15)	(6.4)	(0.07)	(8.3)	(0.007)
Quarter 3	19.1	33***	4.3	53***	1.5	75***	0.226*
	(0.59)	(3.6)	(0.17)	(4.1)	(0.08)	(5.0)	(0.008)
Quarter 4	20.4	42***	4.8	70***	1.7	93***	0.213
	(0.63)	(3.4)	(0.19)	(3.7)	(0.09)	(4.5)	(0.007)

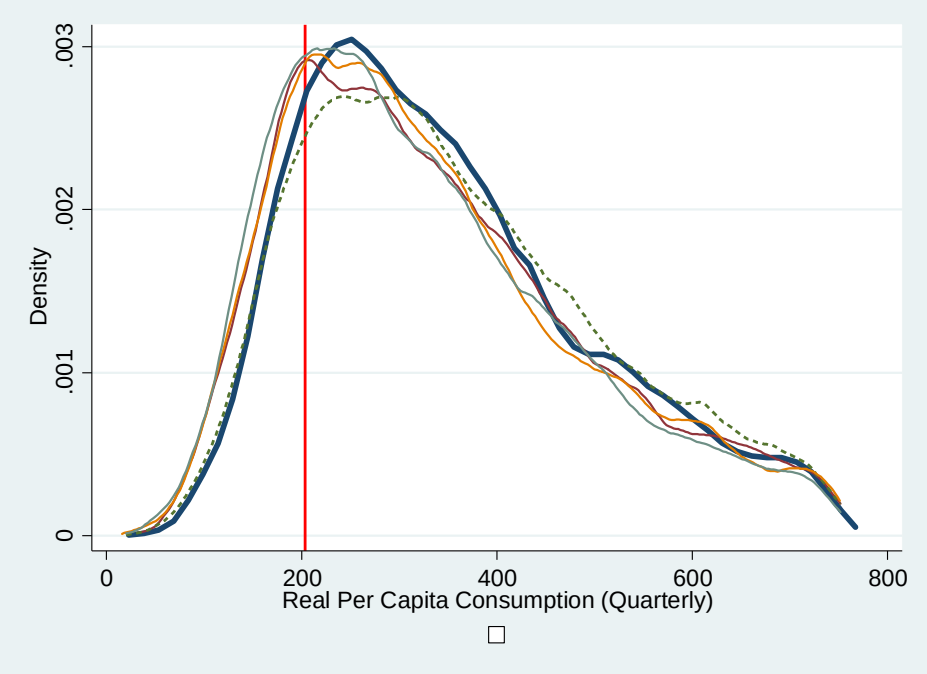
Note: Same as Table 2. For the Theil index, asterisks indicate whether the difference between the status quo and quarter measure is statistically significant. *, **, and *** indicate that the 90-, 95- and 99-percent confidence intervals, respectively, for the two measures do not overlap. Confidence intervals are based on bias-corrected, empirical densities resulting from a clustered bootstrap with 1,000 replications.

Table 4: Status Quo and Ever Poor, Comparisons in Jordan

	Headcount		***Poverty Gap***		***Squared Poverty Gap***	
	Estimate	Difference from Status Quo (%)	Estimate	Difference from Status Quo (%)	Estimate	Difference from Status Quo (%)
Status Quo	14.4		2.8		0.9	
	(0.54)		(0.14)		(0.06)	
Ever poor						
1. Consumption gap	33.0	129***	4.1	45***	1.4	62***
	(0.73)	(1.9)	(0.15)	(4.2)	(0.07)	(5.2)
2. Rawlsian	33.0	129***	8.3	196***	3.1	256***
	(0.73)	(1.9)	(0.24)	(1.9)	(0.12)	(2.2)

Note: Same as Table 2.

Figure 1: Distribution of Per capita Consumption in Jordan



Note: Epanechnikov kernal density estimates of real per capita consumption. The vertical line is the quarterly per capita poverty line for 2010 (set at 203.425 JD). The thick solid line is the real per capita consumption density average over 4 quarters; the dotted line is the real per capita consumption density for Quarter 2. The 3 other thin solid lines are real per capita consumption densities for Quarters 1, 3, and 4. The distribution truncates the top 10% of the distribution.