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Abstract

Studies of economic inequality have traditionally relied on income or consumption as their welfare aggregate. This is problematic, because households choose their labor market participation, and smooth their consumption over time based on their wealth. Neither income nor consumption measures welfare or inequality perfectly. Wealth must be accounted for as an economic outcome as well as a driver of lifetime opportunities. Since wealth is distributed more widely, and is related positively to income and consumption, overall inequality is likely to exceed inequality measured by income or consumption alone.

We use panel surveys and wealth indexes based on productive and non-productive household assets to examine economic inequality in four MENA countries – Egypt, Ethiopia, Jordan and Tunisia. Wealth distribution and households' economic mobility are evaluated across surveys. To mitigate ordinality of wealth indexes, they are benchmarked by applying relative asset prices estimated in one survey to other surveys.

We report the degree of wealth inequality within and across countries, and across regional and demographic dimensions. In Egypt and Ethiopia, households' revealed welfare changes over time are discussed. Wealth distributions are juxtaposed with the distributions of household earnings and consumption to gauge the degree of multidimensional inequality. The relationship between productive and non-productive assets is assessed.

We find that the wealth index is distributed widely in Ethiopia and Tunisia, and more moderately in Egypt and Jordan. Wealth is subject to great urban–rural and educated-uneducated gaps. In Egypt and Ethiopia wealth rose for the majority of households over time, making them better off, but consistently fell for the poorest ventile. Wealth and earnings are positively correlated for individual households, but have different aggregate distributions, subject to different trends over time. Finally, productive and non-productive assets are substitutes bought by different households for different purposes, with different implications for welfare and inequality.

JEL Classifications: D31, D63, N35

Keywords: multidimensional inequality; asset-based wealth; quantity indexes of wealth; MENA.

ملخص

درجت الدراسات الخاصة بعدم المساواة الاقتصادية، من الناحية التقليديَّة، على الاعتماد على الدخل أو الاستهلاك للتعرف على مجمل الرفاهية. وهذا أمر محفوف بالمشاكل لأن الأسر تختار المشاركة في سوق العمل، وتقوم بضبط استهلاكها على أساس ثروتها مع مرور الوقت. فلا الدخل ولا الاستهلاك وحده يقيس مجمل الرفاهية أو عدم المساواة تماما. لذا يجب اعتبار الثروة بمثابة نتيجة اقتصادية كونها محرك الفرص طوال الحياة. وبما أن الثروة موزعة توزيعا واسعا، وترتبط ارتباطاً إيجابياً بالدخل والاستهلاك، فمن المرجح أن يتجاوز إجمالي عدم المساواة ما يتم قياسه بالدخل أو الاستهلاك وحده.

تستخدم الدراسة استطلاعات رأي ومؤشرات الثروات على أساس ما يتوفر للأسر المعيشية من أصول إنتاجية وغير انتاجية لدراسة عدم المساواة الاقتصادية في أربعة بلدان في منطقة الشرق الأوسط وشمال أفريقيا وهي مصر وإثيوبيا والأردن وتونس. ويتم تقييم توزيع ثروة الأسر وحراكها الاقتصادي من خلال تلك الاستطلاعات. وللتخفيف من رتابة مؤشرات الثروة، نقيسها بتطبيق أسعار الأصول النسبية المقدرة في استطلاع واحد على الاستطلاعات الأخرى.

ونورد ما نصل إليه بشأن درجة عدم المساواة في الثروة داخل البلدان نفسها وبين البلدان بعضها البعض، وعبر الأبعاد الإقليمية والديموغرافية. ففي مصر وإثيوبيا نناقش التغيرات التي طرأت في الأسر المعيشية مع مرور الوقت. ثم نضع توزيع الثروات مقابل توزيعات أرباح الأسر واستهلاكها لقياس درجة عدم المساواة المتعددة الأبعاد. ويتم تقييم العلاقة بين الأصول المنتجة وغير المنتجة.

نجد أن مؤشر الثروات موزع على نطاق واسع في إثيوبيا وتونس، ولكن بشكل أكثر اعتدالا في مصر والأردن. كما تبين الثروة فجوات شاسعة بين المناطق الحضرية والمناطق الريفية وبين المتعلمين وغير المتعلمين. في مصر وإثيوبيا ارتفعت الثروة لغالبية الأسر المعيشية مع مرور الوقت، مما جعلها أفضل حالا، بينما انخفضت ثروة الفئات الأكثر فقرا باستمرار. وترتبط الثروة والمكاسب بشكل إيجابي بالنسبة لأسر فردية، ولكن بتوزيعات مجمعة مختلفة حيث تخضع لاتجاهات مختلفة مع مرور الوقت. وأخيراً، تعتبر الأصول الإنتاجية وغير الإنتاجية بدائل اشترتها أسر مختلفة لأغراض مختلفة، ولهذا تختلف آثارها على الرفاهية وعدم المساواة.

1. Introduction

Inequality in the Middle East and North Africa (MENA) is low compared to other developing regions, and has been declining over time. Bibi and Nabli (2010) reviewed the evidence of inequality in the region and concluded that MENA countries in particular fall within the range of countries with moderate inequality, when compared to other regions such as East Asia, Latin America, South Asia and Sub Saharan Africa. Inequality measures based on both the Gini coefficient and the share of income of the top to bottom deciles have been declining over time. These findings are echoed in several recent studies robust to various measurement issues pertaining to data quality, survey representation and non-response (Ncube and Anyanwu 2012; Alvaredo and Piketty 2014; Assaad et al. 2016; Ianchovichina et al. 2015; Hlasny and Intini 2015; Hlasny and Verme 2018). By contrast, the popular perception among large segments of the population in the region is that inequality is high and increasing, and that this high inequality was a prime reason for the popular uprisings erupting in 2011 and the following years (Verme et al. 2014; Arampatzi et al. 2015).

The apparent puzzle, of low and declining inequality and high perception of inequality as reported on values surveys, has lead researchers to consider other notions of inequality such as inequality of opportunity. The prevalent perception that circumstances and particularly connections matter a lot for one's economic success. A recent study utilizing measures of life satisfaction as measured in values surveys has found that people's satisfaction in the region is negatively affected by perceptions of high inequality of opportunity as reflected in cronyism and *wasta* (or connections with the well-off and powerful in society). These make it difficult for people to succeed even when working hard (Arampatzi et al. 2015; Ianchovichina 2017).

Studies using household surveys have attempted to separate observed inequality into a portion due to circumstances, considered "bad inequality", and that due to effort, considered "good inequality" in the sense that more of it reinforces the incentives to acquire higher levels of human capital and to work harder, which are beneficial to growth (El Enbaby and Galal 2015; Assaad et al. 2016). Perpetuating the puzzle, their results indicate that inequality is explained largely by variables measuring effort such as education, and not predominantly by circumstances into which one was born such as parents' education or job status. This would imply that a person's position is not a predetermined state, and that those who work hard can hope to be rewarded appropriately. The observable inequality of opportunity is thus not an answer to the inequality puzzle, and is instead yet another piece in it.

The choice of welfare aggregate has been found to influence the observed degree of inequality. Most studies of inequality rely on household surveys and use expenditure or income data as the best available indicators of household welfare (Deaton and Zaidi 2002). Expenditure is usually considered a better indicator of short term welfare since it is typically smoother, as predicted by the hypotheses of permanent income and declining marginal propensity to consume. Even though income is easier to recall, it fluctuates over time more than expenditure depending on job stability and season and therefore does not closely reflect contemporaneous welfare. Both income and expenditure may suffer from underreporting and systematic non-response. Expenditure may also underestimate current consumption since many items that households purchase like consumer durables can be consumed over long periods of time, well beyond the current year (Ward 2014; Aguiar and Bils 2015). The value of rented property, property that was purchased at a previous date but is being "consumed" today such as housing, and consumption not funded by explicit outlays in a given year also present challenges with relying solely on this type of data. These problems are especially pertinent to the richest groups and ignoring them can underestimate inequality.

Accounting for households' accumulated wealth and assets in possession can address some of these problems, and is generally important for a number of reasons. Conceptually, households'

command of productive and non-productive assets can alter their functionings and hence their wellbeing, and should be incorporated into the welfare aggregate. Wealth is not only an economic outcome but also a productive factor and an important driver of lifetime and intergenerational opportunities. Studies from across developing countries have found that inequality in assets affects individuals' investment in physical and human capital in developing economies with imperfect markets and imperfect enforcement of contracts (Birdsall and Londono 1997; Bardhan 1999), and leads to inequality in individuals' early-life as well as lifetime achievements.

Distribution of wealth in a population also has macroeconomic implications. Weil (2009) reviewed the channels identified in existing growth models in relation to global disparities. Jayadev et al. (2007) identified a positive association between inequality of households' wealth and economic growth across Indian states. Klasen et al. (2017) described how concentration of wealth and income in society affects detrimentally social progress by retarding economic growth, increasing poverty rate, restraining social and intergenerational mobility, hijacking public policies in favor of the rich, leading to political and social polarization, discouraging social cooperation and coordination, and weakening of the social compact.

Moreover, empirical evidence in the MENA region suggests that wealth may be an important dimension of inequality, and a factor helping to resolve the inequality puzzle. Wealth is distributed very unequally in several MENA countries, and interest earnings and capital gains are known to be captured poorly in income surveys (Alvaredo and Piketty 2014; Alvaredo et al. 2017; Assouad 2015; Ianchovichina 2017). In-depth evaluation of the effect of asset wealth on households' economic outcomes is thus warranted.

This paper contributes to existing literature in several respects. We use an alternative measure of welfare inequality, based on household asset holdings of both productive and non-productive assets. Productive assets have traditionally been omitted from the wealth index for lack of data. Asset holdings, like consumption, are smoothed by households across years, suggesting that the wealth index is a plausible indicator of households' contemporaneous welfare. Asset holdings are easier to observe and recall, and less prone to censoring by respondents or statistical agencies, and are therefore less susceptible to measurement errors than consumption.

We examine the inequality in household wealth and its variation across space and time in seven panel surveys from four MENA countries: Egyptian, Jordanian and Tunisian labor market panel surveys (LMPS), and Ethiopian Socio-economic Surveys (SES). These surveys are used as the only panel surveys with extensive information on household assets available for the region.[1] They are comparable in their content, sampling design and representativeness for national populations. Their panel component allows us to track households' asset ownership over time. While the four countries differ substantially in the stage of their economic development and political situation, they can be thought of jointly showing a mosaic of the conditions observed across the region. Because the countries are analysed separately, the choice of countries does not bias our results, but inference to the rest of the region must of course be done carefully.

We measure the degree of wealth inequality in national populations, across urban/rural, male/female, more/less educated, employed/unemployed households and other demographic groups, as well as between countries and years. Furthermore, we compare wealth distributions across countries and across years in Egypt and Ethiopia, using appropriately standardized asset weights, and discuss the implications of these results for households' welfare. Wealth distribution is juxtaposed with the distribution of household wage earnings or consumption to

[1] For completeness, Iraqi SES for 2006 and 2012 are also available, but they are not included in this study because of the unstable political situation on the ground, potentially affecting data quality and interpretation of results. Ethiopian SES for 2015, and Jordanian LMPS for 2014 are being made available in a preliminary version at the time of writing.

gauge the degree of multidimensional inequality. Lastly, the joint distribution of productive and non-productive assets is discussed.

To our knowledge, this is one of the first studies investigating wealth inequality across several MENA countries with different political, social and economic structures. It is also the first study using principal component analysis for one survey and applying the asset loadings to other surveys to derive a quasi-absolute measure of cross-survey differences in wealth distribution. Inquiry into multidimensional inequality is still in its infancy, and this study provides initial insights regarding the role of asset ownership, and specifically productive assets in overall inequality.

The remainder of the paper is organized as follows: Section II reviews the recent literature on wealth inequality with a special emphasis on evidence from the MENA. Section III outlines the methods for estimating household wealth, for measuring inequality across space and time, and for attributing wealth gaps to households' skills and differential opportunities. Section IV presents the main results, and section V concludes with key findings, their implications and further research directions.

2. Existing evidence of wealth inequality

Recent work of Emanuel Saez (2006), Anthony Atkinson et al. (2011) and Thomas Piketty (2014) has sparked popular discussion of income and wealth inequality, as evidenced by the voluminous literature tackling the issue of inequality over the past decade. They have collected and analysed data on top incomes from tax records as well as data on overall economic wealth for most advanced economies, recognizing the importance of analysing trends in assets beyond income to understanding overall inequality. A notable conclusion of their work is that while both income and wealth inequality declined consistently after World War II, the last three decades have witnessed a reversal of these trends in several advanced economies. As income inequality was rising gradually in the US over the past decades, wealth inequality – estimated based on a capitalized income method – was rising at an alarming rate, and has now reached levels similar to those at the dawn of the Great Depression (Saez and Zucman 2014).

Filmer and Pritchett (2001) proposed a method to calculate household wealth using principal component analysis (PCA) of household assets. They tested their method on surveys where both asset and expenditure information was available and found that the classification of households was similar based on the two methods. Sahn and Stifel (2003) showed that an asset index of wealth provides a good measure of households' poverty status. McKenzie (2005) used an asset index for Mexico to estimate the impact of this inequality on state-level school enrolment of boys. He found that even after controlling for household income and demographics, boys' school attendance was lower in Mexican states with higher wealth inequality.

Literature comparing wealth distribution across survey waves is in its infancy due to data and methodological limitations. One challenge is the need to anchor the respective ordinal wealth distributions using some external statistics on households at particular quantiles in the wealth distributions. Rutstein and Staveteig (2013) anchored their country-level wealth distributions by identifying the levels of asset holdings corresponding to various levels of absolute poverty or economic status in surveys, and then shifting and scaling individual national wealth distributions to ensure that wealth scores under each distribution were same for the various cut-off points. Ward (2014) used several index-calculation approaches on household-asset data in China to compare wealth inequality across years. He found that, unlike income inequality, wealth inequality was paradoxically declining in China.

Jayadev et al. (2007) had monetary values of all household assets at their disposal to study the evolution of the distribution of wealth over time across Indian states. They concluded that their

inequality results were underestimates, due to several limitations of using monetary measures of wealth. The limitations included mis-measurement of the monetary value of assets, under-reporting of wealth and debts, survey nonresponse of the wealthiest, and the need to deflate values using non-wealth based price indices.

Inequality research using wealth measures in the MENA region is scant. AlAzzawi (2015) and Ramadan et al. (2018) performed mean and quantile decompositions of income and expenditure inequality to examine the role of explained vs. unexplained factors on poverty and inequality across several demographic dimensions such gender as well as urban–rural residence. Relying only on income and expenditure data, their results suggested that the unexplained factors are becoming more important over time. Several studies have used an index of wealth to estimate poverty, economic and job mobility, and transitions in and out of poverty (AlAzzawi 2010). Osman et al. (2006) used a wealth index to develop a poverty targeting methodology in the absence of complete data on income and expenditure. Bérenger et al. (2013) used the correspondence analysis similar to PCA and an estimate of the typical order of acquisition of various assets by households in a country, to infer households' long-term economic status and the profile of households living in poverty in Egypt, Morocco and Turkey. Angeli (2009) and Hlasny (2017) used wealth quintiles to examine outcomes such as maternal and child health and female fertility using health surveys. None of these studies examined the distribution of wealth per se, or compared them across surveys.

El Enbaby (2012) assessed inequality of opportunity in wealth in Egypt in 2006 by constructing an asset index in the ELMPS. The share of inequality of opportunity from total wealth inequality in Egypt was estimated to amount to between 20% and 45% of total inequality in wealth, depending on the measure of inequality used. El Enbaby and Galal (2015) used ELMPS (1998-2012) to perform similar analysis using both wages and an asset-based wealth index. Circumstances were found to account for a minor portion of inequality of opportunity in both wages and wealth, but their role was three times as high for the wealth index.

3. Methods

Principal component analysis

Following Filmer and Pritchett (2001), a one-dimensional index of wealth is constructed based on households' all available assets. The wealth index w is obtained from the first component in the principal component analysis (PCA) of households' observable ownership of all productive and non-productive assets, including livestock, farm equipment and capitalization of firms owned by households. This first component can be expressed as the weighted sum of households' assets x_p (numbering P assets, $p \in P$), where x is a potentially non-integer stock of each asset. Asset ownership is standardized by the mean and standard deviation across households, and the weight (or loading) a_p on each standardized unit of asset p is selected to maximize sample variance of the index subject to $\Sigma_p a_p^2=1$:

$$w = \sum_p a_p \left(x_p - \overline{x_p}\right) \Big/ stdev\left(x_p\right) \quad (1)$$

Household level subscripts are omitted for simplicity. The PCA method assigns the highest weights to assets that vary most across households, thus informing on maximum discrimination in asset ownership between households, and allowing for heavy tails of the wealth distribution. By accounting for non-productive as well as productive household assets, and for business and farm assets, we expand on typical coverage in studies of household assets, and alleviate biases due to systematic differences between urban and rural households.[2] With the first principal

[2] As a by-product of this analysis, we could comment on errors introduced in wealth indexes when only domestic non-productive assets are accounted for; when household wealth, consumption or expenditure is normalized by household size; when asset ownership is observed as binary rather than as count; or when information in wealth indexes is reduced by reporting of only categorical indexes such as wealth quintiles.

component identified, we can compute the portion of the total variance in the observed variables that it accounts for, and the loadings of individual assets in it. Regression scores from the first principal component are used as the wealth index for each household.

One concern with the use of principal-component factor loadings a_p for various household assets is that the same loadings are applied to all households regardless of differentials in regional costs or typical quality, and all units of the same asset type (households' first and second car). These are restrictive assumptions, but without external information on systematic differences in values there may be no superior alternatives. Another problem is that individual assets may contribute systematically differently to the true wealth of, say, urban and rural, or rich and poor households.[3] For these reasons, principal component analyses are sometimes performed separately for urban and rural households, or wealth quantiles are identified separately among urban and rural households (but on the same nationwide wealth index) (Rutstein 2008). To evaluate how serious the urban–rural inconsistency is in our data, we pursue the first method to estimate a separate wealth index for each group. We then extrapolate the asset loadings among each group to the other group, and observe the resulting changes in the wealth distribution in each group, depending on whether the urban-only, rural-only or nationwide sets of loadings are used.

Wealth distribution within countries

By design, the estimated index is distributed around zero with unit variance, but may not be distributed normally or symmetrically, depending on the distribution of the stocks of all included assets. To facilitate interpretation vis-à-vis real-world distribution of wealth, the index is transformed to be bounded between 0 and 100:

$$\widetilde{w} = 100 \times {(w - \min w)}\Big/{(\max w - \min w)} \qquad (2)$$

This index measures the relative position of any household, in terms of wealth, in the range between the poorest and the wealthiest households. This transformation keeps relative distances between all scores unchanged, and does not affect the delineation of wealth quantiles. Setting the minimum to 0, implicitly assuming that the lowest true value of wealth in the sample is zero, also facilitates comparison of the distributions of wealth, income and consumption, and allows computing of selected inequality measures. In fact, the assumption of a zero-minimum wealth is plausible given that our analysis considers gross non-depreciated household assets rather than households' net worth and does not account for household debt or future liabilities, and given the high degree of poverty gaps in the MENA.[4]

Unfortunately, differences in wealth scores across households with different profiles of asset ownership are not amenable to cardinal interpretation. Asset loadings derived in PCA do not reflect precisely the real market values of individual asset types, and treat all units of each asset type as having the same value. Nevertheless, the shape of the wealth distribution can be informative of the degree of wealth concentration or polarization within a country. The wealth

[3] Size of dwelling is valued very differently across regions. Gas stove, flushing toilet and other appliances may have different installation and maintenance costs in urban and rural areas, and their production year and quality may vary systematically between urban and rural areas. Assets such as motorcycle may be associated with higher economic status in rural households (i.e., positive factor loading in a rural sample), but lower economic status in urban households (negative factor loading in an urban sample).
These problems are different from the issue of spatial cost differentials, and cannot be solved using spatial price indexes, because these are not disaggregated by commodity, do not apply to durables purchased in prior years etc.

[4] For example, the lowest-wealth household in the 1998 Egyptian survey owns 25% of capital in a co-owned firm worth 1000-4999LE, and owns a 2-room dwelling of 30m^2 with mud floor, brick and mud walls, wooden roof, water from a well, toilet connected to an indoor tank, and kerosene cooker. It has no other reported assets.
The lowest-wealth household in the 2006 Egyptian survey rents a 3-room dwelling of 40m^2 with a wooden roof, brick and mud walls, mud floor, electricity lighting, water tap connected to public network, toilet connected to an indoor tank.
The household owns a black-and-white TV, landline phone, small person-pulled cart, selected livestock, but no other assets.
Using the transformation in equation 2, these households are modelled as having zero wealth.

index can also preserve the correct ranking of households on the wealth scale, and can facilitate their classification into the correct wealth quantile groups.

Evolution of asset ownership over time

Since asset loadings vary across survey waves, wave-specific wealth indexes are not comparable across waves. McKenzie (2005:234) proposed pooling survey waves together, and estimating asset loadings and wealth index scores on the pooled dataset. This yields asset loadings which are weighted averages of the loadings across waves, weighted by sample sizes, asset ownership patterns and sampling weights in the respective waves. The problem is that these factor loadings – and by extension the resulting wealth index – may be biased and non-representative of the relative value of assets in any wave. Instead, we argue that using a single wave to derive asset loadings and applying them to the rest of surveys may be preferred. If we identify a survey in which the asset loadings are most relevant (e.g., recent wave), and estimated most precisely (e.g., largest sample, or most evenly distributed asset ownership), and apply these loadings to the stocks of assets owned in different waves, we could construct real-valued wealth indexes comparable across waves. Comparing surveys with similar underlying real values of assets – such as successive waves of same-country surveys – we could compare the respective imputed wealth distributions or evaluate growth of asset ownership over time in a country.

Estimating the asset loadings in alternative years and applying each set of loadings to other years allows us to derive growth incidence curves for wealth, and compute the Paasche and Laspeyres quantity indexes of asset ownership. Focusing on the changes in asset ownership at individual households, rather than nationwide, allows us to better capture changes in the distribution of wealth across years, and estimate households' revealed changes in welfare. The Paasche and Laspeyres quantity indexes can be computed as follows:

$$PI = \sum_p a_{p,t} x_{p,t} \Big/ \sum_p a_{p,t} x_{p,b} \tag{3}$$

$$LI = \sum_p a_{p,b} x_{p,t} \Big/ \sum_p a_{p,b} x_{p,b} \tag{4}$$

In these expressions, $a_{p,t}$ is the loading of asset *p* at time *t*, $x_{p,t}$ is the quantity of asset *p* owned at time *t*, the summations are over all *p* asset types, and *b* is the base year. Household-level subscripts are removed for simplicity. When the Paasche index for a household exceeds one, the household is said to reveal its preference for its stock of assets at time *t* over its stock in *b*, because both bundles ($x_{p,t}$ and $x_{p,b}\ \forall p$) are affordable to it at time *t*. Similarly, when the Laspeyres index is less than one, the bundle in year *b* is said to be revealed preferred to the bundle in *t*. Evaluating the Paasche and Laspeyres quantity indexes in tandem allows us to place bounds on the share of households made revealed-better off or worse off over time, when it is unclear which set of factor loadings and which set of assets (when some assets are surveyed only in some years) to use for the comparison.[5] Finally, to study the incidence of wealth growth across population, and to motivate the following analysis of wealth gaps between demographic groups, growth incidence curves are estimated.

To interpret changes in the wealth index across surveys in absolute terms, the extrapolation would require that the relative values of different asset types remain unchanged across surveys. This would require that different asset types are subject to the same price inflation, depreciation, replacement by households, as well as quality improvement over time. These are

[5] The Paasche and Laspeyres quantity indexes allow us to compute the Fisher quantity index as: $FI=(PI\times LI)^{½}$. This could be further used to compute the Elteto, Koves and Szulc quantity index for multilateral comparisons of quantities, which has certain robustness properties over competing quantity indexes (Hill 1997). In this study, in recognition of data limitations in all survey waves, only transparent, bilateral comparisons are performed using PI and LI.

restrictive assumptions for extrapolation across long spans of time or across dissimilar countries. These assumptions, however, are thought to be valid for the majority of durable assets across adjacent years or neighbouring countries. For surveys evaluated here, extrapolation of asset loadings within a single decade or across nearby Arab countries is thought to be appropriate.[6]

A more important problem with the extrapolation of asset loadings is that the set of surveyed assets changes across waves. Questions about new technology products (MP3 player/iPod, smartphone, internet, laptop) are introduced into surveys, but questions about old ones (landline, fax) are also sometimes retired. As a result, we cannot put value on some assets in comparison years, because their loadings are not imputed in the base year, and some asset loadings from the base year cannot be applied in comparison years for lack of asset-ownership data there. To tackle this issue, several alternative approaches can be taken. This study opts to use the survey wave with the larger number of asset types (typically the most recent survey) as the base year, and the ownership of assets missing in surrounding waves is imputed by extrapolation using the assumption of no change from the base year (i.e., no depreciation, no additional purchase, etc.). Ownership of new technological products is coded as zero in preceding years.[7]

Wealth gaps between demographic groups, and their vectors

Following the study of growth incidence of wealth and welfare, we evaluate wealth gaps across selected within-country demographic groups: urban/rural households, and households headed by married/unmarried, male/female, more/less educated, economically active/inactive, employed/unemployed, full-time/part-time employed, and employer/wage-worker heads. We report the prevalence of various demographic characteristics in each wealth-quantile group, and wealth gaps between the respective demographic groups across various percentiles of the groups' wealth distributions – the conditional-quantile wealth gaps.

Wealth distribution across countries

Comparing the levels of wealth and their distribution across countries is subject to the analogous challenges as comparing them between survey waves, but the assumptions imposed are more restrictive. The availability of assets, asset prices, and the typical quality and age of assets owned by households are likely to differ across countries in different stages of economic development, with different fiscal regimes and cultural norms. An additional problem is that different national statistical agencies choose to survey different sets of household assets using different survey questions.

Several factors mitigate these problems. Most assets evaluated here, including building materials, appliances, electronics, and farming equipment and even livestock are internationally tradable in competitive markets, and households across the MENA region have similar demands for them, so they are expected to carry similar real values across countries. As a notable exception, the values of land, real estate or basic public utilities clearly vary across countries. However, even for these assets, their values do not vary merely across countries, but also between urban and rural areas, across towns, and across individual neighborhoods in towns. The PCA does not account even for this within-country variation, even though this is deemed more serious than any cross-survey gaps in means.[8] Taking a conservative approach

[6] However, the 1988 wave of ELMPS is omitted, because the stock of assets surveyed in that wave is very limited, and the extrapolation of factor loadings from later waves is inappropriate due to the long interval in between.

[7] An alternative approach would be to use the survey with the most limited number of asset types as the base year, and assets unavailable there are omitted even in other waves, to preserve comparability. This is the approach taken in many previous studies, relying on a small but consistent set of asset types.

[8] In fact, the estimated values of individual housing and home-financing categories, dwelling area and land are rather consistent qualitatively as well as quantitatively across survey waves, and even across countries (table A2 in the annex). As a robustness check of the within-country variation in land values, we have performed PCA distinguishing urban land rent/ownership from rural land rent/ownership. We find that the estimated nationwide land value is almost entirely due to

in the following analysis, our benchmark specification treats all countries separately, and extrapolates asset loadings only across waves for the same country (i.e., Egypt or Ethiopia). Subsequently, we extrapolate asset loadings across Egypt, Jordan and Tunisia, since these countries are all geographically-proximate Arab countries with similar social norms, demographics and industrial composition. They are all in a transitional stage of development, with markets in similar types of assets, whose populations have similar distributions of needs and tastes.

ERF has performed thorough harmonization of LMPSs, with the result that 42 percent of all asset types are available among all of the recent LMPSs – the Egyptian (2006 and 2012), Jordanian (2010) and Tunisian (2014) surveys. Another quarter of all asset types are comparable among three of these four surveys, and another 15 percent of asset types are comparable between two surveys. Less than one-fifth of all asset types are unique to a particular survey wave, and thus cannot be used for extrapolation.[9]

Comparison of wealth distributions of adequate quality is thus possible between the Egyptian, Jordanian and Tunisian surveys. Egyptian 2012 LMPS is used as a benchmark, from which asset loadings are extrapolated to the rest of surveys. This choice reflects several advantages of the Egyptian 2012 survey: the largest sample of 12,060 households; the largest set of 94 asset types whose factor loadings can be estimated; and the largest set of asset types that are also present in other surveys and can thus be used for extrapolation.[10] Egypt 2012 is also the second most recent survey evaluated here, making the estimated asset loadings and wealth scores relevant to our understanding of today's society.

For assets missing from ELMPS 2012,[11] they are ignored even if surveyed in other waves, to preserve comparability of how inclusive the wealth indexes are. Since these assets typically have low economic value, their omission does not bias the estimation of wealth indexes in other surveys substantially. For assets missing in other waves but surveyed in ELMPS 2012,[12] they are imputed by extrapolation using two assumptions. One, in the case of ELMPS 2006, we assume no change in ownership from the 2012 base year (i.e., no depreciation, no additional purchase, etc.). Ownership of technological assets such as laptops, or internet access is set to zero in 2006. Two, in the case of Jordanian and Tunisian surveys, we apply to them not only asset loadings but also the average levels of ownership among urban/rural households from ELMPS 2012, accounting for sampling weights. This underestimates the degree of wealth inequality in Tunisia and particularly in Jordan (specifically the within-group inequality component among urban, and rural households), because the ownership for 12 asset types in the case of Tunisia, and 21 asset types in Jordan must be imputed using ELMPS 2012 urban/rural group averages. The wealth index in JLMPS and TLMPS is thus effectively based on fewer asset types varying across households. Nevertheless, the bias is thought to be modest

land in rural areas where nearly 90% of the instances of land rent/ownership occur. Urban land is estimated to carry higher value as expected. In what follows, urban and rural land will be used together because of the low prevalence of urban land rent/ownership, and because of potential estimation issues with such a dichotomous categorization of assets.

[9] This analysis excludes Ethiopian surveys because of inherent differences in survey design, coverage and economic conditions in the country. Egyptian 1988 and 1998 LMPSs are also excluded, because the majority of information-technology and productive assets are missing from those surveys (and in any case would carry vastly different factor loadings due to the idiosyncratic evolution of the costs of these assets over long time spans).

[10] Over one-half of asset types in Egypt 2012 are also surveyed in the Egyptian '06, Jordanian and Tunisian surveys, another 30 percent of assets are surveyed in two of the three other surveys, and 10 percent of assets are surveyed in one other survey. Less than 10 percent of assets included in Egypt 2012 are missing from all other surveys.

[11] That is: some categories of energy and water source, paying off of housing and rental of agricultural land, bookcase, fax, hair dryer, solar heater, vacuum cleaner, water filter, 'other equipment,' mill, some types of livestock (chickens, pigeons, rabbits, ducks, geese, turkeys and 'other'), and 'other agricultural equipment.'

[12] That is, in all surveys: DSL/USB internet and satellite external receiver, iPod/mp3 player, agricultural and non-agricultural projects, and farms. Moreover, in JLMPS and TLMPS: kerosene cooker, taxi, tuctuc and winnower. In JLMPS: number of rooms, bicycle, cart, truck, livestock feeder, sheep and camels, machine-pulled plow, poultry batter, thresher. In TLMPS: iron. In ELMPS 2006: housing type, oven, wireless internet, laptop, land.

on account of the fact that 70-80 asset types are observed precisely, and most of the assets with extrapolated ownership are of low economic value.

Multidimensional inequality

Since wealth measures just one dimension of wellbeing, it is important to consider the joint distribution of wealth and other welfare components, such as wage earnings available in LMPSs or total consumption expenditures in Ethiopian SESs, to see whether these dimensions have a complementary or substitution relationship – whereby one's current earning capacity (essentially capacity for the consumption of nondurables) is associated positively or negatively with existing ownership of durables. This, in turn, would affect our assessment of overall inequality. If accumulated wealth affects households' earning and discretionary spending capacity, the results can help us gauge the degree of inequality of opportunities.

We first compute Spearman's and Kendall's rank correlation between households' ranks on the wealth scale and on the scale of wage earnings (consumption, respectively). Second, density of households in the joint space of quantiles of the wealth and earnings distributions is reported (Fisher et al. 2016). Finally, for Egypt and Ethiopia, mobility of households across wealth and earnings quantiles over time is assessed. Because the wealth index represents gross household wealth in real terms, monthly earnings and consumption expenditures are also taken in real 2012 international purchasing-power parity dollars, and are added up to the household level. Earnings are before taxes and other income transfers. Like the wealth indexes, earnings and consumption are used without correction for regional spatial cost differentials.

Another test regards complementarity versus substitutability of households' non-productive and productive assets. Because these two forms are associated with different household capabilities and economic outcomes, we should identify them separately and evaluate their joint distribution. To this end, all household assets are classified as either productive or non-productive, and PCA is performed on each group separately to impute households' productive-asset and non-productive-asset wealth. Productive assets are those with clear potential to contribute to households' earning capacity, or allow households to substitute necessities offered in formal markets – goods and services that households typically buy if the respective assets are missing at home – with those produced at home. Means of transportation and two-way communication, agricultural equipment, sewing and weaving machines, and livestock are classified as productive assets. All other assets, including cooking appliances, one-way information sources such as TV, or home furnishings are classified as non-productive, because they are typically not used as sources of earnings. If these assets are absent, households typically have alternatives beside purchasing them in markets to satisfy the respective consumption needs. This classification thus recognizes the potential of assets to be put to productive uses, not their actual productive use in any household.[13] The background and important features of the available data, particularly data on various types of household assets, and on earnings and consumption, are reviewed in the annex and table A1.

4. Results

Principal component analysis

Table 1 presents standard measures of performance of the principal component analysis. The table shows the portion of variance among all combinations of asset ownership explained by the PCA; the relative performance of the best-fitting principal component relative to the mean performance of all principal components (eigenvalue); measures of how suited the data are for PCA in terms of proportion of variance of asset ownership that is common to them (Keiser-

[13] This classification and the factor loadings obtained differ somewhat between urban and rural households when PCA is run distinguishing assets owned in urban vs. rural areas (refer to footnote 8).

Meyer-Olkin) and adequacy of correlation among assets (Bartlett); and the existence of any assets that contribute nothing to the wealth index (principal components vs. trace).

The first principal component is shown to explain 9–18 percent of total variance in asset ownership among all the asset types, by far the largest fraction relative to the second or other components, particularly in Egypt 1998, Ethiopia 2011 and 2013, and Tunisia 2014. This variance is deemed satisfactory, given the large and heterogeneous set of asset types. The eigenvalue of the first principal component is 8–14 as high as the mean eigenvalue among all principal components, and 2–3 times as high as of the following best-loading component. This suggests that the first principal component alone is adequate at differentiating households according to their asset ownership, and using additional components would not change the imputed wealth scores substantially (Tables A2–A4 and figures A1–A2 in the annex present the loadings, or contributions, of all asset-ownership types to the wealth index.)

The Kaiser-Meyer-Olkin measures of sampling adequacy, evaluating the proportion of variance among variables that are common to them, are 0.57–0.82 across all surveys, exceeding the critical value of 0.60 in all but one case, suggesting that the sets of asset types are adequate to perform PCA in most surveys and borderline acceptable in Tunisia 2014. The Bartlett test of sphericity, determining whether the correlation matrix used for factor analysis is an identity matrix, rejects the null hypothesis of zero correlation across the variables at a high degree of confidence, implying that variable correlations in the sample are not simply due to sampling error, and justifying the use of these variables for PCA (Cureton and D'Agostino 1983). The majority of asset types contribute to the wealth index with positive loadings (figures A3–A4 in the annex; the count of principal components and the trace in table 1 confirm). The loadings have the expected ordering across asset types, and the loadings are qualitatively similar across surveys (refer to tables A2–A4 and figures A1–A2 in the annex). These findings further verify the success of the construction of the wealth indexes that will be used throughout the rest of the study.

One robustness test of this benchmark specification involves checking whether urban and rural households in our data have incompatible patterns of asset ownership, leading to inconsistent distributions of the wealth index in one or both groups. We re-estimate PCA separately for urban and rural households in each national survey, and we impose the factor loadings from one group to the other group in order to test the implications of the changes in factor loadings for the resulting national wealth distributions (refer to table A6 in the annex). For most surveys (except for Egypt 2006) and many assets, the loadings are very similar, and yield wealth indexes of similar ranges and distributions for urban as well as rural groups. They also yield similar rankings of households in terms of wealth. Regardless whether urban or rural asset loadings are used to compute wealth indexes, in all surveys but Egypt 2006 rural households are estimated to be poorer than urban households. The degree of between-group inequality, however, varies by country. Decomposing the Gini coefficient of inequality into the within-group and between-group parts, we find that the purely between-group gaps account for more inequality than the purely within-group variation in most surveys. The mean rural–urban gap is wider in Tunisia (of 13–20 points on the wealth index) and Egypt (9–17 points) than in Jordan (6–8 points).[14] Interestingly, in Egypt, the distribution of wealth is wider among rural households, while in Jordan, Tunisia and particularly Ethiopia it is wider among urban households, indicating that within-group inequality may vary in importance to policy-makers

[14] These additional results are reported in table A5 and figures A5 and A6 in the annex (Ethiopia 2011 does not have a representative urban subsample). Figure A5 reports the loadings of individual assets in the first principal factor when PCA is performed separately for urban and rural households. Figure A6 shows the distributions of wealth between urban and rural households when principal component analyses are performed only on one of the groups and asset loadings are then applied to the other group. The ranges, means and standard deviations of the estimated wealth indexes are shown in table A5.

across countries, and that it could be the advantaged or the disadvantaged group that endures more of within-group inequality.

Wealth distribution within countries

Figures 1–3 present the distribution of households' imputed wealth index across surveys. While these distributions should be viewed with caution on account of the ordinal nature of the wealth indexes, their general shapes are informative qualitatively about the underlying true wealth distributions in the population. The distribution is quite symmetric in labor market panel surveys, possibly with the exception of Jordanian and Tunisian surveys that have moderate right skews. Wealth distributions in LMPSs are also rather narrow, as confirmed by low skewness and kurtosis measures. Distributions in the Ethiopian Socioeconomic Surveys and particularly the 2011 wave, on the other hand, have heavy right tails.

Table A5 in the annex shows these patterns numerically, using commonly used measures of inequality and polarization of the estimated wealth distributions (Jenkins and Jantti 2005).[15] Overall, this analysis suggests that the estimated wealth distribution underestimates the true degree of dispersion of underlying household wealth, particularly at the tails. The inherent problem is that the set of factor loadings derived in PCA may not reflect precisely the relative contribution of rare asset types to true wealth. The estimated wealth distributions are not amenable to cardinal analysis, even though their general shapes may be valid qualitatively. The wealth indexes are still informative of households' approximate ranking on the wealth scale, and are expected to yield accurate classification of households into wealth-quantile groups.

Evolution of asset ownership over time, among Egyptian and Ethiopian survey waves

One implication of the issues discussed in the previous section is that wealth distributions in figures 1–3 are not comparable across surveys. Not only can the derived set of asset weights misrepresent the relative values of rare asset types in a country, but these estimated asset weights can vary across surveys. To conduct between-survey comparisons, one approach is to fix the set of asset weights imputed in one survey, and apply it to asset-ownership data of

[15] Gini coefficients (as well as Ginis generalized to nonstandard ranges of values) indicate low degrees of wealth inequality in all LMPSs, relatively low degree of inequality in Ethiopia 2013, and a high degree of inequality in Ethiopia 2011. By comparison, wealth indexes calculated by ERF using only households' non-productive assets yield Gini of 47.45 (0.48) in Egypt 2012, 42.32 (0.54) in Jordan 2010, and 45.83 (0.86) in Tunisia 2014. Even these measures are low compared to those observed for the distribution of net wealth per adult-equivalent in countries worldwide (Davies et al. 2011) – with Ginis of gross household wealth expected to be higher still.

The same patterns of low reported inequality are seen in wealth percentile ratios, rich households' shares of aggregate wealth, and the concentration index. The estimated percentile ratios are an order of magnitude lower, and the top wealth shares are also significantly underestimated – particularly at the extreme top – compared to what would be expected. Next, concentration index gauges the distances between wealth scores of households on different wealth ranks. A generalized, Erreygers version of the index is used recognizing that wealth scores are bounded but do not have zero as their natural minimum. For LMPSs, the concentration index shows similar trends as other inequality measures, but for Ethiopian surveys and particularly the 2011 wave the estimated concentration indexes are low. This is because the Erreygers concentration index is normalized to satisfy several desirability properties, and this version takes low values if the mean of the wealth index is close to its lower bound (Erreygers 2009:512).

Finally, the measure of polarization between two segments of the population depends greatly on the degree of sensitivity to polarization (α) (Esteban and Ray 1994). Taking the lower bound or a middle value on the sensitivity parameter (α=1 or α=1.3), polarization is estimated to have been low in Egypt 2006 and 2012, and in Ethiopia 2011, while it was moderately high in Ethiopia 2013, and high in Egypt 1998, and in Jordan and Tunisia. Under the upper bound on the sensitivity parameter (α=1.6), polarization is estimated to be very low across all surveys, with only Tunisia showing an order-of-magnitude higher value.

In sum, only the degree of inequality for Ethiopia 2011 is of a plausible magnitude given what we know about income and wealth inequality worldwide (Davies 2008). This Gini is comparable to those estimated for India, 64–67 (Subramanian and Jayaraj 2006), and China, 55 (Li and Zhao 2007).

In China, the top decile of households owned 41.4 percent of aggregate wealth in 2002, compared to 30.8 in 1995. (The top decile of rural households held 30.5% of rural wealth in 2002, and the top decile of urban households held 33.9% of urban wealth). Urban households were typically 20 percent richer than rural households in 1995 (13,698 vs 11,427 RMB), but nearly 4 times as rich as rural households by 2002 (mean wealth 46,134 vs. 12,938 RMB). In India, the top 1% of households own 16 percent of aggregate wealth, and the top 5% own 38 percent, and these rates did not change between 1991-1992 and 2002-2003. Going by these numbers, (rural) Ethiopia '11 exhibits greater inequality than rural China or China overall, and as high or higher inequality as India.

households in other surveys where similar relative market values of assets reign. Subsequent waves of same-country surveys are the most amenable to this exercise, and pose the most interesting questions with respect to wealth comparisons across surveys.

This section addresses how household wealth changed in Egypt between 1998, 2006 and 2012, and in Ethiopia between 2011 and 2013. We infer welfare changes using households' revealed preferences over the bundles of asset ownership at different points in time (assuming households have the ability to sell or exchange their stock of durables). To compare the wealth index across survey waves, we fix relative asset loadings, so that changes in asset ownership would not be confounded with changes in asset loadings, which are simply mechanical constructs of the principal component analysis assigning relative uniqueness value to individual assets rather than measuring their value in absolute terms.

Figure 1 juxtaposes the distributions of wealth indexes across Egyptian survey waves, when alternative waves are used as baselines for the estimation of factor loadings and for normalization to the 0–100 range. In the first panel, extrapolating year-1998 factor loadings to years 2006 and 2012, we find that mean wealth score rises from 36 in 1998 to 41 in the latter two years, and the range shifts from 0–100 to 2–114 (refer to table A7 in the annex). At the same time, standard deviation of the wealth index falls from 16 through 13 to 10. In the second panel, extrapolating year-2006 factor loadings to years 1998 and 2012, we find that mean wealth score rises from 38 in 1998, through 42 in 2006 to 45 in 2012. The range shifts from 11–89 to 14–110. Standard deviation remains between 9 and 12. Finally, in panel three, extrapolating year-2012 factor loadings to years 1998 and 2006, we find that mean wealth score rises from 24 in 1998, through 27 in 2006, to 31 in 2012. The range shifts from 5–63 to 0–100. Standard deviation remains at 7–9 across the three waves. The means, medians, minima and maxima all suggest that Egyptian households' wealth steadily increased, across various quantiles of the wealth distribution. Using the year-2012 loadings, the implied growth of mean wealth during 1998–2006 was 12.2% (1.4% annual growth rate), and during 2006–2012 it was 15.5% (2.4% annually).[16]

In Ethiopia, shown in figure 2, somewhat different patterns emerge. When year-2011 factor loadings are used, mean wealth score rises from 3 (range 0–100) in 2011 to 4 (range 0–122) in 2013, and standard deviation falls from 8 to 6. When year-2013 factor loadings are used, mean wealth score rises from 12 (range 3–72) in 2011 to 17 (range 0–100) in 2013. Standard deviation rises from 6 to 11. Like in Egypt, these findings suggest that Ethiopian wealth distribution rose during 2011–2013 in terms of its mean, median, and range. Using the year-2013 loadings, the implied growth of mean wealth during 2011–2013 was 33.3%, for a 15.5% annual growth rate. While this seems high, it may reflect the recovery of households' livestock and other assets from the crisis of the 2011 drought spell in Ethiopia.[17]

The Paasche and Laspeyres quantity indexes can be used to infer welfare changes revealed from households' adjustments in asset ownership over time. Table 2 shows for each pair of a historic base year and current year, the share of households with the Paasche Index greater than one (and Laspeyres Index lower than one), indicating a revealed improvement in welfare by current year. In Egypt, fixing factor loadings at their 2012 level and assuming all assets to be

[16] At the same time, measures of inequality including the Gini, percentile ratios and top wealth shares show that wealth also became less unequally distributed during 1998–2012. Using year-1998 loadings (2006, and 2012), the Gini fell from 25 to 13 (from 17 to 10, and from 22 to 16, respectively).
The 95:5 percentile ratio fell from 6.6 to 2.4, from 3.1 to 1.9, or from 4.0 to 2.9, depending on which base year weights one uses. Similarly, for example, the top 10 percent wealth share fell from 19 to 16, from 17 to 16, or slightly rose from 14 to 16, depending on which base year weights one uses.

[17] However, measures of inequality are not entirely clear about the direction of change during 2011–2013. Many indicators show wealth distribution becoming more unequal – standard deviation rising (when 2013 loadings are used), Gini stagnating or rising, 95:5 percentile ratio rising, and top 10 percent share either slightly falling (using 2011 loadings) or significantly rising (using 2013 loadings).

available and of similar quality in all comparison years, over two-thirds and close to three-quarters of households (68.5 and 73.4%, respectively) were revealed better off in 2012 than in the base years of 1998 or 2006, since their Paasche index exceeds unity. In 2006, an estimated 55.9 percent of households were revealed better off than in the base year of 1998. In Ethiopia, just over one half of households are revealed to be better off in 2013 than in 2011 (50.3%), while the ranking of the rest of the sample cannot be compared, since the Paasche index is not informative if its value is less than one.

Conversely, the Laspeyres quantity index can help us identify what share of households were clearly revealed-worse off over time. In Egypt, fixing factor loadings at their base-year levels (1998 or 2006) and assuming all assets to be available and of similar quality in all comparison years, now just over one-half of households are estimated to be revealed-worse off in 2006 and 2008 than in the base year of 1998 (52.3 & 58.1%, respectively), and 25.3 percent of households are worse off in 2012 than in 2006. In Ethiopia, 44.3 percent of households are revealed-worse off in 2013 than in 2011. Comparing the conclusions from the Paasche and Laspeyres indexes, there is evidence that some three-quarters of Egyptian households were made better off during 2006–2012, and over one-half of Ethiopian households were made better off during 2011–2013. For the periods 1998–2006 and 1998–2012 in Egypt, however, the two indexes give conflicting predictions, and it is unclear whether one-half of Egyptian households were made better or worse off. This is on account of the difference in the sets of assets surveyed in 1998 (used for factor loadings applied in the Laspeyres index) and 2006–2012 (used for factor loadings applied in the Paasche index).

The Paasche and Laspeyres indexes are both distributed widely across households (refer to figure A7 in the annex), particularly in Egypt during 1998–2006 and in Ethiopia, indicating clear improvements in welfare by some households and potentially large losses by some households too. Most of the distributions are skewed right, suggesting that the gains to households made better off over time potentially exceeded the losses to households made worse off.

Figure 4 shows growth incidence curves for the wealth index in Egypt and Ethiopia, using the sets of factor loadings from the more recent years. The curves for Egypt show that, during 1998–2006, households across all wealth quantiles experienced increases in wealth, with the bottom 30% of households seeing the highest growth of 20–30 percent during the eight years, and households between the 70th and 95th wealth percentile seeing the lowest growth of under 5 percent. During 2006–2012, growth was distributed nearly monotonically across wealth quantiles, with the top two deciles of households seeing 15 percent growth during the six years, and bottom decile seeing a decline up to an estimated 20 percent. Overall, during 1998–2012, all but the poorest ventile of households experienced growth. The poorest ventile saw a depletion of wealth of up to 30 percent, while households in the 20–50th percentile and the top ventile saw growth of nearly 20 percent.

In Ethiopia 2011–2013, similarly, the bottom ventile incurred a reduction in wealth of up to 10 percent, but the rest of households benefitted from positive growth. This growth was highest – over 50 percent – among the top fifth of households, and peaked at over 100 percent among the top ventile of households. Table 3 provides corresponding results regarding the estimated growth (cumulative across the range of years) at the mean and median, mean growth across all percentiles, and measures of pro-poorness of growth at various points on the population distribution (Ravallion 2004).

Wealth gaps between demographic groups

The estimated wealth index was thus found to be distributed widely across national populations in the evaluated countries, and in Egypt and Ethiopia it rose for the majority of households over time, but it also fell for a large group of households. Since, according to the growth incidence

curves and the Paasche index, wealth and the imputed welfare clearly rose for some households but potentially fell for others, it is important to evaluate the incidence of wealth and its growth across various demographic strata of the national populations. Tables 4–5 show the representation of each demographic group in each wealth quantile, and wealth gaps across selected demographic groups and across wealth quantiles.

Table 4 reports that in all national surveys considered, wealthier households are systematically and significantly more likely to be urban and educated, more likely to be headed by married, economically active men currently full-time employed in permanent jobs. In Egypt, Jordan and Tunisia (taken as a set of more comparable countries), the wealthiest quintile of households consists mostly of urban households (87–95 percent), while the poorest quintile has only 7–74 percent of urban households. 50–78 percent of household heads in the wealthiest quintile are secondary-school or higher educated, compared to 3–22 percent in the poorest quintile. These are staggering differences. Moreover, 80–84 percent in the wealthiest quintile are married, compared to 75–80 in the poorest quintile; 84–91 percent in the wealthiest quintile are male, compared to 76–82 in the poorest quintile; 89–94 percent in the wealthiest quintile are working 35 or more hours, compared to 67–89 in the poorest quintile; and 92–98 percent in the wealthiest quintile have permanent jobs, compared to only 69–93 in the poorest quintile.[18]

In Ethiopia, the same trends reign, but the absolute levels are different, because Ethiopia has clearly different demographics and is in a much lower stage of economic development than the other evaluated countries.[19] In the nationwide sample for 2013, 80 percent in the wealthiest quintile live in towns, compared to 0.2 in the poorest quintile; 43 percent in the wealthiest quintile are secondary or more educated, compared to 0.6 in the poorest quintile; 46 percent in the wealthiest quintile are employed, compared to 30 in the poorest quintile; and 84 percent in the wealthiest quintile are working 35 or more hours, compared to 73 in the poorest quintile.

Table 5 shows the same demographic phenomena from a different angle. For each demographic group, it reports the gap in the wealth score across various percentiles of the wealth distribution in the respective demographic groups – the conditional-quantile wealth gaps. For instance, in Egypt 1998, a rural median-wealth household had a wealth score 20.5 points (or just over one standard deviation) lower than its urban median-wealth counterpart. Most of the wealth gaps in table 5 are positive, implying that urban households (and households headed by married, male, educated, economically active, employed, full-time working, and employer heads, respectively) have higher wealth scores than their rural (and households with unmarried, female, less educated, economically inactive, unemployed, part-time working, and non-employer heads, respectively) counterparts, regardless which wealth quantile they occupy in their demographic group. We could refer to the former groups as the advantaged households, and their latter counterparts as the disadvantaged households.

[18] Comparing the demographics across Egypt, Jordan and Tunisia, we also find that fewer Tunisian household heads are secondary or higher educated, economically active and working full time. The rates are particularly low among the poorest two quintiles of households. Fewer of them are wage workers or employers, and more of them are out of labor force, self-employed or unpaid. This is in part due to demographic differences: The Tunisian sample is older (mean age 55.0, compared to Jordan's 45.9 and Egypt's 46.8–48.7). However, this also reflects on the direr labor-market conditions in Tunisia, where the economy has been stagnating or shrinking since 2008. This is in contrast to the positive growth seen in Egypt and Jordan.

[19] Ethiopians have lived through four tumultuous decades involving regime changes in 1974 and 1991, wars with Somalia and Eritrea, and struggle against radical Islamism. Political persecutions in the late 1970s, large-scale famine in 1984, civil war peaking in 1991 and a draught and famine in 2011 have affected the country's current demographics.
Moreover, Ethiopian survey data were harmonized by the World Bank rather than the Economic Research Forum, so some variables are defined differently than their counterparts in Egypt, Jordan and Tunisia. Furthermore, because of the change in the Ethiopian survey from a rural survey (2011) to a fully nationally representative survey (2013), survey-wide summary statistics are not entirely comparable between the 2011 and 2013 waves (CSA & WB 2013, 2015; FAO 2016a,b). Notably only 3.6% of households are classified as urban in 2011 compared to 79.9% in 2013.

Table 5 shows several interesting patterns in the wealth gaps. They are the highest in Ethiopia and Tunisia across most demographic dimensions and most wealth quantiles, followed by Jordan. This matches up with our conclusion regarding the width of the general wealth distributions across countries. Similarly, in Egypt, most wealth gaps systematically fall over time, in agreement with the narrowing down of the general wealth distribution. For instance, rural median-wealth household lagged behind its urban median-wealth counterpart by 20.5 points in its wealth score in 1998, but only 9.7 in 2006, and only 9.0 in 2012.

Wealth gaps are particularly large – on the order of one standard deviation of the wealth index – between urban and rural households, and between educated and less educated households. These gaps occur across all wealth quantiles, but are slightly larger at higher quantiles. The wealth gaps are near zero, but still positive, between households with economically active versus inactive heads, and between male and female headed households. Rather than suggesting that the labor-force participation status and gender of household heads does not affect household wealth, these findings corroborate evidence from prior studies that households' status as economically inactive or female-led is associated with some unmeasured flows of assets, such as receiving an inheritance of wealth, or receiving of remittances from family members living away from the household (Ramadan et al. 2018).

Wealth gaps are typically higher at higher quantiles, suggesting that the advantageous characteristics are more beneficial to households, the higher the household is in the wealth distribution. Some wealth gaps are negative, suggesting that the evaluated characteristics are not obviously advantageous, and may be associated with lower wealth scores in some parts of the wealth distribution. In Jordan, female-headed households in the middle of the wealth distribution are wealthier than their male middle-wealth counterparts. These female-headed households may have male breadwinners living away from their families and transmitting remittances home.

Being economically active is associated with lower wealth scores at the top of the wealth distributions in Jordan and Tunisia (as well as at a few other wealth quantiles in Egypt 2006 and Jordan 2010). These households may represent the working rich whose wealth falls short of that held by leisure class. Relatedly, being employed – compared to searching for adequate work opportunities – is associated with lower wealth scores in the top ventile of the wealth distributions in Egypt 2012 and Jordan. Surprisingly, however, being employed is also associated with lower wealth scores in lower wealth quantiles in all Egyptian surveys. This could mean that the Egyptian working poor have lower wealth scores than households who engage only in non-market activities. In Jordan, we similarly observe that full-time workers in the lower half of the wealth distribution have lower wealth scores than part-time workers.

Finally, while being an employer (compared to a wage worker, for the most part) is associated with higher wealth scores in Jordan and Tunisia, in the lower half of the wealth distribution in Egypt it is associated with lower wealth scores. This suggests that the delineation of employers versus self-employed workers could be blurry among lower-wealth Egyptian households. Being an employer of 1–2 service workers may not be associated with any material advantages relative to being a regular self-employed worker.

Wealth distribution across MENA countries

Figure 5 and table A8 report on the distribution of wealth indexes in Egypt (2006 and 2012), Jordan and Tunisia, when a common set of factor loadings – using asset ownership in ELMPS 2012 – is applied to asset ownership profiles of households in the respective surveys. Figure 5 can be compared to figures 1 and 3, where the surveys' own factor loadings of assets were used. Figure 5 shows a more comparable set of national distributions, using the same weights applied to each type of household asset across all surveys, and giving rise to comparable levels of the wealth index and comparable inequality measures. ELMPS 2012 is shown to include a

slightly higher and less left-skewed distribution of wealth than ELMPS 2006, suggesting that improvement occurred among relatively poor households. Jordan has a higher and narrower distribution of wealth than the Egyptian surveys, with a heavier right tail. Tunisia is shown to lag behind in the level of household wealth, with its wealth distribution strictly stochastically dominated by all the other surveys. The Tunisian distribution is also more unequal, and has long left and right tails.

Egypt 2006 features wealth distribution with a lower mean, higher inequality measures, and a higher degree of left-skew than in year 2012, once again confirming that Egypt saw economic progress, and a fall in inequality and poverty between 2006 and 2012. Jordan is estimated to have the highest average household wealth as well as the lowest wealth inequality according to various measures, and is the only survey with right-skewed wealth distribution. The Tunisian distribution is left skewed, with the greatest range, lowest mean, and a high degree of kurtosis, corroborating evidence that the Tunisian economy has been underperforming along multiple dimensions.

In table A8, the Tunisian Gini, percentile ratios, and wealth shares among the richest 5-50 percent of households are the highest among the evaluated surveys. However, most of the estimated degrees of inequality are too low relative to what we suspect about the distribution of gross wealth in the MENA region. This puts into question the use of cardinal scores of the wealth indexes, and suggests that relative-wealth measures such as wealth deciles remain more robust to uncertainties about the distances among households in terms of wealth.

Still, the inequality measures in table A8 appear more consistent across the four surveys than those in table A5. Our analysis suggests that in studies using multiple countries from a world region, the use of a standardized set of asset weights – such as the one used here – may lead to better cross-country alignment of households in terms of which national quantile of wealth they belong to. Finally, using common sets of asset weights is crucial if it is the degree of inequality in the entire world region (e.g., MENA) rather than national inequality that feeds public perceptions or public policy (Alvaredo and Piketty 2014).

Inequality across wealth and earnings

Preceding sections have found evidence of wealth gaps between MENA countries, inequality across households in various circumstances, and evolution of households' wealth and of wealth distributions over time. The degree of inequality was found to be unexpectedly low, on account of the limitations of PCA at imputing the real market values of all household assets. Wealth inequality thus remains part of the inequality puzzle in MENA. One hypothesis worth exploring is that several dimensions of inequality interact – including ex ante inequality of opportunities such as wealth inequality, and ex post inequality of consumption – giving rise to perceptions of high composite inequality. This section therefore offers initial evidence of cumulative inequality in MENA countries, considering gaps in both existing wealth and earnings/consumption.

Table 6 reports basic descriptive statistics for earnings, or consumption alone. Real earnings in Egypt are shown to have risen during 1998–2006, but slightly declined during 2006–2012. This can be seen in the range, the mean as well as the median of earnings. In Ethiopia, consumption expenditures appear to have declined during 2011–2013, also according to various measures. This is surprising given that the 2011 wave did not include city residents, who would presumably raise the level of observed consumption. Given that year 2011 saw a widespread draught and famine, the statistics for year 2013 could reflect the depletion of households' wealth during and in the aftermath of the crisis. Across all countries, Jordanian households enjoy the highest earnings, particularly those in the upper end of the earnings distribution. While median earnings in Jordan are only slightly higher than in Tunisia, and 78–85 percent higher than in Egypt, mean earnings are 62 percent higher than in Tunisia and 2.5 times as high

as in Egypt. All earnings and consumption distributions are right-skewed, but the Jordanian distribution has a particularly long right tail.[20]

The Gini coefficients, percentile ratios and top shares show the expected degrees of inequality in wage earnings and consumption, and are quite consistent across most surveys. The Gini of earnings fluctuated between 40–42 in Egypt, was at 38 in Tunisia, and was as high as 58 in Jordan, on account of a few outliers at the extreme top of the earnings scale (Hlasny and Intini 2015). The Gini of consumption in Ethiopia was 43 in 2011 and 37 in 2013. The 95:5 percentile ratio (and 90:10 ratio) is consistently between 9.6 and 12.3 (5.1–6.8, respectively) across all surveys. The top earnings shares show that the highest-earning 20 percent of households earn between 44.9 and 50.3 percent of national wage earnings, except in Jordan where their share is 64.6 percent. The top 1 percent of households hold among themselves 5.2–7.9 percent of national earnings across all surveys, except for Ethiopia 2011 and Jordan, where the shares are 10.4 and 24.9 percent, respectively.

These results for earnings/consumption are in contrast to those for wealth. Wealth was rising and becoming more equally distributed over time in Egypt, whereas earnings are fluctuating and becoming less equal. Tunisia appeared to be the poorest and most unequal in terms of wealth (refer to table A8), while it is ahead of Egypt in the level and equality of earnings. These findings suggest that one must consider economic outcomes such as earnings and wealth jointly, particularly when they give conflicting accounts of people's wellbeing across space and time (Ward 2014).

Pearson's correlation of wealth and earnings (consumption for Ethiopia), taking into account cardinal wealth-distances across households, shows high association between them, except in Ethiopia 2011. Spearman's rank correlation, taking into account more appropriately only the ordering of households on the wealth and earnings scales, shows even stronger association, suggesting that the cardinal wealth scores may not be the most accurate at gauging households' exact prosperity.[21] Finally, concentration index of wage earnings/consumption against households' wealth confirms the strong degree of association between earnings and accumulated wealth.

Classifying households according to which quintile of the wealth and earnings distributions they belong to, we can evaluate the ordinal relationship between their relative wealth and relative earnings status (Fisher et al. 2016). Tables 7–8 present the densities of households in the joint distribution of relative wealth and relative earnings (consumption for Ethiopia) in all surveys.

Each cell in tables 7 and 8 shows the share of households in a quintile of one distribution (say, wealth) who are in a specific quintile of the other distribution (earnings), and vice versa. There are two numbers in each cell. The upper-right number shows the share of households in a wealth quintile (adding up to 100%), who are in a specific quintile of earnings. The lower-left number shows the share of households in an earnings quintile (adding up to 100%), who are in a specific quintile of wealth. The bottom row (and the right-most column) of the tables shows the sum of densities across all quintiles of wealth for each quintile of earnings (sum across all quintiles of earnings for each quintile of wealth, respectively).

In the absence of any relationship between the wealth and earnings statuses of households, each cell would show 20 \ 20. If the relationship were positive and perfect, each cell on the main

[20] Refer to figure A8 in the annex. In Jordan, 3 households earn $52–181k, 8 households earn $21–26k, and 20 households earn $10–19k. But even without these 31 households, mean earnings are PPP $896, median is $565 (just ahead of Tunisia), and Gini coefficient is 44.49.

[21] Refer to table A9 in the annex. Kendall's rank correlations are of similar magnitude across all columns as Pearson's correlation.

diagonal would show 100 \ 100, and 0 \ 0 off the diagonal. For convenience, cells with both shares above 20 are highlighted, and any share above 25 is in boldface.

Tables 7 and 8 show that there is clear positive relationship between households' wealth and earnings statuses, because densities along the main diagonal are higher than off the diagonal. There is also evidence of polarization in the joint distribution, since densities in the top-left and bottom-right corners of the tables are higher than densities in the middle of the tables. This is particularly the case for Egypt 2012 and for Ethiopian surveys. Another interesting pattern in tables 7–8 is that the joint distribution is not symmetric around the main diagonal, and shows different degree of spread around the diagonal. In earlier surveys in Egypt (1998, 2006) and particularly in Ethiopia, the distribution of wealth for most quintiles of earnings/consumption has a dense right end, especially at higher earnings quintiles. As a consequence, in cells below the main diagonal in tables 7–8 we see 'high value \ low value,' while in cells above the main diagonal we see 'low value \ high value.' By contrast, in Tunisia (and somewhat in Egypt 2012) we see the opposite pattern, implying that the distribution of wealth across many quintiles of earnings has a heavier left end, especially at lower earnings quintiles.

This means that in earlier years in Egypt (1998, 2006) and in Ethiopia, households with higher wage earnings or consumption came from the top end of the wealth distribution. The sorting of households by wealth is much less clear among lower earners. In Tunisia and in Egypt 2012, on the other hand, higher earners came from more wealth groups, while lower earners came disproportionately from the bottom of the wealth distribution. This reflects cross-country differences in opportunities for lower-wage versus higher-wage employment. Nevertheless, across all surveys we find that the combination of earnings inequality within any wealth quantile, and wealth inequality, produces a two-dimensional inequality of a higher level than implied by either one of the two stand-alone forms.

For countries with panel data – Egypt and Ethiopia – this analysis could be enhanced by evaluating intertemporal mobility of households among wealth and earnings quantiles. Figure A9 in the annex confirms that the association between past and current wealth is high both in Egypt 2006–2012 and Ethiopia 2011–2013. But whereas the correspondence holds across all wealth groups in Egypt, implying modest social mobility throughout, in Ethiopia it is by far the strongest in the top quintile. The perpetuation of status is strong at the top end, while it is weaker among lower wealth groups. This finding extends the observation above that in Ethiopia households with higher consumption came from the top end of the wealth distribution. Now we can add that the capacity for consumption spending is effectively limited to households with pre-existing high wealth. Among lower wealth groups, more opportunity for mobility across wealth quantiles and for choice regarding consumption level exists.

Tables 7–9 and densities shown in figure A9 can be used to compute the Shorrocks (1978) mobility index, interpreted as the share of households that are in different quintiles on the two respective univariate distributions. The sum of densities on the main diagonal in table 7–9 (either the upper-right or lower-left densities) should be subtracted from five, and the result divided by four. A value of 1 would be interpreted as perfect mobility, while a value of 0 would indicate no mobility, or perfect determination. By this measure, mobility of wealth in Egypt between years 2006 and 2012 was rather low, at 0.56, implying that one-half of households remained in the same wealth quintile six years later despite the flux of the revolution and various demographic and economic changes.

Table 9 (density plot available on request) completes the exposition by showing the relationship between households' asset ownership in a survey wave (Egypt 2006 or Ethiopia 2011) and their earnings/consumption in the following wave (Egypt 2012, Ethiopia 2013). The densities shown look very much like those in tables 7 and 8. Through persistence of households' wealth – across all wealth quintiles in Egypt, and particularly among the highest wealth quintile in Ethiopia –

households' wealth helps to predict their earnings and consumption years later. The Shorrocks mobility index takes the values 0.85–0.91 across surveys in table 7, 0.89–0.93 in table 8, and 0.90–0.92 in table 9. These values indicate that transitions across quintiles of wealth and earnings distributions occur for nearly nine out of ten households and do not give rise to excessive concerns over the mobility of earnings as a function of pre-existing wealth.[22]

Productive versus non-productive assets

The final question addressed in this study concerns the relationship between households' ownership of productive and non-productive assets, and their joint role in overall economic inequality, particularly in relation to households' capacity for wage-earning and consumption. We can evaluate this question for all but one survey. In ELMPS 1998, only 8 out of 50 assets are classified as productive (refer to table A1) so this survey cannot be used for constructing an index of productive-asset wealth. ELMPS 2006 (2012) contains 44 (45, respectively) productive assets, or about one-half of all assets. In Jordan, Tunisia and Ethiopia, 34–38 assets – or approximately 40 percent of all assets – are classified as productive. In these surveys, the similar numbers of productive and non-productive assets raise hope that the distributions of productive-asset and nonproductive-asset wealth will be inferred with comparable and sufficient precision. However, this ultimately depends on how well PCA can discriminate across households and across assets in imputing households' unique productive-asset and nonproductive-asset wealth. Table A10 in the annex reports on the construction of the two wealth indexes.

We compare the relative distributions of these wealth indexes across households using their quintiles. We review the densities of households across all quintiles of productive and non-productive wealth distributions, and we condition on the quintile of households' earnings attained (Fisher et al. 2016). Figure A10 shows joint distributions of productive and non-productive wealth for households in the first (lowest) earnings quintile, and the joint distribution for households in the fifth (highest) earnings quintile.

Conditional on households' earnings quintile, productive and non-productive components of wealth are jointly highly concentrated, but the concentration is not monotonic. In Egypt and Jordan, households in the lowest quintile of the earnings distribution come from lower quintiles of non-productive wealth, but middle quintiles of productive wealth. Households in the top earnings quintile come from the top end of the non-productive wealth distribution, but also the bottom end of the productive wealth distribution. The two types of assets appear substitutable in households' possession. Households accumulate the two types of assets in different circumstances for different purposes. Low income households accrue nontrivial amounts of productive assets in order to use them to supplement their wage earnings. Top wage-earning households hardly invest in productive assets.

In Tunisia, households in the lowest quintile of the earnings distribution come from lower quintiles of non-productive wealth, but the highest quintile of productive wealth. Households

[22] This may be viewed as supporting the finding by El Enbaby and Galal (2015) that circumstances such as wealth have had low effect on future earnings in Egypt. On the other hand, the finding contrasts with Majbouri's (2017) finding that income mobility in Egypt has been low relative to that observed in Jordan as well as in absolute terms. The conflicting conclusions are not thought to be an artefact of data measurement errors, selective sample attrition in the LMPS, or the mechanics of the PCA. In fact, by holding asset values constant across waves, we may think that our estimate of wealth mobility (figure A9) is underestimated.
The different findings by Majbouri and here can be partially attributed to modelling differences between the two empirical analyses. Majbouri's study relies on 141 pseudopanels for Egypt (rather than 4,292 household records), and evaluates mobility in income (rather than the link between wealth and contemporaneous/future wage earnings). This choice of data structure and focus on mobility in a single variable diminishes the degree of variation one would *a priori* expect. We know that wage earnings and wealth evolve in different ways, even when they have high correlation.
Income is also expected to evolve more smoothly over time than wage earnings. Nevertheless, these arguments do not explain why Egypt is found to exhibit less mobility than Jordan in Majbouri's study, and as much mobility here. This is an area worth further exploration.

in the top earnings quintile come from the middle of the non-productive wealth distribution, but from higher quintiles of the productive wealth distribution. Hence, low income households again appear to use productive assets to supplement their wage earnings. However, high-earning households still invest substantially in productive assets.

In Ethiopia 2011, households in the lowest quintile of the consumption distribution appear to come either from lower quintiles of non-productive wealth and the lowest quintile of productive wealth, or a small group of them come from the highest quintile on the distribution of both types of assets. Households in the top consumption quintile come from the top ends of the distributions of ownership of both asset types. In 2013, both the poorest and the richest households in terms of consumption are surprisingly shown to come from the high end of the non-productive wealth distribution and low end of the productive wealth distribution. This could be a feature of the wealth index in that survey (which is constructed, by design, based on noting maximum discrimination in asset ownership between households). Alternatively, it could imply a poverty trap whereby the poorest households suffer from the lack of productive resources and inability to convert their non-productive durables for consumables in rough years. Richest households, on the other hand, benefit from their non-productive wealth, and have no reason to invest in productive assets.

5. Discussion

This study has offered estimates of the distribution of household wealth across seven surveys for four MENA countries to supplement evidence of inequality in incomes and expenditures widely reported in existing studies. The study has also examined the potential issue with lumping together asset ownership of urban and rural households, and the issue of combining productive and non-productive assets, for the construction of a single nationwide set of asset loadings and a single wealth index. Finally, the study contrasted the estimated distribution of asset wealth with the observed distribution of (concurrent or future) earnings and consumption, in order to comment on the role of wealth in the composite distribution of multidimensional welfare, households' capabilities, and inequality of opportunities.

Standard statistics of PCA performance suggest that our sets of productive and non-productive assets can be used jointly in PCA, and yield wealth scores with acceptable properties, both for within-country comparisons and for consistency across survey waves. One limitation is that the constructed wealth scores have ordinal but not cardinal interpretation, and standard inequality measures cannot be computed for them. Still, the qualitative shapes of wealth distributions, and ordinal preference relations between bundles owned in different points in time can be relied on. Wealth distributions in LMPSs are symmetric and rather narrow, while the distribution in Ethiopia has a heavy right tail. Households at different wealth quantiles have systematically different demographics. Wealth gaps are typically higher at higher quantiles, suggesting that the advantageous characteristics are more beneficial to households, the higher the household is in the wealth distribution.

While urban and rural households clearly use different sets of assets and value them differently, our tests show that the two sets of asset loadings are not incompatible, and yield similar distributions of wealth in urban and rural areas. As expected, we find that rural households across all surveys are disadvantaged in terms of asset ownership, and inequality of asset ownership is also typically higher in rural regions.

The results in this study indicate the existence of substantial disparities in the distribution of wealth across MENA countries and between urban and rural regions, but also moderate improvements in asset ownership and in "revealed" welfare from asset ownership over time in Egypt and Ethiopia. Interestingly, the identified patterns of evolution of wealth, and wealth inequality, did not agree with those found for household wage earnings or consumption.

The study offered initial estimates of the dynamic relationship between households' wealth accumulated in earlier years, and earning capacity, consumption or wealth retained in later years. Preexisting wealth plays an important role in households' earning, consumption and wealth-accumulation capacity, a topic for further research.

Finally, the comparison of productive and non-productive asset ownership was found to be complex across low-income and high-income households. Productive assets appeared to serve as essential resources supplementing low wage earnings in some surveys, but in other surveys it was higher income households that appeared to accrue more of productive assets. One possible interpretation was that in these countries, poor households were trapped in deprivation without an opportunity to obtain productive assets.

In sum, represents an initial attempt to survey the problem of the dimensions and measurement of wealth inequality in the MENA. We confirm that wealth plays an important role in the composite distribution of multidimensional welfare, households' capabilities, and inequality of opportunities. However, significant follow up research is warranted. We identify high wealth gaps across demographic groups, such as between urban versus rural, and more versus less educated households. Why these gaps differ across different quantiles of the wealth distribution, and whether these gaps are due to differentials in households' market-valued characteristics or differentials in access to economic opportunities is unclear, partly due to the ordinality of the estimated wealth index. This is an area of high importance for future research.

Another limitation is that this study considered only one specification of the welfare aggregate – gross household asset-based wealth. Throughout the text, a number of caveats and assumptions were mentioned in need of further examination. Regional spatial cost differentials were assumed away, although we know these to be important given the substantial differences in factor prices for land and labor across regions. Quality differences in assets across households and across units owned by the same households were not considered, for lack of necessary information. In future research, 'unit equivalent scale' should be explored, recognizing the fact that for many assets – be it land, vehicles or cattle – the first units are typically worth more than following units owned.

Household size was also not accounted for, in recognition of the public-good nature of many household assets. This is a limitation, since we could not study intra-household allocation of wealth, or well-being per capita in households of different sizes (Sierminska and Smeeding 2005). Other than introducing some elementary results for wealth gaps between urban and rural households, other demographic wealth gaps were not evaluated due to space limitations. Other demographic analyses – such as by employment type, residence status, or ethnicity in Jordan – may be important to our understanding of households' patterns of wealth accumulation. Similarly, beside the basic partitioning of assets into productive and non-productive assets, no attempt was made to distinguish say, necessities from discretionary goods, or assets with different schedules of depreciation, with different implications regarding lifetime and intergenerational inequality. More importantly, important classes of assets were omitted from analysis for lack of data, including financial instruments, insurance and options, intellectual property such as firm goodwill, debts, or embodied human and social capital.

In spite of these enduring gaps in our knowledge, it is our hope that the various complementary results reported in this study present novel insights regarding the facets of wealth inequality across the MENA, and policy options on how best or even whether at all such inequality should be tackled. We trust that the new evidence will serve as guidance for further research by academics, governments and international organizations alike.

References

Aguiar, M., and M. Bils (2015). Has consumption inequality mirrored income inequality? American Economic Review 105(9):2725–2756.

AlAzzawi, Shireen (2010). The Dynamics of Poverty and Inequality in an era of Economic Liberalization: The Case of Egypt, ERF Working Paper 539.

AlAzzawi, Shireen (2015). Endowments or Discrimination? Determinants of Household Poverty in Egypt, ERF Working Paper 931, August 2015.

Alvaredo, Facundo, and Thomas Piketty (2014). Measuring Top Incomes and Inequality in the Middle East: Data Limitations and Illustration with the Case of Egypt. Economic Research Forum, Working Paper 832, May 2014.

Alvaredo, Facundo, Lydia Assouad, and Thomas Piketty (2017). Measuring Inequality in the Middle East 1990-2016: The World's Most Unequal Region? CEPR Discussion Paper No. DP12405, October 2017.

Angeli, Aurora (2009). Economic and non-economic poverty in the MENA Region. ERF Workshop on Poverty Reduction, Growth and Inequality in the MENA Region, November 6.

Arampatzi, E., M. Burger, Elena Ianchovichina, T. Rohricht, and R. Veenhoven (2015). Unhappy Development: Dissatisfaction with life on the Eve of the Arab Spring, Policy Research Working Paper 7488, World Bank.

Assaad, R. C. Krafft, J. Roemer and D. Salehi-Isfahani (2016). Inequality of Opportunity in Income and Consumption in the Middle East and North Africa in Comparative Perspective," ERF working paper 1003, May 2016.

Assouad, Lida (2015). Top Income and Personal Taxation in Lebanon. An Exploration of Individual Tax Records, Master's Thesis, Paris School of Economics.

Atkinson, A, Piketty, T. and Saez, E. (2011). Top incomes in the long run of history, Journal of Economic Literature 49(1):3–71.

Bardhan P., Bowles S., Gintis H. (1999). Wealth Inequality, Wealth Constraints and Economic Performance. In: Atkinson A.B., Bourguignon F. (ed.), Handbook of Income Distribution. Amsterdam: Elsevier.

Bérenger, Valérie, Joseph Deutsch, and Jacques Silber (2013). Durable goods, access to services and the derivation of an asset index: Comparing two methodologies and three countries, Economic Modelling 35(3):881–891.

Bibi, S., and Nabli, M.K. (2010). Equity and Inequality in the Arab Region, ERF Policy Research Report 33, February 2010.

Birdsall, N., Londono J.L. (1997). Asset Inequality Matters: An Assessment of the World Bank's Approach to Poverty Reduction. American Economic Review Papers and Proceedings 82(2):32–37.

Central Statistical Agency of Ethiopia and World Bank (CSA & WB, 2013). Ethiopia Rural Socioeconomic Survey (ERSS): Survey Report, May 7, 2013, Washington: World Bank.

Central Statistical Agency & Living Standards Measurement Study – World Bank (CSA & WB, 2015). Ethiopia Socioeconomic Survey (ESS) – 2013/14: Survey Report (Workshop Version), March 25.

Cureton, E.E., and R.B. D'Agostino (1983). Factor analysis: An applied approach. Hillsdale, NJ: Erlbaum.

Davies, James B., Ed. (2008). Personal Wealth from a Global Perspective, UNU-WIDER Studies in Development Economics, Oxford, UK: Oxford University Press.

Davies, James B., Susanna Sandstrom, Anthony B. Shorrocks, and Edward N. Wolff (2011). The level and distribution of global household wealth, Economic Journal 121(551): 223–254.

Deaton, A., and S. Zaidi (2002). Guidelines for Constructing Consumption Aggregates for Welfare Analysis, Living Standards Measurement Study Paper 135, World Bank, Washington, DC.

El Enbaby, Hoda (2012). Evaluating Inequality of Opportunity in Egypt Using a Wealth Index. Unpublished Master's thesis. London, United Kingdom: The London School of Economics and Political Science.

El Enbaby, Hoda, and Rami Galal (2015). Inequality of Opportunity in Individuals' Wages and Households' Assets in Egypt. ERF Working Paper 942.

Erreygers, G. (2009). Correcting the Concentration Index. Journal of Health Economics 28(2):504–515.

Esteban, Joan Maria and Debraj Ray (1994). On the Measurement of Polarization, Econometrica 62(4):819–851.

Filmer, Deon, and Lant H. Pritchett (2001). Estimating Wealth Effect without Expenditure Data – or Tears: An Application to Educational Enrollments in States of India. Demography 38(1):115–132.

Fisher, Jonathan, David S. Johnson, Timothy M. Smeeding, and Jeffrey P. Thompson (2016). Inequality in 3D: Income, Consumption and Wealth. Presented at IARIW General Conference, Dresden, August 2016.

Food and Agriculture Organization (FAO, 2016a). Components of Income Aggregate: 2011-12 Ethiopian Rural Socioeconomic Survey, Rural Income Generating Activities Project of the Agricultural Development Economics Division, Food and Agriculture Organization, April.

Food and Agriculture Organization (FAO, 2016b). Construction of Consumption Aggregates for the Ethiopia Socioeconomic Survey Wave 2: Supplemental Information.

Hill, Robert J. (1997). A taxonomy of multilateral methods for making international comparisons of prices and quantities, Review of Income and Wealth 43(1):49–69.

Hlasny, Vladimir (2017). Evolution of opportunities for early childhood development in Arab countries. International Journal of Human Rights in Healthcare 10(4):256–276.

Hlasny, Vladimir and Vito Intini (2015). Representativeness of top expenditures in Arab region household surveys. UN ESCWA/EDID working paper 11, Beirut, December 2015.

Hlasny, Vladimir and Paolo Verme (2018). Top Incomes and the Measurement of Inequality in Egypt. World Bank Economic Review 32(1).

Ianchovichina, Elena (2017). Eruptions of Popular Anger: The Economics of the Arab Spring and Its Aftermath, MENA Development Report, Washington: World Bank.

Ianchovichina, Elena, Lili Mottaghi, and Shantayanan Devarajan (2015). Inequality, Uprisings, and Conflict in the Arab World, Middle East and North Africa Economic Monitor, October 2015, World Bank, Washington, DC.

Jayadev, A., S. Motiram, and V. Vakulabharanam (2007). Patterns of Wealth Disparities in India during the Liberalisation Era, Economic and Political Weekly 42(38):3853–3863.

Jenkins, Stephen P., and Markus Jantti (2005). Methods for Summarising and Comparing Wealth Distributions, paper presented at the Luxembourg Wealth Study conference, Perugia, Italy, January 27–29.

Klasen, Stephan, Giovanni Andrea Cornia, Rebeca Grynspan, Luis F. López-Calva, and Nora Lustig (2017). Economic Inequality and Social Progress, Ch.3 in Report of the International Panel on Social Progress. https://www.ipsp.org/download/chapter-3-economic-inequality-social-progress.

Li, Shi, and Renwei Zhao (2007). Changes in the Distribution of Wealth in China, 1995-2002, UNU-WIDER research paper 2007/03.

Majbouri, Mahdi (2017). Income mobility and the Arab spring: the case of Egypt and Jordan, Applied Economics Letters 24(15):1070–1074.

McKenzie, David J. (2005). Measuring Inequality with Asset Indicators, Journal of Population Economics 18(2):229–260.

Ncube, M., and J.C. Anyanwu (2012). Inequality and Arab Spring Revolutions in North Africa and the Middle East, African Development Bank: Africa Economic Brief 3(7):1–23.

Osman, M., E. Zakareya, and W. Mahrous (2006). Targeting the poor in Egypt: A ROC approach, Presented at 13th ERF Annual Conference, Kuwait, 16-18 December 2006.

Piketty, Thomas (2014). Capital in the 21st Century. Cambridge, MA: Belknap Press.

Ramadan, Racha, Vladimir Hlasny, and Vito Intini (2018). Inequality decomposition in the Arab region: application to Jordan, Egypt, Palestine and Tunisia, Review of Income and Wealth, forthcoming.

Ravallion, Martin (2004). Pro-poor growth: a primer, Policy Research Working Paper, Washington: World Bank, March 2004. http://dx.doi.org/10.1596/1813-9450-3242.

Rutstein, Shea O. (2008). The DHS Wealth Index: Approaches for rural and urban areas, DHS Working Papers No. 60.

Rutstein, Shea O., and Sarah Staveteig (2013). Making the Demographic and Health Surveys Wealth Index Comparable, paper presented at the 27th IUSSP International Population Conference, Busan, August 2013.

Sahn, D.E., and D.C. Stifel (2003). Exploring alternative measures of welfare in the absence of expenditure data. Review of Income and Wealth 49(4):463–489.

Saez, Emmanuel (2006). Income and Wealth Concentration in a Historical and International Perspective. In Public Policy and the Income Distribution, ed. Alan J. Auerbach, David Card, and John M. Quigley, 221–258. New York: Russell Sage Foundation.

Saez, Emmanuel, and Gabriel Zucman (2014). Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax data, NBER Working Paper 20625, October.

Sierminska, Eva, and Timothy Smeeding (2005). Measurement Issues: Equivalence Scales, Accounting Framework, and Reference Unit, Paper presented at the Luxembourg Wealth Study Workshop, Perugia, January 27-29, Revised May 2005.

Shorrocks, Anthony F. (1978). The Measurement of Mobility, Econometrica 46(5):1013–1024.

Subramanian S., and D. Jayaraj (2006). The Distribution of household wealth in India, UNU-WIDER research paper 2006/116.

Verme, Paolo, Branko Milanovic, S. Al-Shawarby, S. El Tawila, M. Gadallah, and E.A.A. El-Majeed (2014). Inside Inequality in the Arab Republic of Egypt: Facts and Perceptions across People, Time and Space, World Bank Studies, Washington DC.

Ward, Patrick S. (2014). Measuring the Level and Inequality of Wealth: An Application to China. Review of Income and Wealth 60(4):613–635.

Weil, D. (2009). Economic Growth (3rd Edition), London and New York: Routledge.

Table 1. PCA results, all surveys

	EG98	EG06	EG12	JO10	TU14	ET11	ET13
% of variance explained by 1st component	18.04	9.33	8.75	10.93	9.33	13.27	13.03
Eigenvalue of first component	9.02	8.12	8.14	8.85	7.65	13.93	13.68
Kaiser-Meyer-Olkin	0.62	0.67	0.65	0.72	0.57	0.82	0.76
Bartlett test of sphericity, Chi^2	278k	295k	487k	184k	157k	780k	406k
Degrees of freedom	1,225	3,741	4,278	3,160	3,321	5,460	4,851
Observations	4,816	8,351	12,060	5,102	4,521	3,969	5,262
Principal components (asset types)	49	86	93	80	82	99	99
Trace (sum of eigenvalues)	50	87	93	81	82	105	105

Note: PCA accounts for households' sampling weights.

Table 2. Paasche and Laspeyres quantity indexes of asset ownership

	Egypt			Ethiopia	
	Base yr \ Current yr 2006 \ Current yr 2012			Base yr \ Current yr 2013	
Paasche Index > 1 (% hhds)	1998	55.9%	68.5%	2011	50.3%
Base year EG12, ET13	2006		73.4%		
Laspeyres Index < 1 (% hhds)	1998	52.3%	58.1%	2011	44.3%
Base year EG98 or EG06, ET11	2006		25.3%		

Notes: PI>1 indicates that households revealed-prefer their bundle of assets in the current year, to that in the base year. For the Paasche Index, factor loadings from the current year are used: 2012 in the case of Egypt; 2013 in the case of Ethiopia. N_{Egypt1} = 413 households were present in both waves 1998 and 2012, with factor loadings in 2012; N_{Egypt2} = 681 households were present in both waves 1998 and 2006, with factor loadings in 2006; N_{Egypt3} = 6,612 households were present in both waves 2006 and 2012, with factor loadings in 2012; $N_{Ethiopia}$ = 5,289 households were present in both waves 2011 and 2013, with factor loadings in 2013.
LI<1 indicates that households revealed-prefer their bundle of assets in the base year, to that in the current year. For the Laspeyres Index, factor loadings from the base year are used: 1998 or 2006 in the case of Egypt; 2011 in the case of Ethiopia. N_{Egypt1} = 413 households were present in both waves 1998 and 2012, with factor loadings in 1998; N_{Egypt2} = 681 households were present in both waves 1998 and 2006, with factor loadings in 1998; N_{Egypt3} = 6,611 households were present in both waves 2006 and 2012, with factor loadings in 2006; $N_{Ethiopia}$ = 5,288 households were present in both waves 2011 and 2013, with factor loadings in 2011.
Figure A7 in the annex shows the distributions of the Paasche and Laspeyres quantity indexes across all households.

Table 3. Growth incidence of wealth score over time, by wealth quantile

	Egypt			Ethiopia
	1998–2006	2006–2012	1998–2012	2011–2013
Growth rate in mean	11.25	10.69	12.01	53.46
Growth rate in median	10.39	10.60	13.84	40.46
Mean percentile growth rate	13.47	8.82	11.08	61.19
Rate of pro-poor growth at 10th %ile	26.62	-5.24	-5.22	13.72
Rate of pro-poor growth at 15th %ile	26.93	-2.49	-0.65	15.28
Rate of pro-poor growth at 20th %ile	26.60	-0.67	2.62	16.56
Rate of pro-poor growth at 25th %ile	25.93	0.68	4.84	17.58
Rate of pro-poor growth at 30th %ile	24.96	1.87	6.49	18.45

Estimation of wealth quantiles accounts for households' sampling weights. Growth is cumulative across the entire range of years.

Table 4. Household demographic composition by wealth quintile (%)

Characteristic	Quintile	EG98	EG06	EG12	JO10	TU14	ET11[a]	ET13[a]
Urban	5 (Top)	88.58	89.26	86.92	95.05	95.24	3.59[b]	79.93
	4	76.28	75.55	68.57	90.31	90.63	0.98	9.82
	3	46.51	45.66	45.34	81.84	82.03	0.40	0.36
	2	22.02	24.09	20.04	78.16	63.12	0.27	0.12
	1 (Bottom)	7.34	10.40	10.43	73.53	20.12	0.05	0.18
	Total	48.13	48.98	46.26	83.78	70.17	1.06	18.08
	Households	4,816	8,351	12,060	5,102	4,521	3,969	5,290
Married HH head	5	84.50	83.82	84.28	89.26	90.05	82.20	77.89
	4	84.25	79.67	82.98	86.24	80.64	82.03	79.07
	3	81.17	80.88	81.49	89.07	81.91	81.81	76.65
	2	79.97	78.57	81.32	87.45	70.98	76.37	77.60
	1	79.59	78.00	78.67	74.74	76.07	71.14	76.73
	Total	81.90	80.19	81.75	85.35	79.89	78.71	77.58
	Households	4,816	8,351	12,060	5,102	4,472	3,881	5,231
Male HH head	5	85.75	84.83	83.80	85.09	90.54	84.99	63.97
	4	86.47	80.85	83.19	85.64	83.52	85.67	77.43
	3	81.38	80.13	80.11	87.40	85.70	82.55	77.99
	2	84.02	79.68	77.79	87.84	75.20	76.51	78.65
	1	81.30	79.91	79.07	82.04	75.61	69.93	79.22
	Total	83.79	81.08	80.79	85.60	82.12	79.92	75.49
	Households	4,816	8,351	12,060	5,102	4,469	3,897	5,261
Secondary+ educated HH head (vs. less than secondary)	5	69.52	74.14	77.60	71.93	49.99	12.77	43.16
	4	44.14	48.86	57.57	49.15	20.66	3.49	7.82
	3	26.21	38.20	46.41	42.92	13.79	0.94	2.66
	2	15.08	22.94	31.95	28.02	7.25	0.00	1.41
	1	7.25	12.03	18.91	22.09	2.60	0.16	0.56
	Total	32.43	39.23	46.49	42.82	18.65	4.70	17.49
	Households	4,811	8,350	12,057	5,102	4,203	1,397	2,531
HH head econ. active (vs. OLF)	5	70.40	69.24	72.75	64.76	49.56	–	–
	4	73.26	68.10	73.03	68.88	48.65	–	–
	3	67.43	70.62	70.46	72.93	54.09	–	–
	2	69.10	67.45	66.97	69.64	44.51	–	–
	1	65.45	69.15	64.42	65.54	44.88	–	–
	Total	69.13	68.91	69.52	68.35	48.33	–	–
	Households	4,816	8,351	12,060	5,102	4,521	–	–
HH head employed (vs. unemployed or OLF in Ethiopia; vs. unemployed in other surveys)	5	98.60	99.21	98.07	96.64	99.02	27.84	46.41
	4	97.33	97.80	96.31	95.88	98.16	22.91	36.62
	3	95.38	97.54	95.74	94.73	94.83	20.93	30.98
	2	96.04	97.97	97.87	94.72	94.68	22.18	40.58
	1	97.20	98.86	98.57	93.19	91.32	24.20	29.54
	Total	96.93	98.28	97.28	95.03	95.68	23.62	36.75
	Households	3,321	5,962	8,538	3,453	2,148	3,880	5,211
HH head working 35+ hours/week (vs. 0-35)	5	–	94.04	88.79	89.73	89.55	51.92	83.97
	4	–	90.97	85.14	88.56	82.05	63.20	65.70
	3	–	86.47	82.95	88.09	80.06	73.42	42.80
	2	–	83.01	79.59	87.94	83.13	13.12	60.63
	1	–	79.15	79.97	88.75	67.15	28.83	72.63
	Total	–	86.48	83.33	88.59	80.12	51.11	75.30
	Households	–	6,421	8,882	3,336	2,040	435	995
HH head in permanent job (vs. temporary, seasonal, intermittent)	5	97.71	96.73	91.82	97.84	93.45	–	–
	4	93.82	91.88	80.79	97.60	85.59	–	–
	3	91.83	90.08	73.68	95.83	81.76	–	–
	2	81.50	86.90	68.02	93.32	72.58	–	–
	1	70.61	82.54	72.54	92.80	69.02	–	–
	Total	86.91	89.41	77.49	95.49	80.52	–	–
	Households	3,579	6,421	8,884	3,336	2,269	–	–

Note: All summary statistics account for households' sampling weights.

[a] Ethiopian surveys use different definitions of education, employment and occupation, giving rise to summary statistics that are not entirely comparable to Egypt, Jordan and Tunisia.

[b] The 2011 Ethiopian "rural" survey covers only rural and small-town areas, notably omitting large cities.

Table 4 (cont.). Household demographic composition by wealth quintile (%)

Characteristic	Quintile	EG98	EG06	EG12	JO10	TU14
HH head employer (vs. wage worker, self employed, unpaid family worker)	5	21.10	19.49	17.08	30.70	17.85
	4	15.17	18.04	10.51	11.19	9.75
	3	15.52	17.21	6.86	7.51	6.85
	2	18.62	26.11	12.34	5.76	5.31
	1	19.17	35.90	32.13	4.31	2.94
	Total	17.90	23.66	15.81	11.70	8.51
	Households	3,579	6,421	8,884	3,322	2,256
HH head wage worker (vs. self employed, unpaid family worker)	5	89.05	90.02	87.11	80.23	79.85
	4	83.36	81.07	84.43	77.99	72.66
	3	78.44	77.68	83.58	83.31	76.56
	2	71.27	72.27	79.89	84.79	80.82
	1	70.29	70.81	73.50	91.05	58.64
	Total	78.32	78.54	82.10	83.68	73.28
	Households	3,000	4,973	7,450	3,006	2,094

Note: All summary statistics account for households' sampling weights.

Table 5. Wealth gaps across selected demographic groups and group wealth percentiles

Gap	Wealth %ile	EG98	EG06	EG12	JO10	TU14	ET11[a]	ET13[a]
Urban–rural	95th	16.40	14.58	11.45	13.79	20.56	14.92[b]	43.31
	90th	15.63	11.52	9.87	13.82	20.01	11.50	41.31
	75th	16.19	9.03	7.76	9.99	17.61	7.19	30.51
	50th (Median)	20.50	9.66	9.03	7.21	18.77	2.63	18.59
	25th	23.26	13.31	11.82	5.86	18.45	1.18	13.18
	10th	21.74	14.27	12.39	4.64	15.69	0.64	10.37
	5th	18.22	13.41	11.02	3.76	14.25	0.45	8.54
Married–unmarried	95th	3.94	3.35	1.04	5.44	10.00	0.29	0.24
	90th	2.01	2.55	0.61	5.61	9.45	0.38	0.62
	75th	1.74	1.11	0.95	2.64	5.35	0.27	0.08
	50th (Median)	2.81	0.93	1.21	4.58	5.46	0.20	0.31
	25th	2.14	1.35	1.77	6.52	2.99	0.14	0.11
	10th	3.48	1.48	1.39	4.81	2.57	0.08	-0.10
	5th	2.54	1.81	1.10	3.71	2.59	0.07	-0.33
Male–female	95th	2.33	2.39	0.63	1.50	8.99	0.51	-11.75
	90th	1.40	2.41	0.60	1.08	8.75	0.38	-8.82
	75th	1.73	1.22	1.41	-0.90	4.98	0.46	-5.90
	50th (Median)	1.93	0.83	1.53	-0.24	6.35	0.29	-0.64
	25th	1.72	0.63	1.28	2.31	5.24	0.18	-0.32
	10th	3.17	0.90	0.47	1.18	4.75	0.07	-0.38
	5th	2.00	1.04	0.15	0.95	2.84	0.04	-0.43
Educated–less educated	95th	13.99	13.40	9.31	17.42	19.07	7.40	24.38
	90th	13.33	10.31	7.58	14.95	19.28	7.44	30.15
	75th	12.59	7.04	5.67	12.38	17.15	4.93	31.10
	50th (Median)	16.07	7.58	6.87	10.20	15.32	2.77	20.64
	25th	19.90	10.17	9.10	8.84	16.45	1.65	12.82
	10th	18.33	12.13	8.38	6.52	17.32	0.96	9.15
	5th	14.12	10.91	7.27	4.19	16.80	0.96	6.06
Economically active–OLF	95th	0.33	-0.92	0.00	0.52	-2.20	–	–
	90th	0.51	0.36	0.05	-0.76	-0.45	–	–
	75th	0.49	0.03	1.04	-1.99	0.14	–	–
	50th (Median)	1.77	-0.10	1.55	-0.66	0.54	–	–
	25th	2.22	-0.06	2.08	0.68	2.04	–	–
	10th	2.99	0.46	1.29	0.34	2.54	–	–
	5th	2.79	1.12	0.67	-0.08	1.94	–	–
Employed–unemployed (or OLF in Ethiopia)	95th	6.61	2.99	-0.42	-1.09	13.76	1.07	7.21
	90th	6.20	4.41	1.35	1.95	11.36	1.17	7.69
	75th	5.37	1.36	0.94	3.71	9.65	0.30	4.22
	50th (Median)	2.99	-1.18	-0.26	2.99	8.39	0.07	0.39
	25th	1.89	-2.70	-4.21	3.37	9.15	-0.01	0.41
	10th	-3.08	-3.22	-4.27	1.36	6.24	-0.01	0.30
	5th	-3.58	-3.59	-4.33	-0.02	4.23	0.01	0.47
Full time–part time (35+ vs. 0-35)	95th	–	7.16	2.53	0.11	6.15	-31.35	21.11
	90th	–	5.03	2.46	0.16	7.35	-2.45	19.91
	75th	–	4.12	2.03	1.69	5.49	-1.35	13.09
	50th (Median)	–	4.43	2.31	-1.05	4.07	0.20	9.96
	25th	–	5.11	2.22	-0.15	7.33	0.48	5.95
	10th	–	3.30	0.94	-0.65	4.87	0.39	1.41
	5th	–	2.45	1.05	-0.51	2.40	0.13	-0.08
Employer–nonemployer (wage worker, self employed, unpaid family worker)	95th	4.48	0.54	3.91	16.27	11.49	–	–
	90th	2.12	-0.93	2.65	17.39	10.01	–	–
	75th	1.39	-1.57	0.09	15.72	11.72	–	–
	50th (Median)	-0.78	-4.01	-5.57	13.26	9.04	–	–
	25th	-0.56	-5.70	-8.87	9.98	11.18	–	–
	10th	1.24	-5.02	-8.40	8.16	10.70	–	–
	5th	0.47	-4.32	-7.53	6.16	5.10	–	–

All summary statistics account for households' sampling weights.

[a] Ethiopian surveys use different definitions of education, employment and occupation, giving rise to summary statistics that are not entirely comparable to Egypt, Jordan and Tunisia.

[b] The 2011 Ethiopian "rural" survey covers only rural and small-town areas, notably omitting large cities.

Table 6. Distribution of monthly household gross wage earnings or consumption (PPP2012$)

				Wage earnings		Consumption expend.	
	EG98	**EG06**	**EG12**	**JO10**	**TU14**	**ET11**	**ET13**
Range	7–9,609	6–10,008	4–9,972	6–181,196	1–10,169	9–9,025	8–2,891
Median	256	326	313	579	564	242	210
Mean	342	450	431	1,203	743	334	264
Standard deviation	315	490	464	4,975	749	414	208
Skewness	7.533	5.587	6.258	27.847	6.586	6.838	3.242
Kurtosis	174.583	52.774	74.367	952.418	69.908	70.607	24.466
Gini (×100)	39.97	41.89	41.40	57.76	38.01	43.34	37.12
	(0.66)	(0.73)	(0.70)	(4.07)	(2.01)	(1.35)	(0.55)
95:5 percentile ratio	10.879	10.311	11.176	11.917	9.573	12.279	10.266
90:10 percentile ratio	6.800	5.884	5.779	6.000	5.147	6.519	5.928
80^{th} percentile	480.44	599.73	570.33	1,108.59	979.91	423.06	369.23
60^{th} percentile	312.29	390.13	370.37	689.85	684.29	290.77	248.49
40^{th} percentile	216.53	274.94	267.09	529.59	507.58	204.64	178.61
20^{th} percentile	139.06	182.43	185.19	370.51	343.09	131.58	118.15
Top 1% share (%)	5.75	8.58	7.81	24.93	7.92	10.36	5.16
Top 5% share	18.38	22.30	21.74	43.94	19.67	23.82	16.96
Top 10% share	29.62	32.73	32.33	52.49	29.64	34.20	27.52
Top 20% share	45.87	48.18	46.35	63.67	44.74	49.04	43.47
Top 50% share	76.91	77.44	76.51	83.37	73.95	78.03	75.14
Bottom 20% share	5.76	5.86	6.06	4.59	6.40	5.20	6.15
N	3,248	5,402	7,894	3,494	1,308	3,832	5,071

Households with all members failing to report wage earnings are omitted. All statistics account for households' sampling weights.

Table 7. Household densities on joint distribution of wealth and earnings quintiles (%hhds)

Egypt 98	**Earnings: 1**		**2**		**3**		**4**		**5**		**Total**	**Shorrocks=.85**
Wealth:		**40.42**		23.62		16.01		11.29		8.66		100
1	**27.16**		14.40		9.34		6.49		4.46		11.73	
		27.96		**25.44**		21.55		14.56		10.49		100
2	**25.40**		20.96		17.00		11.31		7.30		15.86	
		16.18		**25.29**		**25.29**		19.71		13.53		100
3	19.40		**27.52**		**26.34**		20.21		12.43		20.94	
		13.40		19.00		20.95		24.85		21.80		100
4	19.40		24.96		**26.34**		**30.77**		24.19		25.28	
		5.76		8.93		16.10		24.32		**44.89**		100
5	8.64		12.16		20.98		**31.22**		**51.62**		**26.20**	
Total	100	17.46	100	19.24	100	20.1	100	20.41	100	22.78	100	

Egypt 06	Earnings: 1		2		3		4		5		Total	Shorrocks=.89
Wealth:		**36.28**		23.02		19.19		12.21		9.30		100
1	**29.80**		18.66		14.97		9.69		7.22		15.92	
		25.84		23.22		20.61		18.41		11.92		100
2	23.59		20.92		17.88		16.24		10.29		17.70	
		20.95		24.15		21.23		20.22		13.45		100
3	21.87		24.88		21.05		20.39		13.27		20.23	
		15.26		19.90		**25.04**		21.81		17.99		100
4	17.57		22.62		**27.40**		24.26		19.58		22.33	
		5.83		10.64		16.01		24.79		**42.74**		100
5	7.16		12.91		18.69		**29.43**		**49.64**		23.82	
Total	100	19.38	100	19.64	100	20.40	100	20.07	100	20.51	100	

Egypt 12	Earnings: 1		2		3		4		5		Total	Shorrocks=.91
Wealth:		**30.24**		22.87		21.16		15.87		9.86		100
1	24.78		20.96		17.81		14.10		9.70		17.72	
		28.70		22.54		19.94		16.56		12.27		100
2	**27.83**		24.43		19.86		17.40		14.27		20.97	
		24.67		21.55		22.57		19.33		11.88		100
3	24.08		23.51		22.62		20.44		13.91		21.1	
		16.79		19.54		23.53		22.35		17.79		100
4	15.76		20.50		22.68		22.73		20.03		20.29	
		8.21		10.31		18.00		**25.38**		**38.10**		100
5	7.56		10.61		17.03		**25.33**		**42.09**		19.91	
Total	100	21.62	100	19.34	100	21.05	100	19.95	100	18.03	100	

Jordan 10	Earnings: 1		2		3		4		5		Total	Shorrocks=.87
Wealth:		**35.03**		**28.00**		15.45		11.86		9.66		100
1	**37.41**		23.55		18.86		12.23		10.67		20.75	
		22.13		**29.79**		20.64		17.43		10.01		100
2	**26.36**		**27.96**		**28.11**		20.06		12.35		23.15	
		16.12		**27.35**		19.29		22.83		14.41		100
3	19.44		**25.99**		**26.60**		**26.60**		17.99		23.44	
		12.07		19.31		16.29		**26.09**		**26.24**		100
4	11.78		14.85		18.18		24.61		**26.52**		18.98	
		7.11		13.81		10.25		24.27		**44.56**		100
5	5.01		7.66		8.25		16.50		**32.47**		13.68	
Total	100	19.43	100	24.67	100	17.00	100	20.12	100	18.78	100	

Tunisia 14	Earnings: 1		2		3		4		5		Total	Shorrocks=.86
Wealth:		**46.54**		**25.76**		12.74		10.25		4.71		100
1	**53.00**		**29.52**		19.25		16.89		7.80		**27.60**	
		26.10		**25.47**		19.81		15.41		13.21		100
2	**26.18**		**25.71**		**26.36**		22.37		19.27		24.31	
		14.71		**26.05**		24.79		18.91		15.55		100
3	11.04		19.68		24.69		20.55		16.97		18.20	
		9.73		**25.22**		19.47		20.80		24.78		100
4	6.94		18.10		18.41		21.46		**25.69**		17.28	
		5.45		13.33		16.36		24.85		**40.00**		100
5	2.84		6.98		11.30		18.72		**30.28**		12.61	
Total	100	24.24	100	24.08	100	18.27	100	16.74	100	16.67	100	

Notes: Densities account for households' sampling weights.

Table 8. Household densities on joint distribution of wealth and consumption quintiles, Ethiopia (%hhds)

Ethiopia 11	**Consump: 1**		**2**		**3**		**4**		**5**		**Total**	**Shorrocks=.90**
Wealth: 1	**28.68**	**37.94**	18.64	24.13	13.06	16.47	10.53	12.81	6.75	8.65	15.68	100
2	**26.16**	**30.54**	20.95	23.94	16.75	18.65	14.36	15.42	10.13	11.45	17.77	100
3	15.85	17.80	19.02	20.90	22.43	24.01	21.20	21.89	14.16	15.40	18.48	100
4	10.44	11.91	17.10	19.08	19.00	20.66	22.98	24.10	21.95	24.25	18.19	100
5	18.87	13.10	24.29	16.51	**28.76**	19.04	**30.92**	19.74	**47.01**	**31.62**	**29.88**	100
Total	100	20.75	100	20.30	100	19.78	100	19.08	100	20.09	100	

Ethiopia 13	Consump: 1		2		3		4		5		Total	Shorrocks=.94
Wealth: 1	21.93	**26.67**	19.60	22.42	16.84	19.76	13.94	16.85	10.18	14.30	16.27	100
2	**25.82**	**31.06**	18.54	20.98	16.84	19.54	14.24	17.03	8.20	11.39	16.45	100
3	16.95	23.84	15.89	21.04	13.95	18.93	13.44	18.79	10.70	17.39	14.06	100
4	15.85	18.13	17.37	18.70	18.90	20.87	18.66	21.21	15.96	21.09	17.29	100
5	19.44	10.70	**28.60**	14.82	**33.47**	17.78	**39.72**	21.73	**54.96**	**34.96**	**35.93**	100
Total	100	19.78	100	18.62	100	19.09	100	19.66	100	22.86	100	

Notes: Densities account for households' sampling weights.

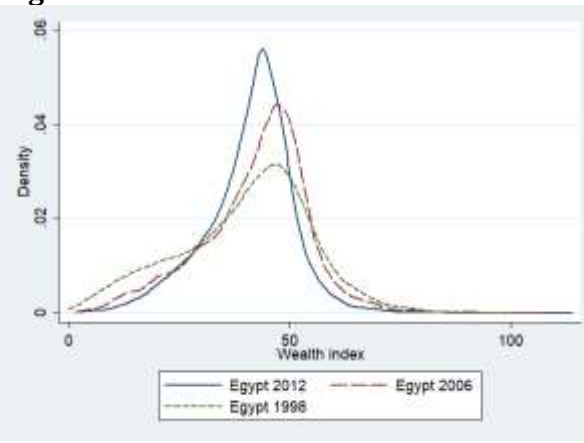
Table 9. Household densities on joint distribution of wealth in a year and earnings/consumption quintiles in the following year (%hhds)

Egypt 06–12	**Earnings: 1**		**2**		**3**		**4**		**5**		**Total**	**Shorrocks=.92**
Wealth: 1	24.18	**28.19**	19.80	20.82	18.20	20.55	15.13	17.52	11.26	12.91	17.7	100
2	24.18	**26.99**	22.18	22.32	20.42	22.07	14.11	15.64	11.84	12.99	18.49	100
3	21.58	22.21	22.31	20.70	20.07	20.00	19.91	20.35	16.55	16.74	20.05	100
4	17.85	16.72	21.93	18.52	23.80	21.59	**25.82**	24.02	20.80	19.15	22.03	100
5	12.20	11.59	13.78	11.80	17.50	16.09	**25.03**	23.61	**39.54**	**36.91**	21.73	100
Total	100	20.63	100	18.61	100	19.98	100	20.49	100	20.28	100	

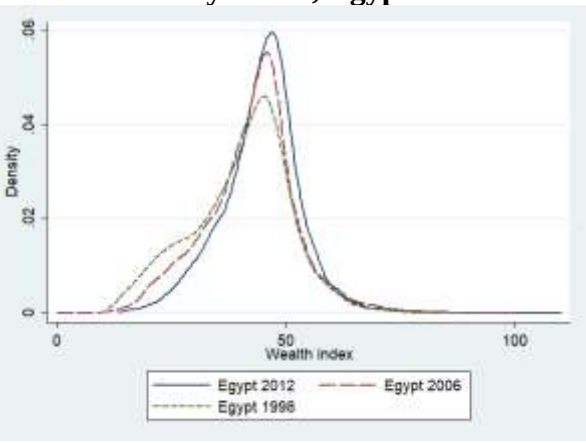
Ethiopia 11–13	Consump: 1		2		3		4		5		Total	Shorrocks=.90
Wealth: 1	**27.62**	**36.81**	17.76	22.12	14.31	17.35	12.18	15.22	6.06	8.50	15.52	100
2	**25.23**	**29.64**	23.01	**25.27**	17.52	18.72	13.46	14.82	9.34	11.54	17.61	100
3	15.67	17.64	20.31	21.38	21.17	21.67	18.13	19.13	17.05	20.18	18.38	100
4	14.74	16.35	15.34	15.91	21.46	21.65	20.40	21.21	21.34	24.89	18.65	100
5	16.73	11.60	23.58	15.29	**25.55**	16.11	**35.84**	23.30	**46.21**	**33.70**	29.84	100
Total	100	20.69	100	19.34	100	18.82	100	19.40	100	21.76	100	

Notes: Densities account for households' sampling weights. N_{EG}=4,292. N_{Eth}=3,640

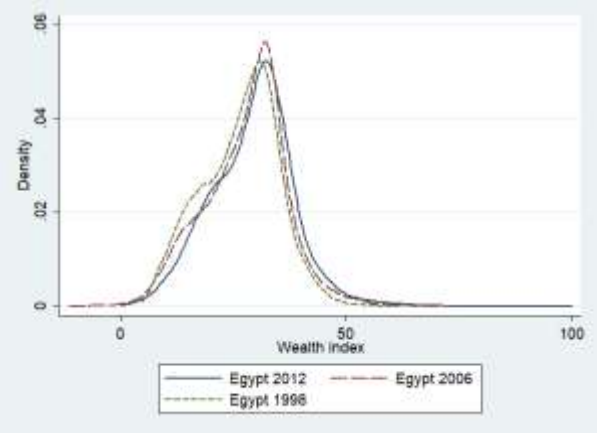
Figure 1. Distribution of the asset wealth index across survey waves, Egyptian LMPS



i. Using Egypt 1998 factor loadings



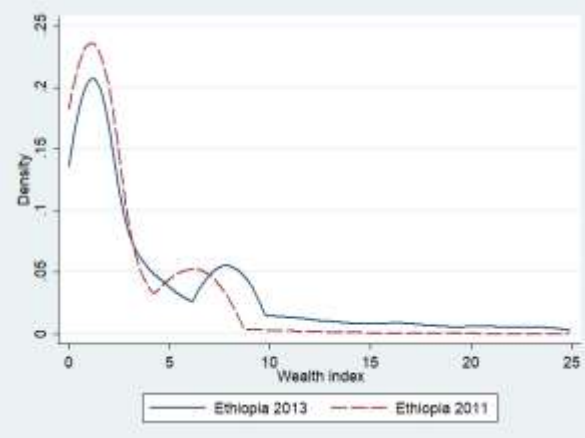
ii. Using Egypt 2006 factor loadings



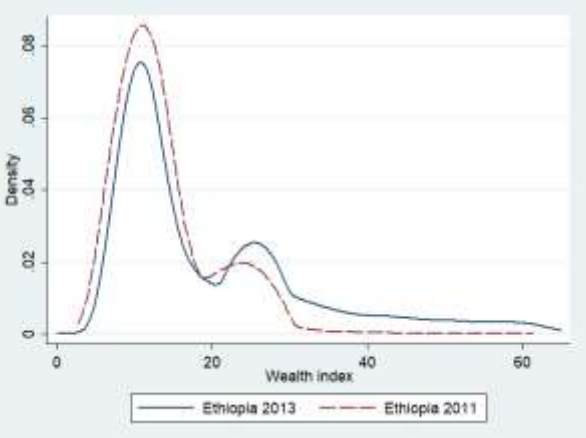
iii. Using Egypt 2012 factor loadings

Notes: In subfigure (i) Egypt 1998 is used as a base survey on which principal component analysis is performed. Variable loadings are extrapolated to other surveys and multiplied by asset ownership there. In subfigures (ii) and (iii), 2006 and 2012 surveys are used as base years for factor loadings, respectively.

Figure 2. Distribution of the asset wealth index, Ethiopia Socioeconomic Surveys



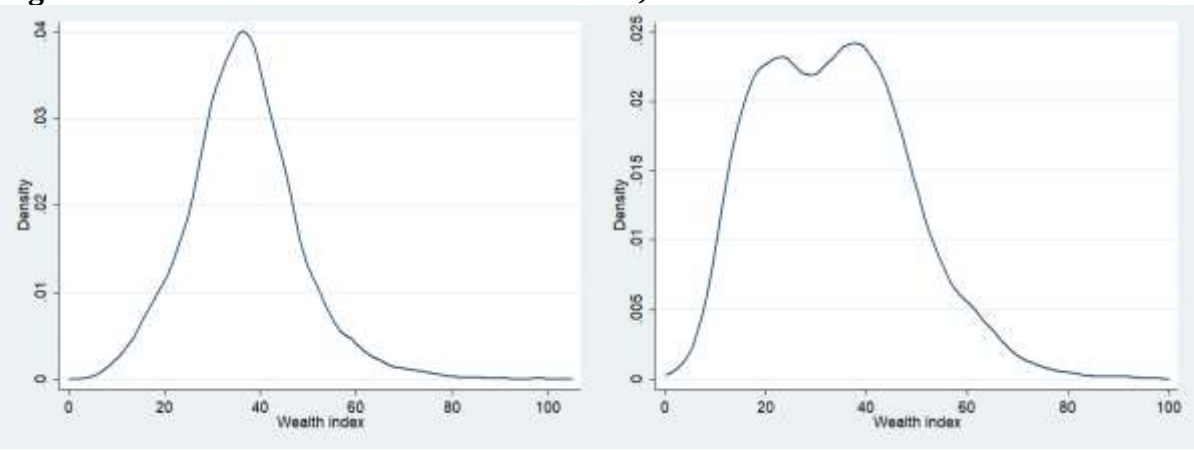
i. Using Ethiopia 2011 factor loadings



ii. Using Ethiopia 2013 factor loadings

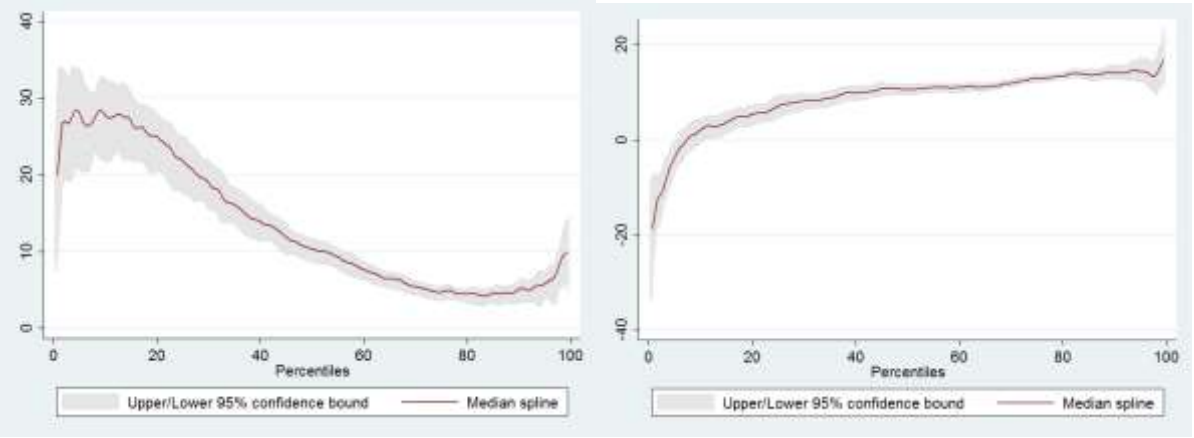
Notes: In subfigure (i) Ethiopia 2011 is used as a base survey on which principal component analysis is performed. Variable loadings are extrapolated to the 2013 survey and multiplied by asset ownership there. In subfigure (ii) loadings from Ethiopia 2013 are used for asset ownership in both waves.

Figure 3. Distribution of the asset wealth index, Jordanian and Tunisian LMPS

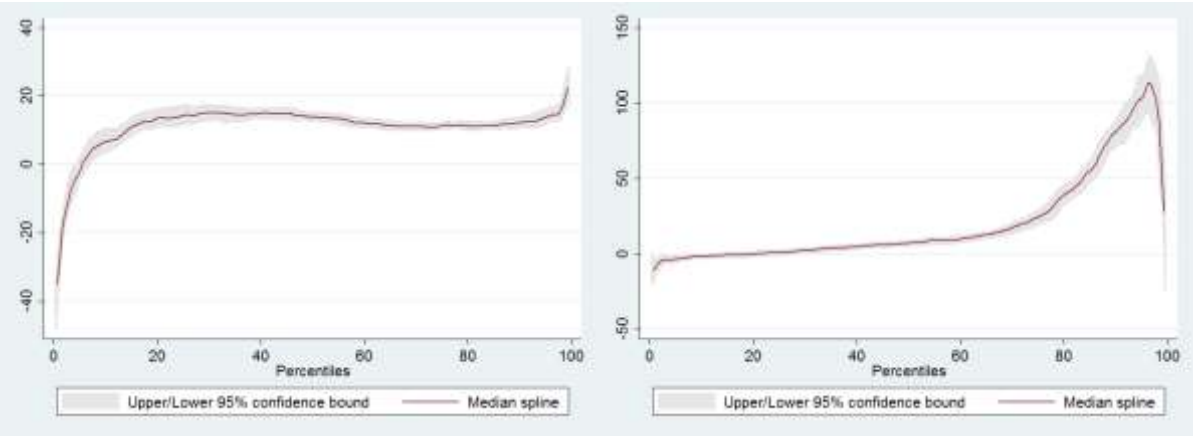


i. Jordan 2010 ii. Tunisia 2014

Figure 4. Growth incidence curves for Egypt 1998–2012, and Ethiopia 2011–2013



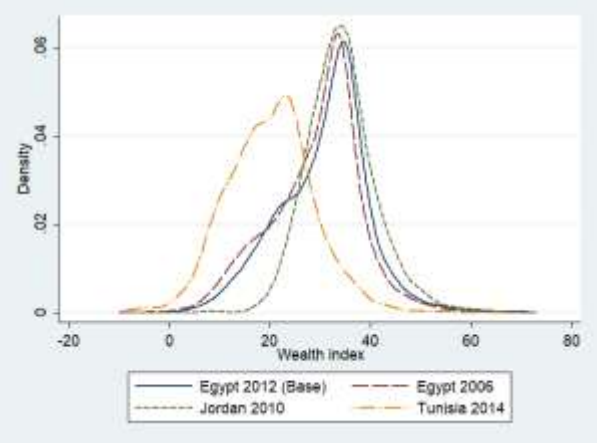
i. Egypt 1998-2006, using 2006 factor loadings ii. Egypt 2006-2012, using 2012 factor loadings



iii. Egypt 1998-2012, using 2012 factor loadings iv. Ethiopia 2011-2013, using 2013 factor loadings

Notes: Estimation of wealth quantiles accounts for households' sampling weights. 95% confidence intervals are bootstrap estimates using 50 repetitions.

Figure 5. Cross-country comparison of the asset wealth indexes, using ELMPS 2012 factor loadings



Egypt 2012 is used as a base survey on which principal component analysis is performed. Variable loadings are extrapolated to the other surveys and multiplied by asset ownership there.

Annex. Additional information and results

Data

Our analysis relies on data from seven waves of panel surveys for four MENA countries, including Egypt Labor Market Panel Surveys (LMPS) 1998, 2006 and 2012; Jordan LMPS 2010; Tunisia LMPS 2014; and Ethiopia Socioeconomic Survey (ESS) 2011 and 2013.

To put the surveys in perspective of historical events in the MENA region, the Jordanian survey was administered during January–April 2010, less than a year before protests erupted in Amman in January 2011 over economic conditions in the country and government incompetence. Those protests came on the heels of a revolution in Tunisia in December 2010 that led to a change of government and ushered in democratic changes. In the following months Arab Spring uprisings swept through several MENA region countries. In Egypt, popular revolution started only days after the ousting of the Tunisian president and the events in Jordan. The Egyptian president was also ousted in February 2011, and the secular regime was replaced by an Islamist government led by the Muslim Brotherhood in June 2012. Continued popular protests over both economic and political concerns led to the ousting of the elected president in June 2013, and a new government came to power through a coup d'état. The Egyptian LMPS was conducted amidst this domestic and region-wide flux and uncertainty, during March–June 2012. Tunisian survey was conducted between February and November 2014, a period of political stabilization and pluralist rule after the enactment of a new consensus national constitution.

Ethiopia avoided political turmoil during 2011, and only in 2016 saw protests calling for social and administrative reforms, which have simmered to this day. But even Ethiopia was not spared economic crises in 2011. The first wave of the Ethiopian survey was conducted between October 2011 and March 2012, in the aftermath of the East Africa drought, which affected rural residents' access to nutrition and earning opportunities, and – in combination with poor policy responses – caused widespread famine. Humanitarian aid was hampered and diverted by local authorities, resulting in an excess of suffering and deaths. The second wave of the Ethiopian survey was administered between September 2013 and April 2014, at a time when economic conditions had stabilized. Milder spells of food insecurity were experienced in 2015.

The Egyptian, Jordanian and Tunisian surveys were obtained from the Economic Research Forum's Open Access Micro Data Initiative (OAMDI 2016), and the Ethiopian surveys from the World Bank's Living Standards Measurement Study (CSA & WB 2013, 2015). Labor market and socioeconomic panel surveys are suitable for our endeavor as they contain vast information on households' productive and non-productive assets, business and farm ownership, and household members' circumstances and outcomes harmonized across survey waves.

All surveys used here were conducted subject to a multi-stage sampling design stratified at the level of administrative regions. All surveys provide sampling weights, and their samples are nationally representative.[23] Individual waves of Egyptian LMPS and Ethiopian Socioeconomic Survey are harmonized among themselves, facilitating intertemporal comparison of statistics, and enabling us to follow the evolution of asset ownership and economic conditions over time (Assaad and Krafft 2013; CSA & WB 2013, 2015; El Enbaby and Galal 2015). The available surveys are deemed to be of high quality, and there is no *a priori* indication that the data suffer from measurement errors or bias-inducing attrition of survey subjects. The data will thus be used in their micro-level panel form without aggregating them into demographic groups

[23] With the exception of the 2011 Ethiopian "rural" survey, which covers only rural and small-town areas, notably omitting Addis Ababa.

(Majbouri 2016). Table A1 provides basic summary statistics and documentation for these surveys.

Household assets accounted for in this study include both private and "public" goods, capturing household-members' individual consumption as well as consumption shared by all members. Total household wealth rather than wealth per capita is used for several reasons. One, identity of purchasers, owners and users of assets is not reported in household surveys. Asset holdings are typically surveyed in household modules rather than individual modules of questionnaires. Two, many durables are of public-good nature in that they bestow benefits on multiple household members, and these benefits are not easy to split or allocate to individual members. Three, it is unclear what adult-equivalence scale should be used for asset ownership, particularly since there are various classes of assets.

Asset ownership could be categorized into three groups: housing capital (real estate type and size, materials, infrastructure, access to utilities), physical non-productive capital (household durables, appliances), and physical productive capital (transportation, two-way communication, commercial and agricultural capital, livestock, land) (McKenzie 2005; Ward 2014). The value of physical productive capital is adjusted for the household's co-ownership share of this capital, and if the value is in monetary units (i.e., firm ownership), for inflation. Monetary values are converted to year-2012 dollars using currency conversion factors and US GDP-deflator inflation.[24] We study all assets jointly rather than utilize the above classification, because the three indexes would not be related cardinally, and because there are too few asset types in each category to perform PCA successfully. Only in the analysis of multidimensional inequality, we differentiate housing and non-productive capital from productive capital.[25] Beside asset ownership, the surveys contain information on households' demographics, current wage earnings or consumption, and various labor-market outcomes. Cross-sectional population weights are used to obtain nationally-representative and cross-survey comparable results.

The labor market panel surveys report monthly total wage earnings in real purchasing-power parity (international) 2012 dollars. These are not corrected for spatial price differences across national regions. A substantial number of households have all members failing to report wage earnings. These households are omitted from this analysis, at the potential cost of inefficiency or even bias to the estimated relationship between wealth and earnings, because it is possible that the information is missing systematically.

The Ethiopian surveys report households' total annual food and non-food consumption expenditures excluding house rent. Only nominal values are reported, but spatial cost differentials are also provided. Consumption data in Ethiopia are censored at the 99th percentile to ensure data quality such as robustness to outliers. Several dozen households also have consumption aggregate missing for failure to report important consumption components (FAO 2016a,b). To make these consumption data comparable to the wealth indexes, and to earnings in LMPSs, several procedures are undertaken: Values of consumption are divided by 12 to reflect monthly consumption. Spatial cost differentials are not used, but year 2011 and 2013 consumption expenditures are converted to real 2012 purchasing-power parity dollars. Both earnings and consumption are aggregated up to the household level.

The available data have several notable limitations that affect the usability and interpretation of the obtained wealth indexes. Asset ownership is partially harmonized between waves of the Egyptian and Ethiopian surveys, but much less so across countries, particularly for types of

[24] Conversion rates are as follows: 1998 Eg. pound: 1.087; 2006 Eg. pound: 1.138; 2012 Eg. pound: 1.795; 2010 Jord. dinar: 0.292; 2014 Tun. dinar: 0.612; 2011 Eth. birr: 5.008; 2013 Eth. birr: 6.561 (World Bank 2015a,b).

[25] Refer to table A1. Table A2 reports the lists of assets included with their range of values in each wave of the Egyptian LMPS, as well as their loadings in the PCA. Tables A3 and A4 show the equivalent statistics for the Jordanian and Tunisian LMPS, and for the two waves of the Ethiopian Socioeconomic Survey.

housing, construction materials, and commercial and agricultural assets. For this reason, this study will provide limited comparison of the levels of wealth across countries, for the most part commenting on the degree of relative inequality and polarization of wealth across countries.

Several components of net assets are notably missing from our analysis for lack of consistent data. One, household debt and other present or future liabilities (e.g., inheritance taxes) are omitted as unavailable. Wealth indexes thus have gross-wealth interpretation. We also exclude the accumulation of durable non-physical capital, such as social networks, education or skills (Echevin 2013). Value of households' financial assets (including savings, pension, insurance etc.) is omitted because surveys do not cover them, or too few households report them. Our asset index can thus be thought of as gross physical wealth, or assets that are convertible to cash within several years.

One problem in the available survey data is missing observations. If a household fails to report ownership of any single asset, the entire household would be dropped from the PCA. Possible solutions include dropping such households, dropping assets suffering from high item nonresponse, or imputing values of the missing items using information about the households or on the typical rate of ownership of that asset in the population. The first two approaches would omit valuable information from the calculation of the wealth index in the population. To take advantage of the greatest possible number of household observations and asset types surveyed, we attempt to impute missing values. In the case of surveys with multiple waves, households' ownership of the same asset in adjacent survey waves is used. (This is not done for technology assets including computers, cell phones, mp3 players, and internet access.) In the absence of ownership information from adjacent waves, we use sampling-weights adjusted mean ownership rate across survey households in the same survey wave, differentiating urban and rural households, to fill in missing values.

Table A1. Basic description of evaluated surveys

Survey wave	Source & documentation	Hhds	Mean pop. sampling weight	Product. asset types	Non-product. assets	House type	Enterprise own.	Farm & agric. assets	Land own.[a]
EG98 LMPS	OAMDI 2016; Assaad & Barsoum (2000)	4,816	2,452.61	8	42	No	Cur.value	No	No
EG06 LMPS	--; Barsoum (2007)	8,351	1,841.91	44	43	No	Cur.value	Mkt.value	No
EG12 LMPS	--; Assaad & Krafft (2013)	12,060	1,627.11	45	50	Yes	Cur.value	Mkt.value	Binary
JO10 LMPS	--; Jordan (2010), Assaad (2012)	5,102	243.51	34	50	Yes	Cur.value	Mkt.value	Binary
TU14 LMPS	--; Assaad et al. (2016)	4,521	600.09	35	47	Yes	Cur.value	Mkt.value	Area
ETH11 SES	LSMS; CSA & WB (2013)	3,969	2,983.36	38	67	No	Binary	Binary	Area
ETH13 SES	LSMS; CSA & WB (2015)	5,262	3,277.42	38	68	No	Binary	Binary	Area

Notes: LSMS is the World Bank Living Standards Measurement Study. OAMDI is the Economic Research Forum's Open Access Micro Data Initiative.

[a] This excludes land included in the valuation of enterprises.

Table A2. Asset summary statistics and PCA loadings: Egyptian Labor Market Panel Surveys

Asset	Description (units)	1998 mean (range)	Loading	2006 mean (range)	Loading	2012 mean (range)	Loading
house	own (0/1)	0.661 (0–1)	-0.149	0.629 (0–1)	-0.131	0.504 (0–1)	-0.128
house1	paying off (0/1)	0.053 (0–1)	0.081	0.049 (0–1)	0.094		
house2	rent furn./unfurn. (0/1)	0.232 (0–1)	0.136	0.211 (0–1)	0.123	0.198 (0–1)	0.117
house3	fringe ben/free (0/1)	0.054 (0–1)	-0.022	0.111 (0–1)	-0.024	0.204 (0–1)	-0.010
housetyp	apt. (count)					0.722 (0–2)	0.214
housetyp1	villa (0/1)					0.052 (0–1)	-0.017
housetyp2	village house (0/1)					0.171 (0–1)	-0.186
housetyp3	rooms (0/1)					0.040 (0–1)	-0.088
floor	mud (0/1)	0.220 (0–1)	-0.225	0.147 (0–1)	-0.211	0.101 (0–1)	-0.162
floor1	brick/stone (0/1)	0.027 (0–1)	-0.022	0.015 (0–1)	-0.022	0.011 (0–1)	-0.030
floor2	tile/cement (0/1)	0.746 (0–1)	0.224	0.823 (0–1)	0.190	0.619 (0–1)	-0.036
roof	straw/mud (0/1)	0.051 (0–1)	-0.102	0.035 (0–1)	-0.101	0.030 (0–1)	-0.056
roof1	wood (0/1)	0.244 (0–1)	-0.197	0.163 (0–1)	-0.185	0.113 (0–1)	-0.156
roof2	iron tile (0/1)	0.012 (0–1)	-0.008	0.012 (0–1)	-0.017	0.006 (0–1)	-0.020
roof3	concrete (0/1)	0.692 (0–1)	0.236	0.785 (0–1)	0.221	0.840 (0–1)	0.179
wall	brick/concrete (0/1)	0.695 (0–1)	0.133	0.840 (0–1)	0.144	0.825 (0–1)	0.058
wall1	brick & mud (0/1)	0.084 (0–1)	-0.133	0.050 (0–1)	-0.113	0.041 (0–1)	-0.100
wall2	reinf. Concrete (0/1)	0.124 (0–1)	0.049	0.052 (0–1)	0.014	0.108 (0–1)	0.034
wall3	mud/brick (0/1)	0.094 (0–1)	-0.136	0.057 (0–1)	-0.133	0.025 (0–1)	-0.077
rooms	(count)	3.82 (1–20)	0.055	3.766 (1–16)	0.049	3.514 (1–14)	0.071
dwelarea	dwelling (sq.m.)	95 (2–1700)	0.017	91 (3–1200)	0.020	84 (6–400)	0.047
light source	el./generator (0/1)	0.979 (0–1)	0.086	0.993 (0–1)	0.056	0.996 (0–1)	0.024
toilet	indoor, netwk (0/1)	0.549 (0–1)	0.209	0.600 (0–1)	0.204	0.660 (0–1)	0.206
toilet1	indoor tank (0/1)	0.374 (0–1)	-0.171	0.346 (0–1)	-0.170	0.298 (0–1)	-0.173
toilet2	shared, netwk (0/1)	0.021 (0–1)	-0.017	0.015 (0–1)	-0.024	0.020 (0–1)	-0.056
toilet3	shared, tank (0/1)	0.044 (0–1)	-0.060	0.033 (0–1)	-0.072	0.019 (0–1)	-0.068
water	indoor tap (0/1)	0.874 (0–1)	0.170	0.960 (0–1)	0.121	0.939 (0–1)	0.108
water1	well (0/1)	0.078 (0–1)	-0.125	0.026 (0–1)	-0.097	0.015 (0–1)	-0.056
water2	outside tap (0/1)	0.044 (0–1)	-0.105	0.007 (0–1)	-0.047	0.030 (0–1)	-0.089
telephone	(count)	0.311 (0–1)	0.211	0.574 (0–1)	0.188		
internet	wireless (count)					0.044 (0–6)	0.130
int_dsl	DSL connect. (0/1)					0.072 (0–1)	0.138
int_usb	USB connect. (0/1)					0.022 (0–1)	0.055
keros. cook	(count)	0.671 (0–6)	-0.134	0.290 (0–4)	-0.113	0.196 (0–4)	-0.136
cookr	fuel cooker (count)	0.712 (0–2)	0.200	0.882 (0–4)	0.135	0.852 (0–10)	0.130
heater	(count)	0.062 (0–4)	0.123	0.049 (0–3)	0.129	0.053 (0–4)	0.093
AC	(count)	0.037 (0–6)	0.094	0.052 (0–3)	0.150	0.101 (0–5)	0.161
bike	(count)	0.199 (0–5)	0.048	0.157 (0–4)	0.008	0.080 (0–5)	0.012
B/W TV	(count)	0.403 (0–2)	-0.107	0.203 (0–2)	-0.147	0.035 (0–3)	-0.051
cam	(count)	0.108 (0–4)	0.145	0.072 (0–6)	0.137	0.029 (0–4)	0.093
cell	(count)			0.343 (0–6)	0.210	1.822 (0–10)	0.139
color TV	(count)	0.563 (0–3)	0.241	0.775 (0–4)	0.224	0.959 (0–3)	0.131
comp	desktop (count)			0.094 (0–3)	0.169	0.270 (0–4)	0.185
comp1	laptop (count)					0.062 (0–6)	0.135
dishwasher	(count)	0.015 (0–1)	0.064	0.016 (0–2)	0.094	0.019 (0–2)	0.068
fan	electric (count)	0.88 (0–10)	0.185	1.22 (0–10)	0.122	1.628 (0–9)	0.096
freezer	(count)	0.043 (0–2)	0.111	0.047 (0–2)	0.137	0.083 (0–2)	0.136
mp3	mp3 or iPod (count)					0.020 (0–4)	0.076
iron	(count)	0.648 (0–6)	0.221	0.708 (0–4)	0.199	0.693 (0–3)	0.176
motorcycle	(count)	0.017 (0–1)	0.022	0.017 (0–1)	0.011	0.058 (0–1)	-0.001
microwave	(count)	0.014 (0–2)	0.032	0.020 (0–2)	0.088	0.064 (0–3)	0.129
oven	(count)					0.319 (0–7)	-0.050
radio	(count)	0.82 (0–10)	0.141	0.764 (0–7)	0.137	0.341 (0–4)	0.106
refrg	(count)	0.683 (0–4)	0.237	0.860 (0–5)	0.191	0.95 (0–10)	0.111
sat	satellite dish (count)			0.181 (0–3)	0.167	0.862 (0–8)	0.115

sat1	extra receiver (count)					0.009 (0–3)	0.033
sew	(count)	0.163 (0–3)	0.120	0.073 (0–3)	0.087	0.053 (0–7)	0.048
video	(count)	0.118 (0–2)	0.163	0.092 (0–2)	0.169	0.025 (0–2)	0.093
wat. heater	(count)	0.318 (0–4)	0.236	0.414 (0–10)	0.233	0.500 (0–4)	0.225
washer	semiauto (count)	0.861 (0–5)	0.191	0.953 (0–4)	0.120	0.696 (0–4)	-0.128
washer1	auto (count)					0.316 (0–2)	0.216
car	(count)	0.063 (0–2)	0.133	0.063 (0–3)	0.162	0.070 (0–4)	0.150
taxi	(count)	0.009 (0–2)	0.015	0.007 (0–2)	0.013	0.007 (0–2)	0.018
truck	(count)	0.009 (0–8)	0.021	0.008 (0–3)	0.019	0.010 (0–2)	0.015
tuctuc	(count)			0.001 (0–1)	0.003	0.007 (0–2)	0.005
land	own (0/1)					0.148 (0–1)	-0.166
non-ag. Proj.	(count)					0.196 (0–4)	0.052
agric. Proj.	(0/1)					0.166 (0–1)	-0.175
farm	(count)					0.161 (0–2)	-0.165
mill	(count)			0.001 (0–2)	-0.006		
ownfirm	(PPP2012$)	2,399 (0–55k)	0.009	2,010 (0–66k)	0.068	1,521 (0–42k)	0.074
ownfirm1	(0/1)					0.108 (0–1)	0.005
ownfirm2	(0/1)					0.094 (0–1)	0.082
cart	animal (count)			0.049 (0–5)	-0.067	0.033 (0–3)	-0.107
cart1	human-dr. (count)			0.025 (0–5)	-0.038	0.014 (0–5)	-0.069
insecticide	motorized (count)			0.003 (0–4)	-0.020	0.002 (0–2)	-0.032
insecticide1	manual (count)			0.004 (0–1.9)	-0.024	0.003 (0–1)	-0.031
livest. Feed	(count)			0.001 (0–4)	-0.006	0.000 (0–1)	0.000
livestock	cow (count)			0.376 (0–1500)	-0.004	0.104 (0–45)	-0.094
livestock1	buffalo (count)			0.169 (0–50)	-0.060	0.091 (0–45)	-0.083
livestock2	goat (count)			0.128 (0–55)	-0.052	0.087 (0–25)	-0.072
livestock3	sheep (count)			0.094 (0–40)	-0.033	0.063 (0–25)	-0.049
livestock4	camel (count)			0.004 (0–50)	-0.010	0.001 (0–2)	-0.020
livestock5	donkey (count)			0.153 (0–20)	-0.102	0.086 (0–4)	-0.153
livestock6	horse (count)			0.016 (0–25)	-0.010	0.004 (0–2)	-0.033
livestock7	chicken (count)			9.967 (0–2200)	-0.040		
livestock8	pigeon (count)			0.946 (0–200)	-0.035		
livestock9	rabbit (count)			0.223 (0–300)	-0.014		
livestock10	duck (count)			2.402 (0–256)	-0.078		
livestock11	goose (count)			0.777 (0–100)	-0.064		
livestock12	turkey (count)			0.095 (0–15)	-0.023		
livestock13	others (count)			0.005 (0–10)	-0.004		
beehive	(count)			0.013 (0–12)	-0.027	0.001 (0–18)	-0.005
plow	machine-pull (count)			0.004 (0–7)	-0.010	0.002 (0–1)	-0.027
plow1	animal-pull (count)			0.006 (0–7)	-0.024	0.004 (0–1)	-0.042
poultry bat.	(count)			0.001 (0–1)	0.006	0.002 (0–5)	-0.007
sprinkler	(count)			0.005 (0–13)	-0.007	0.003 (0–2)	-0.035
thresher	motorized (count)			0.004 (0–5)	-0.012	0.004 (0–2)	-0.035
thresher1	manual (count)			0.002 (0–1.9)	-0.027	0.001 (0–2)	-0.021
tractor big	(count)			0.005 (0–2)	-0.005	0.006 (0–2)	-0.041
tractor sml.	(count)			0.004 (0–1.5)	-0.019	0.002 (0–1)	-0.026
water pump	mechanical (count)			0.034 (0–5)	-0.052	0.021 (0–3)	-0.083
wat. pump1	animal power (count)			0.006 (0–5)	-0.026		
wat. pump2	manual (count)			0.010 (0–1.9)	-0.042	0.008 (0–1)	-0.054
winnower	(count)			0.001 (0–1.9)	-0.001	0.002 (0–1)	-0.024

Note: Households weighted using sampling weights. Monetary converted to 2012 purchasing-power parity dollars (World Bank 2015a,b).
N_{98} = 4,816; N_{06} = 8,351; N_{12} = 12,060.

Table A3. Asset summary statistics and PCA loadings: Jordan & Tunisia LMPS

Asset	Description (units)	Jordan 2010 mean (range)	Loading	Description (units)	Tunisia 2014 mean (range)	Loading
house	apt own (0/1)	0.447 (0–1)	0.108	tradition. House (0/1)	0.139 (0–1)	-0.067
house1	house own (0/1)	0.218 (0–1)	-0.060	core house (0/1)	0.083 (0–1)	-0.119
house2	rent (0/1)	0.226 (0–1)	-0.013	court yard (0/1)	0.127 (0–1)	-0.131
house3	fringe benefit/free (0/1)	0.034 (0–1)	-0.056	town house (0/1)	0.266 (0–1)	0.036
house4				duplex/villa (0/1)	0.215 (0–1)	0.092
house5				villa floor (0/1)	0.103 (0–1)	0.087
house6				apt (0/1)	0.054 (0–1)	0.094
house7				own (0/1)	0.856 (0–1)	-0.014
house8				rent (0/1)	0.099 (0–1)	0.036
floor	cement (0/1)	0.066 (0–1)	-0.096	cement (0/1)	0.352 (0–1)	-0.181
floor1				tile/ceramic (0/1)	0.642 (0–1)	0.184
roof	concrete/cement (0/1)	0.992 (0–1)	0.031	concrete (0/1)	0.923 (0–1)	0.083
roof1				steel/zinc (0/1)	0.037 (0–1)	-0.068
wall	concrete/cement (0/1)	0.113 (0–1)	-0.022	brick/stone (0/1)	0.659 (0–1)	-0.085
wall1	cement/bricks (0/1)	0.621 (0–1)	-0.125	concrete (0/1)	0.328 (0–1)	0.088
rooms				(count)	3.014 (0–8)	0.181
dwelarea	dwelling (sq.m.)	129 (20–960)	0.178	dwelling (sq.m.)	145 (1–2k)	0.091
light source	network (0/1)	0.998 (0–1)	0.010	el. bill (0/1)	0.922 (0–1)	0.077
light1				el., no bill (0/1)	0.074 (0–1)	-0.071
toilet	toilet & bath (0/1)	0.588 (0–1)	-0.183	toilet (0/1)	0.412 (0–1)	-0.218
toilet1	2 toilets & bath (0/1)	0.374 (0–1)	0.210	toilet & bath (0/1)	0.529 (0–1)	0.179
toilet2	network (0/1)	0.644 (0–1)	0.098	2 toilets & bath (0/1)	0.045 (0–1)	0.112
toilet3				sewage netwk (0/1)	0.579 (0–1)	0.193
toilet4				septic tank (0/1)	0.376 (0–1)	-0.164
water	pipe, filter (0/1)	0.209 (0–1)	0.142	indoor tap (0/1)	0.810 (0–1)	0.179
water1	pipe (0/1)	0.411 (0–1)	-0.164	outdoor tap (0/1)	0.073 (0–1)	-0.056
water2	tank (0/1)	0.012 (0–1)	-0.046	private well (0/1)	0.043 (0–1)	-0.087
water3	well/spring (0/1)	0.062 (0–1)	-0.003	public well (0/1)	0.051 (0–1)	-0.121
water4	piped (0/1)	0.982 (0–1)	0.053			
telephone	(count)	0.245 (0–3)	0.175	(count)	0.163 (0–6)	0.155
internet	connect. (count)	0.156 (0–2)	0.192	connect. (count)	0.132 (0–4)	0.200
cookr	fuel cooker (count)	0.369 (0–3)	-0.165	gas network (0/1)	0.176 (0–1)	0.174
cookheat1				gas cylinder (0/1)	0.815 (0–1)	-0.164
heating	central (count)	1.579 (0–8)	-0.059			
heat1	gas (0/1)	0.449 (0–1)	0.144			
heat2	kerosene (0/1)	0.334 (0–1)	0.047			
heat3	el. (0/1)	0.071 (0–1)	-0.055			
heat4	diesel, wood, coal (0/1)	0.062 (0–1)	-0.005			
heater, space	(count)	0.049 (0–1)	0.175	(count)	0.042 (0–1)	0.120
AC	(count)	0.192 (0–6)	0.163	(count)	0.245 (0–21)	0.170
bike				(count)	0.076 (0–5)	0.064
bookcase				(count)	0.063 (0–2)	0.119
B/W TV	(count)	0.015 (0–2)	-0.022			
camera	(count)	0.089 (0–3)	0.132	(count)	0.071 (0–5)	0.099
cell	(count)	2.357 (0–9)	0.160	(count)	1.974 (0–8)	0.149
color TV	(count)	1.155 (0–6)	0.182	(count)	1.028 (0–6)	0.144
computer	desktop (count)	0.417 (0–4)	0.186	desktop (count)	0.104 (0–5)	0.141
computer1	laptop (count)	0.149 (0–4)	0.180	laptop (count)	0.200 (0–5)	0.187
dishwasher	(count)	0.007 (0–1)	0.062	(count)	0.010 (0–1)	0.066
fan	electric (count)	1.255 (0–7)	0.103	electric fan (count)	0.194 (0–11)	0.044
fax	(count)	0.009 (0–1)	0.079			
freezer	(count)	0.083 (0–2)	0.134	(count)	0.037 (0–2)	0.084
hair dryer	(count)	0.528 (0–4)	0.191			
iron	(count)	0.845 (0–4)	0.167			
motorcycle				(count)	0.126 (0–3)	0.020
microwave	(count)	0.363 (0–2)	0.213	(count)	0.147 (0–1)	0.168

oven	(count)	0.706 (0–2)	0.183	cooker/stove (count)	0.697 (0–2)	0.184
radio	(count)	0.303 (0–3)	0.118	(count)	0.370 (0–2)	0.105
refrig.	(count)	0.973 (0–3)	0.110	(count)	0.979 (0–16)	0.069
sat	(count)	1.055 (0–6)	0.170	(count)	0.905 (0–4)	0.104
sew	(count)	0.082 (0–2)	0.040	(count)	0.029 (0–2)	0.057
video tapes	(count)	0.026 (0–2)	0.026			
solar heater	(count)	0.117 (0–2)	0.115			
vacuum	(count)	0.619 (0–3)	0.209			
video, VCR	(count)	0.230 (0–9)	0.150	(count)	0.149 (0–2)	0.133
water heater	(count)	0.617 (0–3)	0.160	(count)	0.469 (0–2)	0.233
washer	semiauto (count)	0.955 (0–3)	0.111	semiauto (count)	0.521 (0–1)	0.049
washer1	auto (count)			auto (count)	0.163 (0–2)	0.206
water filter	(count)	0.212 (0–2)	0.147			
water pump	for home (count)	0.270 (0–3)	-0.002			
other equip.	(0/1)	0.000 (0–1)	0.002	(0/1)	0.003 (0–4)	-0.005
car	(count)	0.510 (0–6)	0.198	(count)	0.198 (0–3)	0.207
motorcycle				(count)	0.126 (0–3)	0.020
truck				(count)	0.024 (0–1)	0.007
ownfirm	(PPP2012$)	7,443 (0–257k)	0.078	(PPP2012$)	1,831 (0–123k)	0.038
cart				donkey cart (count)	0.012 (0–1)	-0.031
cart1				small cart (count)	0.019 (0–2)	-0.025
insecticide	spray. machine, (count)	0.001 (0–2)	0.003	motor (count)	0.003 (0–1)	0.008
insecticide1	hand-powered (count)	0.002 (0–2)	0.003	hand-powered (count)	0.004 (0–1)	-0.013
livestk machn.				(count)	0.001 (0–2)	0.005
livestock	cow (count)	0.014 (0–20)	-0.023	cow (count)	0.149 (0–30)	-0.034
livestock1	goat (count)	0.084 (0–150)	-0.018	chicken (count)	1.645 (1–60)	-0.082
livestock2	sheep (count)	0.090 (0–300)	-0.016	goat (count)	1.130 (1–50)	-0.049
livestock3				sheep (count)	1.810 (1–100)	-0.082
livestock4				camel (count)	1.012 (1–25)	-0.016
livestock5	donkey (count)	0.008 (0–1)	-0.047	donkey (count)	1.003 (1–10)	-0.013
livestock6	horse (count)	0.009 (0–2)	-0.046	horse (count)	1.002 (1–7)	-0.009
livestock7	chicken (count)	0.496 (0–5k)	-0.001			
livestock8	pigeon (count)	0.023 (0–100)	-0.008			
livestock9	rabbit (count)	0.010 (0–9)	-0.037			
livestock10	duck (count)	0.008 (0–1)	-0.046			
livestock11	beehive (count)	0.008 (0–1)	-0.047			
livestock13	other (count)	0.008 (0–1)	-0.047	other (count)	1.026 (1–50)	0.006
beehive	(count)	0.003 (0–10)	-0.003	(count)	0.003 (0–8)	-0.006
plow	machine-pull (count)			machine-pull (count)	0.006 (0–2)	0.009
plow1	animal-pull (count)	0.001 (0–2)	-0.015	animal-pull (count)	0.007 (0–2)	-0.022
poultry batter				(count)	0.002 (0–8)	-0.006
sprinkler	(count)	0.001 (0–1)	-0.002			
thresher				motor (count)	0.002 (0–3)	0.008
thresher1				hand-powered (count)	0.001 (0–1)	-0.011
tractor big	(count)	0.002 (0–2)	-0.008	(count)	0.008 (0–2)	0.025
tractor small	(count)	0.001 (0–1)	0.008	(count)	0.005 (0–2)	0.000
water pump	mechanical (count)	0.004 (0–3)	0.146			
water pump1	manual (count)	0.001 (0–2)	-0.003			
agricul equip	(0/1)	0.009 (0–1)	0.005			
agriland	own (0/1)	0.113 (0–1)	0.043	own (area)	0.570 (0–1k)	-0.005
agriland1	rent (0/1)	0.002 (0–1)	-0.007			
drip irrigation	(count)	0.003 (0–3)	0.011	(count)	0.005 (0–5)	0.007

Note: Households weighted using sampling weights. Monetary converted to 2012 purchasing-power parity dollars (World Bank 2015a,b).
N_{JO} = 5,102; N_{TU} = 4,521.

Table A4. Asset summary statistics and PCA loadings: Ethiopia Socioeconomic Surveys

Asset	Description (units)	2011 mean (range)	2011 Loading	2013 mean (range)	2013 Loading
homeown	own (0/1)	0.842 (0–1)	-0.008	0.717 (0–1)	-0.117
homeown1	free (0/1)	0.054 (0–1)	0.007	0.076 (0–1)	0.026
homeown2	rent (0/1)	0.076 (0–1)	0.005	0.202 (0–1)	0.118
wall	wood (0/1)	0.678 (0–1)	-0.020	0.681 (0–1)	-0.033
wall1	mud/bamboo (0/1)	0.146 (0–1)	0.025	0.088 (0–1)	-0.039
wall2	stone (0/1)	0.141 (0–1)	-0.003	0.152 (0–1)	0.007
wall3	brick/block (0/1)	0.008 (0–1)	0.010	0.052 (0–1)	0.133
wall4	iron/asbestos/other (0/1)	0.027 (0–1)	0.007	0.027 (0–1)	0.003
roof	iron (0/1)	0.425 (0–1)	0.004	0.619 (0–1)	0.116
roof1	thatch/plastic (0/1)	0.466 (0–1)	-0.026	0.291 (0–1)	-0.110
roof2	wood/bamboo (0/1)	0.086 (0–1)	0.041	0.065 (0–1)	-0.026
roof3	cement/asb./brick/oth. (0/1)	0.023 (0–1)	0.013	0.025 (0–1)	0.011
floor	mud/dung (0/1)	0.948 (0–1)	-0.009	0.801 (0–1)	-0.200
floor1	cement/tile (0/1)	0.035 (0–1)	0.012	0.163 (0–1)	0.178
floor2	wood/bamb/parq/plastic (0/1)	0.014 (0–1)	-0.003	0.017 (0–1)	0.032
floor3	brick/ceram/marble/oth (0/1)	0.003 (0–1)	0.006	0.019 (0–1)	0.093
rooms	(count)	1.661 (0–9)	0.007	1.839 (0–9)	0.086
kitchen	traditional indoor (0/1)	0.232 (0–1)	0.031	0.228 (0–1)	-0.056
kitchen1	traditional outdoor (0/1)	0.322 (0–1)	0.000	0.425 (0–1)	0.052
kitchen2	modern (0/1)	0.007 (0–1)	0.003	0.044 (0–1)	0.120
toilet	flush (0/1)	0.020 (0–1)	-0.001	0.068 (0–1)	0.127
toilet1	pit latrine, ventilated (0/1)	0.022 (0–1)	-0.001	0.093 (0–1)	0.089
toilet2	pit latrine, non-vent (0/1)	0.420 (0–1)	0.017	0.363 (0–1)	-0.041
toilet3	bucket/field/other (0/1)	0.440 (0–1)	-0.019	0.321 (0–1)	-0.087
toilet4	pit, shared, non-vent. (0/1)	0.098 (0–1)	0.003	0.155 (0–1)	0.053
bath	bath/shower (0/1)	0.019 (0–1)	0.006	0.093 (0–1)	0.170
bath1	bathroom (0/1)	0.015 (0–1)	0.010	0.041 (0–1)	0.065
bath2	bath place (0/1)	0.966 (0–1)	-0.011	0.866 (0–1)	-0.181
drink water	private tap (0/1)	0.029 (0–1)	0.018	0.110 (0–1)	0.175
drinkw1	shared tap (0/1)	0.029 (0–1)	0.005	0.140 (0–1)	0.114
drinkw2	community tap (0/1)	0.098 (0–1)	-0.005	0.137 (0–1)	-0.008
drinkw3	kiosk (0/1)	0.108 (0–1)	0.009	0.098 (0–1)	0.002
drinkw4	protected well (0/1)	0.277 (0–1)	-0.006	0.224 (0–1)	-0.066
drinkw5	unprotected well (0/1)	0.207 (0–1)	-0.023	0.115 (0–1)	-0.057
light source	el. Meter, private (0/1)	0.076 (0–1)	0.016	0.167 (0–1)	0.169
ltsrc1	el. Meter, shared (0/1)	0.106 (0–1)	0.013	0.253 (0–1)	0.094
ltsrc2	Dry cell switch (0/1)	0.177 (0–1)	-0.008	0.188 (0–1)	-0.056
ltsrc3	Kerosene (0/1)	0.501 (0–1)	-0.019	0.287 (0–1)	-0.096
ltsrc4	solar/battery/lantern/ candle/wood/other (0/1)	0.141 (0–1)	0.021	0.106 (0–1)	-0.041
cooksrc	collect fire wood (0/1)	0.773 (0–1)	-0.002	0.586 (0–1)	-0.150
cooksrc1	buy (0/1)	0.104 (0–1)	0.011	0.155 (0–1)	0.079
cooksrc2	coal (0/1)	0.018 (0–1)	0.005	0.091 (0–1)	0.102
cooksrc3	crop/leaves/dung (0/1)	0.081 (0–1)	-0.003	0.069 (0–1)	-0.029
cooksrc4	kerosene/gas/biogas (0/1)	0.007 (0–1)	0.002	0.016 (0–1)	0.027
cooksrc5	electric (0/1)	0.002 (0–1)	0.002	0.058 (0–1)	0.169
phone	(count)	0.051 (0–4)	0.203	0.078 (0–16)	0.105
phone2	(0/1)			0.559 (0–1)	0.127
cellphone	(count)	0.384 (0–7)	0.093	0.860 (0–11)	0.173
kerosene stove	(count)	0.080 (0–3)	0.157	0.118 (0–3)	0.114
butan stove	(count)	0.026 (0–2)	0.204	0.013 (0–2)	0.077
el. stove	(count)	0.020 (0–4)	0.187	0.101 (0–6)	0.156
blanket	(count)	2.064 (0–16)	0.003	2.376 (0–20)	0.106
bed/mattress	(count)	1.027 (0–12)	0.033	1.457 (0–31)	0.136
watch	(count)	0.394 (0–5)	0.071	0.310 (0–6)	0.081

radio/tape play.	(count)	0.380 (0–4)	0.089	0.387 (0–4)	0.094
TV	(count)	0.074 (0–3)	0.223	0.239 (0–3)	0.219
CD player	(count)	0.058 (0–2)	0.233	0.159 (0–3)	0.200
satellite	(count)	0.044 (0–2)	0.240	0.133 (0–3)	0.193
sofa	(count)	0.041 (0–8)	0.203	0.101 (0–8)	0.168
bike	(count)	0.042 (0–3)	0.211	0.034 (0–6)	0.055
sewing mach.	(count)	0.030 (0–2)	0.227	0.015 (0–4)	0.018
weav. Mach.	(count)	0.033 (0–18)	0.186	0.059 (0–28)	0.005
elmitad	(count)	0.020 (0–2)	0.230	0.094 (0–2)	0.202
mitad1	(count)	0.076 (0–3)	0.142	0.124 (0–3)	0.125
fridge	(count)	0.027 (0–2)	0.227	0.088 (0–2)	0.189
jewelry	gold/silver (count)	0.509 (0–17)	0.042	4.985 (0–179)	0.054
wardrobe	(count)	0.050 (0–5)	0.153	0.174 (0–40)	0.115
shelf	(count)	0.116 (0–4)	0.124	0.220 (0–6)	0.139
bio-stove	bio-gas pit (count)	0.019 (0–2)	0.223	0.005 (0–2)	0.024
water pit	(count)	0.040 (0–2)	0.181	0.032 (0–3)	-0.004
mofer/kember	(count)	0.802 (0–12)	0.007		
water pump	(count)	0.045 (0–5)	0.152	0.114 (0–30)	0.102
oven	traditional, mitad (0/1)	0.679 (0–1)	0.008	0.601 (0–1)	-0.121
oven1	traditional, non-remov. (0/1)	0.197 (0–1)	-0.007	0.193 (0–1)	0.009
oven2	energy-saving, el. (0/1)	0.030 (0–1)	0.006	0.112 (0–1)	0.176
car	(count)	0.019 (0–2)	0.226	0.036 (0–23)	0.045
motorcycle	(count)	0.024 (0–2)	0.239	0.013 (0–2)	0.034
another dwell.	(count)	0.222 (0–5)	0.014	0.627 (0–8)	-0.003
nonagri	(0/1)	0.081 (0–1)	0.009	0.113 (0–1)	0.052
store	(0/1)	0.053 (0–1)	0.003	0.057 (0–1)	0.012
profess. office	(0/1)	0.004 (0–1)	0.003	0.050 (0–1)	0.022
bar	(0/1)	0.082 (0–1)	0.009	0.114 (0–1)	0.052
nonagri proj.	(0/1)	0.049 (0–1)	0.011	0.057 (0–1)	0.008
field type1	(sqm)	2703.545 (0–97,020)	-0.004	2555.893 (0–812,180)	-0.030
field type2	(sqm)	1255.626 (0–98,233)	0.000	1274.120 (0–250,206)	-0.027
field type3	(sqm)	1510.192 (0–99,142)	0.000	870.429 (0–285,004)	-0.019
cart	hand-drawn (count)	0.037 (0–2)	0.237	0.017 (0–2)	0.019
cart1	animal-drawn (count)	0.033 (0–2)	0.222	0.021 (0–2)	0.001
sickle/machid	(count)	1.367 (0–25)	-0.004	1.115 (0–25)	-0.084
axe/gejera	(count)	0.528 (0–10)	0.028	0.412 (0–12)	-0.050
axe1/pick/geso	(count)	0.563 (0–13)	0.022	0.468 (0–8)	-0.058
plough	traditional (count)	0.698 (0–12)	0.018	0.527 (0–6)	-0.095
plough1	modern (count)	0.053 (0–30)	0.081	0.018 (0–3)	0.000
livestock	cattle (count)	2.898 (0–100)	-0.003	2.376 (0–96)	-0.073
livestock1	sheep (count)	1.889 (0–100)	-0.003	1.417 (0–120)	-0.046
livestock2	goat (count)	2.563 (0–118)	-0.003	1.956 (0–230)	-0.039
livestock3	horse (count)	0.090 (0–8)	-0.005	0.064 (0–9)	-0.023
livestock4	donkey (count)	0.383 (0–8)	-0.007	0.273 (0–6)	-0.053
livestock5	mule (count)	0.024 (0–3)	0.000	0.019 (0–7)	-0.015
livestock6	camel (count)	0.286 (0–40)	-0.002	0.180 (0–87)	-0.010
livestock7	hen, laying (count)	0.850 (0–22)	-0.006	0.735 (0–70)	-0.056
livestock8	hen, non-laying (count)	0.110 (0–10)	-0.002	0.061 (0–5)	-0.022
livestock9	cock (count)	0.300 (0–12)	-0.007	0.243 (0–40)	-0.044
livestock10	cockerel (count)	0.164 (0–15)	-0.009	0.145 (0–21)	-0.031
livestock11	pullet (count)	0.321 (0–11)	-0.009	0.258 (0–81)	-0.031
livestock12	chicken (count)	1.240 (0–36)	-0.002	0.749 (0–34)	-0.044

Note: Households weighted using sampling weights. N_{11} = 3,969; N_{13} = 5,262.

Table A5. Inequality measures, asset-based wealth indexes

		EG98	EG06	EG12	JO10	TU14	ET11	ET13
Range (by design)		0–100	0–100	0–100	0–100	0–100	0–100	0–100
Mean		36.469	41.735	29.684	41.198	38.829	2.462	16.001
Median		38.052	42.694	30.551	40.077	38.732	1.021	11.843
Standard deviation		15.933	10.247	8.962	14.059	15.058	8.416	11.248
Skewness		-0.081	0.067	-0.080	0.579	0.343	9.692	2.577
Kurtosis		2.499	3.922	4.065	3.482	3.230	104.618	9.993
Gini (×100)		24.84	13.48	15.81	19.60	22.21	62.81	29.53
		(0.38)	(0.15)	(0.16)	(0.25)	(0.30)	(2.13)	(0.41)
Generalized Gini		24.88	13.49	15.81	19.62	22.22	62.84	29.53
		(0.29)	(0.12)	(0.13)	(0.20)	(0.27)	(1.43)	(0.26)
95:5 percentile ratio		6.599	3.788	2.924	3.371	4.608	14.885	5.001
90:10 percentile ratio		3.984	1.912	2.149	2.577	3.148	7.819	3.263
Top 1% share (%)		2.08	1.78	1.85	2.09	2.10	28.95	4.11
Top 5% share		10.86	9.09	9.44	10.83	11.07	49.59	19.17
Top 10% share		18.67	15.58	16.13	18.34	18.90	57.75	29.19
Top 20% share		32.93	27.59	28.50	31.83	32.68	68.72	43.17
Top 50% share		68.98	60.33	62.00	64.74	66.51	86.70	69.44
Concentration index (×100)		36.28	22.58	19.73	31.34	33.81	6.41	19.54
(Erreygers 2009)		(0.09)	(0.08)	(0.06)	(0.12)	(0.12)	(0.29)	(0.24)
Polarization (×100)	α=1.0	0.581	0.183	0.125	0.468	0.637	0.153	0.332
(Esteban & Ray 1994)		(0.035)	(0.008)	(0.008)	(0.041)	(0.081)	(0.038)	(0.022)
	α=1.3	0.055	0.014	0.009	0.045	0.068	0.017	0.033
		(0.006)	(0.001)	(0.001)	(0.006)	(0.018)	(0.006)	(0.004)
	α=1.6	0.005	0.001	0.001	0.004	0.008	0.002	0.003
		(0.001)	(0.000)	(0.000)	(0.001)	(0.004)	(0.001)	(0.001)

Note: All inequality calculations account for households' sampling weights.
Wealth indexes reported here are estimated using factor loadings from own survey wave; factor loadings thus differ across columns.
Standard errors on Ginis, generalized Ginis and polarization indexes are bootstrap estimates.

Table A6. Summary statistics of wealth index distributions between urban and rural households, using alternative (urban or rural) factor loadings

	Urban factor loadings				Rural factor loadings			
	Urban mean (sd)	Range	Rural mean (sd)	Range	Urban mean (sd)	Range	Rural mean (sd)	Range
Egypt 1998	48.6 (11.9)	0–100	33.4 (14.7)	-1–100	39.8 (12.9)	0–107	26.0 (13.0)	0–100
Egypt 2006	4.4 (5.6)	0–100	9.9 (13.5)	0–137	37.1 (9.7)	3–140	29.1 (9.7)	0–100
Egypt 2012	33.1 (8.6)	0–100	24.0 (8.2)	-5–56	64.8 (15.0)	-26–182	48.3 (15.7)	0–100
Ethiopia 2013	21.2 (15.0)	0–100	7.3 (4.5)	-6–84	44.4 (25.7)	2–119	11.4 (9.1)	0–100
Jordan 2010	42.2 (12.6)	0–100	35.6 (11.3)	-48–80	43.5 (16.3)	-3–118	36.2 (14.3)	0–100
Tunisia 2014	32.9 (13.6)	0–100	19.8 (9.7)	-9–85	49.0 (16.1)	9–168	29.4 (14.2)	0–100

Note: PCA is performed on urban (rural, respectively) subsample, and asset loadings in the first principal factor are applied to both subsamples.
Ethiopia 2011 does not have a representative urban subsample.

Table A7. Inequality measures, asset-based wealth indexes for Egypt and Ethiopia, using factor loadings from alternative base years

	Base year 1998		Base year 2006		Base year 2012		Base yr '11	Base yr '13
	EG06	**EG12**	**EG98**	**EG12**	**EG98**	**EG06**	**ET13**	**ET11**
Range (by design)	1–107	2–114	11–89	14–110	5–63	-11–73	0–120	3–72
Mean	41.493	41.481	37.656	45.023	24.088	27.024	3.790	12.420
Median	43.510	42.886	38.680	45.755	24.219	28.007	1.454	10.955
Standard deviation	12.597	9.736	11.539	8.505	9.145	9.457	6.320	6.235
Skewness	-0.318	-0.430	-0.063	-0.104	0.110	-0.053	4.113	5.488
Kurtosis	3.603	4.471	2.564	4.411	2.346	3.319	30.705	44.660
Gini (×100)	16.75	12.75	17.43	10.34	21.73	19.37	63.17	18.61
	(0.20)	(0.14)	(0.24)	(0.11)	(0.28)	(0.21)	(0.50)	(0.62)
Generalized Gini	15.76	13.17	14.94	10.59	18.11	18.86	61.04	23.52
	(0.16)	(0.12)	(0.17)	(0.09)	(0.20)	(0.41)	(0.44)	(0.38)
95:5 percentile ratio	3.333	2.415	3.069	1.940	4.025	3.793	46.259	2.699
90:10 percentile ratio	2.332	1.832	2.414	1.615	2.964	2.699	19.304	1.923
Top 1% share (%)	1.96	1.79	1.99	1.85	1.59	1.67	10.31	4.53
Top 5% share	10.34	9.46	10.23	9.43	8.27	8.58	38.95	14.79
Top 10% share	17.87	16.40	17.41	16.15	14.43	14.96	53.67	21.90
Top 20% share	31.80	29.34	30.54	28.74	26.04	26.92	69.79	33.73
Top 50% share	67.00	63.57	65.13	62.68	58.08	59.74	89.76	62.75

Note: The inequality measures should be compared to those for base years, in table 2. All inequality calculations account for households' sampling weights.
Wealth indexes reported here are estimated using factor loadings from base year; factor loadings are thus same among sets of columns.
Standard errors on Ginis, generalized Ginis and polarization indexes are bootstrap estimates.

Table A8. Inequality measures on wealth indexes derived from ELMPS 2012 factor loadings of assets

		EG12	**EG06**	**JO10**	**TU14**
Range		0–100	-11–73	-32–70	-34–68
Mean		29.684	27.024	35.461	23.186
Median		30.551	28.007	34.914	23.536
Standard deviation		8.962	9.457	7.198	8.559
Skewness		-0.080	-0.053	0.328	-0.156
Kurtosis		4.065	3.319	4.941	4.600
Gini (×100)[a]		15.81	19.37	11.17	19.97
		(0.16)	(0.21)	(0.15)	(0.30)
Generalized Gini		15.81	18.86	11.24	20.22
		(0.13)	(0.41)	(0.17)	(0.33)
95:5 percentile ratio		2.924	3.793	1.966	4.237
90:10 percentile ratio		2.149	2.699	1.648	2.755
Top 1% share (%)		1.85	1.67	1.66	1.87
Top 5% share		9.44	8.58	8.75	10.52
Top 10% share		16.13	14.96	15.20	17.94
Top 20% share		28.50	26.92	27.13	31.24
Top 50% share		62.00	59.74	58.75	64.82
Concentration index (×100)		19.73	13.90	10.61	12.50
(Erreygers 2009)		(0.06)	(0.05)	(0.05)	(0.06)
Polarization (×100)	α=1.0	0.125	0.164	0.232	0.346
(Esteban & Ray 1994)		(0.008)	(0.006)	(0.021)	(0.045)
	α=1.3	0.009	0.012	0.022	0.037
		(0.001)	(0.001)	(0.004)	(0.010)
	α=1.6	0.001	0.001	0.002	0.004
		(0.000)	(0.000)	(0.001)	(0.002)

Note: All inequality calculations account for households' sampling weights.
Wealth indexes reported here are estimated using factor loadings from the same survey wave – ELMPS 2012. Estimates for Egypt 2012 are same as those in table 2, and estimates for Egypt 2006 are same as those in table A5.
Standard errors on Ginis, generalized Ginis and polarization indexes are bootstrap estimates.
[a] 71 wealth scores out of 17,974 are non-positive, and so are reset to +0.001 here for the standard Gini to take them into account. This makes a small difference. All other inequality measures the their original wealth scores.

Table A9. Association between gross household wealth and gross real monthly earnings or consumption

	Wage earnings					Consumption expend.	
	EG98	**EG06**	**EG12**	**JO10**	**TU14**	**ET11**	**ET13**
Pearson's correlation	0.391	0.344	0.270	0.133	0.296	0.002[a]	0.302
Spearman's rank correlation	0.428	0.376	0.302	0.368	0.441	0.297	0.316
Kendall's tau-a rank correlation	0.297	0.259	0.206	0.256	0.305	0.203	0.215
Kendall's tau-b rank correlation	0.298	0.259	0.207	0.257	0.306	0.205	0.215
Concentration index against wealth	20.25	19.55	15.03	20.23	17.13	9.98	11.14
(×100)	(1.17)	(1.22)	(1.23)	(8.57)	(1.65)	(1.80)	(0.80)
N	3,248	5,402	7,894	3,494	1,308	3,832	5,071

Notes: Households with all members failing to report wage earnings, or important component of consumption, are omitted. Pearson's correlation accounts for households' sampling weights, while Spearman's and Kendall's statistics do not. All concentration indexes and correlation coefficients but one[a] are significant at 0.1 percent level, with the significance level corrected for the expected accidental occurrences using Bonferroni's method. Standard version of the concentration index is used here, using zero as the natural lower bound of wage earnings. Huber-White robust standard errors are in parentheses.

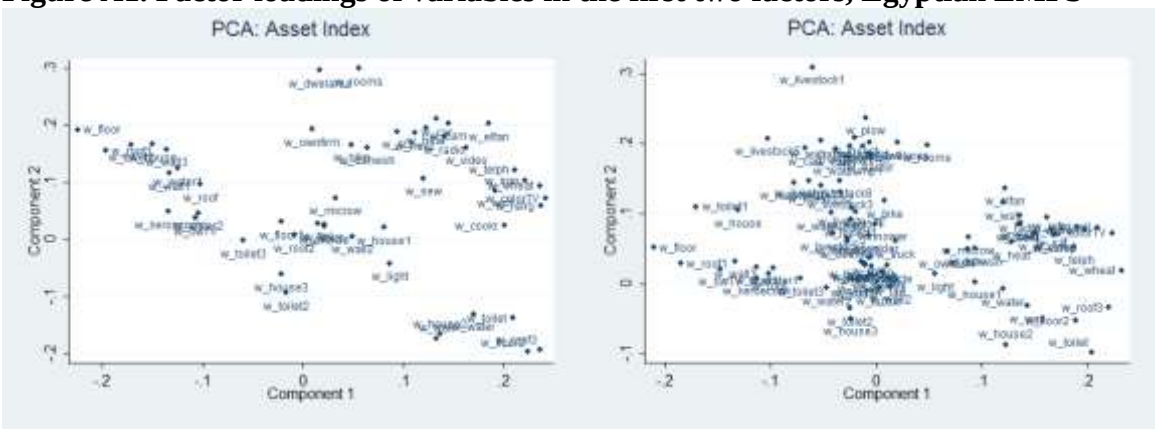
Table A10. Inequality measures, wealth indexes based on productive vs. non-productive assets

	EG98		**EG06**		**EG12**		**JO10**		**TU14**		**ET11**		**ET13**	
	Prod.	**Non-prod.**	**Prod.**	**Non-prod.**	**Prod.**	**Non-prod.**	**Prod.**	**Non-prod.**	**Prod.**	**Non-prod.**	**Prod.**	**Non-prod.**	**Prod.**	**Non-prod.**
Median	4.5	40.6	0.3	43.7	9.1	42.7	0.4	39.0	0.2	44.9	1.3	1.8	28.3	5.6
Mean	8.3	38.3	0.6	41.1	10.8	40.6	1.0	39.1	0.4	43.5	2.9	3.4	28.8	10.2
St.dev.	10.6	15.9	1.3	12.0	5.8	11.1	5.8	13.4	1.9	14.5	8.9	8.2	5.4	13.0
Skewness	1.7	-0.3	30.9	-0.6	3.3	-0.5	10.9	0.2	34.4	-0.2	9.2	9.4	1.0	2.8
Kurtosis	6.4	2.4	2134.3	3.7	18.2	3.5	125.2	3.1	1690.9	2.7	93.5	102.8	7.5	11.2
Gini (×100)	43.1	23.6	54.5	15.8	20.4	15.0	63.0	19.4	56.7	18.9	56.1	56.2	10.1	53.9
	(0.6)	(0.4)	(0.8)	(0.2)	(0.3)	(0.2)	(2.5)	(0.2)	(2.9)	(0.2)	(2.5)	(1.8)	(0.1)	(0.5)
95:5 pc ratio	--[a]	6.2	14.6	3.3	3.4	2.8	2.8	3.5	7.4	3.7	7.5	17.8	1.8	30.3
90:10 pc rat.	--	3.7	7.1	2.3	2.3	2.1	2.1	2.6	3.9	2.7	4.1	8.0	1.6	13.3
Top 1% shr.	5.8	2.0	13.3	1.8	3.8	1.6	55.7	2.0	28.5	1.8	29.6	22.0	1.7	7.0
Top 5% shr.	27.0	10.3	38.0	9.1	16.5	8.8	61.8	10.3	46.5	9.6	48.1	41.2	8.7	31.2
Top 10% shr.	40.6	17.8	51.4	15.6	25.4	15.3	65.4	17.7	53.1	16.8	56.6	50.2	15.0	45.0
Top 20% shr.	60.6	31.9	65.6	28.0	34.5	27.8	70.3	31.1	63.3	30.0	65.2	62.3	26.6	61.6
Top 50% shr.	96.1	68.2	78.6	62.0	61.9	61.5	82.6	64.7	84.3	64.4	81.7	84.0	58.1	84.6

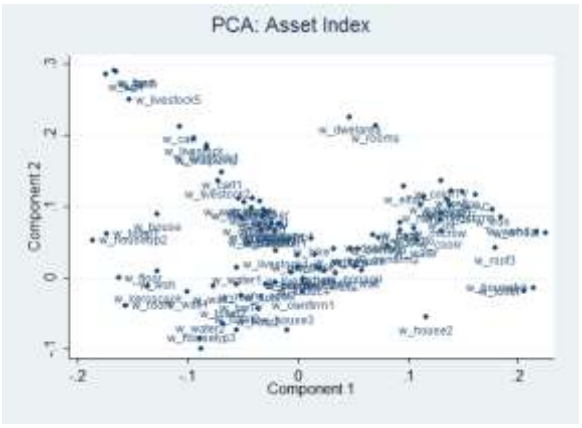
Notes: All statistics account for households' sampling weights. All wealth indexes range from 0 to 100 by design. Standard errors on Ginis are bootstrap estimates.

[a] 5th and 10th percentiles are zero.

Figure A1. Factor loadings of variables in the first two factors, Egyptian LMPS



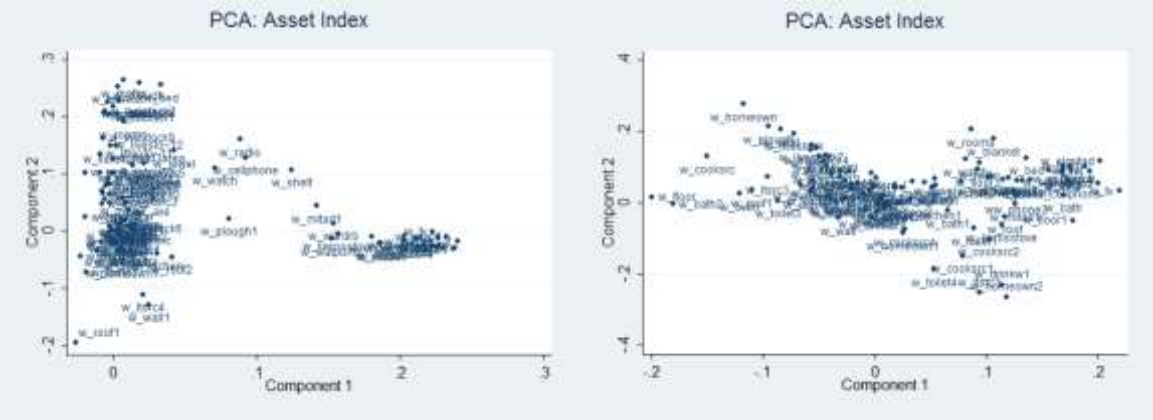
i. Egypt 1998 ii. Egypt 2006



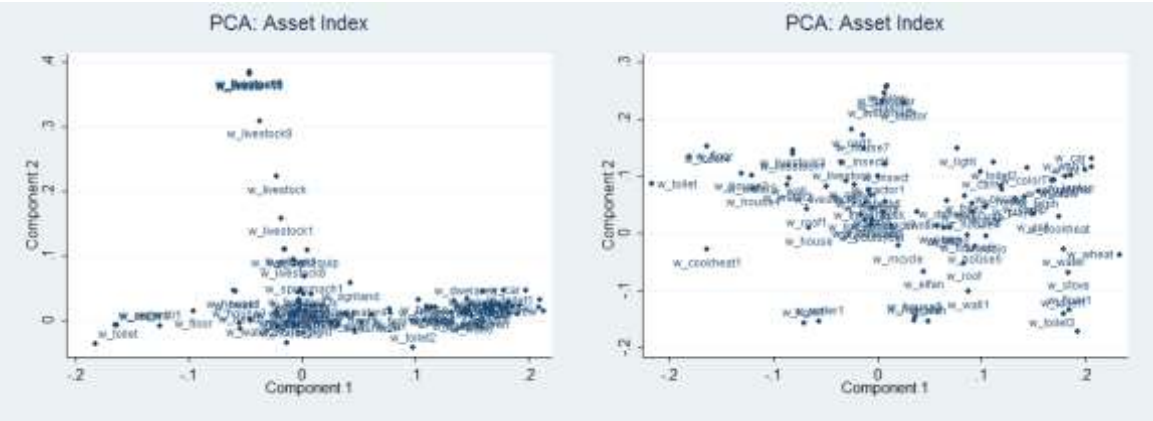
iii. Egypt 2012

Unrotated loadings of two first principal components, normalized to have sum of squared loadings = 1.

Figure A2. Factor loadings of variables in the first two factors, Ethiopian, Jordanian and Tunisian surveys



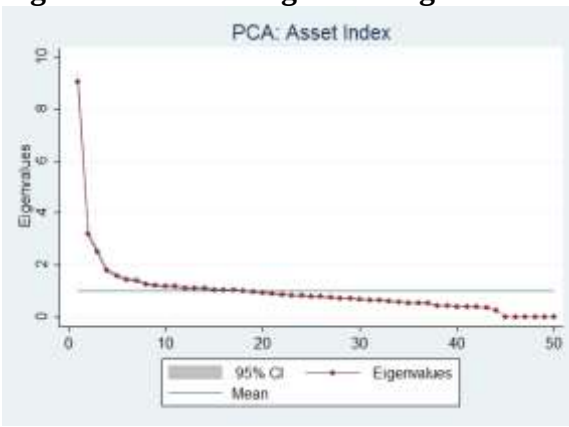
i. Ethiopia 2011 ii. Ethiopia 2013



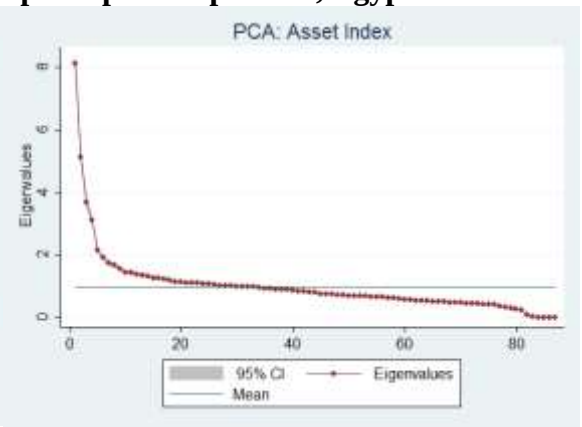
iii. Jordan 2010 iv. Tunisia 2014

Unrotated loadings of two first principal components, normalized to have sum of squared loadings = 1.

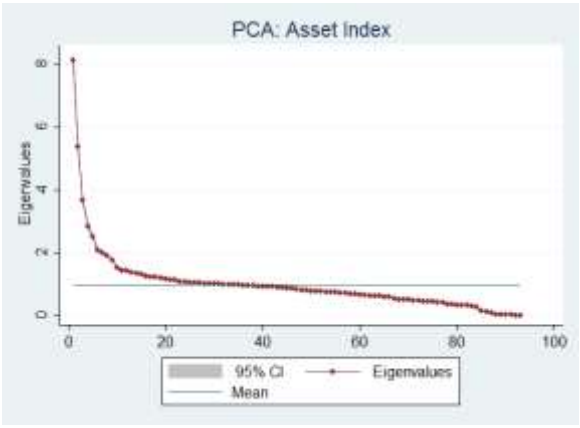
Figure A3. Scree diagram of eigenvalues of principal components, Egyptian LMPS



i. Egypt 1998

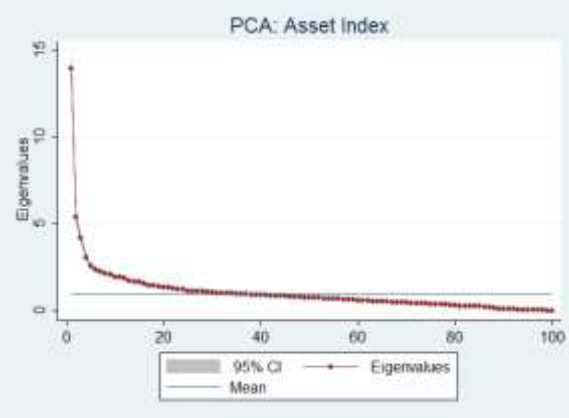


ii. Egypt 2006

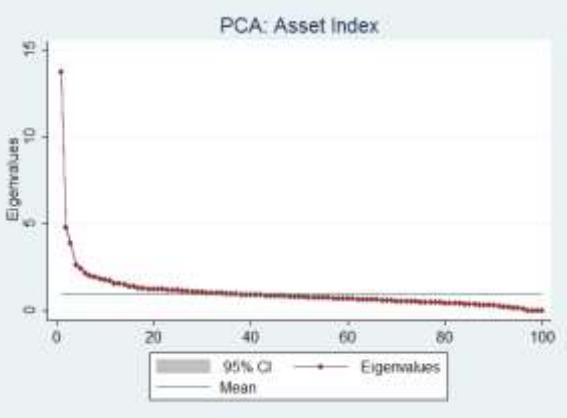


iii. Egypt 2012

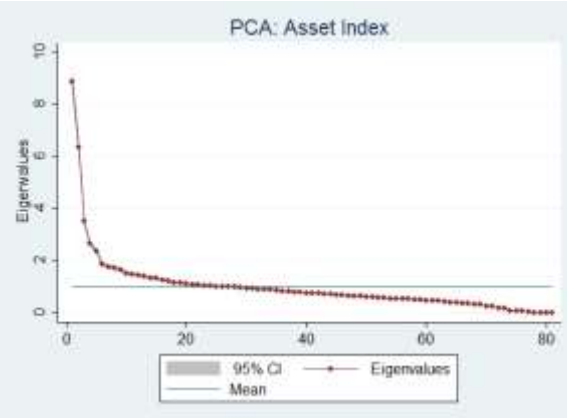
Figure A4. Scree diagram of eigenvalues of principal components, Ethiopian, Jordanian and Tunisian surveys



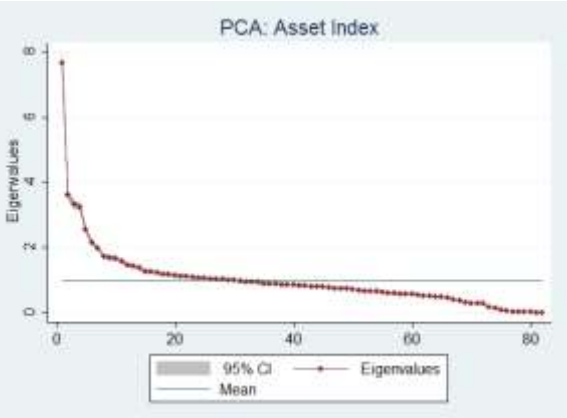
i. Ethiopia 2011



ii. Ethiopia 2013

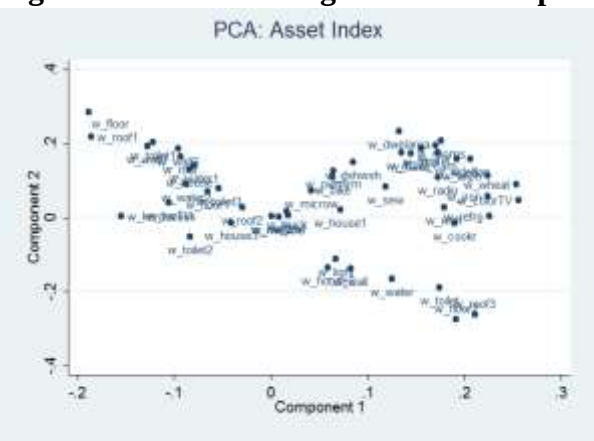


iii. Jordan 2010

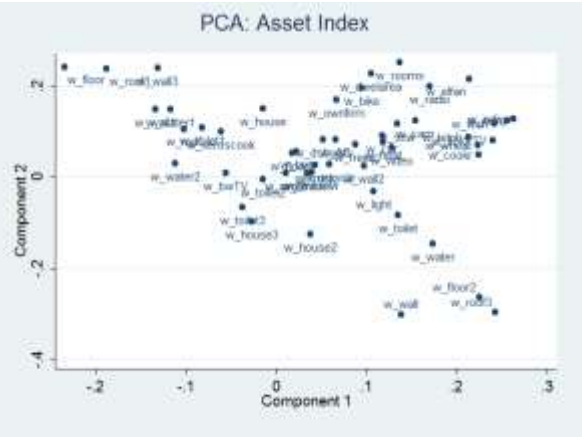


iv. Tunisia 2014

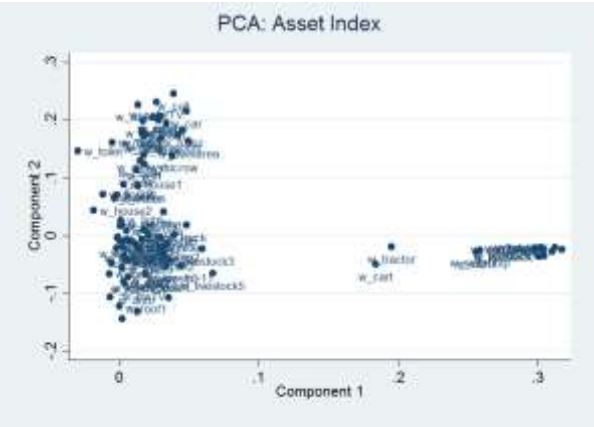
Figure A5. Asset loadings of factor components between urban and rural households



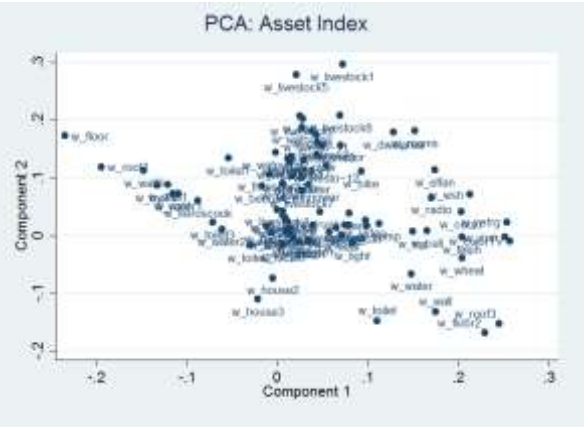
i. Egypt 1998 factor loadings, urban households



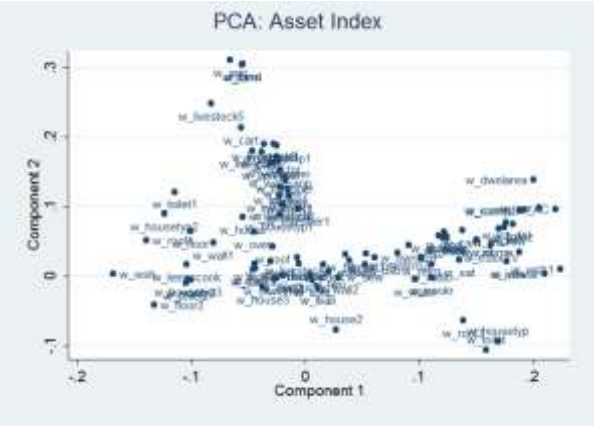
ii. Egypt 1998 factor loadings, rural households



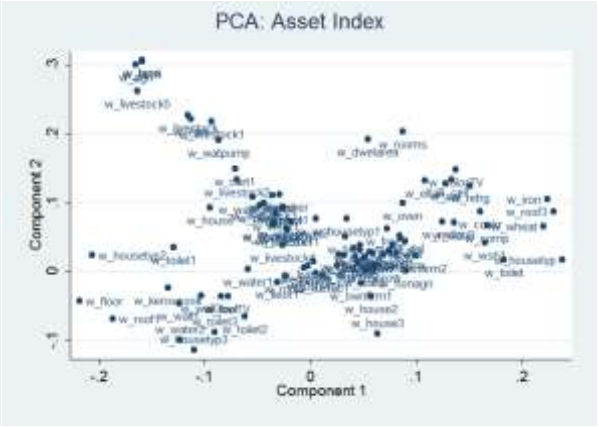
iii. Egypt 2006 factor loadings, urban households



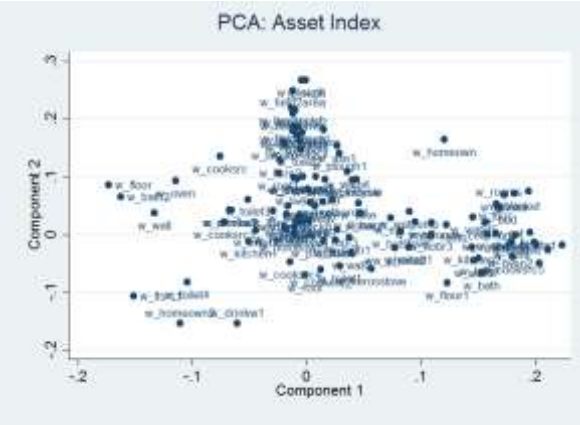
iv. Egypt 2006 factor loadings, rural households



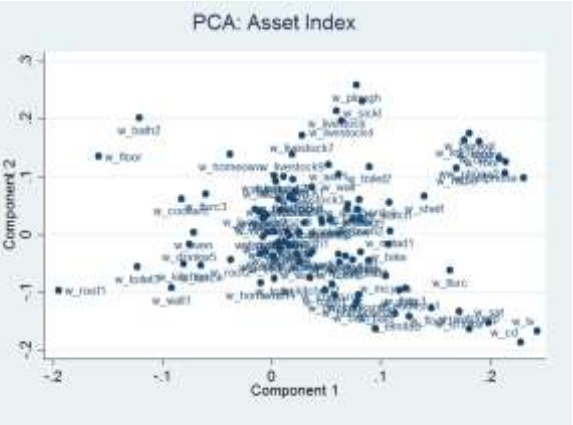
v. Egypt 2012 factor loadings, urban households



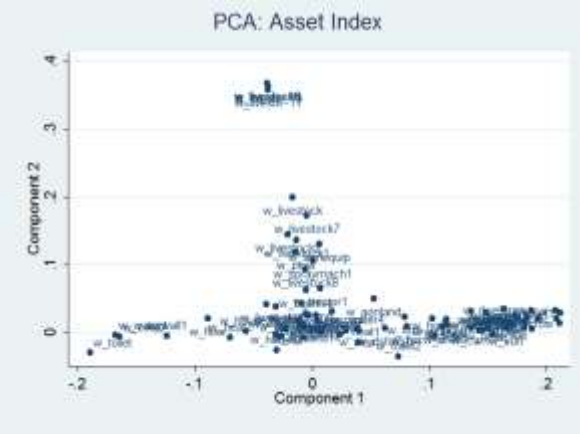
vi. Egypt 2012 factor loadings, rural households



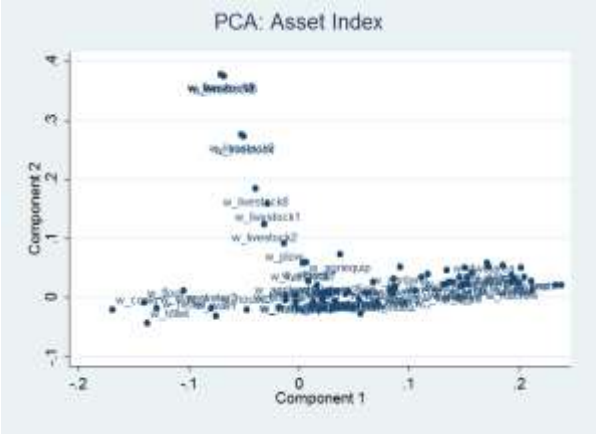
vii. Ethiopia 2013 factor loadings, urban households



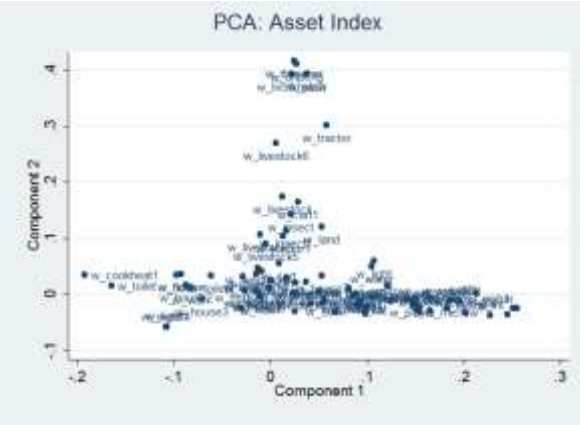
viii. Ethiopia 2013 factor loadings, rural households



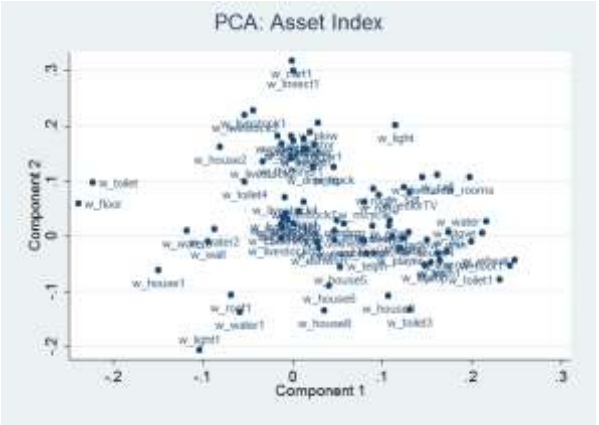
ix. Jordan 2010 factor loadings, urban households



x. Jordan 2010 factor loadings, rural households



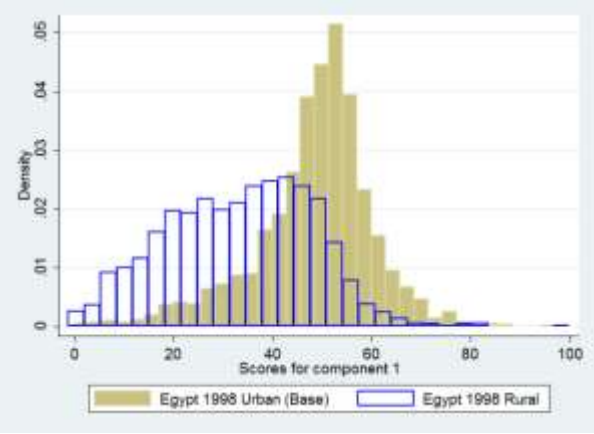
xi. Tunisia 2014 factor loadings, urban households



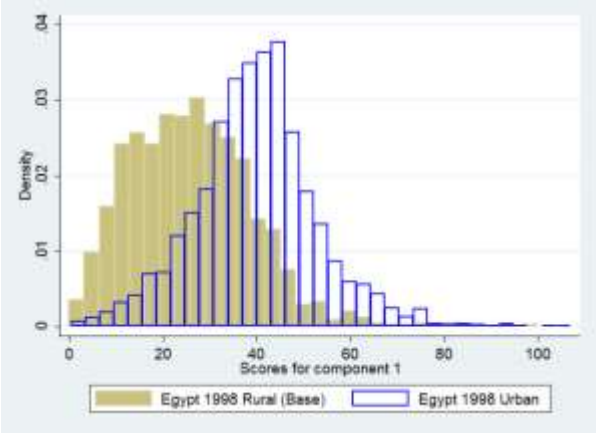
xii. Tunisia 2014 factor loadings, rural households

Note: Of interest are the variable loadings in the first factor component; the second factor component is shown just for illustration, but has no effect on the outcome of PCA.

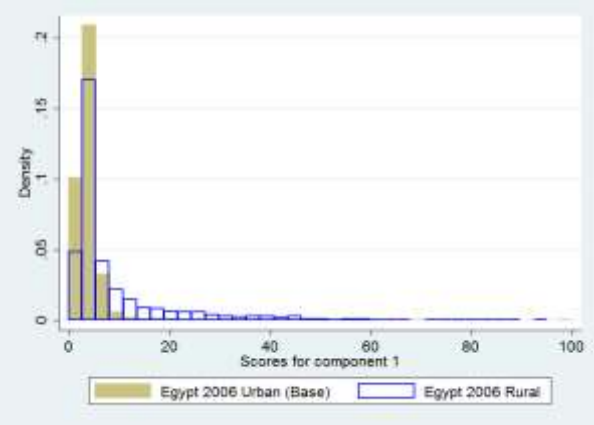
Figure A6. Distributions of wealth indexes between urban and rural households, using alternative (urban or rural) factor loadings



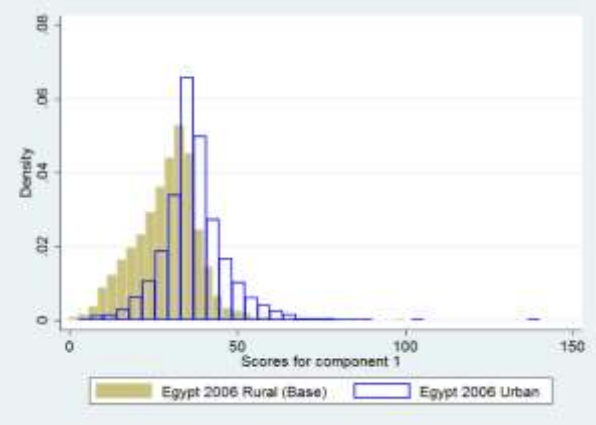
i. Egypt 1998 wealth distributions, urban factor load.



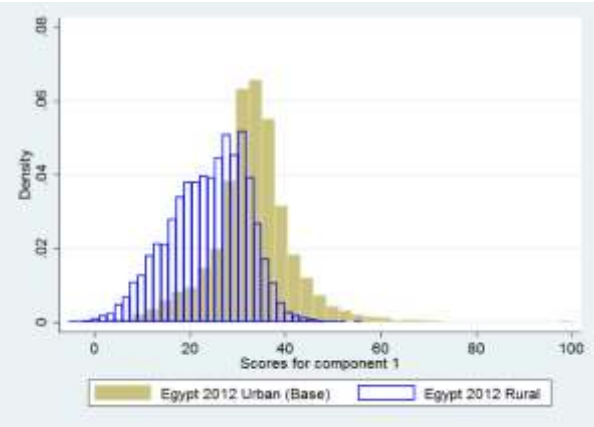
ii. Egypt 1998 wealth distributions, rural factor load.



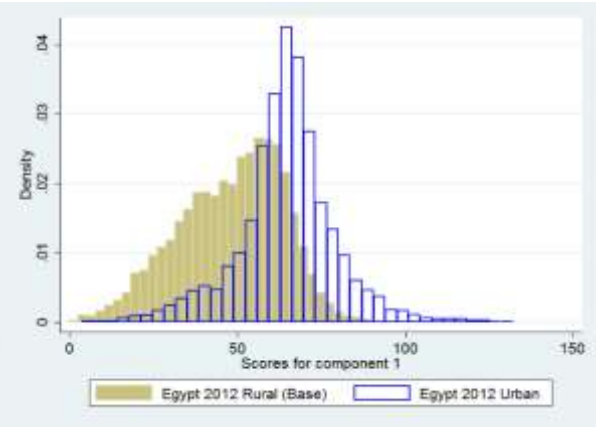
iii. Egypt 2006 wealth distributions, urban factor load.



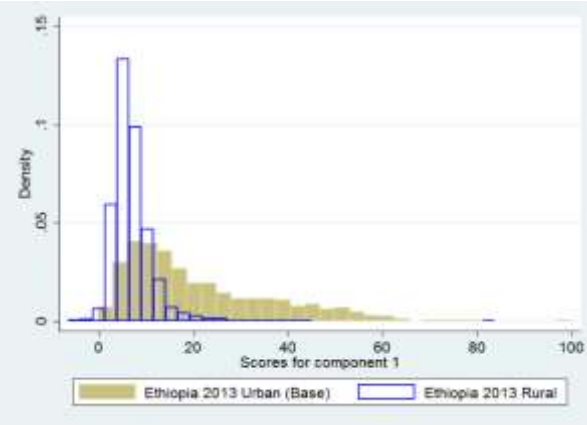
iv. Egypt 2006 wealth distributions, rural factor load.



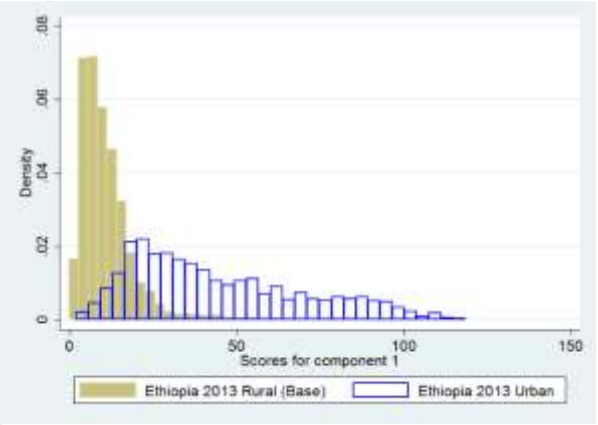
v. Egypt 2012 wealth distributions, urban factor load.



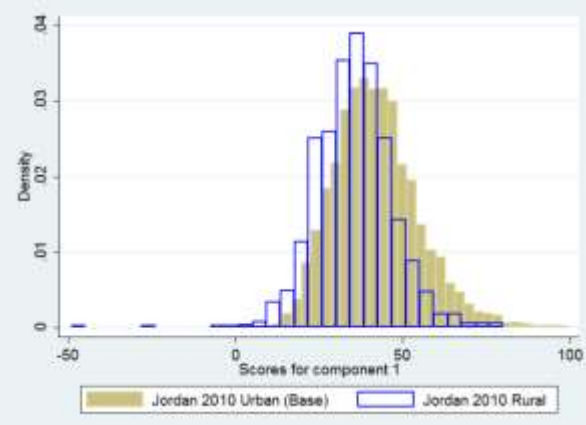
vi. Egypt 2012 wealth distributions, rural factor load.



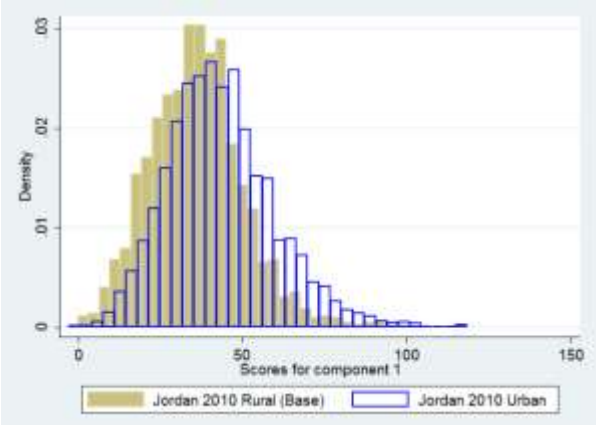
vii. Ethiopia '13 wealth distributions, urban factor load.



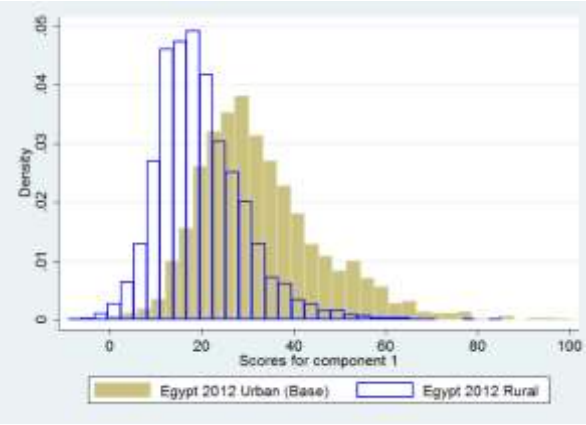
viii. Ethiopia '13 wealth distributions, rural factor load.



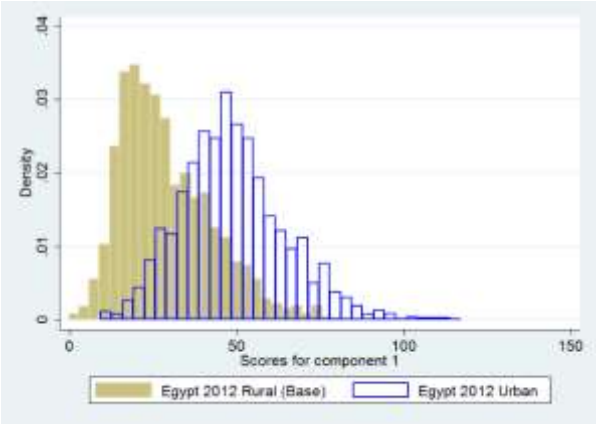
ix. Jordan 2010 wealth distributions, urban factor load.



x. Jordan 2010 wealth distributions, rural factor load.



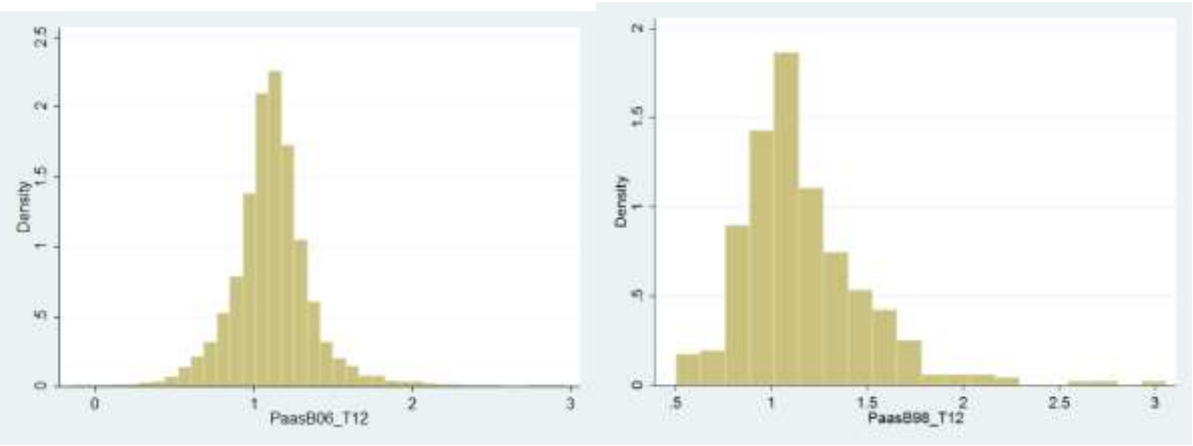
xi. Tunisia 2014 wealth distributions, urban factor load.



xii. Tunisia '14 wealth distributions, rural factor load.

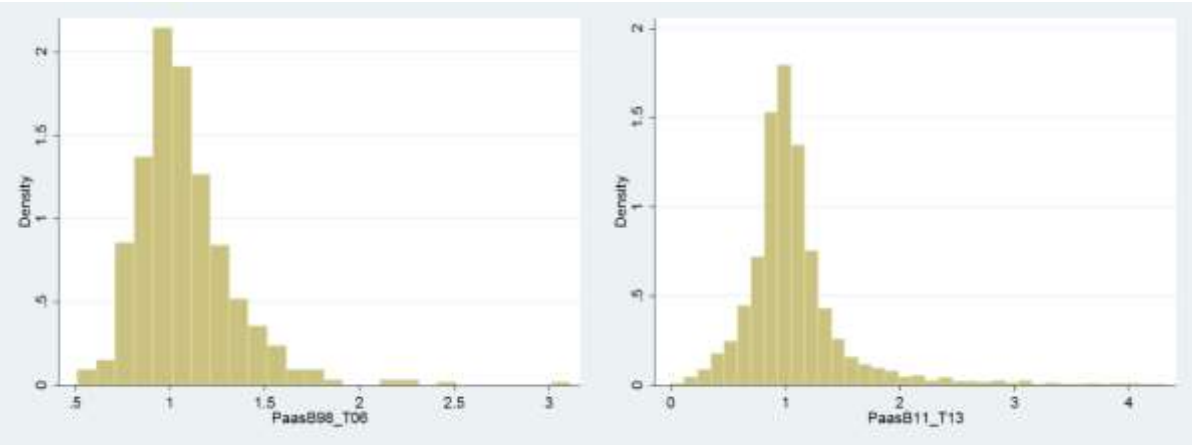
Note: PCA is performed on urban (rural, respectively) subsample, and asset loadings in the first principal factor are applied to both subsamples.

Figure A7. Paasche and Laspeyres indexes across Egypt 1998–2012 and Ethiopia 2011–2013



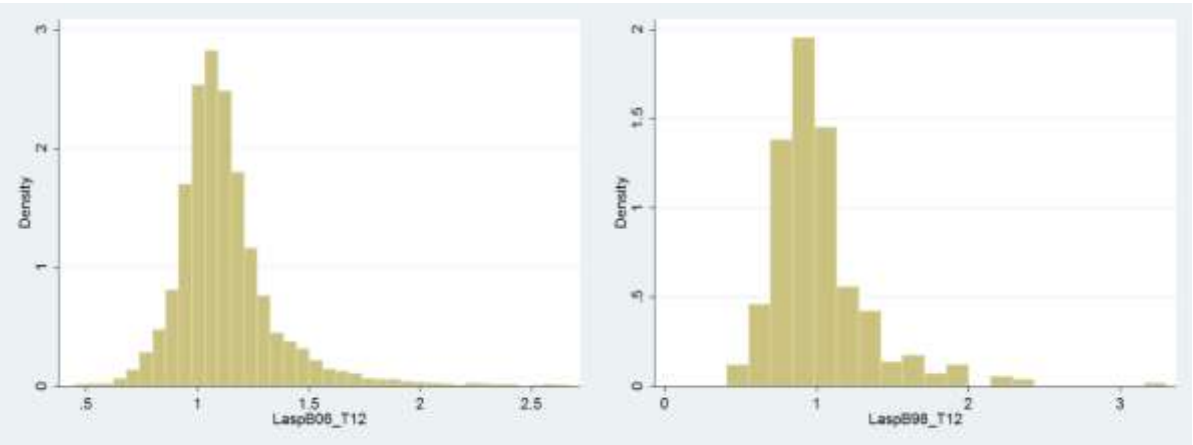
i. Paasche index, Egypt 2012; base year 2006

ii. Paasche index, Egypt 2012; base year 1998



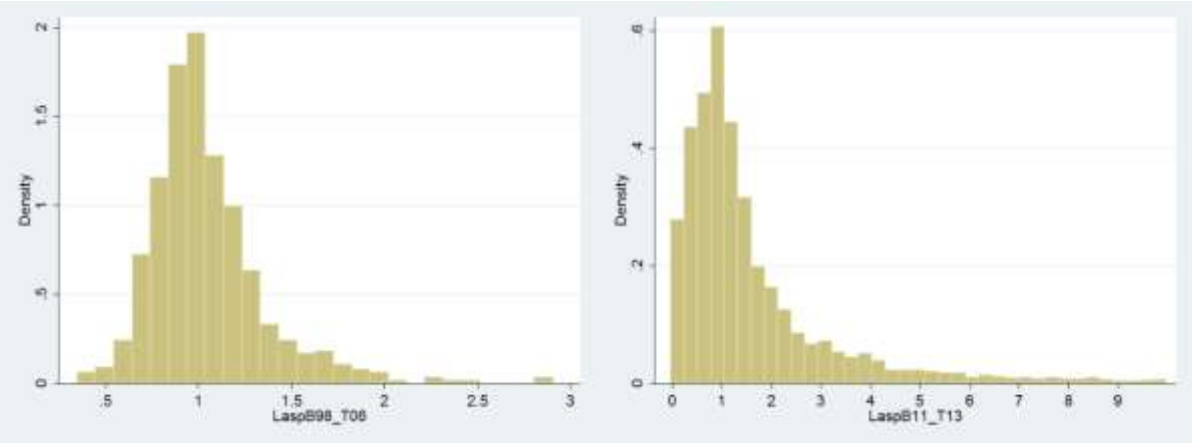
iii. Paasche index, Egypt 2006; base year 1998

iv. Paasche index, Ethiopia 2013; base year 2011



v. Laspeyres index, Egypt 2012; base year 2006

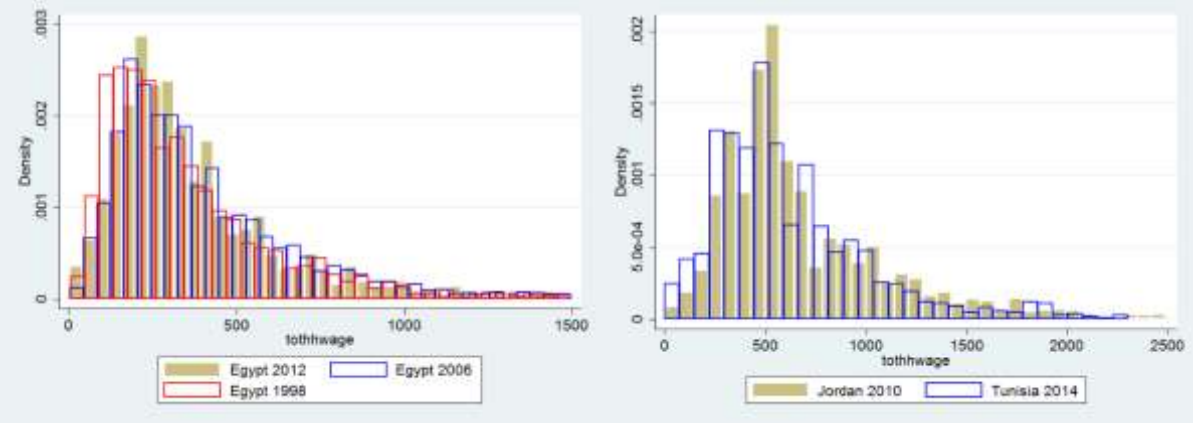
vi. Laspeyres index, Egypt 2012; base year 1998



vii. Laspeyres index, Egypt 2006; base year 1998

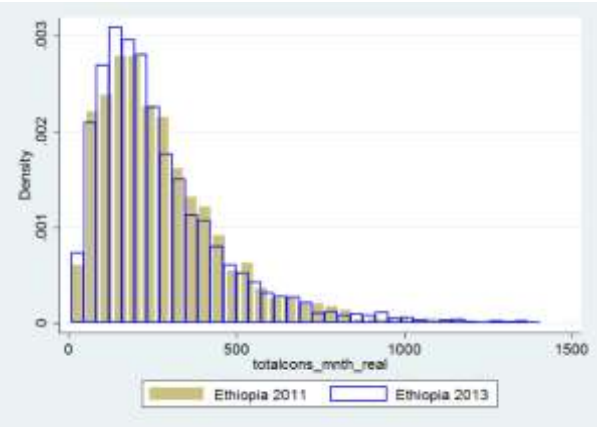
viii. Laspeyres index, Ethiopia 2013; base year 2011

Figure A8. Households' monthly wage earnings and consumption expenditures (PPP2012$)



i. Egypt wage earnings distributions

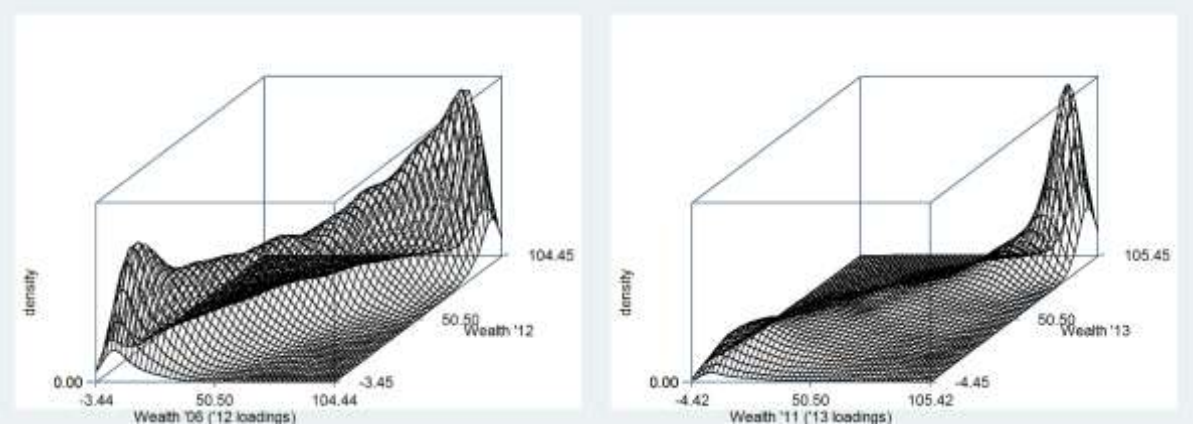
ii. Jordan and Tunisia wage earnings distributions



iii. Ethiopia consumption-aggregate distributions

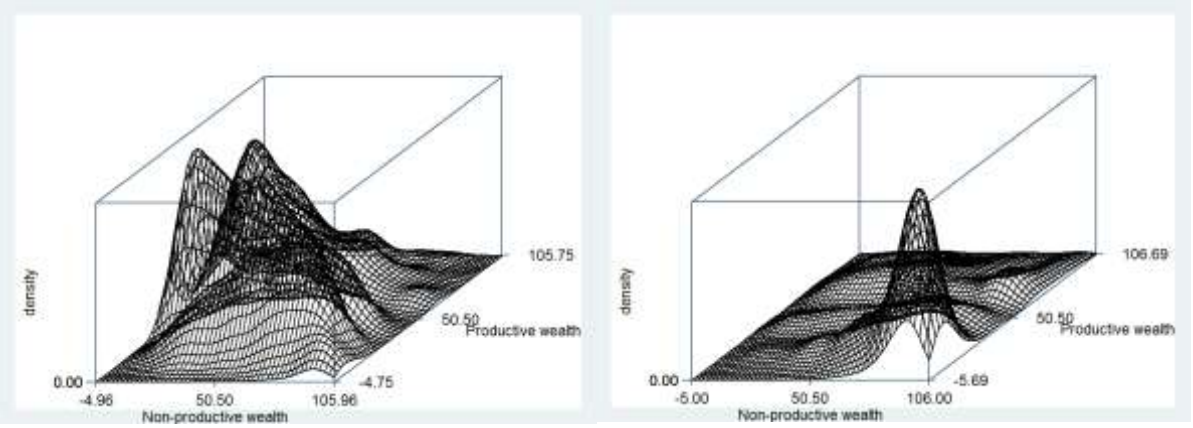
Notes: Monthly household wage earnings or consumption expenditures in real, purchasing-power parity 2012 dollars. The distributions are truncated for clarity of presentation.

Figure A9. Joint distribution of wealth in two subsequent periods, kernel-density contours

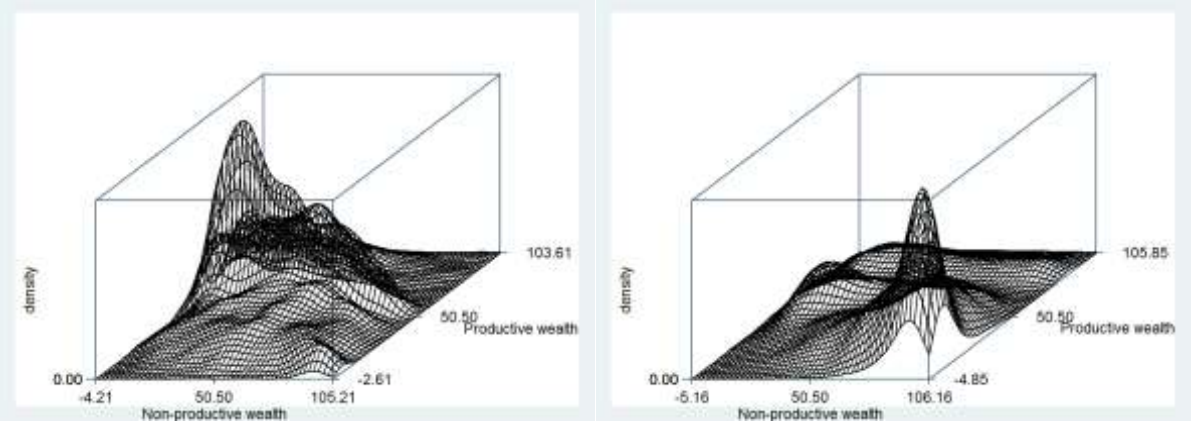


i. Egypt 2006–2012 (2012 loadings) ii. Ethiopia 2011–2013 (2013 loadings)

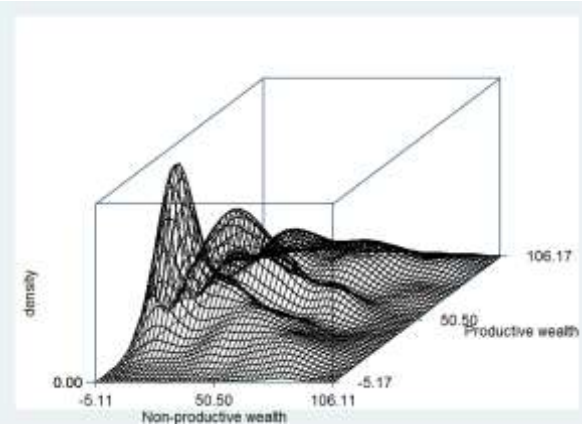
Figure A10. Productive and non-productive wealth distribution, joint kernel-density contours conditioning on earnings quintile



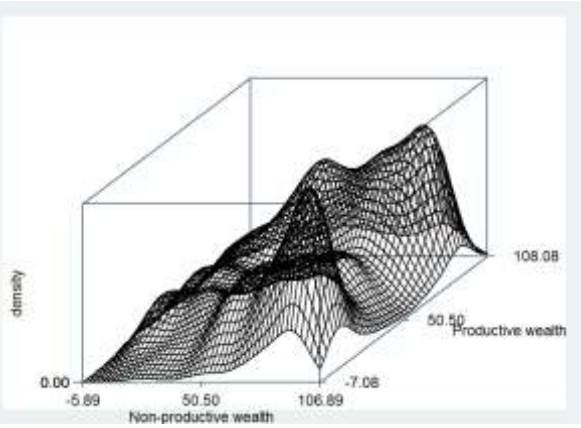
i. Egypt 2006, earnings quintile 1 ii. Egypt 2006, earnings quintile 5



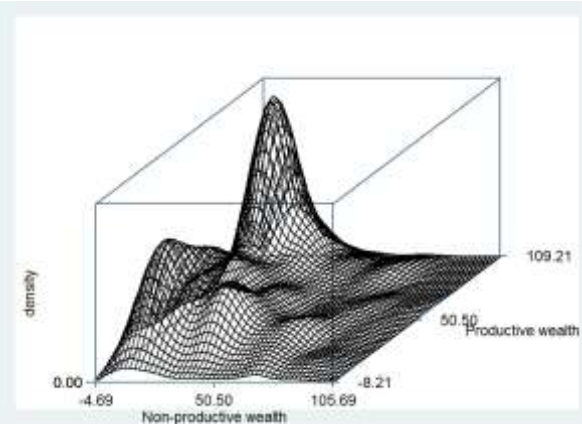
iii. Egypt 2012, earnings quintile 1 iv. Egypt 2012, earnings quintile 5



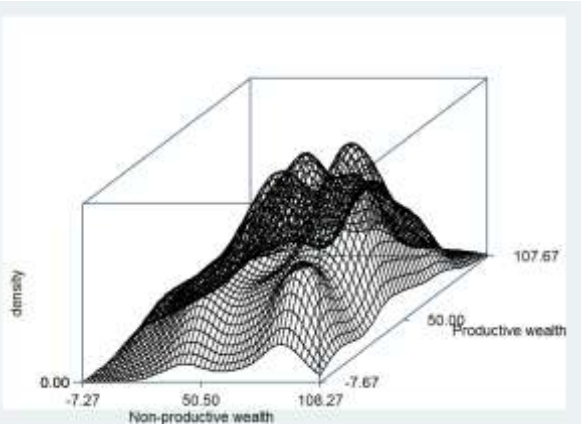
v. Jordan 2010, earnings quintile 1



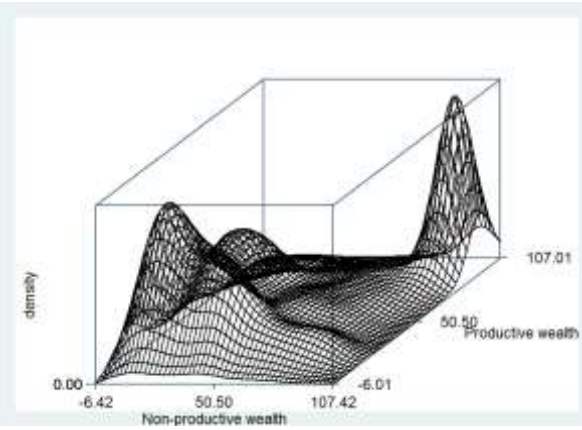
vi. Jordan 2010, earnings quintile 5



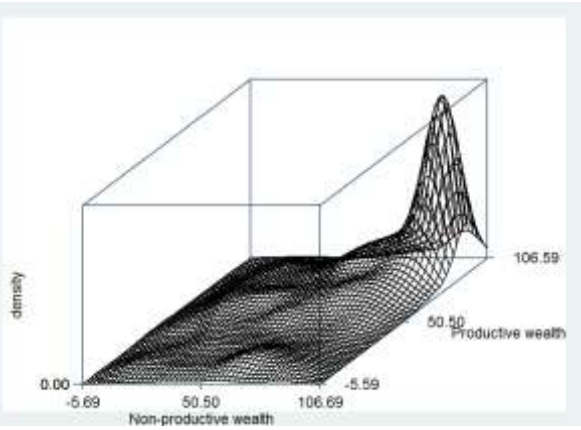
vii. Tunisia 2014, earnings quintile 1



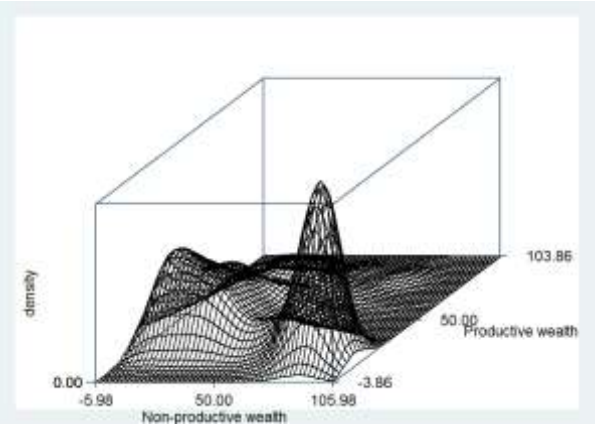
viii. Tunisia 2014, earnings quintile 5



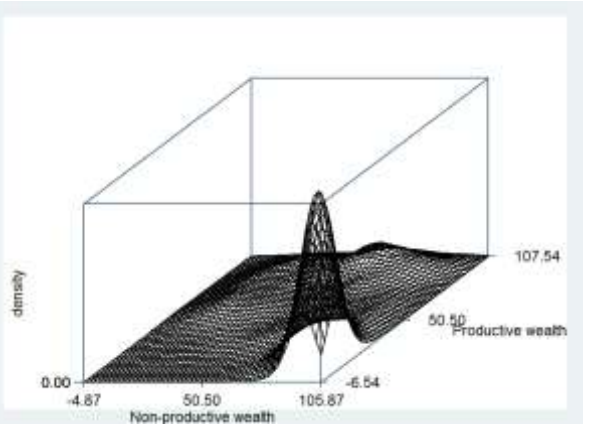
ix. Ethiopia 2011, earnings quintile 1



x. Ethiopia 2011, earnings quintile 5



xi. Ethiopia 2013, earnings quintile 1



xii. Ethiopia 2013, earnings quintile 5

Annex References

Assaad, Ragui (2012). The Structure and Evolution of Employment in Jordan, Economic Research Forum Working Paper 674, Cairo, Egypt.

Assaad, Ragui, and Ghada Barsoum (2000). Egypt Labor Market Survey 1998: Report on the Data Collection, Preparation and Appraisal, ERF technical report, December.

Assaad, Ragui, and Caroline Krafft (2013). The Egypt labor market panel survey: introducing the 2012 round, IZA Journal of Labor & Development 2(8):1–30.

Assaad, Ragui, Samir Ghazouani, Caroline Krafft, and Dominique Rolando (2016). Introducing the Tunisia Labor Market Panel Survey 2014, IZA Journal of Labor & Development 5(15):1–21.

Barsoum, Ghada (2007). Egypt Labor Market Panel Survey 2006: Report on Methodology and Data Collection, ERF working paper 0704, September.

Central Statistical Agency of Ethiopia and World Bank (CSA & WB, 2013). Ethiopia Rural Socioeconomic Survey (ERSS): Survey Report, May 7, 2013, Washington: World Bank.

Central Statistical Agency & Living Standards Measurement Study – World Bank (CSA & WB, 2015). Ethiopia Socioeconomic Survey (ESS) – 2013/14: Survey Report (Workshop Version), March 25.

Echevin, Damien (2013). Measuring Vulnerability to Asset-Poverty in Sub-Saharan Africa, World Development 46(2):211–222.

El Enbaby, Hoda, and Rami Galal (2015). Inequality of Opportunity in Individuals' Wages and Households' Assets in Egypt. ERF Working Paper 942.

Food and Agriculture Organization (FAO, 2016a). Components of Income Aggregate: 2011-12 Ethiopian Rural Socioeconomic Survey, Rural Income Generating Activities Project of the Agricultural Development Economics Division, Food and Agriculture Organization, April.

Food and Agriculture Organization (FAO, 2016b). Construction of Consumption Aggregates for the Ethiopia Socioeconomic Survey Wave 2: Supplemental Information.

Jordan, Kingdom of (2010). Jordan Labor Market Survey 2010: Booklet, Instructions and Reviewing Rules.

Majbouri, Mahdi (2017). Income mobility and the Arab spring: the case of Egypt and Jordan, Applied Economics Letters 24(15):1070–1074.

McKenzie, David J. (2005). Measuring Inequality with Asset Indicators, Journal of Population Economics 18(2):229–260.

Open Access Micro Data Initiative (OAMDI, 2016). Labor Market Panel Surveys (LMPS), http://erf.org.eg/data-portal/. Version 2.0 of Licensed Data Files. Integrated Labor Market Panel Surveys; Egyptian Labor Market Panel Surveys 1998, 2006, 2012; Jordanian Labor Market Panel Survey 2010; Tunisian Labor Market Panel Survey 2014. Egypt: Economic Research Forum (ERF).

Ward, Patrick S. (2014). Measuring the Level and Inequality of Wealth: An Application to China. Review of Income and Wealth 60(4):613–635.

World Bank (2015a). Inflation: GDP Deflator (annual %), World Bank national accounts data, and OECD National Accounts data, World Development Indicators catalog, http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG.

World Bank (2015b). PPP conversion factor, GDP (LCU per international $), International Comparison Program database, World Development Indicators catalog, http://data.worldbank.org/indicator/PA.NUS.PPP.