Distr.
LIMITED
E/ESCWA/EDID/2015/WP.2
22 September 2015
ENGLISH
ORIGINAL: ARABIC

ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA (ESCWA)

MULTIDIMENSIONAL POVERTY INDEX FOR MIDDLE INCOME COUNTRIES

Findings from Jordan, Iraq, and Morocco

Khalid Abu-Ismail,[*]
Heba El-Laithy,[**]
Dina Armanious,[***]
Maya Ramadan,[****]
And
Marwan Khawaja[*****]

United Nations
New York, 2015

[*] Chief of Economic Development and Poverty Section, ESCWA.

[**] Professor at Cairo University, Faculty of Economics and Political Science.

[***] Associate Professor at Cairo University, Faculty of Economics and Political Science.

[****] Economic Researcher, ESCWA.

[*****] Chief of Social Statistics Section, ESCWA.

15-00387

Abstract

Using the Multidimensional Poverty Index(MPI) published by UNDP's Human Development Report as a basis, this paper introduces two additional poverty measures to capture less extreme levels of deprivation in health, education and living condition that are more prevalent in middle-income countries. Applying these measures to three middle and upper middle income Arab countries (Iraq, Jordan and Morocco) shows the overall poverty ranking of the three countries is still preserved, but the differences in spread of headcount poverty are significantly reduced. The results are plausibly correlated with money metric poverty indicators and are empirically robust to factors such as asset ownership, place of residence, family size, and for each indicator. The authors argue the proposed measures can support the monitoring of the Social Development Goal on poverty (SDG1) in Arab States and middle income countries in general.

Acknowledgments

This paper is one of several planned joint research projects on multidimensional poverty between ESCWA's Economic Development and Integration(EDID) and Statistics Divisions(SD) and the Faculty of Economics and Political Science (FEPS) at Cairo University. The paper serves as the main methodological reference paper for the forthcoming ESCWA and League of Arab States (LAS) Arab Poverty Report.

The lead authors of this paper are Khalid Abu-Ismail (ESCWA) and Heba El Laithy (Cairo University) with contributions from Dina Armanious (Cairo University), Marwan Khawaja (ESCWA) and Maya Ramadan (ESCWA).

The process that led up to this report included several expert group meetings organized in close collaboration with ESCWA's partners on multidimensional poverty. In this regard we are indebted to Tarek El Nabulsi from the League of Arab States, Cairo; Sabina Alkire from the Oxford Poverty and Human Development Initiative, UK; Mohamed Moheidin from the Qatar Foundation, Doha; Samman Thapa from the UNICEF(Regional Office), Jordan; and Touhami Abdel Khalek fromthe National Institute of Statistics and Applied Economics (INSEA), Morocco, for their technical contributions and strategic advice on how to reflect regional priorities in our proposed indicators.

We are also grateful to the experts who provided us with valuable comments and feedback: Ahmad Abdel Monem (League of Arab States), Ali Abdel Gader (former Deputy Director of the API and author of many poverty and inequality studies in Arab countries), Bouba Housseini (OPHI), Hamad Al-Attiya (QF), Adriana Conconi (OPHI), Nidhal Ben Cheikh (Center for Social Research Studies, Tunisia), Basma M. Ishaqat (National Aid Fund, Jordan), Ahmad Abu Haidar (MoSD, Jordan), Sarah Ahmed (UNICEF), Valentina Calderon (UNICEF), Cecilia Calderon (UNDP), Niranjan Sarangi (ESCWA) and Aljaz Kuncic (ESCWA).

Last but by no means least we are grateful to Fouad Ghorra and Seth Caldwell for their excellent research support and to Maral Tashjian for her administrative support.

Contents

List of Figures

List of Tables

Introduction

In recent years, there has been much interest in multidimensional poverty measurement. This spur in interest has led to a variety of competing measurement approaches and techniques. At the global level, the Multidimensional Poverty Index developed by Alkire and Santos (2010, 2014)is regularly published by UNDP's Human Development Report. The global MPI implements one of the Alkire and Foster (2007 and 2011) class of poverty measures using data on deprivations in health, education and living standards. Many developing countries have also developed their own country-specific multidimensional poverty measures[1] tailored to suit national development policy priorities and data constraints.[2]In the Arab region, for example, multidimensional poverty studies have been implemented in many countries, mainly using the Alkire-Foster and Unsatisfied Basic Needs methods.[3]In this paper our analyses and results are developed based on Alkire-Foster approach given its wider appeal and methodological simplicity.[4]

The growing interest in multidimensional poverty has also resonated in the discussions on the post-2015 development agenda. In the context of the SDGs, for example, the debate was whether the Multidimensional Poverty Index should replace the '$1.25 per person per day' poverty line as the main global poverty reduction measure. In fact this debate is long overdue. The global money metric poverty comparisons are fundamentally flawed as they rest on the validity of the assumption of a constant purchasing power across time and space. Due to the well-documented problems related to adjustments for exchange rates and inflation, money metric poverty lines (often evaluated in 2005 PPP exchange rates) do not hold purchasing power parity.[5]Arguably, the published PPPs, which are derived based on the International Comparison Programme, underestimate the cost of living in middle-income countries relative to the poorest countries.

In the case of Egypt for example the global $1.25 headcount poverty rates is nearly one sixth of the national poverty rate estimate due to the significant gap between both international and national poverty lines. If the national poverty line is a reflection of a global consensus on what constitutes extreme money metric poverty, the standard cost of basic needs methodology should yield a national poverty line value that hovers around $1.25 (in PPP terms). In fact, this is precisely the argument used by the World Bank when it introduced this poverty line(by arguing it represents the most accurate approximation of the national poverty lines in the World's poorest countries).What then accounts for such a huge discrepancy between the value of the national and the $1.25 poverty lines?

There are two views. The defenders of the $1.25 argue that, despite its problems, it is still the best poverty measure with existing data sources and the discrepancies are due to generous estimation of the non-food portion of the poverty line. Another view, which we favor, is that the problems are more inherent with the way in which PPPs are calculated. Hence, unless constantly revised, they are likely to affect the level and trend of poverty estimates.[6]Are these biases significant enough to change our world view on poverty levels and trends? Abu-Ismail et al (2010) argue this may very well be the case. They control for the PPP problems by adjusting national poverty lines of more than 80 countries based on a regression between the value of the NPLs and average per capita expenditure derived from over 300 income and expenditure survey results and then recalculate the money metric poverty levels and trends accordingly. Contrary to conventional wisdom,

[1] See Sabina Alkire, James E. Foster, Suman Seth, Maria Emma Santos, Jose M. Roche, and Paola Ballon (2015) for a review of the various counting approaches.

[2] See the OPHI led Multidimensional Poverty Peer Network, which provides international support to policy makers engaged in or exploring the construction of multidimensional poverty measures, including input into the design of the measures, and the political processes and institutional arrangements that will sustain them.

[3] See for example UNDP (2007 and 2006) for Lebanon and Iraq and UNICEF (2014) for Syria.

[4] For an illustrative comparison of the UBN and the Alkire Foster methods in an Arab country context and the technical advantages of the latter vis a vis the former see UNDP (2011)

[5] See Deaton 2010 and Abu-Ismail et. al, 2010.

[6]The World Bank revised the poverty line threshold from $1.09 to $1.25 as the measure for MDG 1 for this reason.

they conclude that the world may be much poorer than commonly thought (based on the $1.25)and far less successful in reducing extreme income poverty.

No doubt multidimensional poverty measures avoid these problems since they captures deprivations directly. Thus and in so far as cross country comparisons are concerned, they have an absolute advantage over the money metric equivalents. Within the gamut of multidimensional poverty measures, the global MPI has a clear advantage over other methods for the purposes of cross-country comparison. However, by focusing on extreme and destitute poverty, we argue it gives an incomplete picture on the spread of global poverty since it does not capture less severe forms of human poverty that are more widespread in upper MICs. From the human development perspective, addressing these lower-level deprivations is crucial to the enhancement of capabilities, thus the formation and sustainability of the social 'middle class' which forms the bedrock of socioeconomic structural transformation.

To this end, this paper revises the cut-off thresholds for some of the existing indicators and adds few new ones to the global multidimensional poverty index in order to capture the spread of poverty and vulnerability in their broader form. The result is two additional MPIs, which we refer to as MPI2 and MPI3, with the latter being the least restrictive -if taken by itself- in terms of cutoff levels, but captures the cumulative deprivation of the two previous levels. Combined with the global MPI (referred to here as MPI1), we argue these three categories offer a more holistic view of the spread of poverty and vulnerability:(1) those who are extremely poor (below MPI1); (2) those who are poor but not extremely poor (below MPI2 and above MPI1) and those who are vulnerable to fall into poverty (below MPI3 and above MPI2).

We apply these new MPIs to three middle-income Arab countries: Jordan, Iraq and Morocco and report our results at the national and sub-national levels and conduct some robustness checks. These countries offer a suitable platform to examine our methodology due to sizeable differences in population size (Morocco and Iraq are much larger than Jordan), economic level and structures-wise (Iraq is upper middle oil-rich, Jordan is upper middle oil-poor and Morocco is lower middle oil-poor), human development-wise (Iraq and Morocco are ranked medium HDI while Jordan is ranked high) and in exposure to conflict (Iraq is in conflict). However, according to the most recent data released by OPHI, all three countries have relatively low MPI scores (0.006, 0.045, and 0.067 for Jordan, Iraq and Morocco, respectively). The principal question is whether the higher MPIs will yield significantly different results not only in terms of overall headcount poverty rate, but also in terms of deprivation sources and sub-national inequalities and rankings. If so, this can make a strong case for the inclusion of these measures in a new regional (Arab) and global post 2015 poverty monitoring framework.

Accordingly, the paper is structured as follows: Part I offers a brief review of the global MPI and presents its most recent results for Arab and developing countries and compared with money metric poverty indicators. Part II presents the indicators, cut offs, weighting schemes and other basic properties of our proposed MPIs. Part III shows our results for Iraq, Jordan and Morocco and examines their robustness across influencing factors such as family wealth, place of residence and size. The paper ends with some concluding remarks and suggestions for future follow up research activities.

I Measurement Framework

A. The Multi-dimensional Poverty Index

According to Sen (1976), a general framework for measuring poverty should consist of (1) selecting the space in which poverty is to be assessed, (2) identifying the poor by determining a cut-off for each space to distinguish the poor from non-poor, and (3) aggregating the resulting data by an appropriate poverty index. There are several poverty measurement procedures that are consistent with this general framework.

The Alkire-Foster framework[7]which was developed based upon the Foster-Greer-Thorbecke (FGT) poverty measures is the most widely used to assess multi-dimensional poverty. It is a fairly simple framework consisting of identifying the poor by assigning a cut-off in each equally weighted dimension (normally using a binary coding of indicators), and then using a counting approach to identify the multi-dimensionally poor by an arbitrarily chosen percentage of the overall score.

The Alkire-Foster method was adopted in the Human Development Report and published since 2010 through the HDR report as a global MPI. This MPI was calculated for all countries using the same indicators and methodology extracted from national household surveys. The global MPI is calculated based on a 33% poverty cut-off across the three dimensions of health, education and standard of living. The indicators are "years of schooling, child school attendance, child mortality, nutrition, electricity, improved sanitation, improved drinking water, flooring, cooking fuel, assets ownership" (table 1).

The MPI (referred to as M_0) is the product of two components: the headcount ratio (H) and the intensity of poverty (A). The headcount ratio, also called the incidence of multidimensional poverty, is the proportion of people, out of the total population, experiencing poverty according to the set weights, and the poverty cutoff. The intensity of poverty is the proportion of weighted indicators in which the poor person is experiencing deprivation, it is expressed in percent units. The intensity of poverty has the flexibility to reflect changes in the deprivation level among the poor (referred to as dimensional monotonicity), so if a poor family is deprived in an additional indicator the intensity of poverty increases.

Table 1:The dimensions, indicators, deprivation cutoffs and weights of the global MPI

Dimensions	*Indicator*	*Deprived if--*	*Weights*
Education	Years of Schooling	No household member has completed five years of schooling	1/6
	Child School Attendance	Any school-aged child is not attending school up to class 8	1/6
Health	Child Mortality	Any child has died in the family	1/6
	Nutrition	Any adult or child for whom there is nutritional information is malnourished	1/6
Living Standards	Electricity	The household has no electricity.	1/18
	Improved Sanitation	The household's sanitation facility is not improved (according to MDG guidelines), or it is improved but shared with other households	1/18
	Improved Drinking Water	The household does not have access to improved drinking water (according to MDG guidelines) or safe drinking water is more than a 30-minute walk from home, roundtrip	1/18
	Flooring	The household has a dirt, sand or dung floor	1/18
	Cooking Fuel	The household cooks with dung, wood or charcoal	1/18
	Assets Ownership	The household does not own more than one radio, TV, telephone, bike, motorbike or refrigerator and does not own a car or truck	1/18

Source: Alkire et al., (2013).

The process of constructing MPI requires the availability of all the selected indicators for any household under study. Each indicator has a set cut-off point below which a person/household would be considered deprived in this indicator. Indicators are categorized into 3 dimensions and each dimension is given equal weight of one-third (1/3); this weight is then divided among the indicators within each dimension, so if a

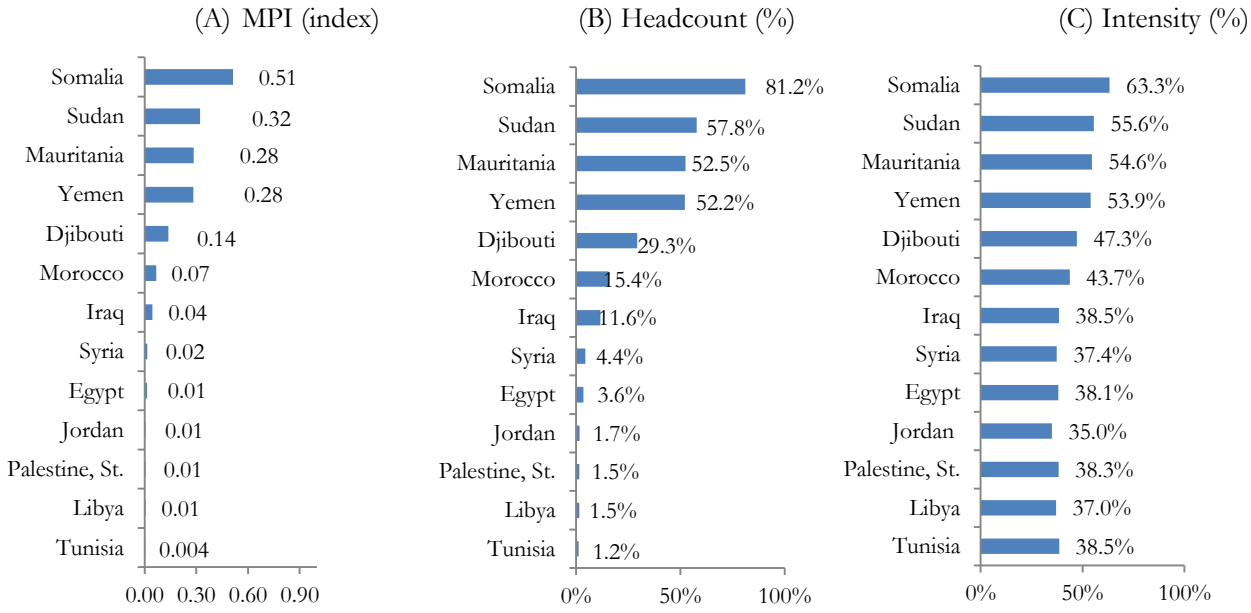
[7]Alkire and Foster, (2007)

dimension included 2 indicators each is given a weight of one-sixth (1/6). The poverty cut-off is used to label a person/household as 'poor' or 'not poor, so if a poverty cut-off is (0.33) then the sum of the weighted indicators in which each person/household is deprived is compared to the poverty cut-off and accordingly the person/household is either 'poor' or 'not poor'. According to MPI methodology, a poor household implies that all its residents are poor. Finally, constructing MPI requires the computation of headcount ratio (H) and intensity of poverty (A). Headcount ratio of multidimensional poverty is the proportion of persons who were categorized as 'poor'. The intensity of multidimensional poverty the proportion of the weighted indicators in which, on average, poor people are deprived. The formula for Multidimensional poverty is M_0=H x A.

B. Results for the Arab Region

According to the most recent data published by the OPHI, most middle and upper middle income Arab countries have a relatively low MPI. The Arab region however also includes some of the poorest nations in the world (Somalia, Sudan, and Mauritania). Since 2011, an increasing number of countries in the Arab region are suffering from ongoing civil wars, military conflict and occupation. The socioeconomic consequences of conflict include, inter alia, large internal population displacement and enlarged number of refugees and across countries. This is expected to have a powerful negative impact on poverty. However, the data in Figure 1 does not capture this impact since most of the Arab countries for which data is available, especially those with highest intensity of conflict, do not have recent surveys.

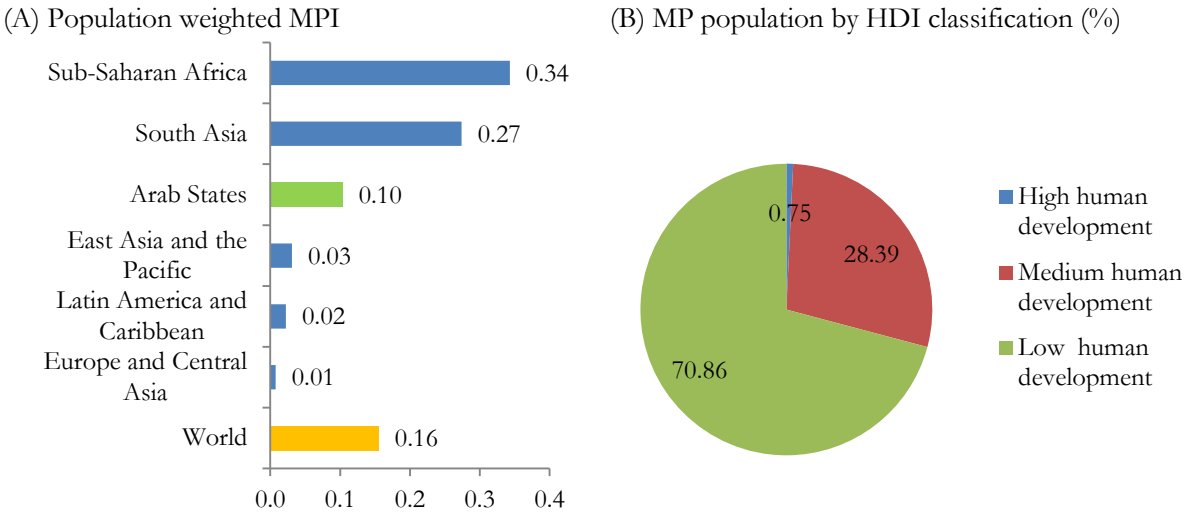
Figure 1: Global Multi-dimensional Poverty Index, Arab Countries(2008-2013)



Source: Alkire, S. and Robles, G. (2015).

The average weighted intensity of deprivation for Arab countries in the sample is 50.5% which is slightly below the average intensity for the 101 developing countries (51.3%).Somalia has the highest intensity of poverty (63.3%) while the lowest intensity occurs in Jordan (35.0 %). The Arab Region's (population weighted) average headcount rate however is significantly below world average (20% versus 29.6% in Figure 2). This translates into an average MPI of 0.10, which is below the global average of 0.16,but still significantly higher than the MPI of Latin America and East Asia and the Pacific. The stylized fact therefore is that multidimensional poverty is relatively low in Arab countries compared to other developing countries.

Figure 2: Population Weighted MPI (A) and distribution of multidimensional poor (MP) population by HDI level (B) for Arab Countries



Source: Authors estimates based on Alkire, S. and Robles, G. (2015) and the Human Development Report (UNDP, 2014).

Table 2 and Figure 1 (E) reveals the distribution of the multidimensional poor and severely poor population in Arab countries, by country HDI classification, with the latter being a sub-set of the former. Of the Arab population in the sample (approximately 260 million, representing more than two thirds of the total Arab population), almost 52 million are multidimensionally poor while 30 million of those are in severe multidimensional poverty. The vast majority of this poor and severely poor population is concentrated in the low human development country group according to the classification adopted by the global Human Development Report (71%).However, a sizeable share (28%) still resides in Arab countries at a medium-level human development (Figure 2 B). Using the World Bank income based classification, the majority of the Arab multidimensional poor population belong to the lower middle-income group. This distribution pattern, shown in table 2 is expected given the vast majority of the Arab population (75%) belongs to this group. The poverty rates for each of the income groups (i.e. dividing column 3 by 1) are 7%, 20.5% and 81.4% for the UMICs, MLICs and LICs, respectively. The concentration of multidimensional poor population in middle-income countries is also confirmed globally, even after excluding China and India. (Alkire et al, 2013)

Table 2:Multidimensional Poor Population in Arab countries by Income Category (2014)

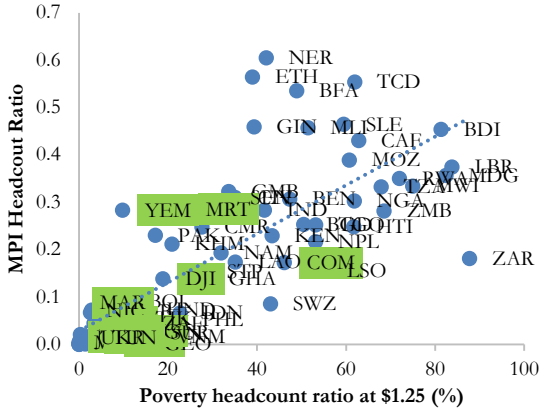
	Total population (12 countries)		**MPI poor population**		**People in severe MPI poverty**	
	(1) in Mils	(2) % of pop.	(3) in Mils.	(4) % of total Arab pop. (1)	(5) Mils.	(6) % oftotal Arab pop. (1)
UMICs (4 countries)	55.5	21.2	4.0	1.5	2.9	1.1
LMICs (7 countries)	197.6	75.4	40.6	15.5	21.5	8.2
LICs (1 country)	8.6	3.3	7.0	2.7	5.7	2.2
Total	261.7	100	51.6	20	30.2	11.5

Source: ibid.

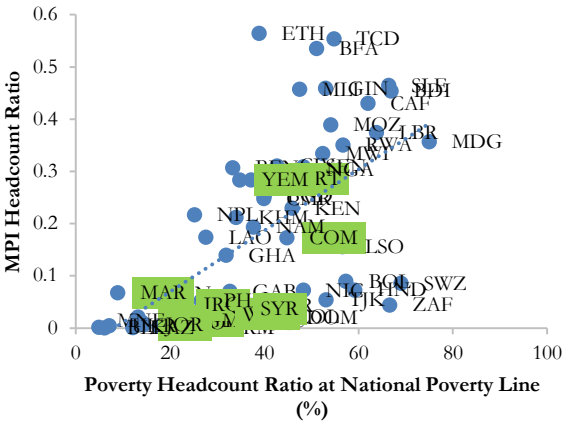
Note: The World Bank income categories are based on the July 2014 Gross National Income estimated using the Atlas Method. For the methodology please see World Development Indicators (World Bank 2015).

Figure 3:Headcount MPI and Money Metric Poverty, Developing Countries (2014)

(A) MPI and poverty rates at $1.25 per day



(B) MPI and poverty rates at the NPL

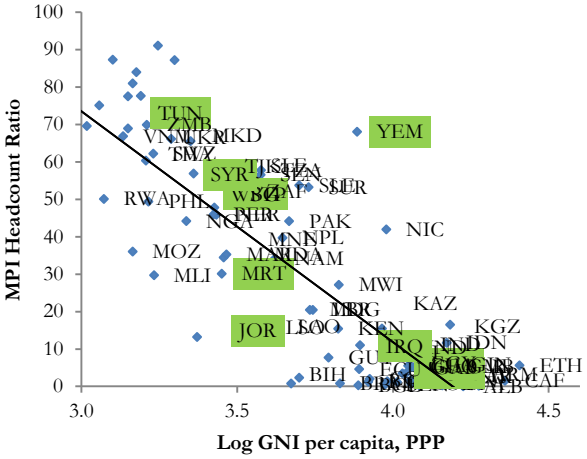


Source: ibid

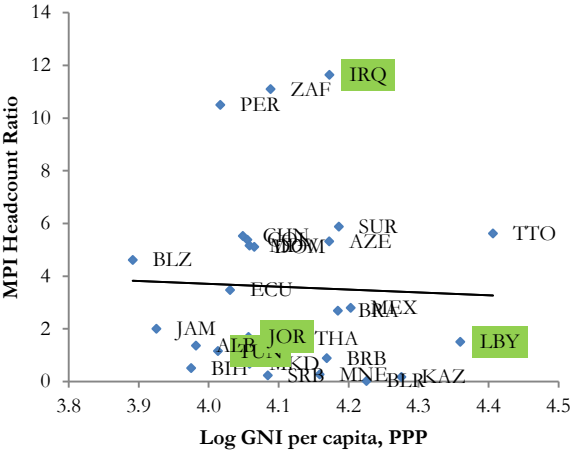
Note: Arab countries marked by green labels.

Figure 4: Headcount MPI and log GNI per capita, PPP (2014)

(A) MPI and GNI per capita, all countries



(B) MPI and GNI per capita, UMIC and HICs



Source: ibid

As expected these multidimensional poverty rates are low relative to the region's money metric poverty rates. As observed from figure 3, whether for the poverty rate under $1.25 or the National Poverty Line, all Arab countries lie below the cross-country regression line. This result is quite peculiar since it cuts across countries that are quite diverse in terms of their income and human development levels. One possible explanation is that social policies were more effective in Arab countries relative to other developing regions at the same level of income per capita due to for example large networks of formal and informal social protection and/or relatively wide access to public social services. Another explanation however is that the indicators and thresholds that determine the global MPI are biased against Arab countries in particular.

To sum, the global MPI underestimates extreme poverty for the vast majority of Arab countries in middle-income category and especially for the upper middle-income group. This problem is not only specific to the Arab region. In figure 4, it is apparent that while there exists a broad relationship between MPI and GNI. If we restrict our sample to upper middle income and high-income countries only, this relationship disappears (a drop in r-squared from approximately 0.7 to 0.1). This indicates that the global MPI thresholds are less relevant to this group of countries.

II Methodology

There is no doubt that the MPI has many advantages not only compared to the conventional money metric poverty measures but also compared to other human poverty measures such as the aggregate-level Human Poverty Index which was also introduced and monitored by the UNDP's Human Development Report prior to 2010:(1) the MPI can accommodate ordinal, cardinal and categorical indicators though dichotomizing the data into 'deprived' and 'non-deprived' according to the cut-off point; (2)MPI satisfies dimensional monotonicity so it detects when the poor person gets deprived in an additional indicator. (3) it can be decomposed by sub-groups (for example by urban-rural areas) which allows better understanding of the poor and facilitates targeting the poorest groups; (4) it can be broken down by indicator thus allows to know how much each indicator is contributing to the overall poverty level; (5) MPI is easy to compute and to interpret (Alkire and Santos 2013).

However, the MPI has several problems:(1)Comparing micro-data from different surveys in a single analysis can be difficult given the definitional and operational differences between these surveys and between the various rounds of the same survey. For example, the Multi-Indicator Cluster Surveys (MICS 1, MICS 2, MICS 3, etc.) differ in their methodologies with regards to the definitions and measurement methods of some variables. (2) The MPI has a limited number of dimensions and indicators. Obvious omissions from an Arab perspective include the employment, governance and security dimensions. (3) We followed the global methodology using a deprivation cutoff of 1/3 and equal weights for the three dimensions, which makes the decision arbitrary, and it can be argued that the weights should reflect complementarities or substitutability across dimensions[8]. These weights, in addition, require consensus building as they mirror implicit developmental trade-offs which can only be the outcome of a political process.(4) The choice of the deprivation thresholds is biased to capture extreme poverty.

Clearly data constraints do not allow the inclusion of more dimensions or indicators however in this paper we argue much more can be done to capture less extreme forms of deprivations with existing data sources. This broader view of the spread of poverty is crucial from a global post-2015 accountability perspective. Middle-income countries governments should be held accountable to their constituencies on the basis of measures that reflect the reality of total and not just extreme deprivation. Poverty, as a central objective of the post-2015 SDG framework, needs a broader measure.

To this end, this section proposes two additional multidimensional poverty measures that would complement the global MPI. In money metric poverty terms, our proposal would be tantamount to increasing the value of the $1.25 per day poverty line by reporting results at the $2.00 and $3.00 per day lines. Section A. begins by highlighting the consistency of our procedure with the Alkire-Foster methodology. Section B. explains our choice of new indicators and poverty thresholds across two new measures of deprivation which we refer to as MPI2 and MPI3.The MPI1, which captures extreme deprivation, corresponds to the global MPI. Section C. is devoted to data sources.

[8]Abu-Ismail et al, (2011)

A. Consistency with the Alkire-Foster Method

Since our proposed MPIs are extensions to the global MPI, the methodology we adopt the same basic methodology and procedures. Here, we follow the same procedure suggested by Alkire and Foster.

To begin with, all three MPI levels were calculated by giving equal weight to each dimension (one-third) and dividing the weight equally among the indicators in the corresponding dimension. A household is considered multidimensionality poor if the weighted aggregate deprivation is greater or equal to 33% given their level cut-offs.

Alkire-Foster however show that the simple headcount ratio (P0) is insensitive to the increase in the scope of poverty, violating the principle of what they call 'dimension monotonicity.' If a poor person is deprived in some indicators and becomes deprived in an additional indicator from the same or a different dimension, the level of poverty remains the same (when considering the headcount only). They proposed an adjusted head count ratio, which is the headcount index weighted by the average deprivation intensity among the poor. The deprivation intensity among the poor is the sum of weighted deprivation for the poor divided by the total number of poor people.

Some of the MPI indicators are individual not household level indicators and are mostly focused on young children e.g. nutrition and school attendance. Yet, a relatively large number of households do not have children, making them automatically non-deprived. Thus, the MPI indicators, and the resulting poverty rates, are to a large extent a reflection of household composition. And yet, they tend to be classified as not multi dimensionally poor simply because the majority of indicators do not apply to them. This can be considered a sample selection issue rather than a missing data issue -- and the results would be biased towards lower poverty rate among household with non-eligible members if some adjustment to selection are not made in the analysis. Furthermore, since countries in the region are quite diverse in family composition, especially in the proportion of young children in the population, poverty comparisons across countries may partly reflect family composition rather than poverty itself.[9]

The issue of missing values for some key indicators also deserves serious attention in constructing composite indexes such as the multi-dimensional poverty index. The inclusion of cases with missing values for some of the indicators in the construction of the index will likely bias the resulting index. This is especially the case if missing cases are treated as non-deprived or vice versa. One common way to avoid the problem is to exclude cases with any missing values – which is the default practice in much of the statistical software packages. However, this will yield biased results if the proportion of missing is relatively large, or if households with missing observations hold certain characteristics (richest quintile for example).In this study missing values did not exceed5% of the cases for any indicator.[10]

B. Indicators and Deprivation Cutoffs

[9] Recently, Dotter and Klasen (2014) considered some solutions/adjustments to this problem, including dropping households with non-eligible populations from the study samples. They suggested a 'hybrid' approach to both substitute missing indicators with other ones from the same dimension and lowering the poverty cut-off for household with non-eligible population. Alternatively, predicted values from a sample selection model could be provided for missing indicators.

[10] Both OPHI and UNDP exclude cases with missing values from the calculation but the sampling weights of the missing cases are recovered in a second step and assigned to individuals with the same age/gender/urban-rural characteristics. The approach is explained in Kovacevic and Calderon 2014:
http://hdr.undp.org/sites/default/files/specifications_for_computation_of_the_mpi.pdf

The choice of dimensions and indicators for use in any index is a reflection of policy priorities, expert opinion and data constraints. Still, in proposing new indicators and cut off thresholds, the following four criteria should be applied: 1) data for the selected indicators should be readily available and have similar or equivalent categorization across surveys; 2) indicators should be relevant to the Arab region context(for example, having no designated space for cooking maybe considered a deprivation in middle income countries rather thana deprivation based on the use wood, charcoal or dung); 3) any new indicator should be pertinent to a significant share of the population; and 4) the aggregate multi-dimensional indices should not overlap so first order dominance should be maintained.

In what follows we discuss how we applied these criteria across the three dimensions (education, health and living standards)of the global MPI to arrive at the new deprivation measures. It is important to mention that in all cases, the second level deprivation includes households that are deprived in the first level. Likewise, the third level deprivation in education covers the first and second levels in addition to the household that satisfy the third level of deprivation. This cumulative aspect of the MPI index holds for all the indicators and dimensions.

Education

The education dimension consists of two indicators: completed years of education and school enrollment. The assumption for including 'year of schooling' is if a household has one member with a given number of years of education then this acquired knowledge is beneficial to other household members. Likewise we assume if a household has one child not enrolled in school then the whole household is considered deprived.

The Arab MDG report (2013) showed that the Arab region reached a high level of primary enrolment in primary level of 92 per cent, and literacy rate among youth is 89 per cent, so in this study we added two additional levels of educational attainment to capture wider range of deprivation in education.

The three levels of school attendance are:
MPI1: Household is deprived if any school-aged child is not attending school up to class 8;
MPI2: Household is deprived if any child age (7 to 17) is not attending school;
MPI3: Household is deprived if any child age (7 to 17) is not attending school or if he attends school but he is two years or more behind the right school grade, the last level was included to capture quality of education.

The three levels of years of schooling are as follows:
MPI1: Household is deprived if no adult household member has completed 5 years of schooling;
MPI2: Household is deprived if no adult household member has completed 8 years of schooling and;
MPI3: Household is deprived if no adult household member has completed 12 years.

Health

The health dimension consists of four indicators: child mortality, under-nutrition, child pregnancy, and full immunization against BCG, DPT, polio and measles. Child mortality indicator does not have different cut-off points so the three level deprivations for this indicator are the same and cover the same households.

Stunting is a long term indicator for malnutrition, while underweight is an indicator of current malnourished children and case management can reserve stunting. It is believed that deprivation experienced by children, even over short periods, can have long term effects. Moreover, evidence suggests mortality risk of children who are even mildly underweight is increased and severely underweight children are at an even greater risk. Stunting is more common in least developed Arab countries where 35 % of children have low height for age,

however in other countries like in Maghreb region the percentage is reduced to 9 per cent.[11] Furthermore some countries like Egypt are acquiring the flaws of rich countries and obesity is reaching a level as high as 20% of the adult population, this is alarming because it leads eventually to other medical conditions such as hypertension and diabetes.[12]In the Gulf countries the high rate of human development lead to a higher caloric intake of fast food, which coupled with a sedentary lifestyle lead to high prevalence of obesity which reached 46 per cent among Kuwaiti adolescents.[13]

The three levels of malnutrition are:MPI1: Household is deprived if any child (0-4) is stunted (low height-for-age) and/or any adult is malnourished (low BMI); MPI2: Household is deprived if any child (0-4) is underweight (low weight-for-age) or stunted, and/or if any adult is undernourished (low BMI); MPI3: Household is deprived if any child (0-4) is underweight, stunted or overweight or obese, or any adult is undernourished or obese. For adults, the nutritional measure is the Body Mass Index. A household that is deprived in nutrition has to have one child and/or one adult who are undernourished or obese. In this study, we introduced obesity as health status measure, and it is becoming prevalent in the Arab region, especially in rich countries.[14]

Teenage marriage in the Arab region is the consequence of two factors: (1) big number of youth in the region, (2)the economic dimension associated with marriage, especially for poorer women. In the past few years the percent of marriage among teenage girls (15-19 years) is declining but the numbers are still alarming. In 2003 the number of teenage married women was 200,000 in Yemen, and 385,000 in Egypt. Most Arab countries avoid setting policies to regulate this phenomenon given that it might contradict with Islamic Law.[15] Teenage marriage is associated with early pregnancy, which is the second cause of death among teen girls (15-19) in the world (WHO, 2014). Early pregnancy is a newly added indicator to MPI2 and MPI3 where a household is deprived if the age of first pregnancy for any woman is less than 18 years.

In the Arab region vaccination coverage is not yet universal. High and middle income countries with good child health care system (e.g. Tunisia) have near to universal vaccination for children, whereas other countries are still deprived of this basic child right. In Lebanon, a middle income country, only 53% of children are vaccinated against measles. Infectious diseases of the poor, which creates double burden of poverty and illness for children of those communities. In addition conflicts areas results in displacement and relocation of people to congested refuges that are prone to epidemics. Vaccination preventable illnesses, such as Poliomyelitis, are still happening in poor Arab countries such as Djibouti and Sudan.[16]

Full immunization against major infectious diseases is a relevant indicator for poverty in the region but the percentages of deprivation in immunization in the current study was below 5% for the second and third levels (2% in Jordan, less than 1% in Iraq) and thus could not be applied in this study. Likewise, the incidence of child pregnancy in the three countries was too low to be used in the MPI.

Living standards

The household living standards are measured in the global MPI by 6 indicators: electricity, drinking water, sanitation, flooring, cooking fuels and durable goods. Three of these indicators are MDG indicators as well, namely, access to safe drinking water, access to sanitation, and the use of solid fuel (wood, charcoal, dung..). These indicators are relevant to Arab countries. Clean and safe water is still a target to be attained in the Arab

[11] UN and LAS (2013)
[12]FAO, (2006)
[13]Abdul-Rasoul, (2012)
[14] It should be noted however that while there is no problem for the MPI calculation, including obesity in the same indicator makes the indicator a two-tailed indicator. This is somehow problematic for policy purposes: if an improvement (or regression) in nutrition occurs, it is hard to know if it is coming from under-nutrition of from obesity.
[15]Rashad et al, (2005)
[16]Jabbour et al, (2012)

region due to the unsafe methods for disposing wastewater, sewage and other wastes are sources polluting drinking water and the ecosystem in general.[17]

In this dimension data availability allowed us to add two additional cut-off point for the following indicators:

1. Water-access:MPI1: Household is deprived if it does not have access to clean water or more than 30 minutes' walk; MPI2: Household is deprived if it does not have well or public tap; MPI3: Household is deprived if it does not have piped water in house.
2. Flooring:MPI1: Household is deprived if household lives in house with earth floor (sand or dung); MPI2: Household is deprived if household lives in house with earth or rudimentary (wood planks/bamboo) flooring; MPI3: Household is deprived if household lives in house with earth, rudimentary or cement floor/asphalt.
3. Assets:MPI1: Household is deprived if it is not having at least one asset related to access to information (radio, TV, telephone) and not having at least one asset related to mobility (bike, motorbike, car, truck, animal cart, motorboat) or at least one asset related to livelihood (refrigerator, arable land, livestock); MPI2-3: having internet, computer and/or tablet.

C. Data Sources

In this study we used data from three household surveys: Multi Indicator Cluster Survey (MICS) for Iraq (2011, MICS4), the Demographic and Health Surveys for Jordan: (2012, DHS-VI) and Pan Arab Project for Family Health (PAPFAM) for Morocco (2011). These household surveys are based on fairly large national representative random samples of households. The sample sizes are 35,705 households for Iraq, 15,915 households for Morocco and 15,190 households in Jordan.

The DHS is an international survey on demographic and health, mainly reproductive health, supported by USAID. It has been conducted in five Arab countries: Egypt, Jordan, Morocco, Tunisia, and Yemen.The most recent DHS includes four questionnaires: household, women, men, and a biomarker questionnaire. It provides data on fertility and mortality rates, nutrition, HIV knowledge and/or prevalence, contraceptive use, child health and health knowledge and practices.[18] The DHS also provides some data on background characteristics of households and their members, including data on education and employment.

MICS4 is a cross-sectional survey developed by UNICEF to focus on child health and wellbeing in low and middle income countries. It is usually conducted in participating countries over several rounds(every 3-5 years). Like the DHS, the MICS includes optional modules that can be tailored by countries to provide data on specific issues of national interest. MICS4 questionnaire is made out of 4 basic parts. First, the household questionnaire collects data mainly on housing condition and amnesties. The questionnaire for women collects data on their background, education, fertility, sexual behaviors, marriage, knowledge of HIV/AIDS, and sometimes on alcohol and tobacco consumption, children health, and life satisfaction. The questionnaire for men is quite similar. The children questionnaire (for children less than five years of age) collects data on child health and development. Since 1995 MICS surveys have been conducted in Algeria, Djibouti, Egypt, Iraq, Lebanon, Libya, Palestine, Qatar, Sudan, Syria, Tunisia, Yemen, and for Palestinian refugees in Syria and Lebanon. The latest data available for MICS4 are available for two countries: Iraq (2011) and Tunisia(2011).

The PAPFAM survey, administered by the League of Arab States, is rather similar to the DHS and MICS, but focuses on family health, mainly reproductive health. It also has standard instrument and optional modules.

Table 3lists the available indicators provided by each survey. The DHS, MICS and PAPFAM questionnaires share many indicators, especially those related to health, housing conditions and education. However, some data items are not similar across surveys, and harmonization of indicators can be a challenge across surveys.

[17] UN and LAS (2013)
[18]Rutstein and Rojas (2006)

In other words, some MPI indicators can easily be constructed in one survey, but other surveys provide only partial information. For example, the indicator on years of schooling is not available in PAPFAM survey for Morocco so we estimated the years of schooling using the question on highest educational level attained to estimate years of schooling.[19] Likewise, PAPFAM survey do not provide information needed to construct the indicator on 'right grade school enrolment' so we calculated the first and the second levels of deprivations on Morocco for that indicator. The malnutrition indicator requires information on both children and adults living in the household, both of which are available in DHS; however MICS and PAPFAM provide these data only for children. This indicator refers to child malnutrition only for Iraq and Morocco.

Table 3:Data availability comparison between household surveys

Indicators	DHS	PAPFAM	MICS
Education			
Years of schooling	√	√	√
School attendance	√	√	√
School grade	√	X	√
Enrollment	X	√	√
Health			
Child mortality	√	√	√
Nutrition	√	Children only	Children only
Immunization	√	√	√
Early pregnancy	√	√	√
Housing			
Electricity	√	√	√
Water	√	√	√
Time to get water	X	√	√
Fuel	√	√	√
Floor	√	√	√
Roof	√	√	√
Sanitation	√	√	√
Assets: TV, Radio, car…	√	√	√
Internet	√	√	√
Overcrowding	√	√	√

Source: DHS, PAPFAM and MICS

III Results

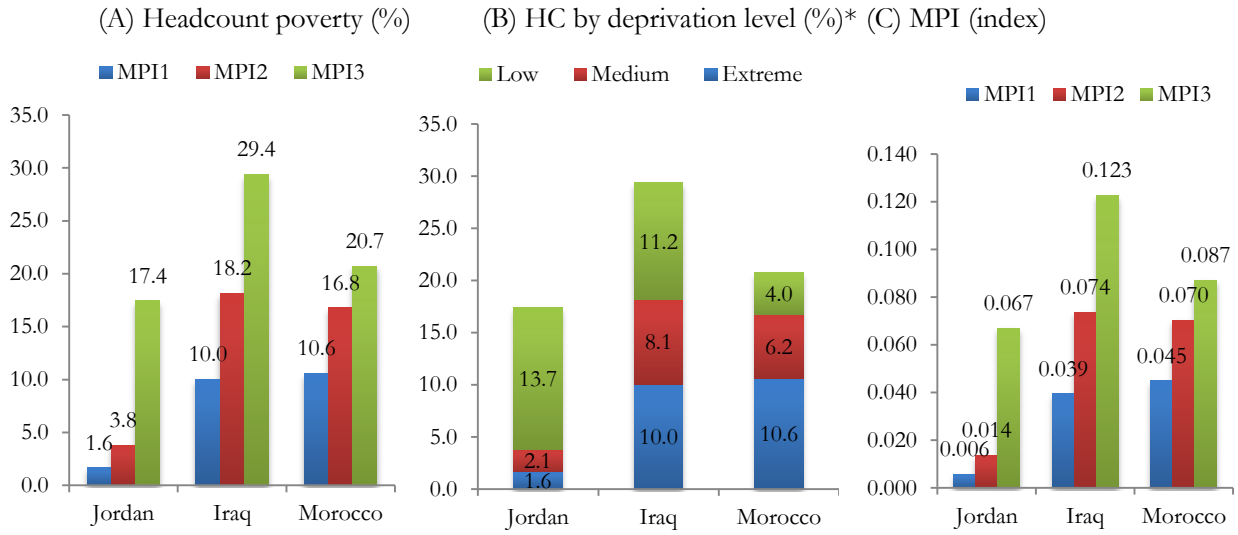
A. Main findings

Figure 5shows the poverty headcount rate for the 3 MPI levels. In all cases poverty rates increases as we move from lower to higher MPI levels, however not at the same pace with significant and high positive rank correlations between all the MPIs in all countries. For Jordan the difference between MPI1 and MPI3 headcount poverty is most striking with more than a tenfold increase (from 1.6% to 17.5%). For Iraq and Morocco headcount poverty rates at MPI3 are triple and double those at MPI1, respectively. Jordan still has the lowest poverty rates at all levels, however, the difference between it and Iraq than Morocco in headcount poverty at MPI3 is less pronounced, indicating high vulnerability. Conversely, there increase in headcount poverty rates from MPI2 to MPI3 is relatively modest in the case of Morocco (from 16.8% to 20.7%). This is

[19] We assumed that individuals who did not attain primary education have less than 5 years of schooling, those who did not attain preparatory education have less than 8 years of schooling and those who did not attain secondary education have less than 12 years of schooling

reflected in the very low share of the households in the low poverty category (4%) compared to Iraq and Jordan as shown in Figure 5(B).

Figure 5: Headcount (HC) poverty rates and MPI by deprivation level

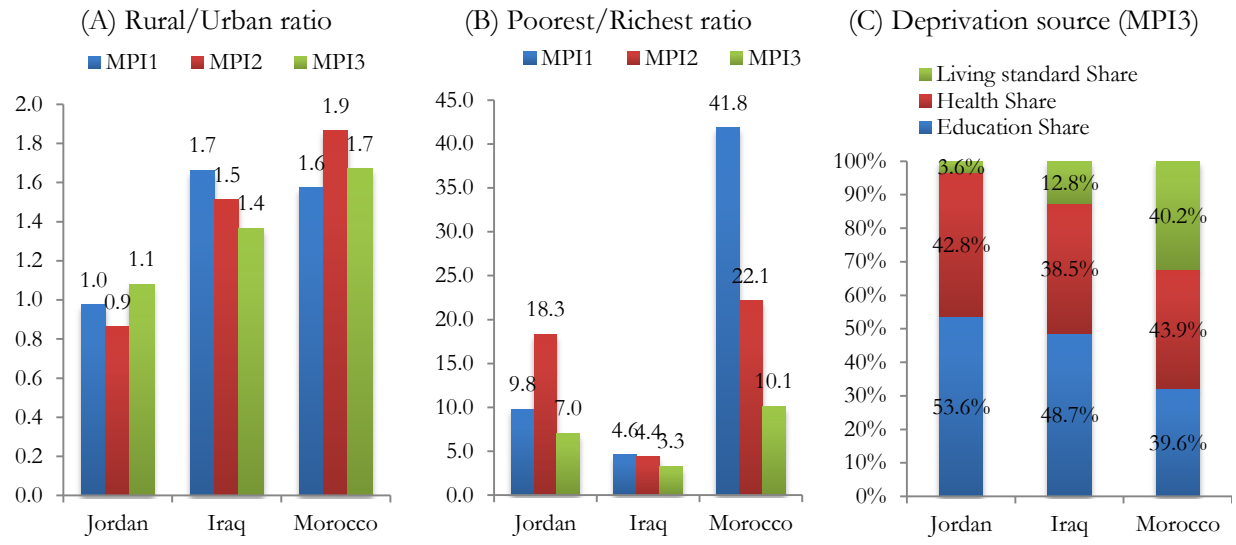


Source: Authors calculations

*Note: For example, Jordan's medium deprivation headcount is calculated by subtracting 1.6 from 3.8; the low level is calculated by subtracting 3.8 from 17.4

These findings have quite significant implications since they reveal a radically very different overall picture of poverty once we introduce the new deprivation measures. If we rely solely on the global MPI, both the headcount poverty and MPI rates in Morocco and Iraq are incomparable to those in Jordan (figure 3 C). Extreme poverty, for whatever reason, is much lower in Jordan. However, at the low level deprivation, the three countries show very similar rates of deprivation intensity (38%, 41% and 42%, for Jordan, Iraq and Morocco, respectively) and headcount poverty, which is reflected in their MPI3 values.

Figure 6: Headcount (HC) poverty by region, poorest to richest wealth quintile and deprivation source

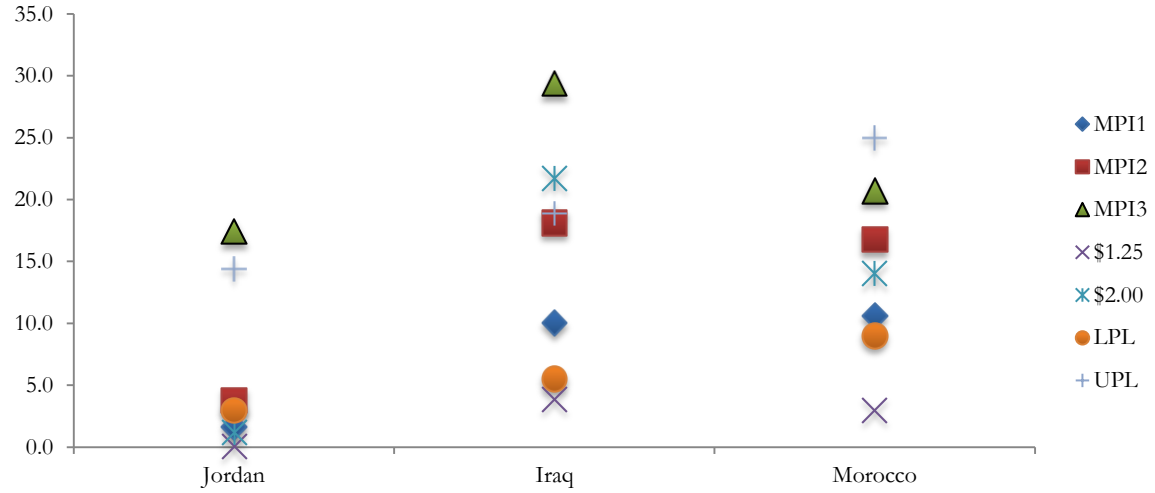


Source: Authors calculations

Figure 6 and Annex Table 4 provide us with a more in depth view of the distribution of poverty across rural and urban regions, wealth groups and by deprivation source for each of the three deprivation levels. This information is useful for policy makers as it provides them with the direction of future social and economic policy interventions. Regardless of the poverty measure, the difference between rural and urban poverty rates is low in Jordan compared to Iraq and Morocco. The inequalities in deprivation are much sharper however between the poorest and richest wealth quintiles in all three countries. Surprisingly, the ratio of the poverty rates of the poorest to the richest quintile is consistently lower in Iraq than in Jordan. The disparity in headcount poverty rates is excessively high for Morocco, particularly for extreme multidimensional poverty. However, it declines dramatically from the MPI1 to the MPI2 level and likewise from the MPI2 to the MPI3 level. This may explain to a large extent the significant drop in incremental poverty rise in Morocco as we increase the poverty cut off threshold. The initial conclusion is that poverty in Morocco is more of a social class problem that requires carefully targeted interventions at the grassroots level. The relatively higher share of deprivation in living standards dimension for Morocco compared to Iraq and Jordan also lends support to this hypothesis.

Finally, the comparative summary multidimensional and money metric poverty statistics plotted in figure 7 are consistent with what we would expect in terms of the ranking of poverty indicators. The global MPI poverty rates correspond to the 1.25$ and to a lesser extent with the lower national poverty line while the MPI2 and MPI3 correspond to the $2.00 per day and the upper poverty line. The spread of the poverty indicators in Iraq and Morocco contrasts with the gap between all indicators on the one hand and the poverty rates at MPI3 and the money metric upper poverty line for Jordan. No doubt explaining these patterns would require a far more detailed country level discussion on policies and measurement methodologies that lies beyond the scope of this study. The conclusion to draw is that, as in the case of the relationship between the $1.25 and the global MPI, our additional multidimensional poverty measures are broadly consistent but not identical to the money metric higher poverty lines. Certainly, this conclusion may change if more countries are added to the sample.

Figure 7: Multidimensional and money metric poverty indicators



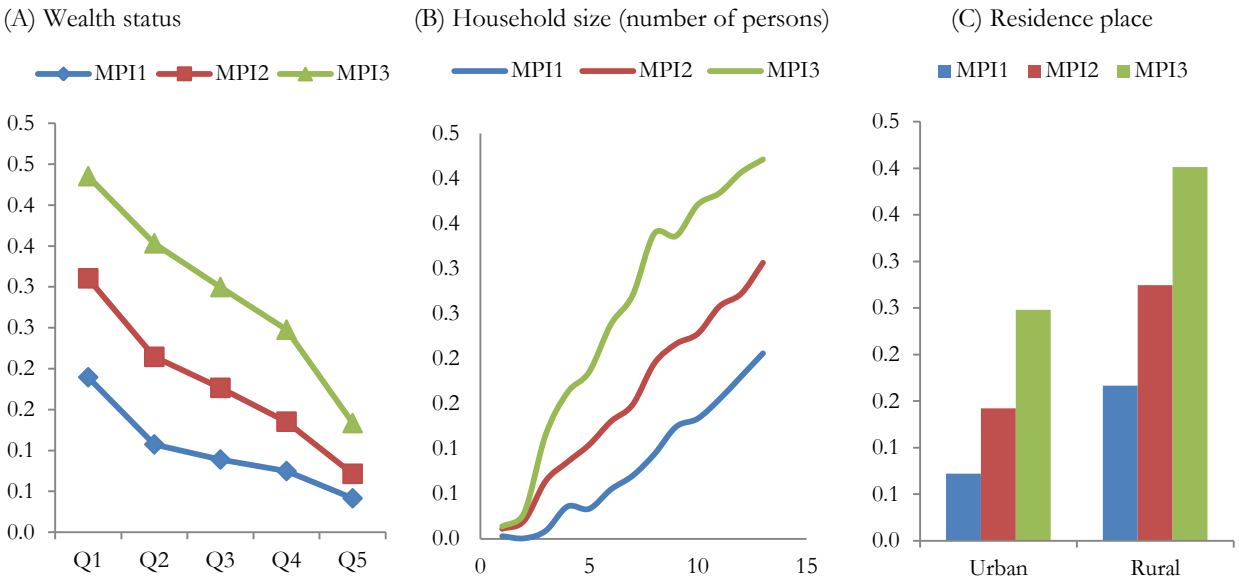
Source: Authors and World Bank Development Indicators
Note: The poverty rate at the upper poverty line for Morocco was estimated based on a regional multiplier.

B. Robustness analysis

It is well documented in literature that factors such as wealth status, location and household size influence deprivation levels. For both the health and education indicators there is a tendency for deprivation to decrease with the increase in asset ownership of the household. In this section, we examine these hypotheses by undertaking a combination of robustness tests. The main question is whether or not the ranking of deprivation (MPI1<MPI2<MPI3) is maintained for wealth quintiles, place of residence, household size, indicators. We also examine if the MPI rankings are consistent across a range of deprivation cut offs (k).

Regarding the first question, our results show that the MPI1 is always lower than MPI2 and MPI3 for the wealth status and household size. The poorest quintile consistently has a higher deprivation rate and vice versa for the richest (Figure 8for Iraq). Deprivation rates vary for different household size with consistently higher rates for larger households and rural residents, except for Jordan where the differences in rural/urban poverty rates are marginal.

Figure 8:Headcount poverty rates by wealth status, household size and residence for Iraq

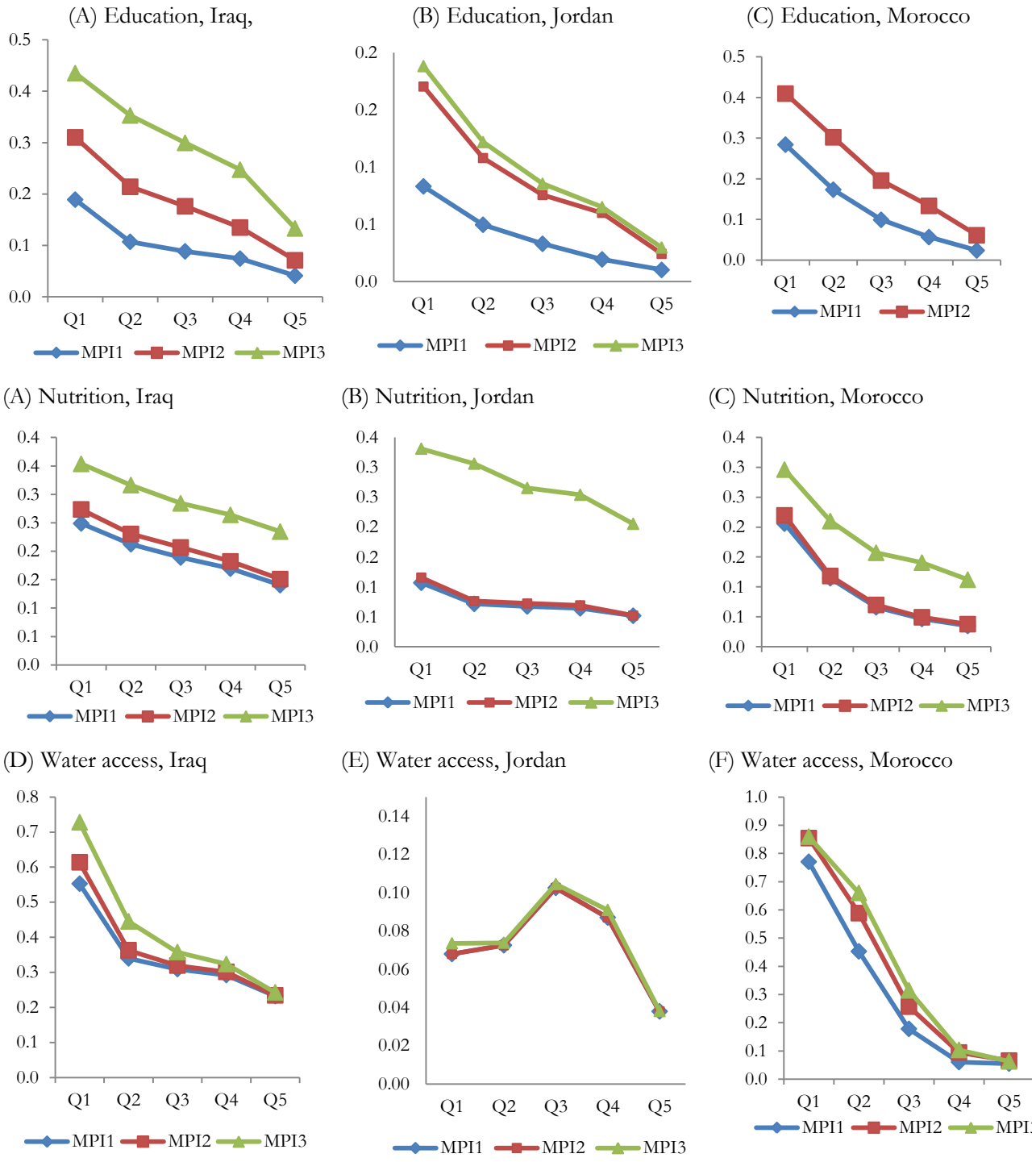


Source: Authors calculations

Similarly, Figure 9 illustrates the headcount poverty rate for different levels of education, nutrition and water access by household wealth status. As expected, increasing the school attendance cutoff from MPI1 to MPI2 significantly increases deprivation in all three countries, especially for the poorest three wealth quintiles. The Annex tables also show that the households' poverty rankings are preserved across poorest to richest quintiles (see Tables A1, A2 and A3 in Annex). However, in case of Jordan, changing the school attendance from the second to third level deprivation results in non-significantly higher deprivation. A similar conclusion is observed when ranking households according to their size or by their place of residence. Deprivation increases as we move from smaller households to larger households and from urban to rural, at all levels(see Figures A1 and A2 in Annex).

Figure 9 also shows a slight difference between MPI1(stunting) and MPI2 (stunted and/or underweight children) for all countries across quintiles. Adding obesity (MPI3) has a far more significant impact on the prevalence rates in all three countries, but particularly so in Jordan. Furthermore, the figure shows that households' rankings with respect to wealth status are robust in the three deprivation levels. Figure A3 confirms that the prevalence rates increase with larger household size; the larger the household, the greater the probability that it has a malnourished adult or a child. Similar results are observed with respect to place of residence (Figure A4).

Figure 9:Levels of deprivation in education, nutrition and water access by wealth status



Source: ibid
Note: Data of Morocco does not include grade of current school attendance.

Figure 9 also indicates higher deprivation cut offs levels in the water indicator induce higher deprivation levels, except in Jordan. Similar conclusion can be derived when we rank deprivation rates at all levels with respect to household size or place of residence. Larger households exhibit higher prevalence as well as rural

areas (see figures A5 and A6 in annex graphs). A similar conclusion applies to the floor and asset ownership indicators where ranking is always preserved for households across wealth quintiles, household sizes and for urban and rural residence (Tables A1-A3 and Figures A9-A10 in Annex).

Table 4: Spearman correlations between Headcount Poverty (MPI1, MPI2, and MPI3)and household size, wealth and place of residence

		MPI1	MPI2	MPI3
Iraq	Household size	0.3087*	0.2832*	0.3191*
	Wealth score	-0.3117*	-0.3395*	-0.3336*
	Urban/rural	0.2845*	0.2476*	0.2269*
Morocco	Household size	0.1090*	0.1182*	0.1156*
	Wealth score	-0.6321*	-0.6128*	-0.5290*
	Urban/rural	0.4586*	0.4605*	0.3978*
Jordan	Household size	0.204*	0.226*	0.242*
	Wealth score	-0.195*	-0.251*	-0.405*
	Urban/rural	0.194*	0.151*	0.165*

Source: Authors calculations
Note: *At 5% level of significance.

Since the MPI is a member of a class of poverty indices that obey properties such as monotonicity and weak transfer,[20] a small change in the cutoff should not lead to a considerable re-ranking of households categories (by wealth index, place of residence, household size or any other variable that is highly correlated with poverty). This can be examined by conducting stochastic dominance analysis.[21] Annex Figures 11 and 12 show how poverty rates change for different cutoffs (k). The results show a first order dominance among the curves. In other words, at all cutoffs, multidimensional poverty increases as we move from MPI1 to MPI2 to MPI3. We extend our analysis to take into accounts different variables such as the wealth index, place of residence and household size. The results, shown in Annex Figures 1-10,are also as expected. For all cut off points, rural areas dominates urban areas, poorest quintiles dominate the richest quintiles, and larger households dominate smaller ones (even after controlling for the bias in that larger households will necessarily have more deprivations). These results are also confirmed by the correlations between MPIs and these variables in Table 4.In all three countries, statistically significant positive rank correlations exist between MPIs on the one hand and household size and place of residence on the other hand while a negative correlation is observed for asset ownership.

Conclusion

It goes without saying that any fundamental improvement in poverty measurement, whether at national, regional or global levels, will require nothing less than a data revolution. Proposals for a new global survey are being discussed to this end in the context of the emerging monitoring framework for the SDGs.[22] However, until such proposals are realized, there is still room to make better use of existing data sources. In this context, we argue that the monitoring and evaluation framework of the SDGs should be based on a variety of human poverty conditions. The global MPI developed by OPHI and UNDP is geared to capture extreme poverty in low income and lower middle-income countries, where the vast majority of the extremely poor

[20]Alkire and Foster (2007)
[21]Given two household groups, A and B, we say that B dominates A if A's MPI estimate is greater than B's MPI for all the considered k values. That is, B has lower poverty than A regardless of the k cutoff
[22] See the Light Survey proposed by the MPPN and OPHI, and Sarangi and Abu-Ismail (2015)

multidimensional poor population live.[23]Our multidimensional measures are geared to capture less severe deprivations that are more widespread in middle and upper middle income countries. Since latter constitutes the majority of the population in the Arab region, our proposed measures are of direct relevance to Arab policy makers in the poverty reduction arena.

Our two additional proposed measures(MPI2 and MPI3) yield results that are significantly different from the global MPI (which is identical to the MPI1). As such, they provide us with a more comprehensive view of the spread of multidimensional poverty. This is the main conclusion emerging from the analyses undertaken for the three Arab countries in this study. By relying solely on the global MPI, headcount poverty in Jordan is non-significant compared[24] to Iraq or Morocco. That leaves little scope for poverty targeting except in the few most deprived regions. At the higher-level MPI, however, Jordan's multidimensional poverty rate is only slightly below that of Morocco. That leaves much room for social policy interventions to reduce vulnerability.

The paper has also undertaken several exercises to check for the robustness of our main results. We found that poverty rates are robust to household wealth, place of residence (rural versus urban), and size: the revised thresholds induce significantly higher deprivation levels, particularly among the households with least assets. The results are also sensitive to changes in our choice of the cutoff (k).

In terms of future research opportunities, there is much that can still be done especially in terms of methodological refinements. For example, the Alkire-Foster method does not take into account household size or composition. In monetary poverty measurement, the standard practice is to adjust the resulting household poverty lines by some form of equivalence scale in order to avoid biases due to economies of scale. In other words, an additional individual in a household typically needs less in terms of shared goods and services, e.g., food and housing, and the 'cost' of children is generally less for household budget than an adult. There is evidence that the MPI is sensitive to household size (Dotter and Klasen 2014), and also to the presence of children in household. However, it is unclear how these adjustments can be done. This could therefore be of interest for future academic research. There is also the potential to add even more indicators and or even dimensions, especially by merging the DHS and MICS with household expenditure surveys.

In the Arab region, with nearly 40 percent of its countries are in situations of conflict or post-conflict and given the widespread humanitarian and refugee crises, which has affected neighboring countries and Europe, the most relevant follow up activity is to make use of these new measurement tools to help examine how the lives of millions of Arab people have been affected and provide policy relevant solutions, thus serve the pressing need for a new regional poverty reduction strategy.

[23] Alkire, et al (2011); Chandy et al,(2011); Glasman, et al (2011); Kanbur et al, (2011); Sumner, (2010); Sumner, (2012).
[24]See Open Working Group Proposal for Sustainable Development Goals, UN (2014).

References

Abdul-Rasoul, Majedah (2012). Obesity in Children and adolescents in Gulf Countries, Facts and Solutions. *Avances en Diabetologia*. Vol. 28. No. 03. Mayo-Junio.

Abu-Ismail, Khalid; Abou Taleb, Gihan; and Ramadan, Rasha (2011).The ADCR 2011: Towards More Sensible Poverty Measurement. A Background Paper for the Arab Development Challenges Report (2011).

Alkire, Sabina, Conconi, Adriana, and Roche, Jose Manuel (2013). Multidimensional Poverty Index 2013: Brief Methodological Note and Results. OPHI.

Alkire, Sabina, and Foster, James. E. (2011). Counting and multidimensional poverty measurement. *Journal of Public Economics*, 95, 476-487.

Alkire, Sabina, and Foster, James. E. (2007,revised January 2008). 'Counting and Multidimensional Poverty Measures', OPHI Working Paper Series, Working Paper No. 7, Oxford Poverty and Human Development Initiative (OPHI).

Alkire, Sabina, and Robles, Gisela (2015). Multidimensional Poverty Index 2015: Brief Methodological Note and Results. OPHI.

Alkire, Sabina; Roche, Jose Manuel; and Seth, S. (2011). Sub-national disparities and inter-temporal evolution of multidimensional poverty across developing countries. OPHI Research in Progress 32a.

Alkire, Sabina and Santos, Maria Emma (2014). Measuring acute Poverty in the Developing World: Robustness and Scope of the Multidimensional Poverty Index. *World Development*, 59, 251-274.

Alkire, Sabina and Santos, Maria Emma (2013). Measuring acute Poverty in the Developing World: Robustness and Scope of the Multidimensional Poverty Index. OPHI working paper no. 59.

Alkire, Sabina and Santos, Maria Emma (2011). Training Material for Producing the Multidimensional Poverty Index (MPI).

Alkire, Sabina and Santos, Maria Emma (2010). Acute multidimensional poverty: A new index for developing countries." UNDP Human Development Report office background paper 2010/11.

Chandy, Laurence and Gertz, Geoffrey (2011).Poverty in numbers: The changing state of global poverty from 2005 to 2015. Brookings Institution.

de Neubourg, Chris ; Chai, Jingqing; de Milliano, Marlous; Plavgo, Ilze; and Wei, Ziru (2012). Cross-country MODA study. Multiple overlapping deprivation analysis (MODA), technical note. UNICEF Office of Research. November (WP 2010-05)

Deaton, Angus (2010). Price indexes, inequality, and the measurement of world poverty. *The American Economic Review*,100(1), i-34.

Department of Statistics (Jordan) and ICF International (2013). Jordan Population and Family Health Survey 2012. Calverton, Maryland, USA: Department of Statistics and ICF International.

Dotter, Caroline and Klasen. Stephan (2014). "The multidimensional poverty index: achievements, conceptual and empirical issues". UNDP Occasional Papers.

FAO (Food and Agriculture Organization) (2006). The double burden of malnutrition Case studies from six developing countries. Food and Nutrition Paper 84. United Nations Food and Agriculture Organization. Rome, 2006

Foster, James, J. Greer, and E. Thorbecke (1984). "A Class of Decomposable Poverty Measures." *Econometrica* 59: 687-709.

Glassman, Amanda L.; Duran, Denizhan; and Sumner, Andy (2011). Global Health and the New Bottom Billion: What Do Shifts in Global Poverty and the Global Disease Burden Mean for GAVI and the Global Fund? Centre for Global Development Working Paper, (270).

Jabbour, Samer; Giacaman, Rita; Khawaja, Marwan and Nuwayhid, Iman (2012). Public Health in the Arab World. Cambridge.

Kanbur, Ravi and Sumner, Andy. (2011). Poor Countries or Poor People? Development Assistance and the New Geography of Global Poverty. DP8489, CEPR.

Lanjouw, Peter and Ravallion. Martin (1996). "Poverty and Household Size." *The Economic Journal* 105: 1415-1434.

Ministry of Health (Morocco), PAPFAM (Pan Arab Project for Family Health), UNICEF (United Nations Children's Fund), UNFPA (United Nations Population Fund), WHO (World Health Organization). (2011). Morocco National Survey on Population and Family Health 2010-2011.

MPPN (Multidimensional Poverty Peer Network) and OPHI (Oxford Poverty and Human Development Initiative) (2014) Post-2015 Light Powerful (LP) Survey Modules. Available from: http://www.ophi.org.uk/wp-content/uploads/MPPN_SDG-Pov_QuexPost2015_Sept-14a.pdf?6b8d26

Rashad, Hoda; Osman, Magued, and Farzaneh Roudi-Fahimi (2005). Marriage in the Arab World. Population Reference Bureau

Rauch, James, and Kostyshak, Scott (2009). The Three Arab Worlds. *Journal of Economic Perspectives,* 23(3), 2009, 165-188

Rutstein, Shea Oscar, and Rojas, Guillermo (2006).Guide to Statistics. Demographic and Health Surveys.

Sarangi and Abu-Ismail (2015) Economic growth, Inequality and Poverty:Analysis of proposed SDGs and targets from an Arab perspective. Issue brief prepared for the ESCWA 'Arab Sustainability Development Report' 2015.

Sen, Amartya (1976). "Poverty: An Ordinal Approach to Measurement." *Econometrica* 44:2.

Sumner, Andy (2012). Where do the poor live? *World Development*,40(5), 865-877.

Sumner, Andy (2010). Global Poverty and the New Bottom Billion: What if Three- Quarters of the World's Poor Live in Middle- income Countries? *IDS Working Papers*,2010(349), 01-43.

UN (United Nations) and LAS (League of Arab States) (2013). Arab Millennium Development Goals Report: Facing Challenges and Looking beyond 2015. E/ESCWA/EDGD/2013/1.

UNDP (United Nations Development Programme) (2011) "Poverty Measurement in Iraq: Findings from Poverty Measurement Technical Committee meeting".

(2010). Human Development Report 2010. The Real Wealth of Nations: Pathways to Human Development

UNICEF (United Nations Children's Fund) (2011). Multi Indicator Cluster Survey (MICS), Iraq. Available from: http://mics.unicef.org/surveys

World Bank (2015). World Development Indicators. Available from: http://data.worldbank.org/news/release-of-world-development-indicators-2015

WHO (World Health Organization) (2014). Adolescent pregnancy: Fact sheet N°364. Updated September 2014.

Annex Tables

Table A.1: Dimensions and indicators in the suggested three levels MPI

	Indicators	MPI (comparable to OPHI-MPI)	MPI2	MPI3
Education	Years of schooling	Deprived if no adult household member has completed 5 years of schooling	Deprived if no adult household member has completed 8 years of schooling	Deprived if no adult household member has completed 12 years of schooling
	School attendance	Deprived if any school age (7 to 15) child is not attending school in grades 1 to 8 of school	Deprived if any child age (7 to 17) is not attending school	Deprived if any child age (7 to 17) is not attending school or If any child 7 to 17 years is two years or more behind in the right school grade
Health	Infant and child mortality	Deprived if any child (under age 5) has died in the family within 5 years prior to survey	Similar to level 1	Similar to level 1
	Nutrition	Deprived if any adult or child for whom there is nutritional information is child's height-for-age is below minus two standard deviations from the international median, adult BMI less than 18.5)	Deprived if any adult or child for whom there is nutritional information is child's height-for-age is or weight for age below minus two standard deviations from the international median, adult BMI less than 18.5)	Deprived if first or second level of deprivation or Weight for height above 2 SD of the median for children or adult BMI is 30 or above
	Immunization	-	Deprived if any child 12 months or more not fully immunized against BCG, DPT, polio and measles	If any child 12-23 months not fully immunized or If any child 24-59 months not fully immunized and did not take MMR and Hepatitis B
	Female health		Age of first pregnancy less than 18 years	Age of first pregnancy less than 18 years
Living Standards	Electricity (MPI)	Deprived if no electricity	Similar to level 1	Similar to level 1
	Drinking water (MPI)	Deprived if HH does not have access to clean water or more than 30 minutes' walk	Deprived if HH does not have well or public tap	Deprived if HH does not have piped water to house
	Sanitation (MPI)	Deprived if household toilet is shared with others who are not members of their household or used unimproved toilet	Similar to level 1	Similar to level 1
	Flooring (MPI)	Deprived if natural flooring (earth, sand, dung)	Deprived if earth or "rudimentary flooring" (wood planks/bamboo)	Deprived if earth or "rudimentary flooring" or "cement floor/asphalt"

	Cooking fuel (MPI)	Deprived if the household cooks with wood, charcoal or dung and does not have a designated space for cooking	Similar to level 1	Similar to level 1
	Assets ownership (MPI)	Not having at least one asset related to access to information (radio, TV, telephone, internet, computer, tablet) and not having at least one asset related to mobility (bike, motorbike, car, truck, animal cart, motorboat) and at least one asset related to livelihood (refrigerator, arable land, livestock. AC, heater)	Not having at least one asset related to access to information (radio, TV, telephone, internet, computer, tablet) and not having at least one asset related to mobility (bike, motorbike, car, truck, animal cart, motorboat) and at least one asset related to livelihood (refrigerator, arable land, livestock. AC, heater)	Not having at least one asset related to access to information (radio, TV, telephone, internet, computer, tablet) and not having at least one asset related to mobility (bike, motorbike, car, truck, animal cart, motorboat) and at least one asset related to livelihood (refrigerator, arable land, livestock. AC, heater)

Source: Authors

Table A.2: MPI and its distribution across dimensions by quintile and rural/urban for Jordan

	Headcount	Intensity	MPI	Education Share	Health Share	Living standard Share
			MPI1			
Q1	4.6%	35.0%	0.016	37.6	56.7	5.7
Q3	0.9%	38.0%	0.003	24.2	75.4	0.4
Q5	0.5%	33.8%	0.002	39.1	59.2	1.7
Urban	1.7%	34.9%	0.006	26.9	72.7	0.4
Rural	1.6%	34.9%	0.006	1.4	98.6	0.0
Total	1.6%	34.9%	0.006	32.3	64.1	3.5
			MPI2			
Q1	9.7%	37.3%	0.036	50.9	43.3	5.8
Q3	2.8%	36.2%	0.010	46.7	53.3	0.1
Q5	0.5%	33.8%	0.002	54.0	44.3	1.7
Urban	3.9%	35.8%	0.014	47.1	51.1	1.8
Rural	3.2%	37.2%	0.012	6.3	93.7	0.0
Total	3.8%	36.0%	0.014	49.0	47.6	3.4
			MPI3			
Q1	35.1%	40.3%	0.142	55.1	38.0	6.9
Q3	15.2%	38.0%	0.058	53.5	45.4	1.2
Q5	5.0%	34.3%	0.017	55.3	43.1	1.6
Urban	17.1%	38.6%	0.066	50.1	49.1	0.8
Rural	18.8%	37.5%	0.071	43.9	55.4	0.6
Total	17.4%	38.4%	0.067	53.6	42.8	3.6

Source: ibid

Table A.3:MPI and its distribution across dimensions by quintile and rural/urban for Iraq

	Headcount	Intensity	MPI	Education Share	Health Share	Living standard Share
				MPI1		
Q1	18.9%	41.1%	0.078	26.4	47.0	26.7
Q3	8.9%	38.7%	0.034	34.5	55.6	9.9
Q5	4.1%	36.4%	0.015	32.5	58.4	9.1
Urban	7.2%	38.1%	0.027	30.9	61.9	7.2
Rural	16.7%	40.5%	0.067	25.3	70.4	4.2
Total	10.0%	39.3%	0.039	29.7	54.7	15.6
				MPI2		
Q1	31.0%	43.0%	0.133	37.5	38.3	24.2
Q3	17.6%	39.1%	0.069	48.5	42.3	9.2
Q5	7.1%	38.2%	0.027	47.1	44.6	8.3
Urban	14.2%	39.5%	0.056	45.0	48.1	6.9
Rural	27.4%	41.9%	0.115	40.9	54.7	4.4
Total	18.2%	40.6%	0.074	43.2	43.0	13.8
				MPI3		
Q1	43.5%	44.9%	0.195	42.2	35.0	22.8
Q3	30.0%	40.5%	0.122	52.6	37.6	9.8
Q5	13.3%	38.9%	0.052	52.7	39.0	8.3
Urban	24.8%	40.4%	0.100	51.3	41.5	7.2
Rural	40.1%	43.6%	0.175	47.5	48.0	4.5
Total	29.4%	41.7%	0.123	48.7	38.5	12.8

Source:ibid

Table A.4MPI and its distribution across dimensions by quintile and rural/urban for Morocco

	Headcount	Intensity	MPI	Education Share	Health Share	Living standard Share
				MPI1		
Q1	35.9%	44.6%	0.160	22.7	34.2	43.0
Q3	4.7%	36.0%	0.017	36.7	57.1	6.2
Q5	0.9%	34.8%	0.003	32.2	63.8	4.1
Urban	7.2%	38.1%	0.028	36.5	50.7	12.9
Rural	16.7%	40.5%	0.067	25.4	38.3	36.3
Total	10.6%	42.4%	0.045	26.5	39.5	34.0
				MPI2		
Q1	51.3%	44.3%	0.227	26.1	27.7	46.2
Q3	8.3%	37.3%	0.031	43.2	47.7	9.1
Q5	2.3%	34.7%	0.008	53.8	43.7	2.5
Urban	5.1%	36.7%	0.019	45.8	38.4	15.8
Rural	31.3%	43.0%	0.134	29.3	31.6	39.1
Total	16.8%	41.9%	0.070	31.7	32.6	35.7
				MPI3		
Q1	53.5%	45.1%	0.241	26.0	32.0	48.1
Q3	13.3%	38.0%	0.051	70.6	73.9	19.7
Q5	5.3%	34.4%	0.018	124.1	97.9	4.3
Urban	9.5%	37.1%	0.035	44.8	39.1	16.1
Rural	34.6%	43.7%	0.151	28.3	34.4	37.2
Total	20.7%	42.0%	0.087	39.6	43.9	40.2

Source: ibid

Table A5: Significant differences between deprivation levels of indicators by wealth status in Jordan, using t-test (at α = 0.05)

Wealth Status	MPI1	MPI2	MPI3	MPI1 to 2	MPI12 to 3
School Attendance					
Q1	0.0832	0.1704	0.1883	*	*
Q2	0.0496	0.1079	0.1219	*	*
Q3	0.0330	0.0756	0.0855	*	*
Q4	0.0193	0.0600	0.0650	*	non-sig
Q5	0.0102	0.0242	0.0297	*	*
Total	0.0390	0.0875	0.0980	*	*
Years of schooling					
Q1	0.0360	0.1003	0.5699	*	*
Q2	0.0090	0.0402	0.4210	*	*
Q3	0.0046	0.0257	0.3212	*	*
Q4	0.0035	0.0117	0.1931	*	*
Q5	0.0001	0.0055	0.0650	*	*
Total	0.0106	0.0366	0.3138	*	*
Water					
Q1	0.2147	0.2147	0.2203	non-sig	non-sig
Q2	0.3863	0.3863	0.3876	non-sig	non-sig
Q3	0.5318	0.5318	0.5338	non-sig	non-sig
Q4	0.6006	0.6006	0.6045	non-sig	non-sig
Q5	0.6336	0.6336	0.6338	non-sig	non-sig
Total	0.4736	0.4736	0.4762	non-sig	non-sig
Flooring					
Q1	0.0043	0.0043	0.1713	non-sig	*
Q2	0.0000	0.0000	0.0350	non-sig	*
Q3	0.0000	0.0000	0.0109	non-sig	*
Q4	0.0000	0.0000	0.0022	non-sig	*
Q5	0.0000	0.0000	0.0006	non-sig	*
Total	0.0009	0.0009	0.0439	non-sig	*
Asset Ownership					
Q1	0.0692	0.0928		*	
Q2	0.0057	0.0072		non-sig	
Q3	0.0027	0.0052		*	
Q4	0.0018	0.0029		*	
Q5	0.0000	0.0003		*	
Total	0.0158	0.0216		*	
Malnutrition					
Q1	0.1070	0.1156	0.3313	*	*
Q2	0.0716	0.0763	0.3063	non-sig	*
Q3	0.0673	0.0723	0.2656	non-sig	*
Q4	0.0642	0.0692	0.2542	non-sig	*
Q5	0.0518	0.0521	0.2057	non-sig	*
Total	0.0724	0.0771	0.2726	*	*

Table A6: Significant differences between deprivation levels of indicators by wealth status in Iraq using t-test (at α = 0.05)

Wealth Status	MPI1	MPI2	MPI3	MPI1 to 2	MPI12 to 3
			School Attendance		
Q1	.2099	.2994	.4355	*	*
Q2	.1817	.2818	.3883	*	*
Q3	.1607	.2745	.3769	*	*
Q4	.1326	.2261	.3134	*	*
Q5	.0613	.1359	.1924	*	*
Total	.1492	.2435	.3413	*	*
			Years of schooling		
Q1	.0336	.1871	.2716	*	*
Q2	.0285	.1920	.3223	*	*
Q3	.0127	.1308	.2610	*	*
Q4	.0066	.0849	.2013	*	*
Q5	.0014	.0367	.0951	*	*
Total	.0166	.1263	.2302	*	*
			Water		
Q1	.5525	.6136	.7279	non-sig	*
Q2	.3396	.3628	.4450	non-sig	*
Q3	.3091	.3192	.3576	non-sig	*
Q4	.2921	.3011	.3233	non-sig	*
Q5	.2322	.2341	.2426	non-sig	non-sig
Total	.3451	.3662	.4193	non-sig	*
			Flooring		
Poorest	.2321	.2333	.2337	non-sig	non-sig
Q1	.0068	.0076	.0093	non-sig	non-sig
Q2	.0012	.0023	.0035	non-sig	non-sig
Q3	0.0000	0.0000	.0002	non-sig	non-sig
Q4	0.0000	0.0000	.0007	non-sig	*
Total	.0480	.0486	.0495	non-sig	non-sig
			Asset Ownership		
Q1	.1159	.1594		*	
Q2	.0364	.0429		non-sig	
Q3	.0169	.0173		non-sig	
Q4	.0010	.0011		non-sig	
Q5	.0004	0.0000		non-sig	
Total	.0341	.0442		*	
			Malnutrition		
Q1	.2489	.2736	.3537	*	*
Q2	.2124	.2304	.3164	*	*
Q3	.1890	.2067	.2842	*	*
Q4	.1694	.1821	.2640	*	*
Q5	.1404	.1510	.2345	*	*
Total	.1920	.2088	.2906	*	*

Table A7: Significant differences between deprivation levels of indicators by wealth status in Morocco using t-test (at α = 0.05)

Wealth Status	MPI1	MPI2	MPI3	MPI1 to 2	MPI12 to 3
			School Attendance		
Q1	.2843	.4099		*	
Q2	.1735	.3024		*	
Q3	.0994	.1960		*	
Q4	.0568	.1337		*	
Q5	.0240	.0613		*	
Total	.1276	.2206		*	
			Years of schooling		
Q1	.0091	.0164	.0187	*	non-sig
Q2	.0266	.0592	.0786	*	*
Q3	.0330	.0925	.1429	*	*
Q4	.0320	.0975	.1818	*	*
Q5	.0136	.0560	.1579	*	*
Total	.0229	.0643	.1160	*	*
			Water		
Q1	.7701	.8541	.8592	*	non-sig
Q2	.4526	.5880	.6597	*	*
Q3	.1778	.2567	.3142	*	*
Q4	.0601	.0939	.1032	*	non-sig
Q5	.0547	.0653	.0625	*	non-sig
Total	.3029	.3715	.3997	*	*
			Flooring		
Q1	.6008	.6299	.6299	*	non-sig
Q2	.1720	.1796	.1796	non-sig	non-sig
Q3	.0395	.0457	.0457	non-sig	non-sig
Q4	.0158	.0169	.0171	non-sig	non-sig
Q5	.0093	.0111	.0111	non-sig	non-sig
Total	.1674	.1765	.1765	*	non-sig
			Asset Ownership		
Q1	.1538	.3140		*	
Q2	.1540	.2005		*	
Q3	.0677	.0951		*	
Q4	.0060	.0099		*	
Q5	.0003	.0009		non-sig	
Total	.0764	.1240		*	
			Malnutrition		
Q1	.2059	.2197	.2963	*	*
Q2	.1145	.1183	.2101	non-sig	*
Q3	.0659	.0698	.1571	non-sig	*
Q4	.0463	.0491	.1406	non-sig	*
Q5	.0347	.0376	.1120	non-sig	*
Total	.0934	.0989	.1832	*	*

Annex Graphs

Figure A.1: Headcount poverty, MPI (1 to 3) for the school attendance indicator by household size

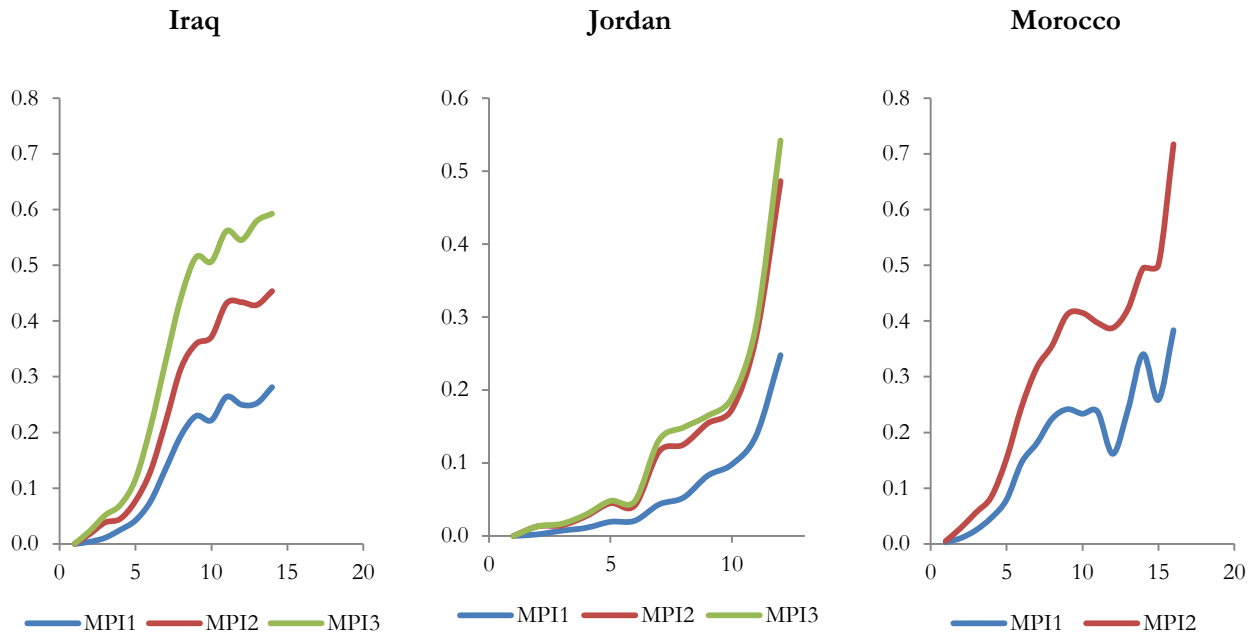


Figure A.2: Headcount poverty, MPI (1 to 3) for the school attendance indicator by place of residence

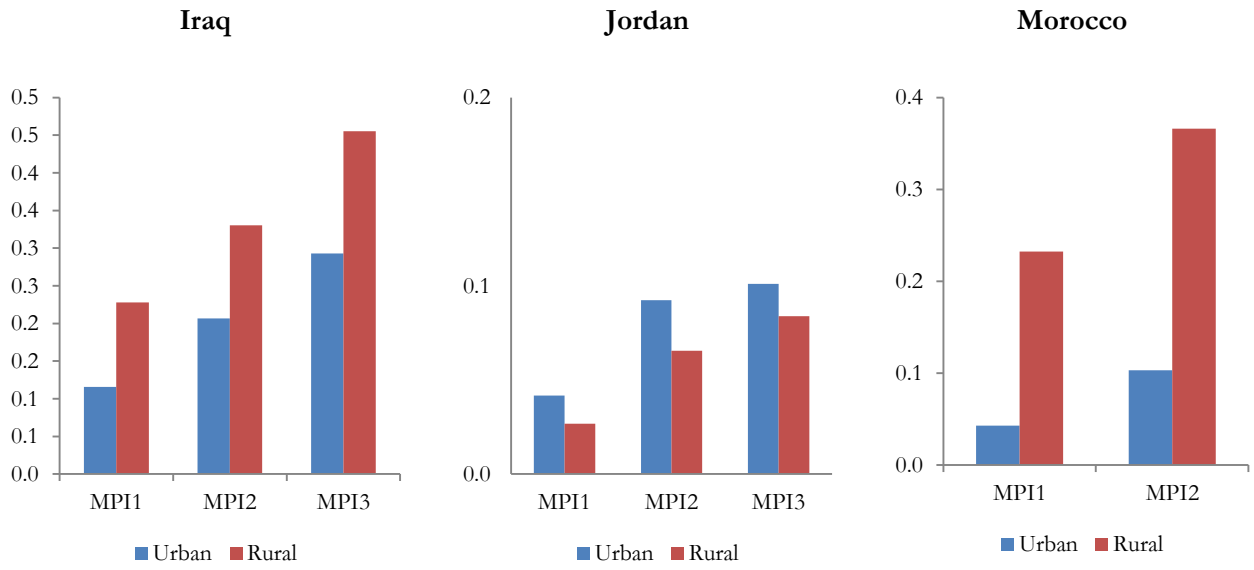


Figure A.3: Headcount poverty, MPI (1 to 3) for the nutrition indicator by household size

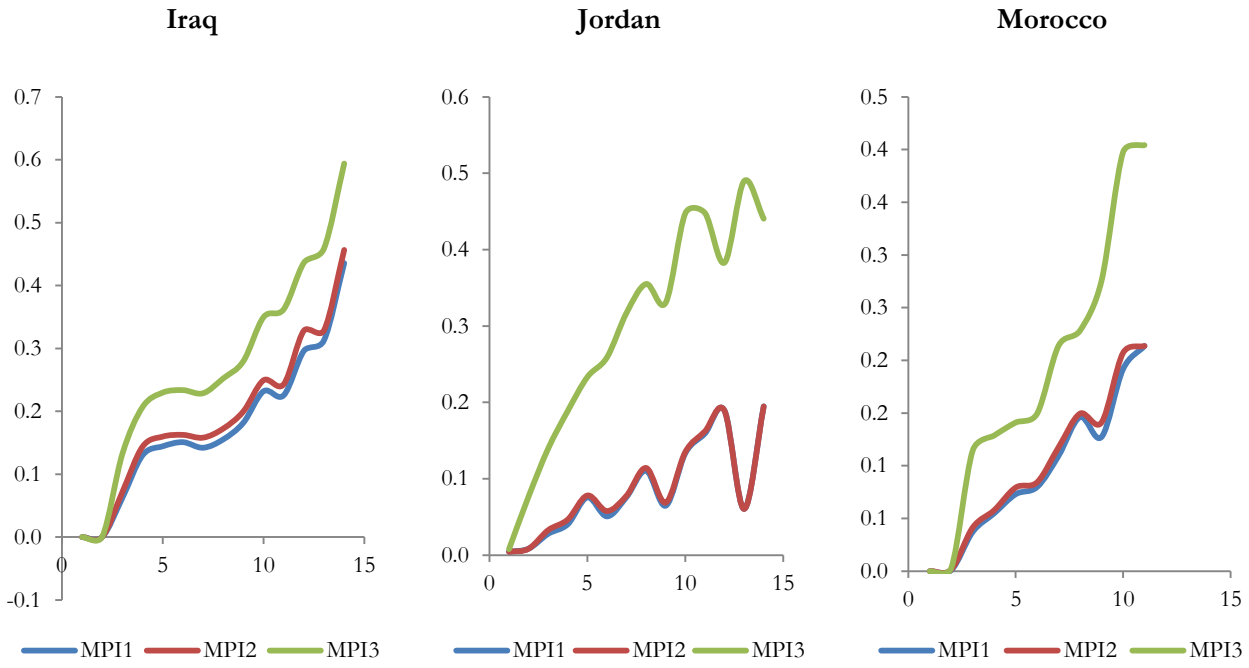


Figure A.4: Headcount poverty, MPI (1 to 3) for the three levels of the nutrition indicator by place of residence

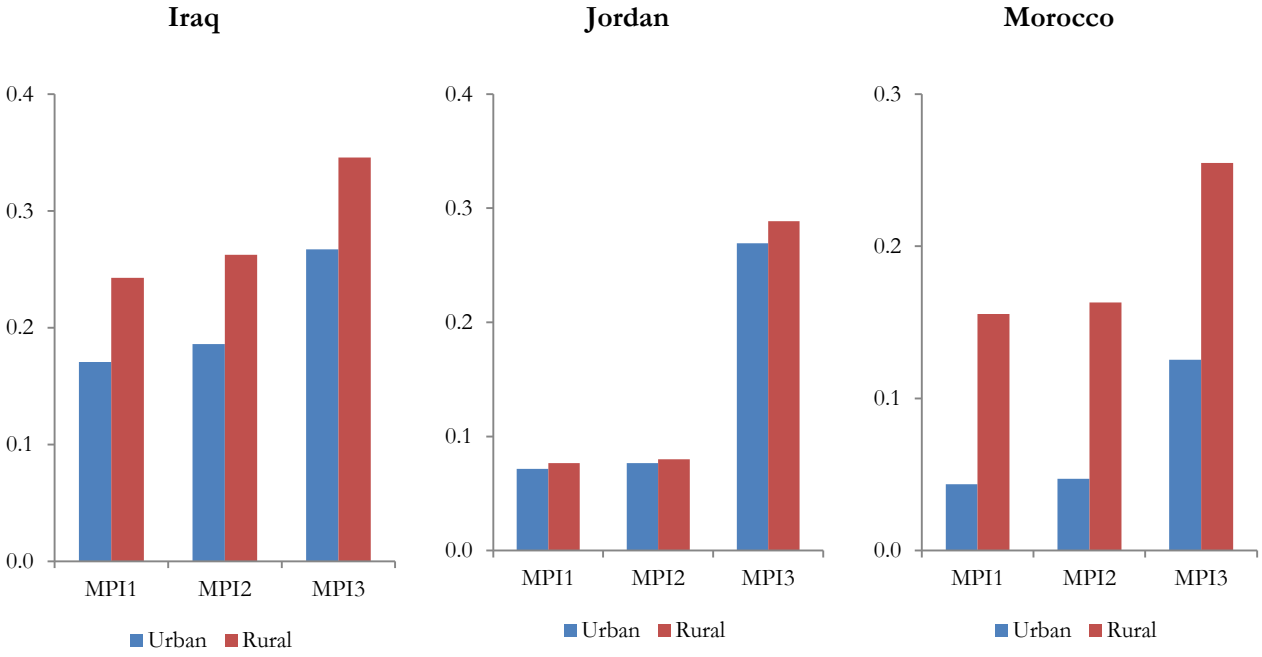


Figure A.5: Headcount poverty, MPI (1 to 3) for the water indicator by household size

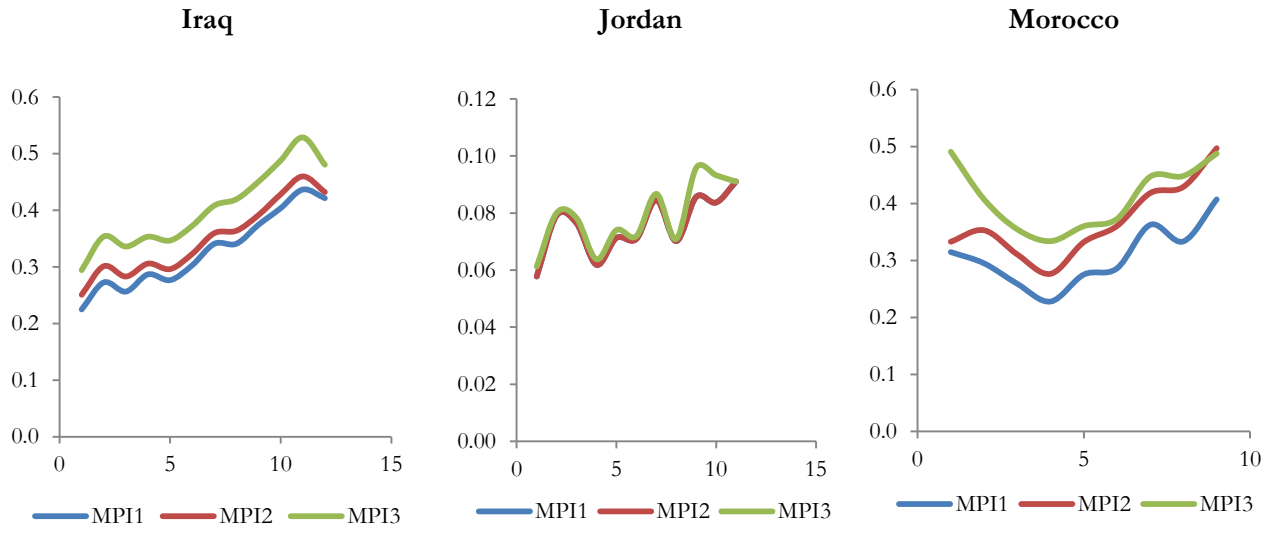


Figure A.6: Headcount poverty, MPI (1 to 3) for the water indicator by place of residence

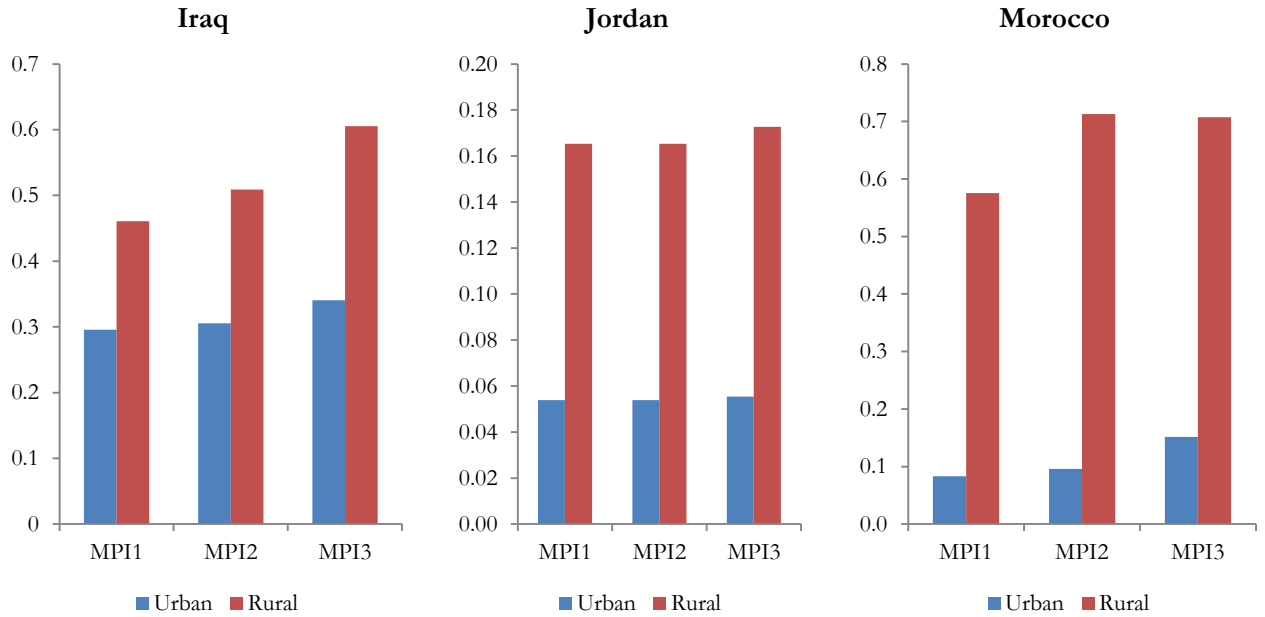


Figure A.7: Headcount poverty, MPI (1 to 3) for the floor indicator by household size

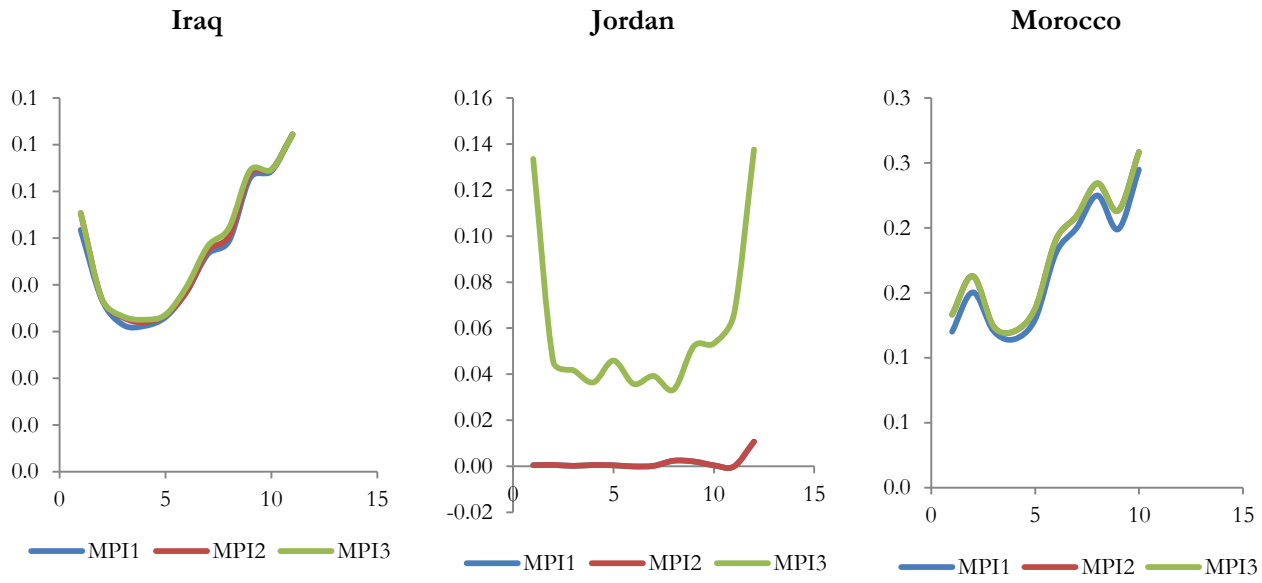


Figure A.8: Headcount poverty, MPI (1 to 3) for the floor indicator by place of residence

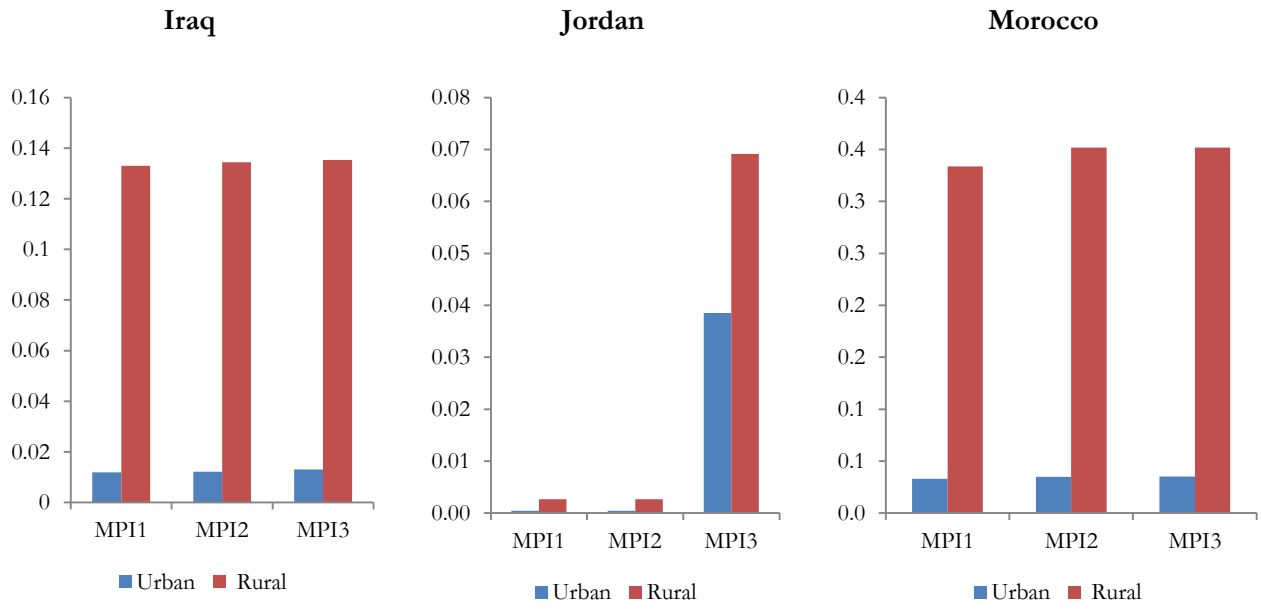


Figure A.9: Headcount poverty, MPI (1, 2) for the asset indicator by household size

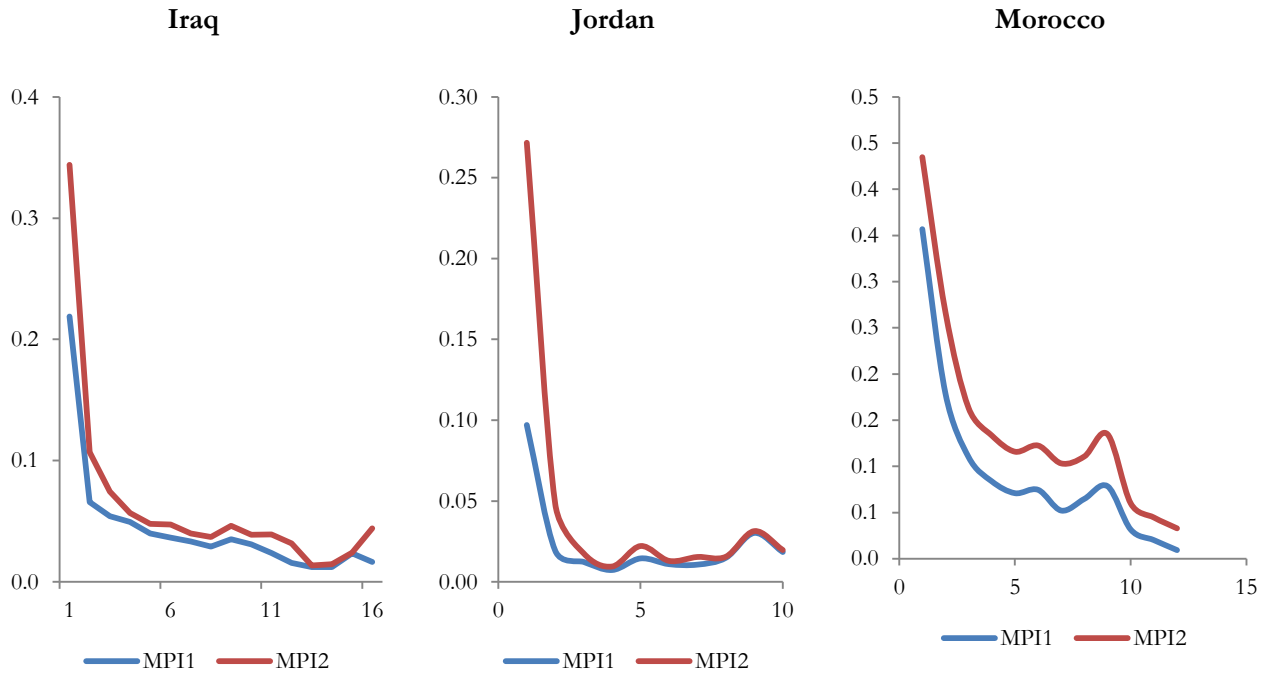


Figure A.10: Headcount poverty, MPI (1, 2) for the asset indicator by place of residence

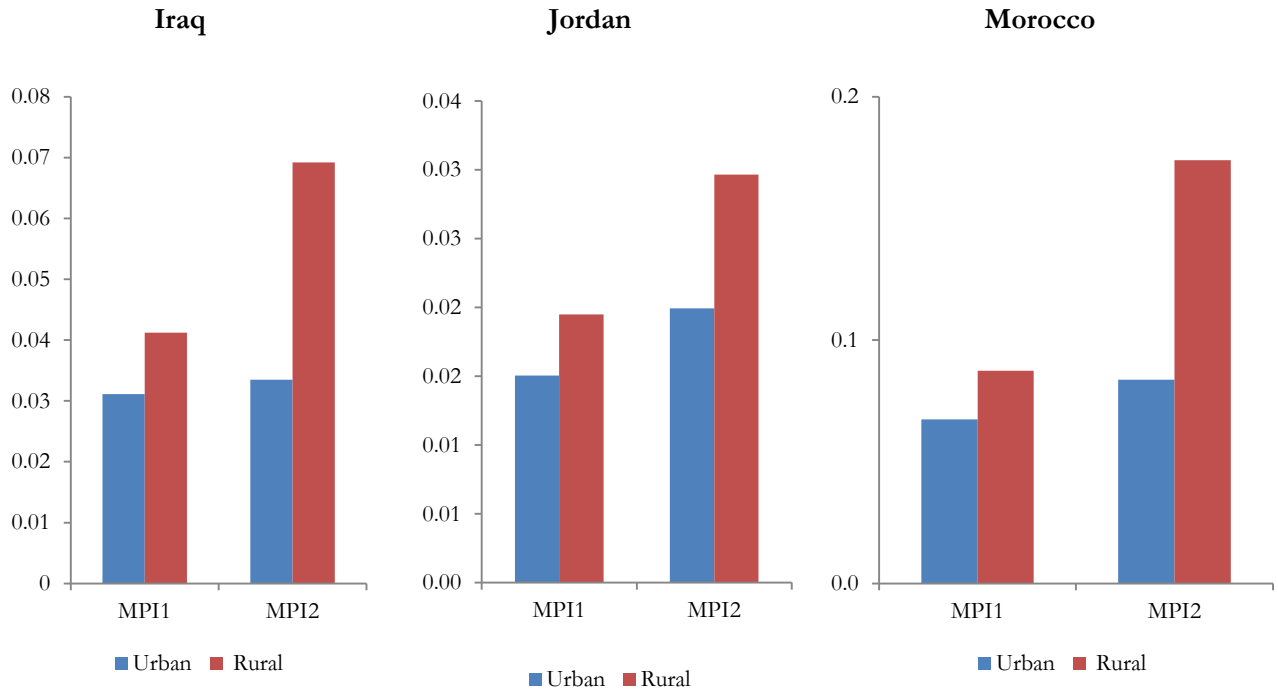


Figure A.11: Headcount poverty, MPI (1 to 3) at different cutoff points by wealth quintiles

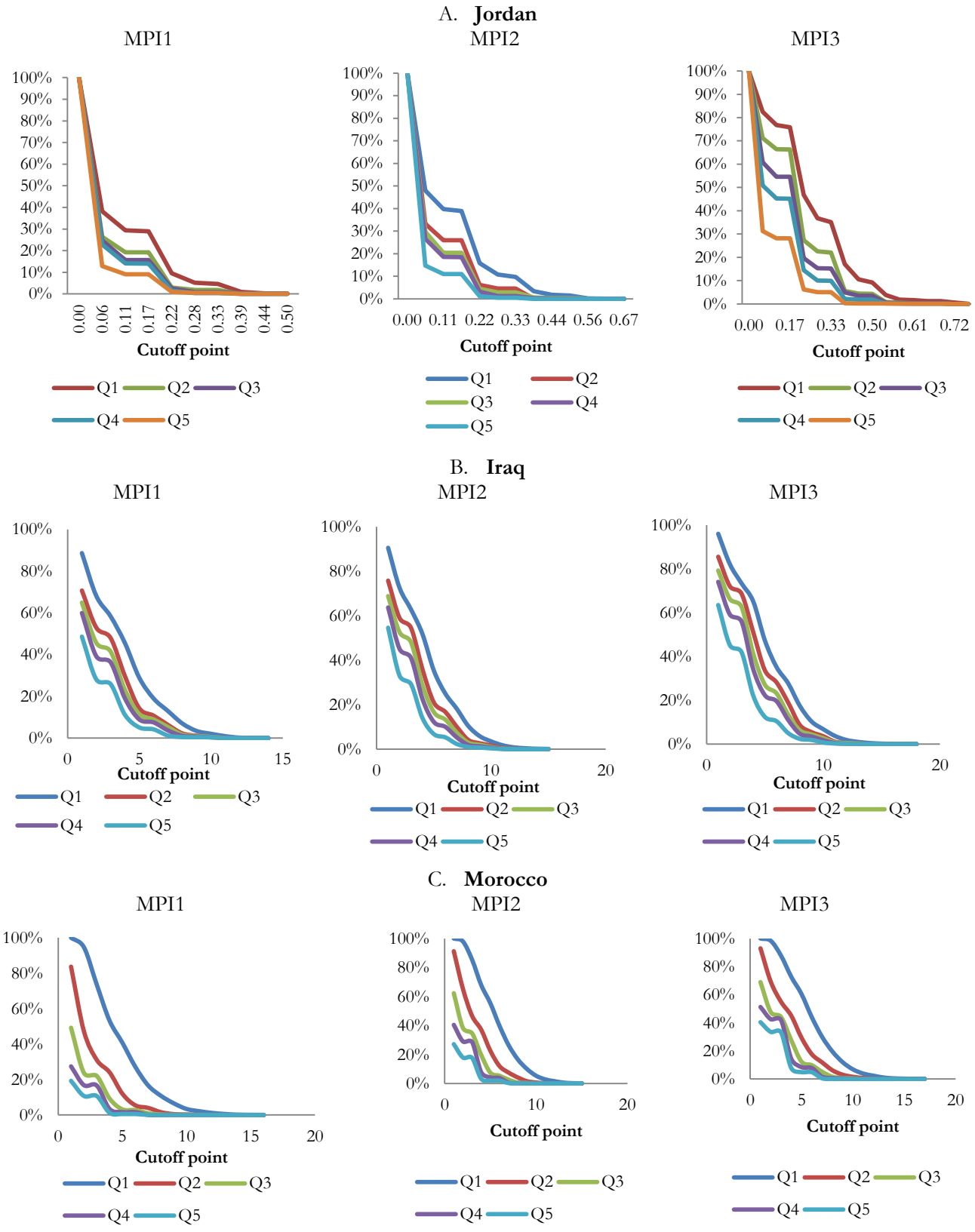


Figure A.12: Headcount poverty, MPI (1 to 3) at different cutoff points by place of residence