Measuring Inequality in the Middle East 1990-2016: The World's Most Unequal Region?

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Abstract. In this paper we combine household surveys, national accounts, income tax data and wealth data in order to estimate income concentration in the Middle East for the period 1990-2016. According to our benchmark series, the Middle East appears to be the most unequal region in the world, with a top decile income share as large as 64%, as compared to 37% in Western Europe, 47% in the USA and 55% in Brazil. This is due both to enormous inequality between countries (particularly between oil-rich and population-rich countries) and to large inequality within countries (which we probably under-estimate, given the limited access to proper fiscal data). We stress the importance of increasing transparency on income and wealth in the Middle East, as well as the need to develop mechanisms of regional redistribution and investment.

Keywords: Inequality, top incomes, Middle East
JEL classification: D3, O53

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References

1. Introduction

In recent decades, the Middle East has been the scene of dramatic political events: wars, invasions, revolutions and various attempts to redraw the regional political map. It is natural to ask whether this high level of political instability is related to the specific structure and level of socio-economic inequality in this region. Unfortunately, available evidence on inequality in the Middle East and how it compares to other world regions is relatively scarce.

In this paper, we attempt to combine available data sources (national accounts, household surveys, income tax data, and wealth rankings) in a systematic manner in order to provide novel estimates of the distribution of income in the Middle East between 1990 and 2016. According to our benchmark series, the Middle East appears to be the most unequal region in the world, with a top decile income share as high as 64%, as compared to 37% in Western Europe, 47% in the USA and 55% in Brazil. This is due both to enormous inequality between countries (particularly between oil-rich and population-rich countries), and to very large inequality within countries (which we probably under-estimate, given the limited access to fiscal data).

These estimates are based on two methodological innovations. To our knowledge, our paper is the first attempt to combine Middle East household surveys with income tax data. Namely, we use the findings from Lebanese income tax micro-files recently exploited by Assouad (2017) and apply generalized Pareto interpolation techniques (Blanchet, Fournier and Piketty, 2017). This leads us to significantly correct upward standard survey-based, within-country inequality estimates. This upward correction should still be viewed as a lower bound, but more plausible than usual measures based solely upon self-reported data. Next, our paper is also the first attempt to combine within-country inequality measures in order to estimate the distribution of income for the entire Middle East region. Both innovations play an important role in accounting for our high inequality findings (they both have impacts that are comparable in magnitude). We stress that we still face important limitations and uncertainties regarding the measurement of income distribution in the region, and that increased transparency on income and wealth is highly needed. However our

main conclusion – namely the fact that the Middle East is one of the most unequal regions in the world, if not the most unequal region – appears to be robust.

Of course, we do not pretend that this high inequality level is the only explanation for the regional political instability. Other factors – religious, historical, cultural and political – certainly play an important role as well. But we believe that inequality can be part of the explanation, or at least that it belongs to a set of background factors that contribute to generate political upheavals. The 1990 invasion of Kuwait by Iraq – two countries with vastly different per capita income and wealth – is a clear and extreme example. More generally, one can plausibly argue that perceptions about inequality and the fairness or unfairness of the distribution of income are determined not only by within-country inequality but also by inequality at the regional level, and even sometime at the global level.

The final outcome of the aggregation of distributions is less straightforward than it may seem, and it requires empirical examination. To a large extent, this paper can be viewed as an exercise of aggregation. We show how changing the geographical level of analysis affects the measurement of inequality. In the case of the Middle East, the concept of nation-state may not be the most meaningful lens through which we can analyze the concentration of income. The total population of the region (about 410 million in 2016) is comparable to Western Europe (420 million) or the United States (320 million), and is characterized by a relatively large degree of cultural, linguistic and religious homogeneity (at least as compared to these other world regions).

Even more strikingly, when we integrate Eastern European countries to Western Europe, thereby looking at a total regional population over 570 million, we find that total inequality rises only moderately. For instance, the top 10% income share rises from 37% in Western Europe to 39% for total Europe (vs. 64% in the Middle East). In other words, putting together Bulgaria and Germany does raise inequality levels, as expected, but it does so in a relatively moderate manner, at least as compared to the enormous inequality levels observed in the Middle East. How much is due to the various institutional features of Europe (such as free mobility or regional development funds), and the lack thereof in the Middle East, is an interesting issue, which falls well beyond the scope of the present paper.

In any case, we feel that such regional comparisons are legitimate and to some extent informative – at least as much as the usual inequality comparisons between nation-states. Both types of comparisons seem to capture complementary and valuable dimensions of individual perceptions about inequality.

This paper is part of a broader project, namely the World Inequality Database (WID.world), that attempts to produce annual distributional statistics – and possibly micro data on income and wealth distributions – that are comparable across countries (Alvaredo et al. 2016). For this, we follow a common methodology that involves the combination of national accounts, surveys, and fiscal data in a consistent manner to produce *distributional national accounts*. The methodology was already applied for the United States (Saez and Zucman, 2016; Piketty, Saez and Zucman, 2016), France (Garbinti, Goupille-Lebret and Piketty, 2016, 2017), China (Piketty, Yang and Zucman, 2017) and Russia (Novokmet, Piketty and Zucman, 2017). Although there are similarities across countries regarding methods, lessons can be drawn from country-specific cases to help produce new databases for future works, in a context of scarcity of data.

The rest of this paper is organized as follows. In section 2, we relate our work to the existing literature on income inequality in the Middle East and at the global level. Section 3 describes our main data sources, concepts, and methodology. In Section 4, we present our main results on the evolution of income inequality in the Middle East, and we also compare our series to other countries. Section 5 provides concluding comments. This paper is supplemented by an extensive online appendix that includes all the raw data and codes, and also presents additional results and robustness checks.

Section 2. Relation to literature on Middle East and global inequality

The study of the evolution of income and consumption inequality using household surveys is a well-established tradition in a number of countries in the Middle East (see e.g. Wahba (1996, 2009) and Said (2007) in the case of Egypt). In addition, following the Arab Spring movement, there has been renewed interest in inequality

measurement in Middle East countries. A number of papers have argued that income inequalities within these countries do not seem to be particularly high by international standards, and therefore that that the source of dissatisfaction might lie elsewhere (see in particular Halsny and Verne (2013); see also World Bank (2012) and Bibi and Nabli, 2010). This somewhat surprising fact, coined "the Enigma of Inequality" (UNDP, 2012) or the "Arab Inequality Puzzle" (World Bank, 2015), has produced a rising literature on inequality in the region (see Ncube and Anyanwu, 2012; Hassine, 2015, Hlasny and Verme, 2015, Roy van der Weide et al. 2016, or Assaad et al. 2017).

As noted in the introduction, our contribution to this literature is twofold. We combine household surveys with income tax data in order to correct upwards the top of survey-based income distributions, and we aggregate within-country distributional data in order to estimate the distribution of income at the level of the entire Middle East. This leads us to relatively novel (though not entirely unexpected) conclusions regarding extreme inequality in the Middle East.

We stress that these results should be viewed as exploratory and suffer from many limitations. In particular, despite our best efforts, our ability to properly measure income inequality within individual countries is severely limited by the low quality of available data sources. The problem is particularly acute in the Gulf countries, for which there exist very few studies on income distribution (see e.g. El-Katiri, Fattouh and Segal (2011) on Kuwait), and where the low standard survey-based Gini coefficients seem to contradict important aspects of their political economy, namely the growing share of migrant population, a large majority of which is composed by low-paid workers living in difficult conditions (Human Right Watch, 2013). The flow of migrant workers in Gulf countries has grown substantially over the period. This sharp increase contributed to make nationals willing to defend their numerous privileges, beginning by restraining naturalization.[1] But the most striking manifestation of the restrictions imposed to the migrant population is probably the highly exploitative

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[1] "Oil wealth, and the practice of dividing some of this among citizens, mean there are very strong economic incentives to limit citizenship to a small pool of people. Gulf nationals typically do not pay income tax, have free health care and education provided by the state, receive subsidies for electricity and fuel, and often receive other benefits (such as land grants). Traditionally they have also expected the state to provide a job – an idea enshrined in some Gulf constitutions and - housing." (Chatham House, 2015, p. 17).

"sponsorship system" of labor or "kafala system" (Human Right Watch, 2013, Kapiszewski, 2006), resulting in the creation of an extremely polarized social structure with two different groups in the legal, social and economic dimensions (Chatham House, 2015). As far as we know, little research has been conducted to study the two populations in order to measure income inequality in Gulf societies (see Naidu et al., 2016 on the UAE, using new administrative wage data for foreigners, and Weyl, 2016). In the context of this paper, we attempt to put together all existing statistical information that has been published regarding the inequality of income between nationals and foreign workers in Gulf countries (see section 4 below). Unfortunately, we still face important limitations in our empirical and quantitative understanding of these issues.

Finally, our paper is closely related to the literature on the world distribution of income (Milanovic, 2002; Bourguignon and Morrisson, 2002; Lakner and Milanovic, 2013). In particular, Lakner and Milanovic (2013) attempts to correct upwards the top income share estimates constructed on the basis of national household surveys to study how much this impacts the measurement of the world distribution of income. Our approach is similar, except that we focus on regional inequality (i.e. inequality measured at the level of a broad region such as the Middle East) rather than global inequality. Of course both approaches are highly complementary: before we can perform a meaningful aggregation at the world level, it is important to ensure that we are able to do it at a broad regional level.

Section 3. Data sources, Concepts and Methodology

This paper relies on four types of data sources: household surveys, income tax data, wealth rankings and national accounts. We define the Middle East as the region going from Egypt to Iran, and from Turkey to the Gulf countries. We start by putting together a macroeconomic database including annual series on population and national income between 1990 and 2016. Basic descriptive statistics for 2016 are reported in Table 1. The region is characterized by very large between-country inequality (we further discuss this issue in section 4). All details about the data sources and methods used to construct homogenous national accounts are described in the online appendix.

In order to estimate the distribution of income in the Middle East, our general methodology follows three steps. We begin with the Middle East household income surveys data series (**step 1**), which we correct using (i) generalized Pareto interpolation techniques (see Blanchet, Fournier and Piketty, 2017 for the description of the interpolation method) and (ii) personal income tax micro-data available for Lebanon (see Assouad 2017 for a description of these fiscal data and their main limitations) (**step 2**). We then use national accounts and rich lists in order to impute tax-exempt capital income (**step 3**). Our concepts and methods generally follow those described in the Distributional National Accounts guidelines used for the World Inequality Database (Alvaredo et al., 2016). In particular, the methodology in three steps is very similar to that used for China in Piketty, Yang, Zucman (2017), and for Russia in Novokmet, Piketty, Zucman (2017), with some differences highlighted in the following sections.

Section 3.1. Step 1: constructing a household income database for the Middle East

Income and inequality data are scarce in the Middle East, notably in the poorest and the richest countries. Although many national statistics offices undertake household surveys on income or expenditure, access to the data is very limited. Until recently, it was almost impossible to obtain micro-data[2]. Finally, when they exist, the databases are often of poor quality (see Bibi and Nabli, 2010 for a review of existing data, and an assessment of their access and quality).

The first part of our work consists in gathering available sources to create a Middle East income database and generate raw survey-based inequality series at the national and then the regional levels. Table 2 summarizes the years on which household survey data were available: there is for each country between 1 and 16 years with data. Regarding the format, there are four cases: (1) 8 countries with survey micro-data; (2) 6 countries with tabulated information on the distribution of income, extracted from household surveys reports and/or statistics offices publications; (3) 3 countries with data on expenditure and consumption (tables or

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[2] See in particular the "Open Access Micro Data Initiative" undertaken by the Economic Research Forum.

micro-data); (4) 1 country, Saudi Arabia, with no detailed published data. In the online appendix we provide a thorough description of all data sources country by country, the information available, and the methodology used to combine them to produce income distribution series over the 1990-2016 period (Appendix A). We briefly summarize three main issues regarding the data construction process in the following.

A first issue concerns the definition of income. Unfortunately, the data quality makes it impossible to harmonize the series in a completely satisfactory manner. Only the micro-data for Turkey contain relatively detailed information on income categories (wages, pension and other replacement income, business, and capital income) enabling to distinguish between different income concepts. Other micro-databases only provide total disposable income, with however some additional information on imputed rental income and/or the amount of taxes on consumption and durable goods, property taxes etc. paid for some years and countries. Tabulated data usually contain limited information on the definition of income. Whenever possible, the survey income concept that we use attempts to approach pre-tax, post-replacement income (see DINA guidelines, Alvaredo et al 2016). More precisely, pension income (and other replacement income such as unemployment insurance) is included, while pension contributions (and other social contributions financing replacement income flows) are deducted. Therefore, in the trade-off between harmonizing our database (between years and/or countries) and approaching the pre-tax income concept we choose the latter. This is a substantial limitation that needs to be corrected in the future.

The second issue concerns the unit of observation. We take the adult individual as the basic unit, and we assume that income is equally split between adult household members (see Alvaredo et al, 2016). We are therefore interested in the distribution of per-adult equal-split income[3]. We normalize our series to the adult population (i.e. aged 20 and more). Using the generalized Pareto interpolation techniques developed in Blanchet, Fournier and Piketty (2017) and the *gpinter* web interface (www.wid.world/gpinter), we estimate the full distribution of raw survey income

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[3] See Appendix A for more details on the country specific hypothesis made to derive the per adult income distributions.

separately for all countries and for the region as a whole[4]. We express the distributions in terms of generalized percentiles (or g-percentiles)[5].

The third issue is related to the years without data. As one can see from Table 2, household surveys are available only for a limited number of years. To infer the distribution of years with no data, we use the household surveys distribution of the closest available years[6]. For a number of countries, we only have one household survey, which means that by construction we are forced to use the same inequality level over the entire 1990-2016 period. As we repeatedly stress throughout the paper, this major limitation implies that we cannot draw robust conclusions about the evolution of income inequality: the main objective of this paper is to estimate the overall level of income inequality in the Middle East, not the evolution.

Additionally, in order to ensure maximal comparability across countries and time, we choose to anchor all country-year-level income distributions to the relevant per adult national income. That is, for every country-year pair, we proportionally upgrade all income levels for all percentiles so that per adult average income coincides always with per adult average national income observed in our macroeconomic database (therefore keeping the income distribution and shares constant). By doing so, we certainly do not pretend that available national income series are perfectly comparable. We simply assume that these are the most comparable income series we have: national accounts at least attempt to apply the same definition of national income in all countries (as defined by the SNA Guidelines developed under the auspices of the UN and other international organizations), which is not the case with survey income. This issue is further discussed in the DINA Guidelines (Alvaredo et al, 2016).

We also report on Table 2 the ratios between total survey income and national income. For most Middle East countries, ratios are 40%-50%, which is fairly small,

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[4] We use the merging option to derive the national distribution of Iran (merging rural and urban distribution) and of the Gulf countries (merging the foreigners and non-foreigners distribution).

[5] There are 127 g-percentiles: 99 for the bottom 99 percentiles, 9 for the bottom 9 tenth-of-percentiles of the top percentile, 9 for the bottom 9 one-hundredth-of-percentiles of the top tenth-of- percentile, and 10 for the 10 one-thousandth-of-percentile of the top one-hundredth- of-percentile.

[6] We also constructed estimates based on the assumption of linear inequality trends between survey years. This made very little difference in both the level and trend obtained for total Middle East inequality, so in our benchmark series we simply use the closest available year for country-level data.

but not unheard of by international standards. Note however that the ratios are substantially smaller in Gulf countries – as low as 20%-30%. That is, compared to other countries, a very large fraction of national income of Gulf countries is missing from self-reported household survey income. To the extent that nationals benefit from the excluded income components (which typically refer to the undistributed profits of oil corporations and the capital income from sovereign wealth funds) more than foreigners, this implies that we are likely to severely underestimate income inequality in Gulf countries. To correct for this, we proceed as follows: we impute a fraction of the missing income (the gap between national income and total survey income) to nationals only, so that the ratio between survey income (augmented by the imputation) and national income reaches 30, 50, 70, or 100%. We take as benchmark survey distributions for Gulf countries the series where this ratio equals 50%, except in Qatar where we take the series where the ratio is 30%.[7]

Section 3.2. Step 2: Fiscal data correction

Self-reported survey data is well-known to underestimate incomes at the top (say, within the top decile, and particularly within the top percentile). Generally speaking, the strategy followed in the World Inequality Database (WID.world) in order to correct for this is to use income tax micro-files (together with national accounts and wealth data in order to cover tax-exempt income). In case income tax data do not exist or is limited in scope (e.g. in case one can only access income tax tabulations rather than micro-files), the DINA Guidelines recommend to supplement existing data with generalized Pareto interpolation techniques (see Alvaredo et al., 2016, and Blanchet, Fournier and Piketty 2017).

In the case of Middle East countries, income tax data are unfortunately extremely limited. Lebanon is the only country for which we were able to access income tax micro-files. These data are relatively detailed, consisting on yearly quasi-exhaustive micro-files over the 2005-2014 period (see Assouad 2017 for a detailed analysis of

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[7] In Qatar, given that foreigners represent a large share of the total population (90%), and that the ratio between survey and national income is particularly low (22%), top income shares are very sensitive to the operation that reattributes part of the missing income to the nationals only (see Figure 9a –Qatar). We therefore only attribute a share of missing income so that the ratio survey/national income equals 30% and not 50% as in other countries.

this data source). However, for other countries, despite our best efforts, we do not have any income tax data (not even income tax tabulations).

This is unfortunate, because household surveys in the Middle East appear to underestimate top incomes at least as much as in the rest of the world, and possibly more. In particular, survey-based inverted Pareto coefficient b(p) are implausibly low for top incomes, generally around 1.5-1.7 (and sometime even less than 1.5) at the level of the top 10% (i.e. p=0.9).[8] In contrast, in all countries in the world with reliable income tax data, inverted Pareto coefficients b(p) are typically between 2 and 3 (or even more in high inequality countries), and tend to follow a U-shaped generalized Pareto curve, with a rising part within the top decile (see Blanchet, Fournier and Piketty, 2017). The Lebanese income tax micro-files confirm this general finding: top income levels reported in tax data are much higher than in household surveys (top 1% incomes are typically 2-3 times higher, with large variations across income levels and over years), and the tax-corrected inverted Pareto coefficients within the top decile are around 3 or higher (see Assouad 2017).[9] The reasons why household surveys almost systematically lead to excessively low b coefficients typically come from the fact that surveys suffer from various under-reporting, truncations and top coding problems (with top coding, or self-censored top incomes, b naturally becomes very close to 1 at the very top).[10] Naturally, surveys have other merits, and include detailed socio-demographic information that one could never obtain using tax data. However, for the study of the top decile - and also for the study of the total inequality level of a country, given the importance of the income share going to the top decile – it is necessary to supplement surveys with other sources and methods.

In order to construct our benchmark series, we choose to adopt correction factors that are based upon the income tax data from Lebanon. More precisely, the income tax micro-files enable us to compute correction coefficients for thresholds and upper

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[8] See on-line technical appendix, Table A3.
[9] See also section 4 and Table 3 below for corrected b(p) coefficients.
[10] Hasly and Verme (2013, Figure 10, p.28) use household income surveys for Egypt between 1999 and 2010 and argue that top-decile inverted Pareto coefficients around 1.5-1.7 are not unusual by international standards. However this conclusion comes entirely from the fact that they compare with coefficients coming from household surveys (which are artificially low).

average income by g-percentiles.[11] We apply no correction below p=0.8, i.e. we assume correction factors exactly equal to 1 below the top 20%, which is approximately the case in the Lebanese data (see Assouad, 2017 on the choice of profiles). These coefficients do not depend on the Lebanese income level, but only on the percentile. We apply the average correction coefficient per percentile over the 2005-2014 period in Lebanon to all other countries. We have also computed a large number of variant series based upon alternative assumptions (see on-line appendix).[12] The impact on the overall inequality level in the Middle East and the comparison with other world regions is relatively limited (as a first approximation). In order to derive more precise estimates, we would need to have access to income tax data (at least in the form of income tax tabulations, and ideally in the form of micro files) for all Middle East countries.

Section 3.3. Step 3: Missing capital income and wealth correction

Finally, we correct our fiscal income series to take into account non-reported and tax-exempt capital income. Important components of capital income are missing from fiscal income data, even in the absence of any tax evasion (see the discussion in Alvaredo et al 2016 and Piketty, Yang and Zucman, 2017). They typically include corporate retained earnings and imputed housing rental income. We assume these "non-fiscal" income y_{nf} is equal to 10% of national income in each country, a reasonable figure given our findings in other countries. For Lebanon however, we estimate it to be 20% of national income, by using available information from national accounts and government reports on tax revenues, published by the Ministry of Finance (see Assouad 2017). Then, to estimate the distribution of personal income $y_p = y_f + y_{nf}$, i.e. the sum of fiscal and non-fiscal income, we need to make an assumption about the distribution of y_{nf} and the correlation between y_f and y_{nf}. We

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[11] By definition, the coefficients are the ratio of thresholds (resp. averages) between the raw survey and the corrected distributions.

[12] In particular, to derive the raw survey distribution of Lebanon, one needs to assume an inverted Pareto coefficient at the top due to the format of available tabulations. This affects the correction coefficients and the levels of inequality in all countries. For other variants on the definition of income and profile of correction, see Assouad, 2017. We have also computed variant series based on the assumption that inverted Pareto coefficients b(p) take average WID.world values (typically within the interval [2,3]) for Middle East countries other than Lebanon. This leads to results for total Middle East inequality that are close in magnitude to those presented here (see on-line technical appendix, Tables A3-A4 for inverted Pareto coefficients for the various countries and years, before and after our benchmark fiscal corrections).

assume that y_{nf} follows the same distribution as wealth, which we estimate by applying generalized Pareto interpolation techniques to wealth rankings (see below). As for the correlation structure between y_f and y_{nf}, on the basis of estimates obtained in countries with adequate micro-files, we use the family of Gumbel copulas, with Gumbel parameter $\theta = 3$ (see Piketty, Yang and Zucman, 2017, and Novokmet, Piketty and Zucman, 2017). We should stress that this wealth-based correction has a relatively limited impact on our final income inequality estimates (and in particular a much smaller impact than the fiscal data correction), so that the uncertainty that we are facing here is unimportant for our main findings (see section 4, Figures 10a-10c).

In order to estimate wealth inequality, we proceed as follows. Most observers tend to assume – and probably rightly so – that the level of wealth inequality in the region is high by both international and historical standards. However, there is substantial uncertainty about the exact level of wealth concentration, due to the almost complete lack of proper statistical evidence. Here we follow a simple methodology similar to that applied in Novokmet, Piketty and Zucman (2017) and use rich lists to produce estimates of top wealth shares for Middle Eastern countries in 2016, which we then use to allocate tax-exempt capital income.

We use billionaire's lists published by Forbes and the magazine Arabian Business. Generally speaking, we find that the share of billionaires' wealth in national income is indeed extremely high by international standards. For Saudi Arabia, Qatar, Bahrain and Lebanon, it is greater than 20% on average, while total billionaire wealth represents between 5% and 15% of national income in the United States, Germany and France over 2005-2015. Wealth concentration is particularly high in Lebanon, where the average income and the average wealth are substantially below Western levels (Assouad, 2017). We stress however that billionaires' lists are particularly fragile and volatile in the Middle East. There are relatively few billionaires and their number varies substantially from year to year (many years have no data). For instance, Forbes reports one or two billionaires in Bahrain and Qatar and only in three years between 1990-2016. However, for some years, billionaires' wealth can represent a very high share of national income. Given that the figures are extremely volatile, using this data source to identify a trend in wealth concentration is impossible. Several reasons can explain why wealth rankings might be particularly

incomplete in the region. First, large amounts of wealth may be missing due to a pervasive use of tax havens and offshore bank accounts. The data leaked from HSBC Switzerland and Mossack Fonseca (the so-called "Swiss leaks" and "Panama Papers") show that Middle East countries are among the top clients of those offshore financial institutions.[13] Evidence indeed indicates that hidden wealth is high by international standards (Zucman, 2015). Andersen et al. (2016) also show that "petroleum-rich autocracies" in the Arab world tend to hide larger amounts of wealth and that they would do it more easily than other countries with oil resources. In addition, rich lists do not include wealth owned by ruling families and heads of states. This may lead to a substantial downward bias in the region, where the line between public and private property is often blurred. We attempt to include figures on state leaders' wealth when we could find some, but reliable information is very scarce.[14]

For all these reasons, we did not attempt to derive annual wealth distribution series. Rather, we compute one average estimate for wealth inequality for each country, applying the same general method as in Novokmet, Piketty and Zucman (2017) for Russia. For each country, we compute average billionaire wealth relative to national income over all available years over 1990-2016. We then compute average standardized distributions of wealth for the US, France and China from WID.world series.[15] We note that variations across countries and over time in these standardized wealth distributions mostly happen above $p_0=0.99$, i.e. below $p_0=0.99$ the ratios of the different percentile thresholds to average wealth are relatively stable over time and across countries, at least as a first approximation with most of the variation taking place within the top 1%. Therefore we choose to use the same normalized distribution for Middle East countries below $p_0=0.99$ as the average US-France-China normalized distribution. To estimate the average wealth, we compute an annual average wealth-income ratio over all countries available in WID.world, and we apply this average to each country average income. The difficult question is to know how to link the distribution from $p_0=0.99$ to billionaire level, and also to make an

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[13] In terms of amount of wealth placed in their offshore accounts. See https://projects.icij.org/swiss-leaks/countries/rankings#money.

[14] We gathered some figures from various sources (newspapers articles, Forbes' "Royals" and "Dictators" lists). We could not cover all ruling families and, when we find information, it is only available for some years. For an example, figures on the Assad family's wealth are only available for two years. We did not find figures on billionaires in Jordan.

[15] That is, we divide all thresholds and bracket averages for all 127 generalized percentiles by average wealth, and we compute the arithmetic average for the three countries.

assumption about the average number n of adults per billionaire family (sometime Forbes includes very large family groups in the same billionaire family; sometime it is just one individual or one married couple). We first re-estimate the 127 generalized percentile within the top 1% of the normalized distribution in order to reach billionaires' level. In our benchmark series we assume n=5 and a linear correction factor f(p) from p_0=0.99 up to billionaire level, as this assumption seems to work relatively well for the US, France and China. [16] This method gives a first approximation of the concentration of wealth in the region. In the appendix we present a number of alternative series based upon explicit assumptions and generalized Pareto interpolation techniques. We should stress again that even though the uncertainty about the exact magnitude of wealth concentration is high, it has relatively limited impact on our final income inequality estimates (see section 4 and Figures 10a-10c below).

Section 4. Main Results: Extreme Concentration of Income in the Middle East

We now present our main results on the level and evolution of income inequality in the Middle East. We start by describing the general evolution of average incomes and between-country inequality in the Middle East region over the 1990-2016 period. We then present what we consider our most robust and interesting finding, i.e. the extreme level of income concentration in the Middle East as a whole (as compared to other world regions), taking into account both between-country and within-country inequality. Finally, we discuss our findings regarding the evolution of income inequality in the Middle East over the 1990-2016 period (which, as we stressed in the previous section, should be viewed as more fragile and exploratory than our findings regarding the level). Complete series and detailed country-level estimates are available in the online appendix.

Section 4.1. Evolution of average incomes and population in the Middle East

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[16] We also estimate variant series based upon alternative assumptions: n=2,4,6,8 instead of n=5, as well as a piecewise linear f(p) with a fraction f=0,0.2,0.4,0.6,0.8,1 of the total correction between p_0=0.99 and p_1=0.999 (and a fraction 1-f between p1=0.999 and billionaire level). For countries without billionaires' data, namely Iran, Jordan, Palestine, Yemen, we simply upgraded the average standardized distributions of wealth for the US, France and China to the country specific average wealth.

The 1990-2016 period has seen a rapid population growth in the Middle East: total population rose by about 70%, from less than 240 million in 1990 to almost 410 million in 2016. The rise in average income has been much more modest. Using purchasing power parity estimates (expressed in 2016 euros), per adult national income rose from about 20 000€ in 1990 to 23 000€ in 2016, i.e. by about 15%. Using market exchange rates (again in 2016 euros), per adult national income rose from less than 9 000€ in 1990 to about 10 000€ in 2016 (see Figure 1a).

Given the importance of migrations and economic relations between the two regions, it is natural to compute the ratio between per adult national income in the Middle East and the West European average (itself defined for the present purpose as the average of per adult national income in Germany, France and the United Kingdom). Using purchasing power parity estimates (PPP), we find that average income in the Middle East stood at about 70-75% of the European average in 1990. It then fell during the 1990s and early 2000s, down to about 60% around 2003-2004, and finally rose back to about 65-70% between 2004 and 2016. Using market exchange rates (MER), the ratio has also been stagnating over the 1990-2016 period, but at substantially lower levels, i.e. around 25-30% of the West European average rather than 60-70% (see Figure 1b).

In our view, both the PPP and the MER viewpoints express valuable and complementary aspects of international inequality patterns. The PPP viewpoint should of course be preferred if we are interested in the living standards of the inhabitants living, working and spending their incomes in the various countries (which is the case of most people). However the MER viewpoint is more relevant and meaningful if we are interested in external economic relations: e.g. the ability of tourists and visitors from Europe or from Gulf countries when they travel to other countries; or the ability of migrants or prospective migrants from Egypt or Syria to send part of their euro wages back home. Here market exchange rates matter, and may also play an important role on the perceptions of inequality. Whatever the viewpoint, it is important to have in mind that per adult average income benefited from very little growth over the 1990-2016: in effect, the vast majority of aggregate national income growth was absorbed by the rise of population (see Figure 1c).

Next, and most importantly, it is critical to stress that there exists enormous and persistent between-country inequality behind the Middle East average. In order to summarize the changing population and income structure of the Middle East, it is helpful to decompose the region into five blocs: (i) Turkey; (ii) Iran; (iii) Egypt; (iv) Iraq and Syria and other non-Gulf countries: Jordan, Lebanon, Palestine, Yemen); and (v) Gulf countries (including Saudi Arabia, Oman, Bahrain, UAE, Qatar and Kuwait) (see Table 1 above). Each of the first four blocs represents about 20-25% of total population of the Middle East, with relatively little variations over the 1990-2016 period (except for a slight rise in the share of the Iraq-Syria-other bloc). The main change in the structure of Middle East population over the past quarter of a century is the rise of the population share of Gulf countries, from about 10% in 1990 to 15% in 1996 (Figure 2). This is almost entirely due to the rise of migrant workers in oil-rich countries (see below).

If we now look at average income patterns in these five sub-regions, we find that per adult national income is substantially below average everywhere except in Gulf countries (see Figure 3a-3b). One can distinguish between two groups: Turkey and Iran, where average incomes have generally been around 50-60% of the West European average in PPP terms (with a significant rise of Turkish incomes over the 2001-2015 period, in contrast to Iranian stagnation); and Egypt and Iraq-Syria-other, where average incomes have always stood at significantly lower levels (around 30-40% of West European average in PPP terms) (see Figure 3a). Using market exchange rates, we find that Egypt-Iraq-Syria-other have stagnated around 10-15% of the West European average (see Figure 3b). It is also worth noting that Turkey rises slightly above Middle East average when we consider MER series, while Iran falls toward the levels of Egypt and Iraq-Syria, reflecting the weakness of the Iranian currency and the relative strength of the Turkish lira.

As compared to the rest of Middle East, Gulf countries clearly belong to a different category. In PPP terms, their average per adult national income was about three times that of Western Europe in 1990, and almost two times in 2016; in MER terms, their income was 40% higher than the West European level in 1990, and is currently about 10% lower (see Figure 4a). In brief: the enormous gap in average incomes between Gulf countries and the more populated Middle East countries has been

trending downward in the past 25 years. However, two remarks are in order. First, the income gap is still enormous: Gulf countries represent only 15% of the Middle East population in 2016, but they receive between 42% (in PPP terms) and 47% (in MER terms) of total Middle East income (Table 1). Back in 1990, their population share was 10%, and their income share was between 44% (PPP) and 48% (MER). Next, the fall in the income gap between Gulf countries and the rest of the Middle East reflects a number of complex and contradictory forces. It is partly due to the evolution of oil prices and output levels, as well as to the relative fast output growth in non-Gulf countries like Turkey. But it is also due to the very large rise of migrant workers, and the consequently migration-led reduction of per adult national income in Gulf countries: the massive inflow of foreign workers (especially in the construction sector and domestic services sector) resulted in a stronger increase in the population denominator than in the income numerator of Gulf countries. By putting together census and survey data for the various countries, we find that the overall rise of the population share of Gulf countries (from 10% to 15% of total Middle East population) is almost entirely due to the massive rise in foreign workers, which increased from less than 50% in 1990 to almost 60% of the total population in 2016 (Figure 4b). From this viewpoint, it is also helpful to distinguish between two groups of Gulf countries: one group made of Saudi Arabia, Oman and Bahrain, where nationals still make a (small) majority of the population (the foreign population share has been relatively stable around 40-45% of total adult population between 1990 and 2016); and another group made of United Arab Emirates (UAE), Kuwait and Qatar, where the nationals make a smaller and smaller minority of the resident population (the foreign share rose from 80% to 90%; see Figure 4b). This second group made about one quarter of total population of Gulf countries in 1990, up to about one third by 2016.

It is worth stressing that our ability to measure income inequalities in oil-rich countries is relatively limited. By exploiting available household surveys, we find that the ratio between average per adult survey income between nationals and foreigners is particularly large in UAE-Kuwait-Qatar (which is not surprising, given the very small share of nationals), and most importantly that this ratio has increased over time, from 250% in 1990 to around 350% in 2016 (see Figure 4c). In Gulf countries where the national-foreigner population structure is closer to 50-50 (i.e. Oman-Bahrain), the

average income ratio between nationals and foreigners appears to be less extreme (but still substantial: around 160%). These estimates are solely based upon self-reported survey data (with no correction for the under-estimation of top incomes), and should therefore be considered as a lower bound. Finally, we are not able to include Saudi Arabia (by far the most populated among Gulf countries) in these computations due to a lack of access to adequate survey data[17].

Section 4.2. Extreme Level of Income Concentration in the Middle East

We now present our main results regarding the level of income concentration in the Middle East. According to our benchmark estimates, the share of total income going to top 10% income earners is about 64% in the Middle East, as compared to 37% in Western Europe and 47% in the USA (Figure 5).

Several remarks are in order. First, these three regions have comparable population sizes (with a total population of about 410 million in the Middle East, 420 million in Western Europe, and 320 million in the USA) and a relatively large degree of cultural, historical and linguistic proximity, so we feel that the comparison is legitimate and meaningful.

Next, the fact that we find much higher inequality levels in the Middle East appears to be extremely robust. We obtain the same finding not only in the benchmark series, but also in all variant series, often with a larger margin. Also, we focus on Figure 5 and subsequent figures on the latest years available (2012-2016), and as we shall see below, the inequality gap with other regions was if anything even higher in previous decades (see section 4.3). Most importantly, we stress again that our inequality estimates for the Middle East are based upon highly conservative estimates of within-country inequality.

Income inequality also appears to be significantly higher in the Middle East than in Brazil – a country with population around 210 million that is often described as one of

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[17] See Appendix for the treatment of Saudi Arabia.

the most unequal in the world, and where the top decile income share is about 55% (according to the recent DINA estimates constructed by Morgan, 2017). The Middle East also displays slightly higher inequality estimates than South Africa, with about 63% for the top decile income share for the latest available years (Alvaredo and Atkinson, 2010, and series updated in 2017 in WID.world).

It is worth stressing that the origins of inequality are obviously very different in these different groups of countries. In the case of the Middle East, they are largely due to the geography of oil ownership and the transformation of oil revenues into permanent financial endowments. In contrast, extreme inequality in South Africa is intimately related to the legacy of the Apartheid system: until the early 1990s, only the white minority (about 10% of the population, which until today roughly corresponds to the top 10% income group) had full mobility and ownership rights. In Brazil, the legacy of racial inequality also plays an important role (it was the last major country to abolish slavery in 1887, at a time when slaves made up about 30% of the population), together with huge regional inequalities. It is striking to see that the Middle East, in spite of its much larger racial and ethno-cultural homogeneity, has reached inequality levels that are comparable to – or even higher than – those observed in South Africa or Brazil.

It is also worth stressing that inequality levels in the Middle East appear to be significantly larger than those observed in giant countries with much bigger populations such as China and India (see Figures 5-6). Here we use inequality estimates that were recently constructed for China and India by Piketty, Yang and Zucman (2017) and Chancel and Piketty (2017). These estimates are obviously far from perfect, but they probably tend to minimize the gap with the Middle East (in particular, we have access to more extensive income tax data for China and India than the for the Middle East).

In brief: according to our estimates, the Middle East appears to be the most unequal region in the world. This is true for the top decile income share, as well as for other inequality indicators; e.g. the top percentile income share is about 30% in the Middle East, vs. 12% in Western Europe, 20% in the USA, 28% in Brazil, 18% in South

Africa, 14% in China and 21% in India (see Figure 6). This is also true for synthetic indicators such as the Gini coefficient (see on-line series at WID.world).

We find it particularly informative to compare the overall levels of the income shares going to the bottom 50%, the middle 40% and the top 10% and 1% in the Middle East and other countries (see Figures 7a-7b). For instance, according to our benchmark estimates, the bottom 50% of the population receives about 9% of total income in the Middle East (vs. 18% in Europe), as compared to 64% for the top 10% (vs. 37% in Western Europe). This clearly illustrates that differences in distributions can make an enormous difference when comparing income and welfare levels across countries.

Section 4.3. Analyzing the evolution of income inequality in the Middle East and other robustness checks

We now turn to our results regarding the evolution of income inequality in the Middle East over the 1990-2016 period. We should stress again that the data sources at our disposal are insufficient to properly analyze trends in inequality. In our benchmark estimates, we find a declining inequality trend at the regional level between 1990 and 2010, followed by a rising trend between 2010 and 2016. However these are trends of relatively small magnitude, and it is unclear whether these are robust findings (more on this below). As a first order approximation, our main finding – and probably the only robust one – is that income concentration is very high and approximately constant in the Middle East region taken as a whole). The fact that inequality remains extreme for all years over the period provides further evidence for the robustness of this result.

According to our benchmark estimates, the top 10% income share fluctuates around 60%-70% of total income between 1990 and 2016, while the bottom 50% income share fluctuates around 5%-10% of total income (see Figure 8a). We have constructed a large number of variant estimates, and these orders of magnitude appear to be robust. When we move from market-exchange-rate estimates (which we use as benchmark series) to purchasing-power-parity estimates, inequality levels

decline a little bit - as one might expect (see Figure 8b).[18] When we change the geographical definition of the Middle East by excluding Turkey (a country whose average income is intermediate between the poorest countries – Egypt, Iraq, Syria, Yemen, etc. – and the oil-rich Gulf countries, and which therefore is likely to moderate inequality at the regional level), we find somewhat higher inequality levels (see Figure 8b). Finally, inequality levels remain extremely high, independently from the fraction of missing income (the gap between national income and total survey income) that we attribute to nationals in Gulf countries. Figure 9a display top income shares for each country in 2016, depending on different scenarios (we impute missing income to nationals so that the average income in the survey (augmented by the imputation) represents 30, 50, 70 or 100% of the average national income). Figures 9b-c show how these different variants affect inequality at the regional levels (even if we attribute proportionally the missing national income to both foreigners and nationals, and not only to nationals, inequality remains extreme).

As one can see from Figures 10a-10b, where we compare the evolution of the top 10% and top 1% income shares in the Middle East and other world regions between 1990 and 2016, the striking fact is that income inequality has always been much higher in the Middle East.[19] The inequality gap was particularly large in 1990 (in a way, the Middle East has been a pioneer region in terms of extreme inequality). The gap decreased during the 1990s-2000s, as other world regions gradually became more unequal, but remains substantial, and the Middle East continues to lead the world inequality ranking (with the possible exception of South Africa).[20]

It is worth noting that, as shown in Figure 10c, when we exclude Gulf countries from our computations, inequality remains extreme, with a top decile receiving more than 50% of total regional income over the entire period. If inequality mechanically increases when we merge countries with very different average incomes, the extent to which it affects top income shares is not straightforward. When we aggregate

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[18] We tend to prefer MER estimates because they are in a way more comparable to those estimated for other world regions (i.e. we do not use price differentials when estimating income inequality within the USA, Brazil, China or India). But as noted above both perspectives offer valuable and complementary insights.

[19] The same conclusion holds true when we look at other inequality indicators such as the bottom 50% income share or the Gini coefficient.

[20] Unfortunately available series for the top 10% and top 1% share in South Africa do not cover all years, so it is difficult to make a complete comparison with the Middle East at this stage.

series from Eastern and Western European countries for instance, inequality increases (relative to Western Europe) but to a much lesser extent than in the Middle East.

In order to better understand the origins of our high inequality estimates, we compare on Figures 11a-11b-11c the results obtained with our benchmark national income series (combining survey data, national accounts, income tax and wealth data), the results obtained with the fiscal income series (ignoring the wealth correction, which as one can see plays a relatively minor role) and the results obtained with the survey data alone. Here we distinguish between the survey income series obtained with different country-level average incomes (anchored on observed country-level per adult national incomes) and the survey income series simulated by assuming fixed country-level average incomes (thereby neutralizing the impact of between-country inequality). As one see, both the within-country inequality effect (fiscal data correction) and the between-country inequality effect play an important role in accounting for the very high inequality estimates.

Finally, we have also simulated what would have been the evolution of income inequality in the Middle East over the 1990-2016 if within-country inequality had remained fixed at the observed 1990 level. As one can see from Figures 12a-12b, the evolution of total inequality at the level of the Middle East taken as a whole would have been virtually the same, with declining inequality between 1990 and 2010 and rising inequality since 2010. This shows that our estimates are mostly driven by the evolution of between-country inequality. This is partly due to the fact that we do not have survey data for all years (see Table 2), so that for some countries our inequality estimates display very little time variations (and in some cases no time variation at all). This is also due to the fact that even in countries with several surveys over the period, we observe limited variations in income inequality, and these variations tend to compensate each other. For instance, surveys indicate that income inequality declined somewhat in Turkey between 2003 and 2007, but then rose between 2007 and 2016; inequality increased in Lebanon between 2005 and 2008 and then stabilized; inequality declined in Egypt between 1999 and 2010, but then rose between 2010 and 2015; inequality increased in the UAE between 1998 and 2009 according to the top 10% income share (but declined according to the top 1% income

share); inequality increased according to both indicators in Qatar between 2007 and 2012; and so on (see Table 3).

Most of these variations are relatively modest in magnitude, so it is not surprising that most of the evolution of Middle East inequality is driven by the evolution of between-country inequality and the fact that the gap in average income between oil-rich countries and other countries has been trending downwards (but is still very large in level). If we had access to adequate income tax data throughout the 1990-2016 period, we might reach different conclusions and find a strong within-country rising inequality trend (such as the one found in a large number of very different countries across the world, e.g. in the USA, Europe, India, China, South Africa, Russia, with varying magnitudes). It is also possible that Middle East countries – like Brazil – belong to a different category, i.e. countries where inequality has always been very large historically (so that it did not rise in recent decades). Given the data sources at our disposal, we are not able to conclude with a satisfactory degree of precision.

Section 5. Concluding comments

In this paper we have combined household surveys, national accounts, income tax data and wealth data in order to estimate the level and evolution of income concentration in the Middle East for the period 1990-2016. According to our benchmark series, the Middle East appears to be the most unequal region in the world, with a top decile income share as high as 64%, as compared to 37% in Western Europe, 47% in the USA, and 55% in Brazil. This is due both to enormous inequality between countries (particularly between oil-rich and population-rich countries) and to large inequality within countries (which we probably under-estimate, given the limited access to proper fiscal data). To our knowledge, this is the first attempt to measure income inequality at the level of the Middle East taken as a whole, and also the first attempt to use income tax data and generalized Pareto interpolation techniques to correct household survey data in the Middle East.

The data at our disposal is highly imperfect, and we still face considerable limitations in our ability to measure inequality in the Middle East. In particular, there is much uncertainty about inequality trends in the period under study. However the general

conclusion that the overall inequality level is one of the highest in the world – if not the highest in the world, with the possible exception of South Africa – appears to be very robust.

In conclusion, we would like to stress the importance of increasing transparency on income and wealth in the Middle East. In particular, it is critical that Middle East countries provide access to household surveys micro-files, and even more importantly that they provide access to income tax data (at least in the form of income tax tabulations). It is very difficult to have an informed public debate about inequality trends – and also about a large number of substantial policy issues such as taxation and public spending – without proper access to such data. While the lack of transparency on income and wealth is an important issue in many – if not most – areas of the world, it appears to be particularly extreme in the Middle East, and arguably raises in itself a problem of democratic accountability, quite independently from the actual level of inequality.

Finally, our results regarding the enormous level of income inequality in the Middle East region naturally point toward the need to develop mechanisms of regional redistribution and investment. In a way, this is already happening, in the sense that oil-rich countries regularly make loans to poorer countries (e.g. Saudi Arabia to Egypt), and that these loans sometimes include implicit or explicit subsidies. However such mechanisms are usually of limited magnitude, and tend to be highly unpredictable. Given the enormous concentration of gross domestic product and national income in the region, mechanisms of regional investment funds similar to those developed in the European Union (with permanent transfers between the richest and the poorest countries of the order of several percentage points of GDP) could make a large difference. These issues would deserve more attention in future research.

References

Alvaredo, F. and A. B. Atkinson (2010). Colonial Rule, Apartheid and Natural Resources: Top Incomes in South Africa 1903-2007. CEPR DP 8155.

Alvaredo. F. and T. Piketty (2015). Measuring Top Incomes and Inequality in the Middle East. CEPR DP 10068.

Alvaredo, F., A. B. Atkinson, T. Piketty and E. Saez (2011-2015). The World Top Incomes Database, 2011-2015.

Alvaredo, F., A. B. Atkinson, T. Piketty and E. Saez (2013). "The Top 1% in International and Historical Pespective", *Journal of Economic Perspectives*, 27(3): 1-21.

Alvaredo F., L. Chancel, T. Piketty, E. Saez and G. Zucman (2017). World Inequality Report 2018. World Inequality Lab. Paris School of Economics.

Alvaredo F., A. B. Atkinson, L. Chancel, T. Piketty, E. Saez and G. Zucman (2016). "Distributional National Accounts (DINA) Guidelines: Concepts and Methods used in the World Wealth and Income Database", WID.world WP 2016/2.

Andersen, J., N. Johannesen, D. Dreyer Lassen and E. Palteva (2016). Petro Rents, Political Institutions, and Hidden Wealth: Evidence from Offshore Bank Accounts. Mimeo.

Assaad, R., Kraft, C. Roemer, J. and Salehi-Isfahani, D. (2017). Inequality of Opportunity in Wages and Consumption in Egypt," Review of Income and Wealth, 10.1111/roiw.12289.

Assouad, L. (2017). Rethinking the Lebanese Economic Miracle: The Extreme Concentration of Income and Wealth in Lebanon, 2005-2014. WID.world WP 2016/13.

Atkinson, A. B. and T. Piketty (2010). *Top Incomes: a Global Perspective*, Oxford University Press.

Atkinson, A. B., and T. Piketty (2007). *Top Incomes over the Twentieth Century. A Contrast between Continental European and English-speaking Countries*, Oxford University Press.

Atkinson, A. B., T. Piketty and E. Saez (2011). "Top Incomes in the Long Run of History", *Journal of Economic Literature*, 49(3), 3-71.

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

Blanchet, T., J. Fournier and T. Piketty. 2017. "Generalized Pareto Curves: Theory and Applications to Income and Wealth Tax Data for France and the United States, 1800-2014." WID.world WP 2017/3.

Bourguignon, F. and C. Morrisson, "Inequality Among World Citizens, 1820-1992", *American Economic Review*, 2002, 92(4), 727-744

Chancel, L., and T. Piketty (2017). Indian income inequality, 1922-2014: From British Raj to Billionaire Raj ?*,* WID.world WP 2017/11.

Chatham House (2015). Future Trends in the Gulf. Report. The Royal Institute of International Affairs.

El-Katiri, L., B. Fattouh and P. Segal (2011). Anatomy of an oil-based welfare state: Rent distribution in Kuwait. Kuwait Programme on Development, Governance and Globalisation in the Gulf States, London School of Economics, number 13.

Garbinti, B., J. Goupille-Lebret, and T. Piketty (2016). "Accounting for Wealth Inequality Dynamics: Methods, Estimates and Simulations for France (1800-2014)." WID.world WP 2016/5.

Garbinti, B., J. Goupille-Lebret, and T. Piketty (2017). "Income inequality in France, 1900-2014: Evidence from Distributional National Accounts (DINA)", WID.world WP 2017/4.

Hassine, N. B. (2015). Economic Inequality in the Arab Region. World Development. 66: 532-556.

Hlasny, V. and P. Verme (2013). "Top Incomes and the Measurement of Inequality in Egypt." World Bank Working Paper.

Hlasny, V. and P. Verme (2015). Top Incomes and the Measurement of Inequality: A Comparative Analysis of Correction Methods using Egyptian, EU, and US Survey Data. Mimeo.

Human Rights Watch (2013): "South Asia: Protect Migrant Workers to Gulf Countries," http://www.hrw.org/news/2013/12/18/south-asia-protect-migrant-workers-gulf-countries.

Kapiszewski, A. (2006). Arab versus Asian Migrant Workers in the GCC Countries.

Lakner, C. and B. Milanovic (2013). "Global Income Distribution - From the Fall of the Berlin Wall to the Great Recession", World Bank, Working Paper, 2013

Milanovic, B. (2002). "True World Distribution, 1988 and 1993: First Calculations Based on Household Surveys Alone", *Economic Journal*, 112 (476), 51-92.

Morgan, M. (2017). Extreme and Persistent Inequality: New Evidence for Brazil Combining National Accounts, Surveys and Fiscal Data, 2001-2015. WID.world wp 2017/12.

Naidu, N, Y. Nyarko, S-Y, Wang (2016). "Monopsony Power in Migrant Labor Markets: Evidence from the United Arab Emirates", Journal of Political Economy, vol. 124, issue 6, 1735 – 1792

Ncube, M. and J.C. Anyanwu (2012). "Inequality And Arab Spring Revolutions In North Africa and The Middle East." Africa Economic Brief 3(7): 1-24. African Development Bank.

Novokmet, F., T. Piketty and G. Zucman (2017). From Soviets to Oligarchs: Inequality and Property in Russia, 1905-2016. WID.world WP 2017/09.

Piketty T., L. Yang and G. Zucman (2017). "Capital Accumulation, Private Property and Rising Inequality in China 1978-2015", WID.world Working Paper 2017/6.

Piketty, T. (2014). *Capital in the 21st century*, Harvard University Press.

Piketty, T., E. Saez and G. Zucman (2016). Distributional National Accounts: Methods and Estimates for the United Sates. NBER Working Paper n. 22945.

Saez E. and G. Zucman (2016). "Wealth Inequality in the United States: Evidence from Capitalized Income Tax Data." *Quarterly Journal of Economics* 131(2), pp. 519-578.

Said, M. (2007). "The Fall and Rise of Earnings Inequality in Egypt: New Evidence from ELMPS, 2006," Economic Research Forum WP 0708.

UNDP (2012). Arab Development Challenges Report 2011. Towards the Developmental State in the Arab Region.

van der Weide, Lakner and Ianchovichina, 2016 "Is inequality underestimated in Egypt? Evidence from house prices", World Bank Policy Research Working Paper 7727.

Wahba, J. (1996). "Earnings and Regional Inequality in Egypt", Economic Research Forum WP 9613.

Wahba, J. (2009). "The Impact of Labor Market Reforms on Informality in Egypt." Population Council Gender and Work in the MENA Region WP number 3.

Weyl, E. G. (2016): "The Openness-Equality Trade-Off in Global Redistribution," Economic Journal (forthcoming).

World Bank (2012). "Inside Inequality in Egypt. Historical trends, recent facts, people's perceptions and the spatial dimension."

World Bank (2015). Inequality, Uprisings, and Conflict in the Arab World. World Bank and Middle East and North Africa Region; MENA Economic Monitor.

Zucman, G. (2015). The Missing Wealth of Nations. University of Chicago Press.
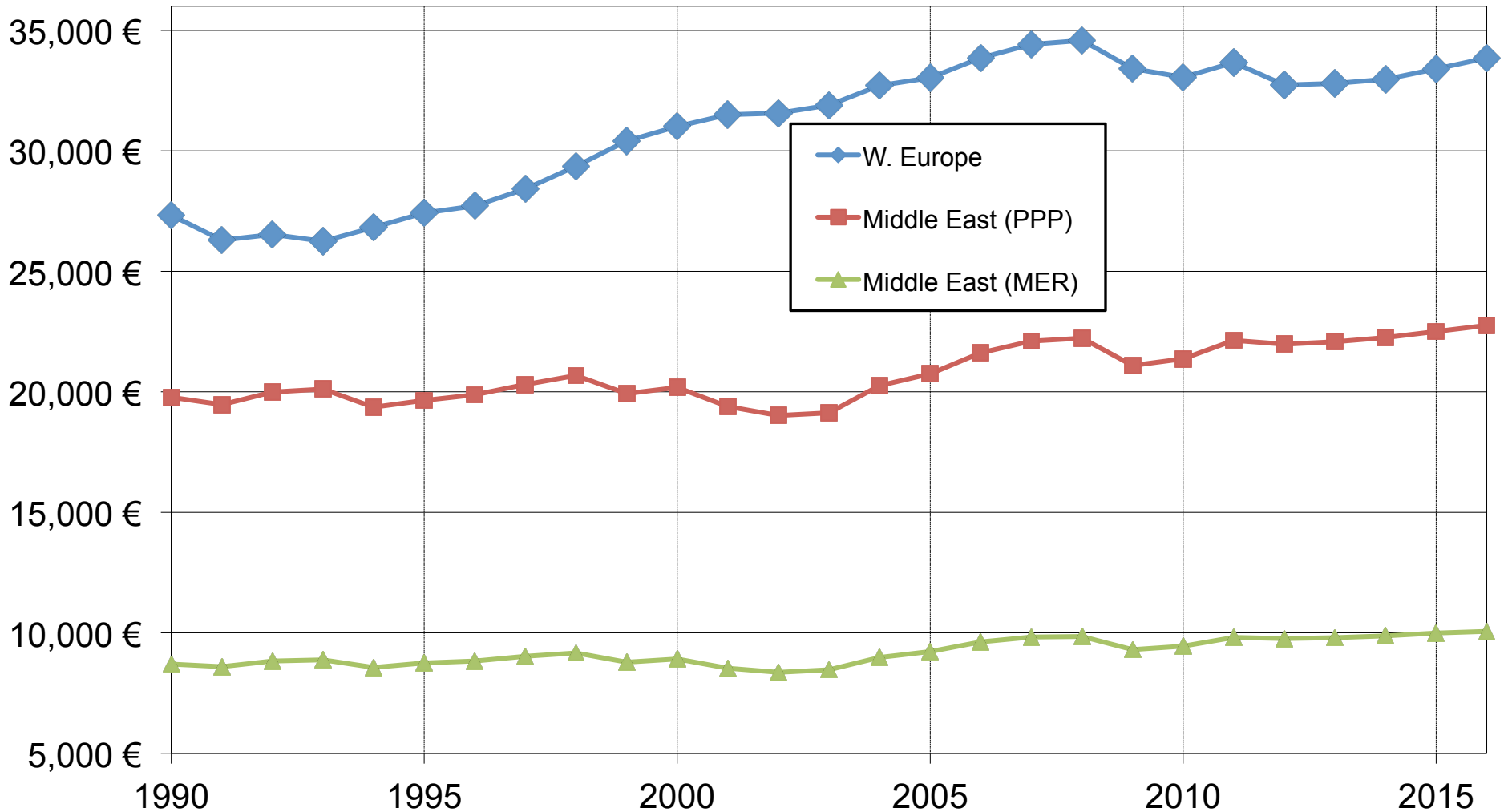
Table 1. Population and income in the Middle East (2016)

	Population (million)	Adult Population (aged 20 and more, in million)	Adult population (% of ME total)	National Income (Billion PPP Euro 2016)	% ME Total Income (PPP)	National Income (Billion MER Euro 2016)	% ME Total Income (MER)
Turkey	**80**	**53**	**21%**	**1,073**	**19%**	**548**	**22%**
Iran	**80**	**56**	**22%**	**896**	**16%**	**330**	**13%**
Egypt	**93**	**54**	**22%**	**800**	**14%**	**234**	**9%**
Iraq-Syria-Other (non-Gulf)	**102**	**52**	**21%**	**570**	**10%**	**243**	**10%**
Iraq	*38*	*18*	*7%*	*354*	*6%*	*112*	*4%*
Syria	*19*	*10*	*4%*	*47*	*1%*	*28*	*1%*
Jordan	*8*	*4*	*2%*	*57*	*1%*	*30*	*1%*
Lebanon	*6*	*4*	*2%*	*57*	*1%*	*40*	*2%*
Palestine	*5*	*2*	*1%*	*16*	*0%*	*12*	*0%*
Yemen	*27*	*13*	*5%*	*39*	*1%*	*21*	*1%*
Gulf Countries	**54**	**37**	**15%**	**2,394**	**42%**	**1,179**	**47%**
Saudi Arabia	*32*	*20*	*8%*	*1313*	*23%*	*575*	*23%*
Oman	*5*	*3*	*1%*	*118*	*2%*	*47*	*2%*
Bahrain	*1*	*1*	*0%*	*46*	*1%*	*26*	*1%*
UAE	*9*	*8*	*3%*	*430*	*7%*	*283*	*11%*
Kuwait	*4*	*3*	*1%*	*258*	*5%*	*122*	*5%*
Qatar	*2*	*2*	*1%*	*229*	*4%*	*126*	*5%*
Total Middle East	**409**	**252**	**100%**	**5,733**	**100%**	**2,534**	**100%**

Table 2. Household surveys used in this paper (1990-2016)

	Survey years	Average ratio (total survey income)/(national income)
Turkey	**1994, 2002-2016**	**43%**
Iran	**2010, 2013**	**49%**
Egypt	**1999, 2004, 2008, 2010, 2012, 2015**	**40%**
Iraq-Syria-Other non-Gulf	**1992-2013**	**53%**
Iraq	*2007*	*60%*
Syria	*2004*	*56%*
Jordan	*1992, 2002, 2006, 2008, 2010, 2013*	*70%*
Lebanon	*2007*	*37%*
Palestine	*1996-1998, 2004-2008, 2010-2011*	*65%*
Yemen	*2006*	*33%*
Gulf Countries	**1995-2013**	**30%**
Saudi Arabia	*2008*	*30%*
Oman	*2010*	*29%*
Bahrain	*1995, 2005, 2015*	*37%*
UAE	*1998, 2009*	*39%*
Kuwait	*2007, 2013*	*21%*
Qatar	*2007, 2012*	*23%*

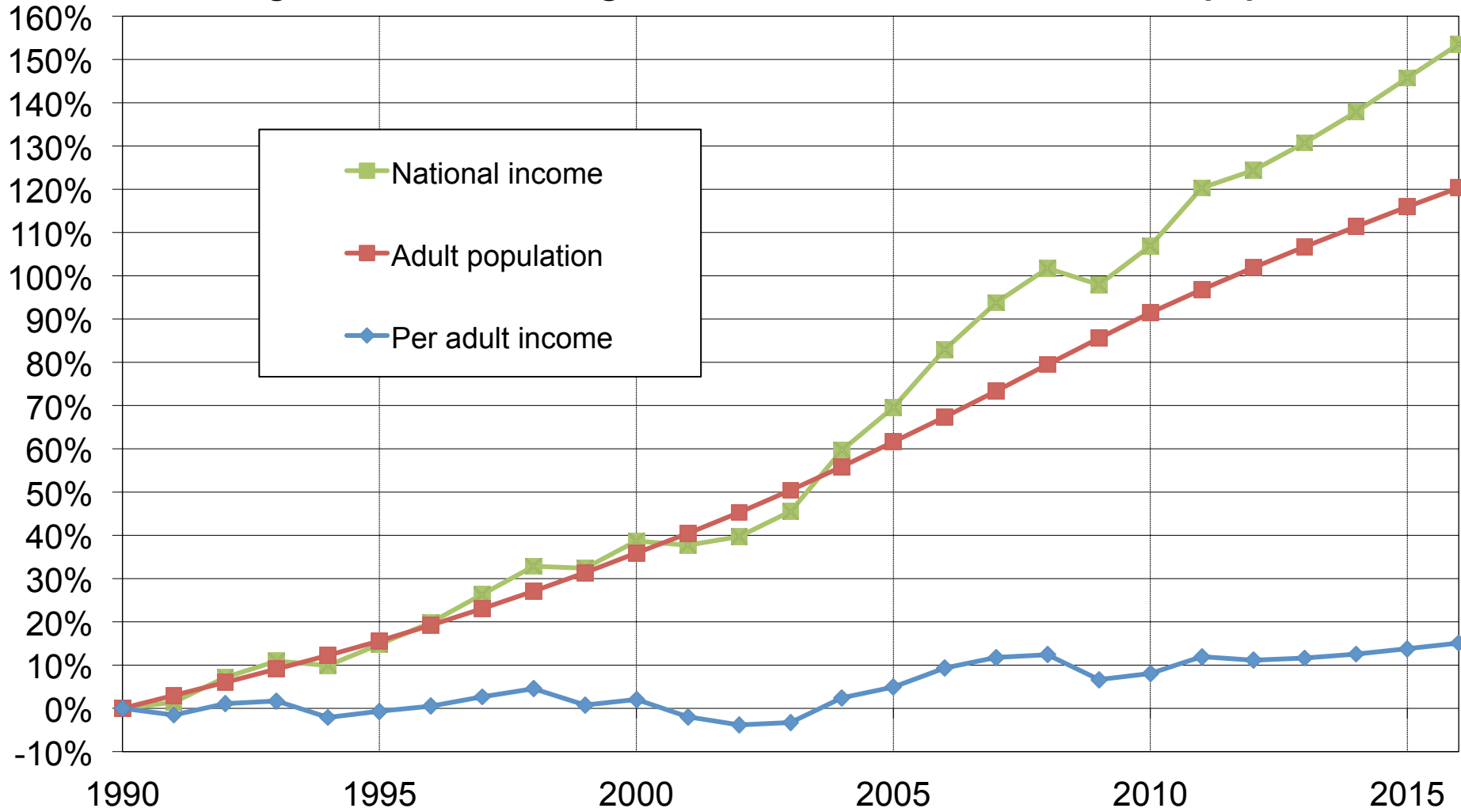# Figure 1a. Per adult national income: Middle East vs W. Europe 1990-2016

Per adult national income in € 2016 PPP (purchasing power parity) vs MER (market exchange rate). Western Europe = Germany-France-Britain. Authors' computations using official national accounts and GDP deflator.

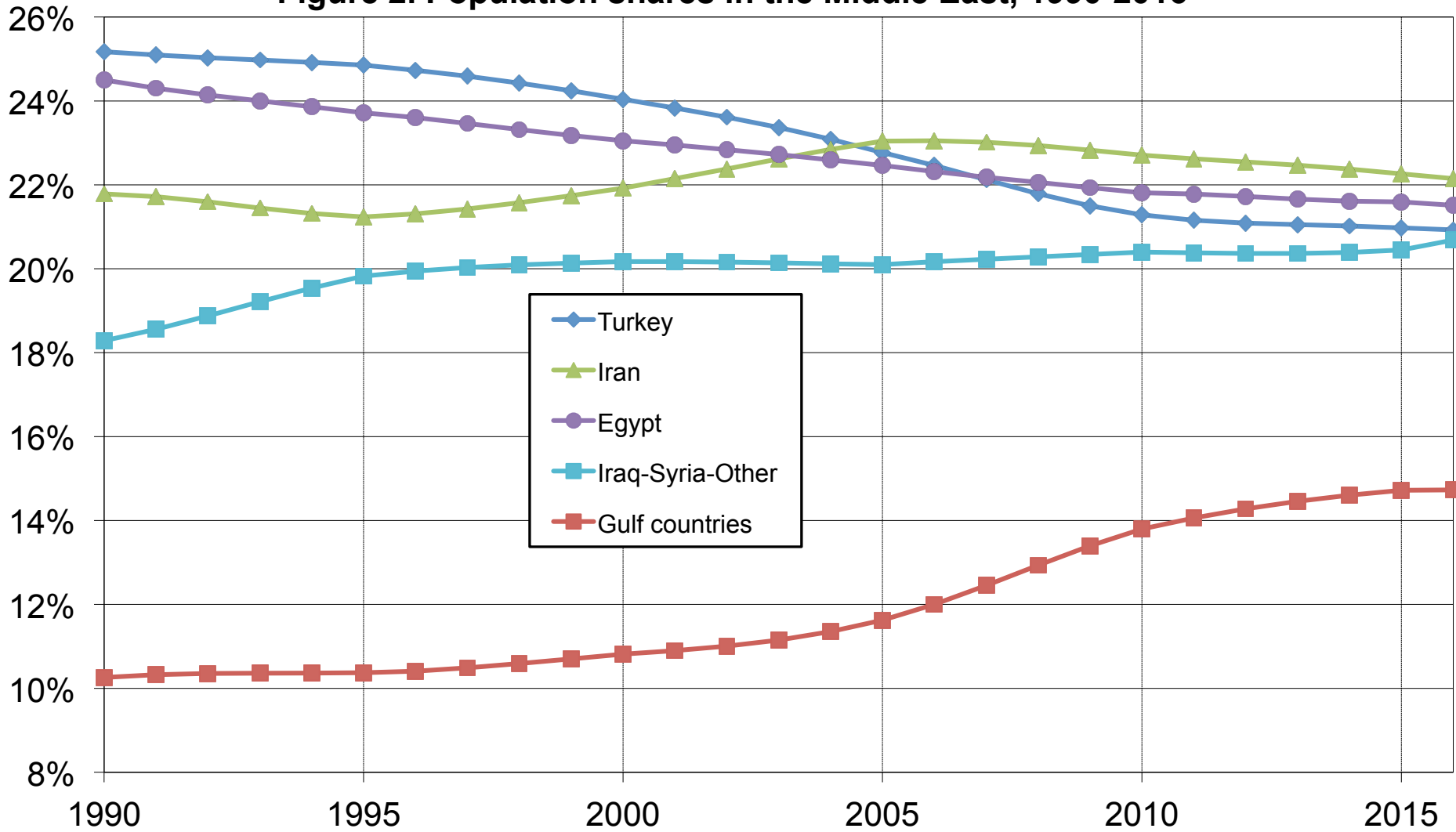**Figure 1b. Per adult national income: ratio Middle East /W.Europe**

Per adult national income in € 2016 PPP vs MER. Western Europe = Germany-France-Britain.

Figure 1c . Cumulated growth in the Middle East: income vs population

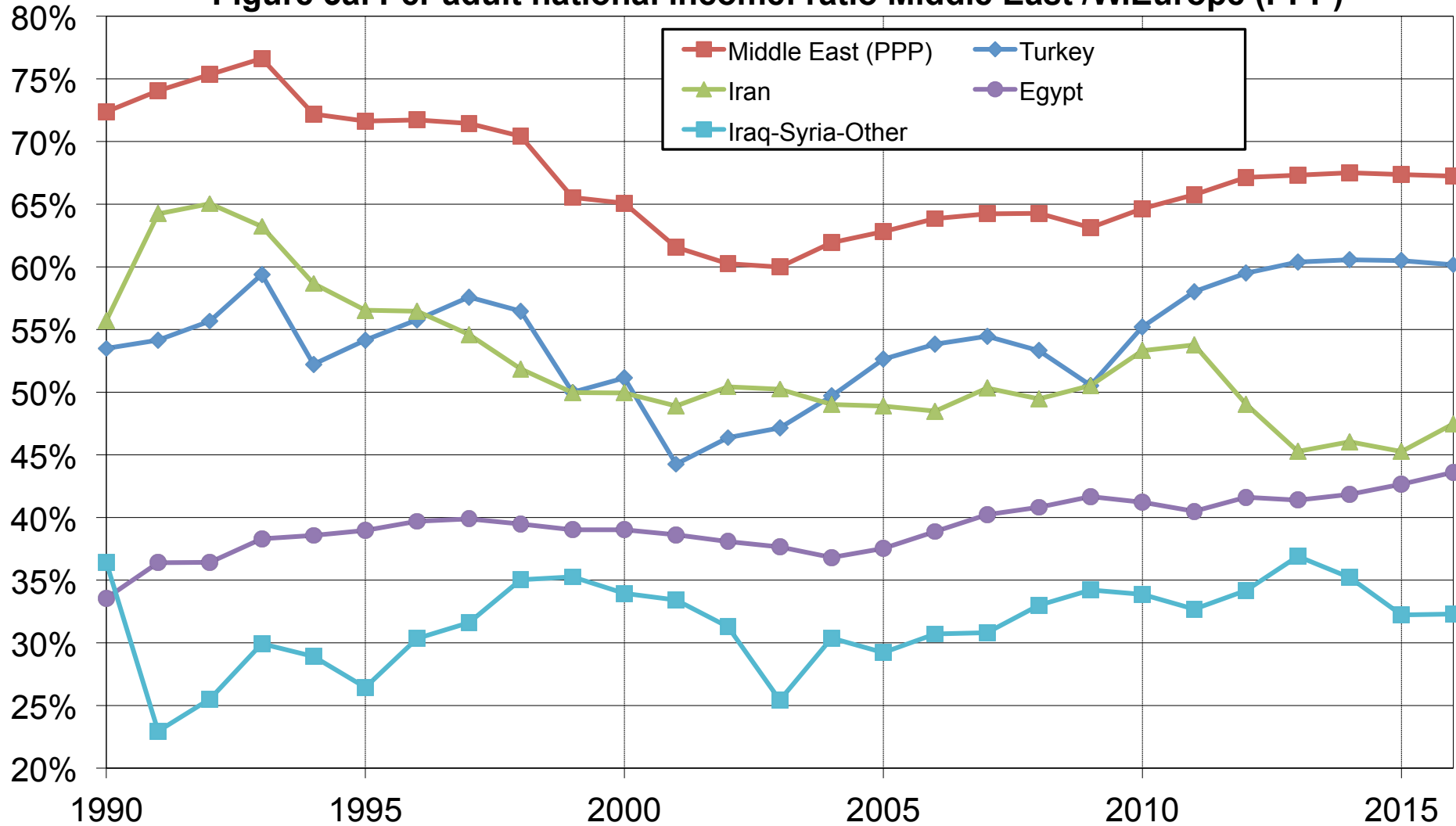Legend: National income, Adult population, Per adult income

Cumulated growth since 1990. National income in € 2016 PPP.

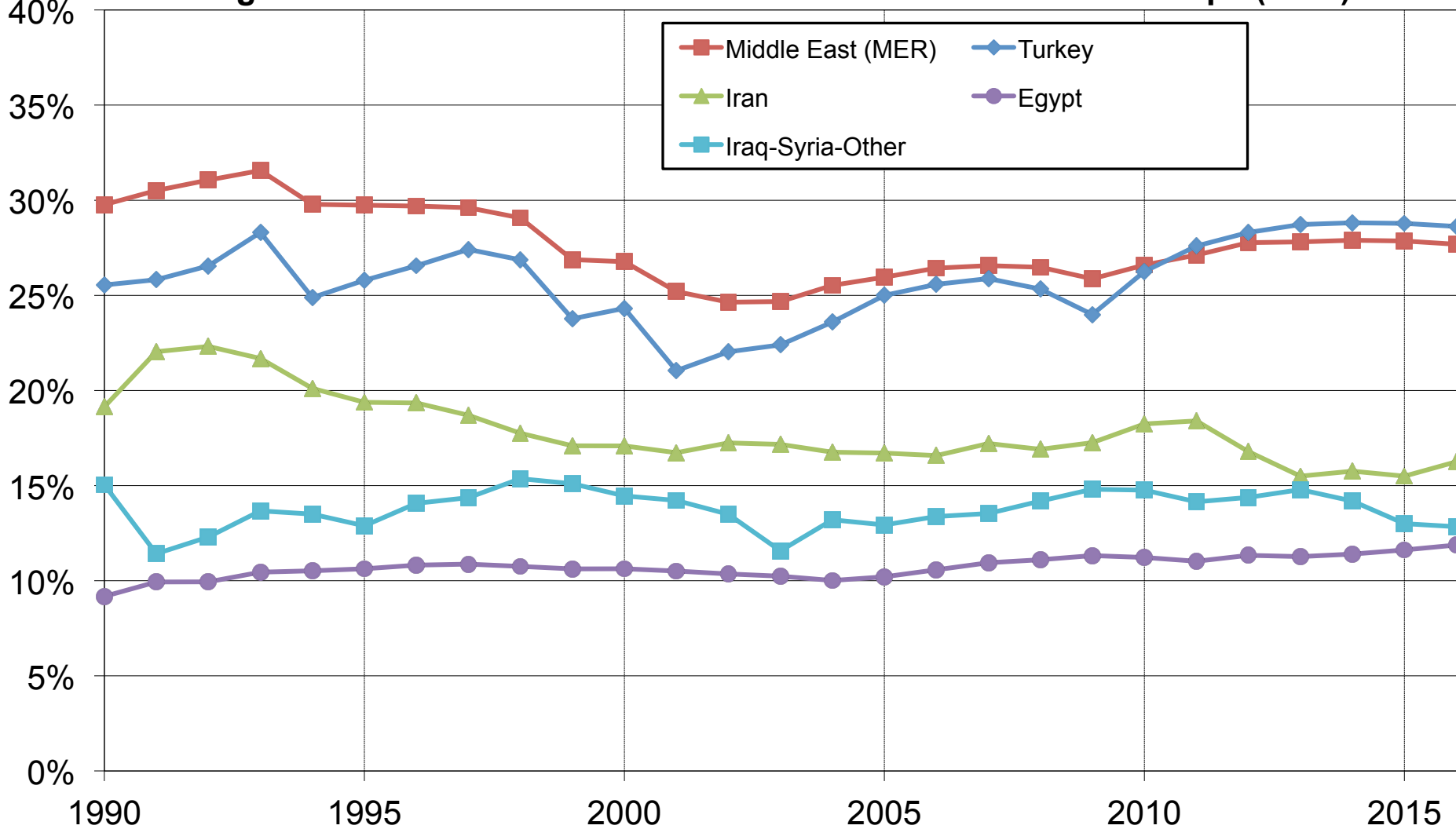# Figure 2. Population shares in the Middle East, 1990-2016

Shares in total Middle East adult population (20+). Gulf countries include Saudi Arabia, UAE, Oman, Kuwait, Qatar, Barhein. Other Arab Middle East countries (Jordan, Lebanon, Palestine, Yemen) are included with Iraq-Syria.

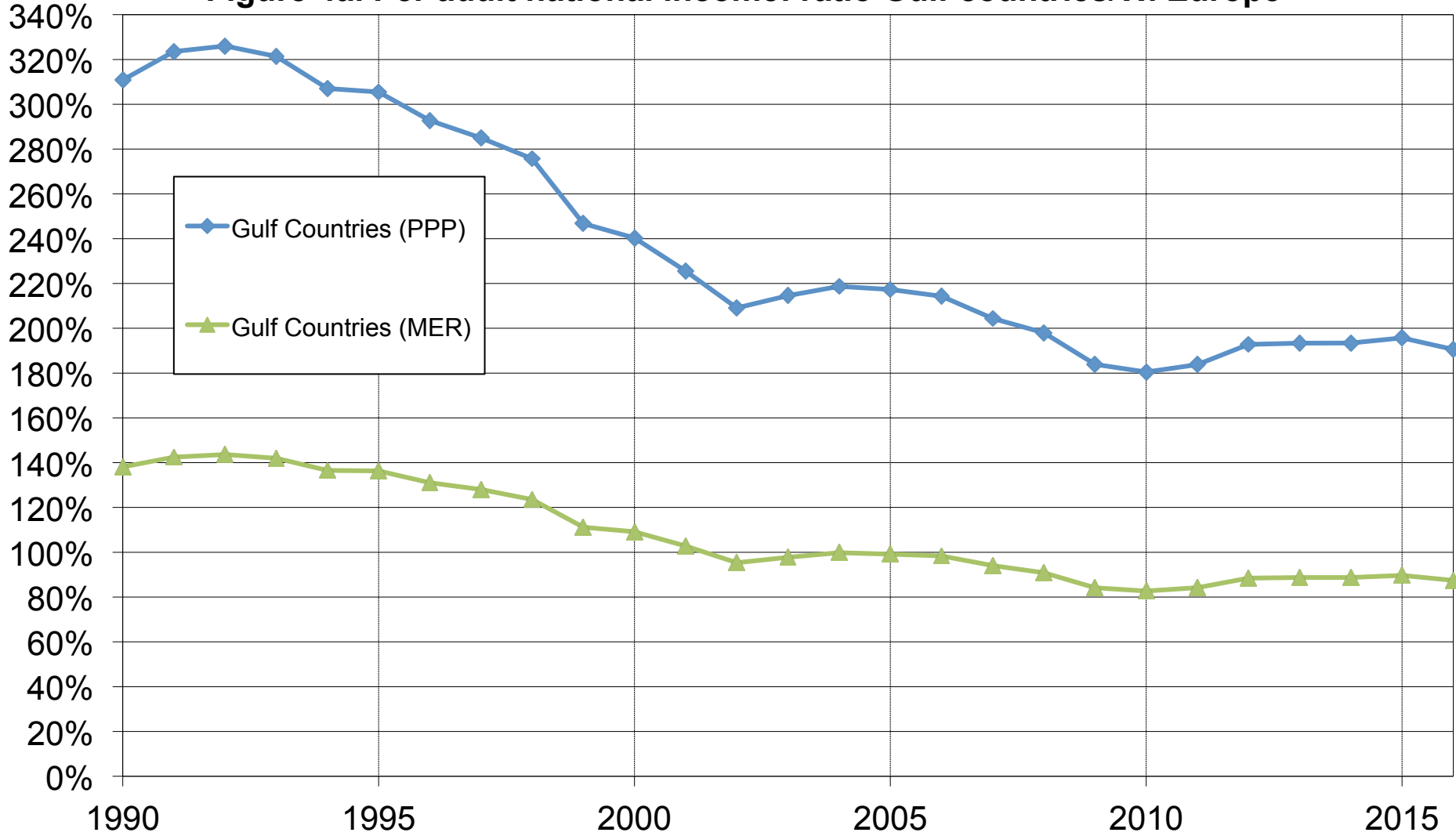# Figure 3a. Per adult national income: ratio Middle East /W.Europe (PPP)

Per adult national income in € 2016 PPP (purchasing power parity). Other Arab Middle East Countries (Jordan, Lebanon, Palestine, Yemen) are included with Iraq-Syria. Western Europe = Germany-France-Britain.

Figure 3b. Per adult national income: ratio Middle East /W.Europe (MER)

Legend:
- Middle East (MER)
- Turkey
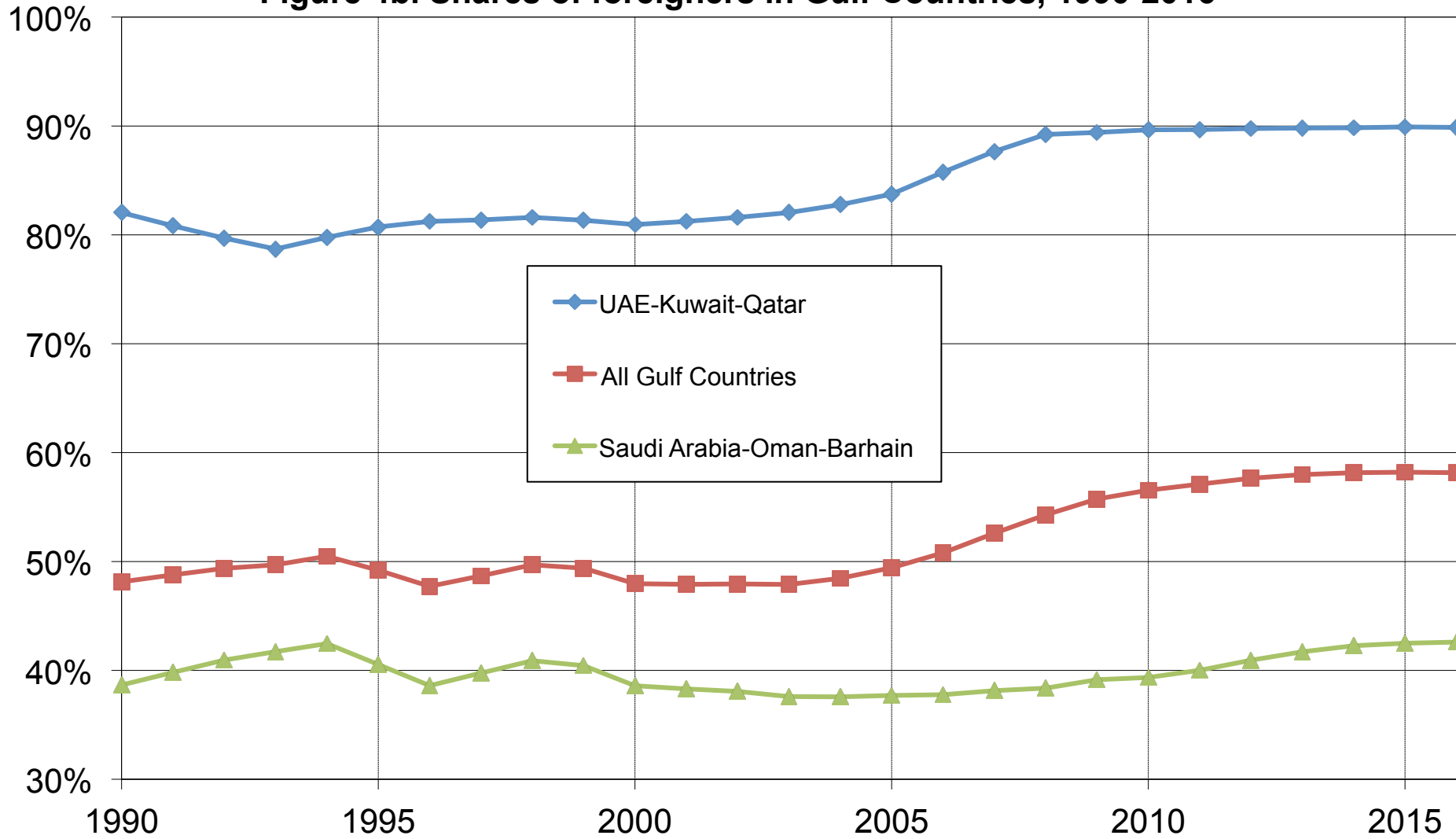- Iran
- Egypt
- Iraq-Syria-Other

Per adult national income in € 2016 MER (market exchange rate). Other Arab Middle East Countries (Jordan, Lebanon, Palestine, Yemen) are included with Iraq-Syria. Western Europe = Germany-France-Britain.

Figure 4a. Per adult national income: ratio Gulf countries/W. Europe
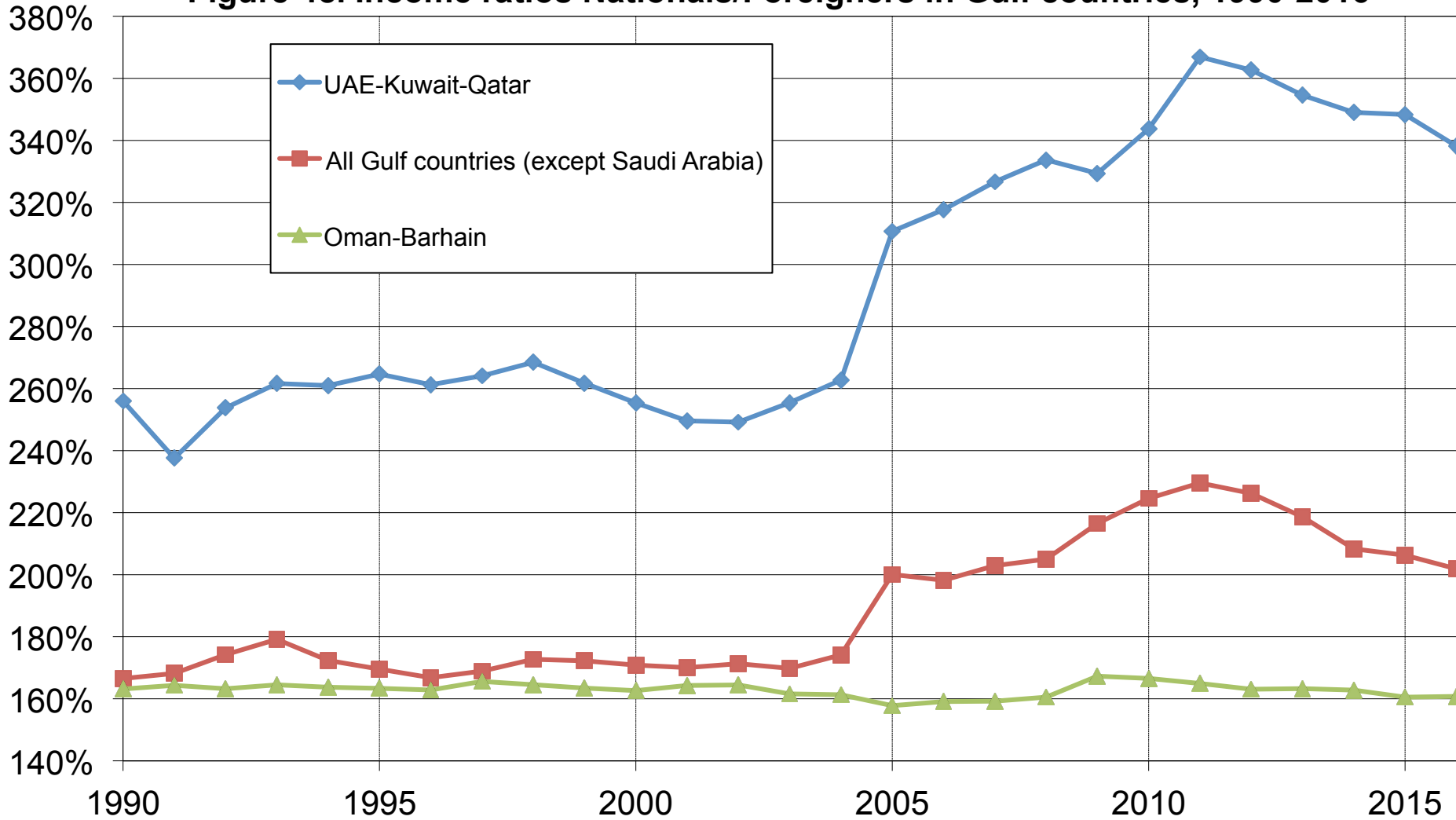

Per adult national income in € 2016 PPP and MER. Gulf countries include Saudi Arabia, UAE, Oman, Kuwait, Qatar, Barhein. W. Europe = Germany-France-Britain.

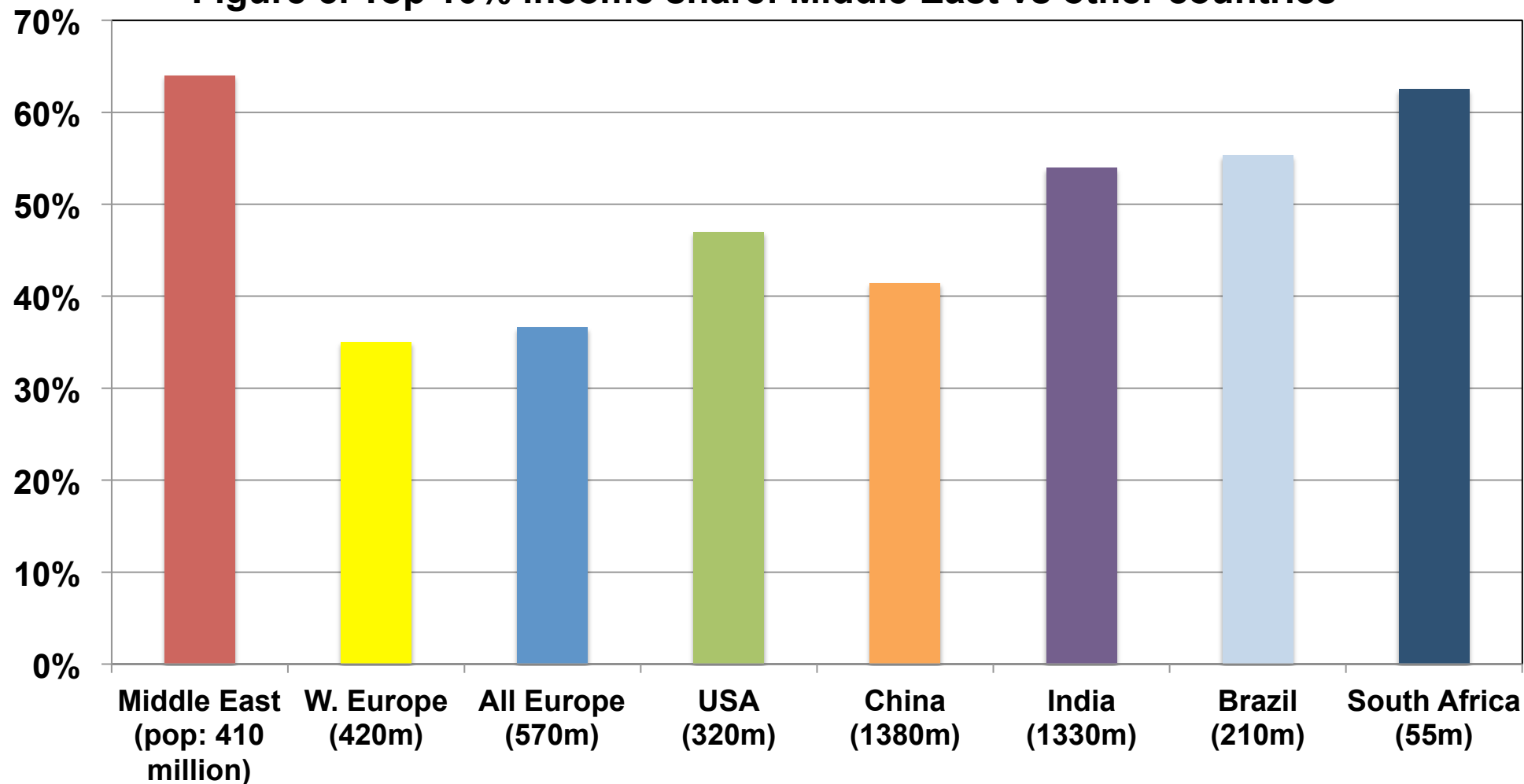**Figure 4b. Shares of foreigners in Gulf Countries, 1990-2016**

Shares of foreigners in the adult population (20+) of Gulf countries (as measured by censuses, administrative sources and household surveys).

Figure 4c. Income ratios Nationals/Foreigners in Gulf countries, 1990-2016
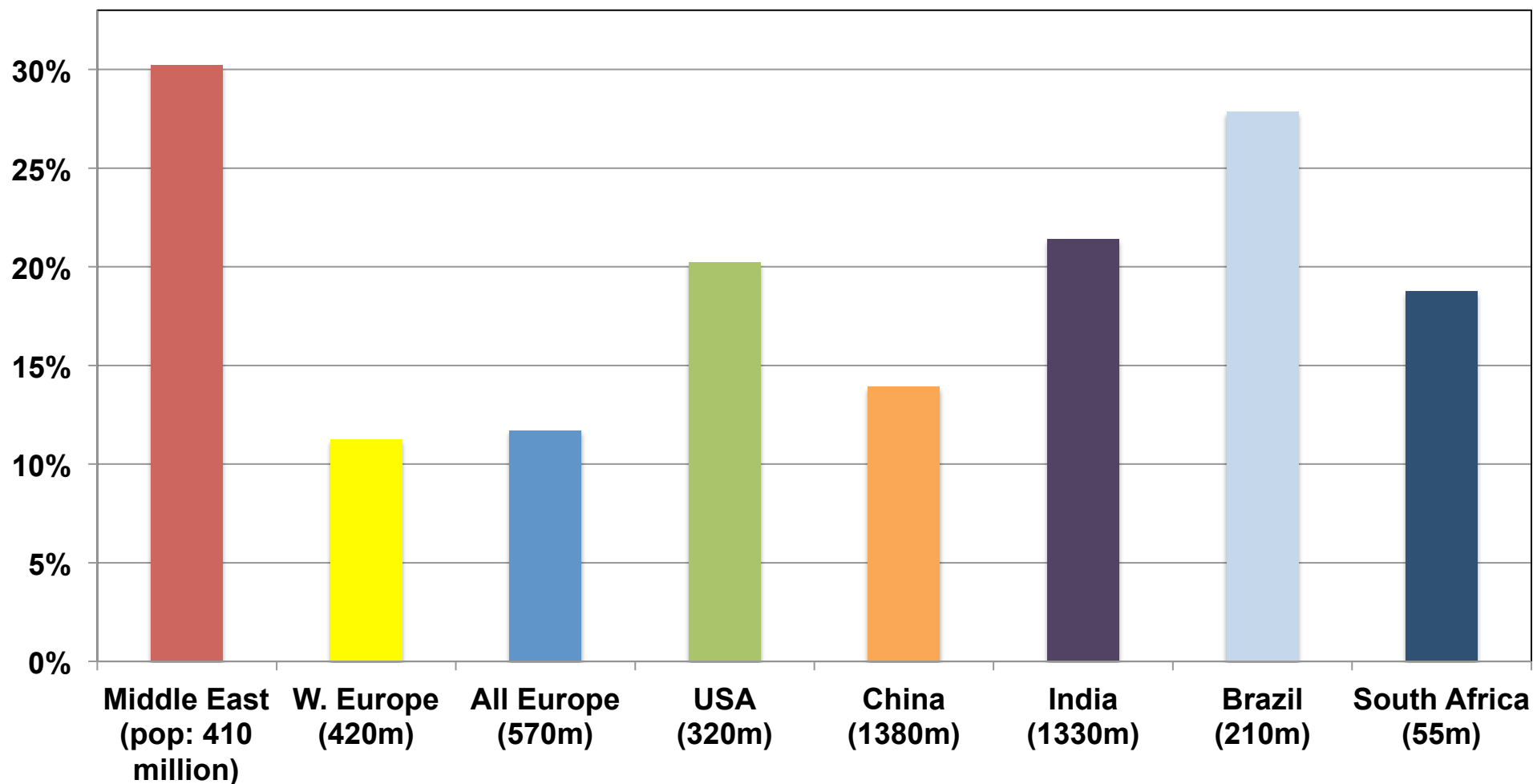

Ratios between average per adult income of nationals and foreigners (as measured by household surveys). These ratios are likely to under-estimate inequality between nationals and foreigners because top incomes are under-reported in surveys (no correction was made here). Detailed survey breakdown not available for Saudi Arabia.

Figure 5. Top 10% income share: Middle East vs other countries

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split series (income of married couples divided by two). Latest years available (2012-2016). Source: WID.world.

Figure 6. Top 1% income share: Middle East vs other countries

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split series (income of married couples divided by two). Latest years available (2012-2016). Source: WID.world.

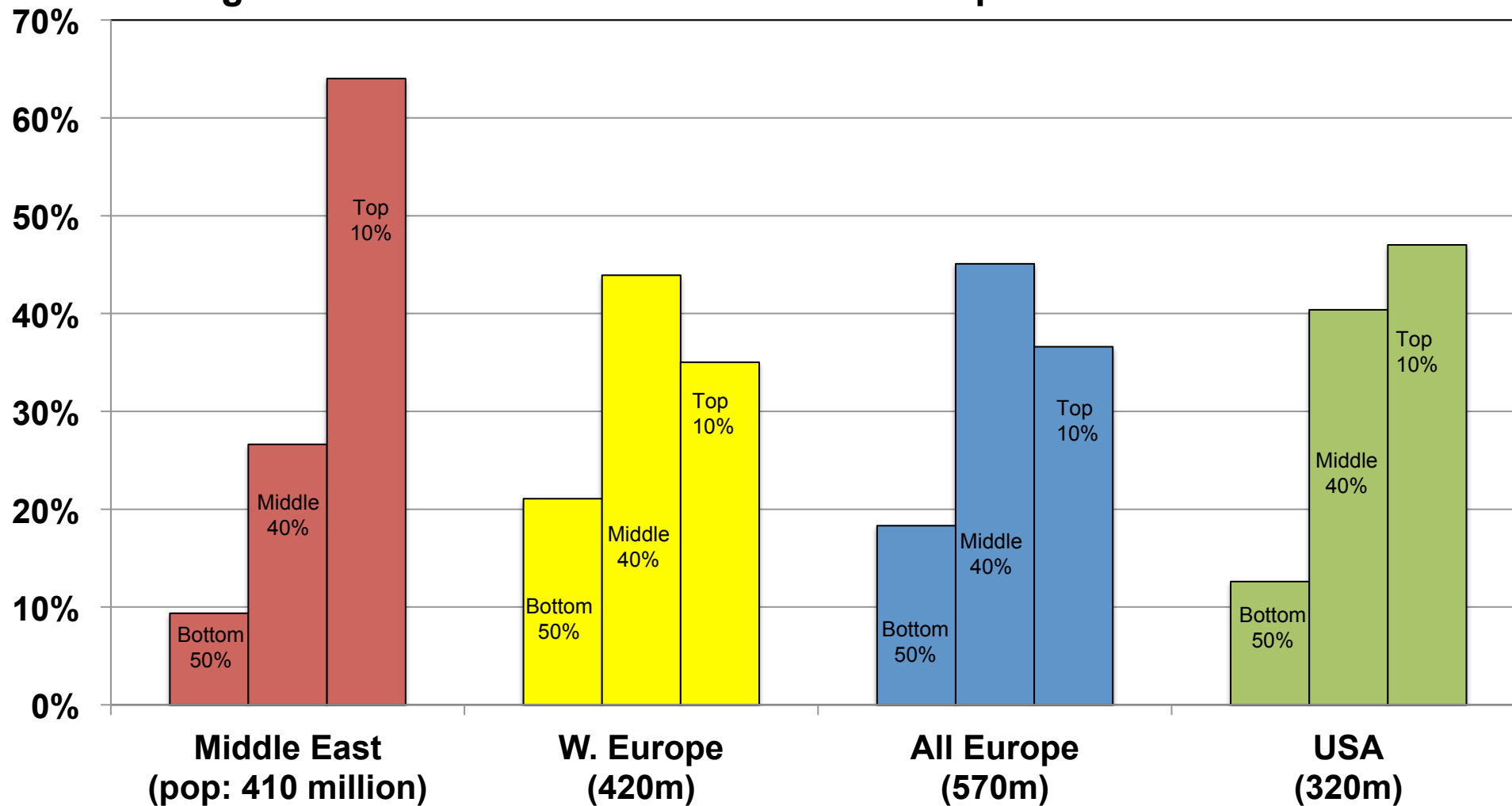# Figure 7a. Bottom 50% vs Middle 40% vs Top 10% income shares

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split series (income of married couples divided by two). Latest years available (2012-2016). Source: WID.world.

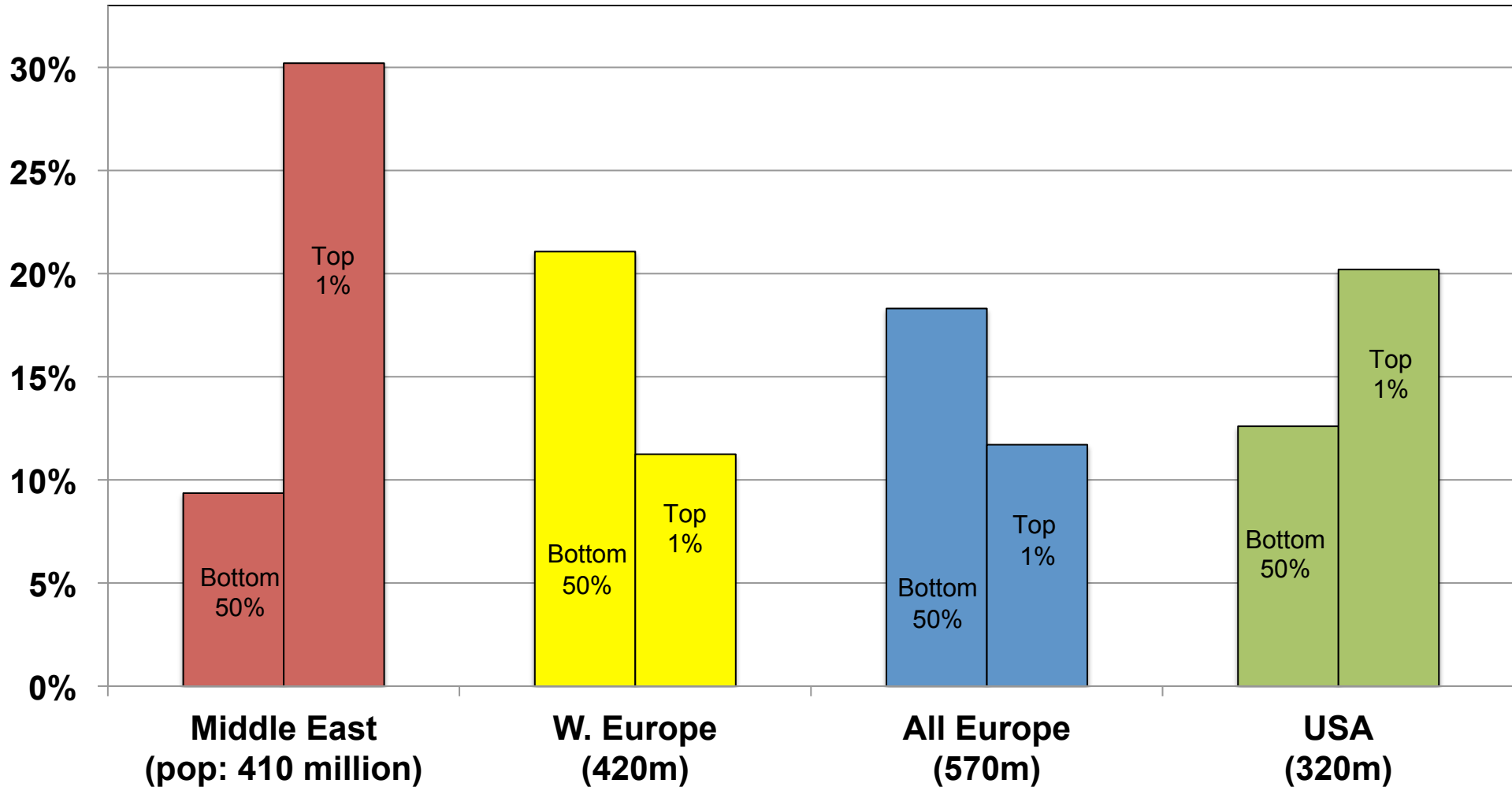# Figure 7b. Bottom 50% vs Top 1% income shares

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split series (income of married couples divided by two). Latest years available (2012-2016). Source: WID.world.

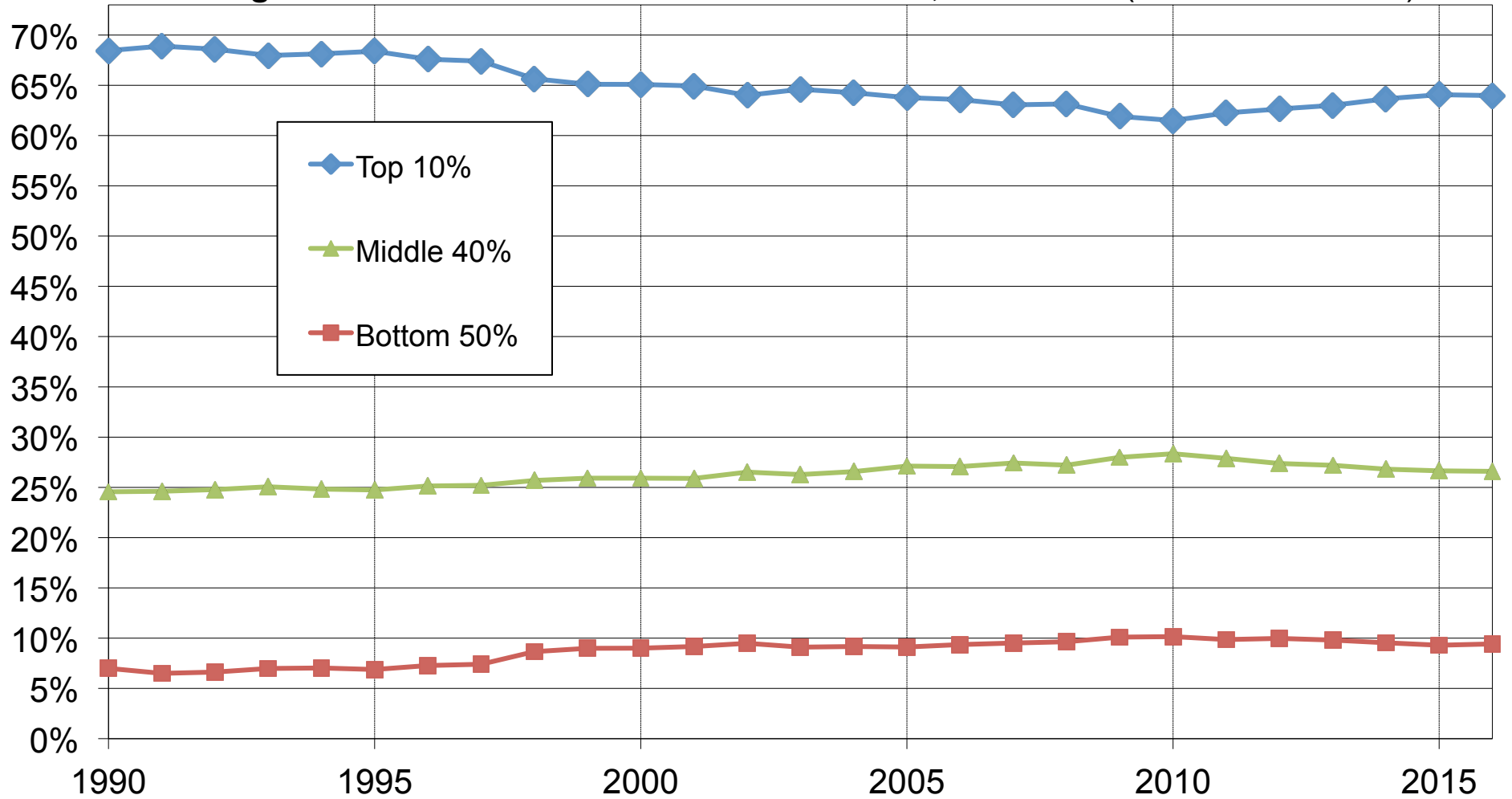# Figure 8a. Income shares in the Middle East, 1990-2016 (benchmark series)

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split-adults series (income of households divided equally among adult members). Benchmark estimates (full Middle East, MER estimates).

Figure 8b: Top income shares in the Middle East, 1990-2016 (variants)

Legend:
- Top 10% (Variant Gulf Countries, 100%)
- Top 10% (MER, without Turkey)
- Top 10% (benchmark) (MER, full Middle East)
- Top 10% (PPP, full Middle East)
- Top 1% (Variant Gulf Countries, 100%)
- Top 1% (MER, without Turkey)
- Top 1% (benchmark) (MER, full Middle East)
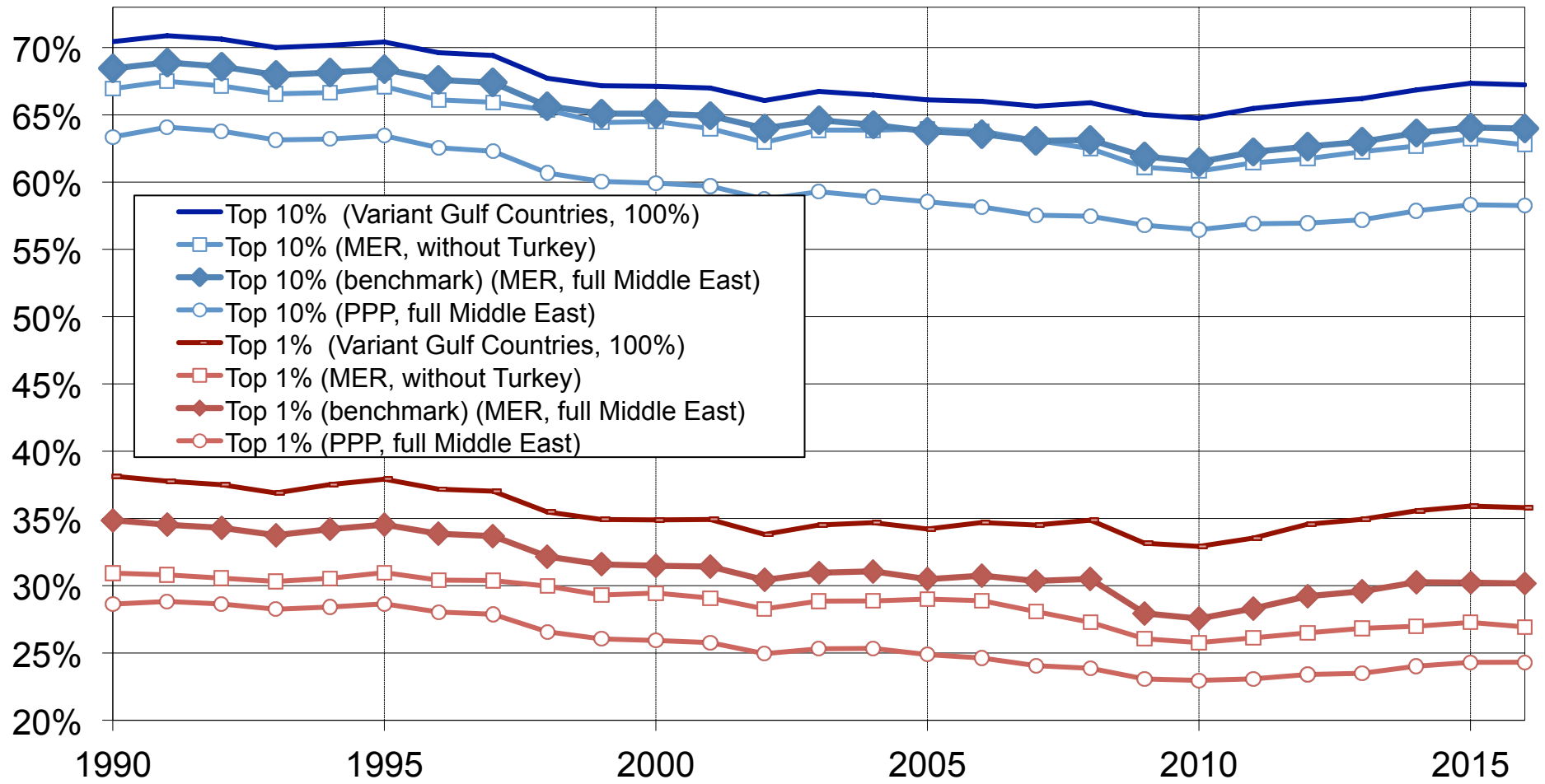- Top 1% (PPP, full Middle East)

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split-adults series (income of households divided equally among adult members). Given that the ratio between survey and national accounts is particularly low (around 20-30%) in Gulf countries, we create a variants where we attribute all missing income to nationals (Variant Gulf countries 100%).

Figure 9a: Inequality Statistics in Gulf countries, 2016 (Variants)

Distribution of income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Survey income series solely use self-reported survey data (but anchors distributions to per adult national income). Fiscal income estimates combine survey and income tax data (but do not use wealth data to allocate tax-exempt capital income). Final estimates (with variants) combine combine survey, fiscal, wealth and national accounts data. Variants estimates are the result of imputing a fraction of missing income (the gap between national income and total survey income) so that the average income in the survey (augmented by the imputation) represents 30, 50, 70 or 100% of the average national income, and combine survey, fiscal, wealth and national accounts data. We also consider a conservative variant where the missing income is proportionally attributed to both foreigners and nationals."

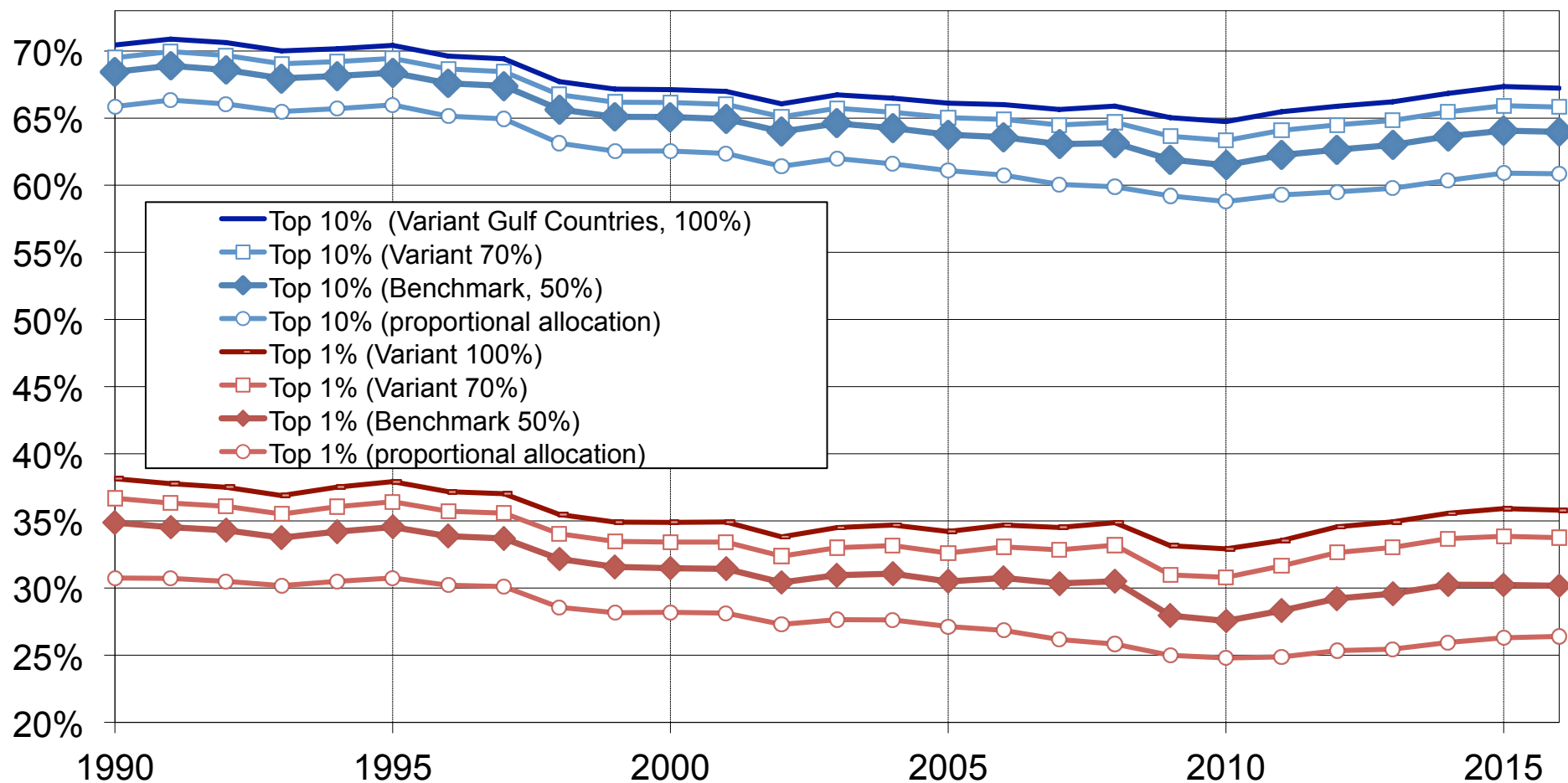# Figure 9b: Inequality Statistics in the Middle East, Variants for Gulf countries (2016)

Distribution of income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Final estimates (with variants) combine combine survey, fiscal, wealth and national accounts data. Variants estimates are the result of imputing a fraction of missing income (the gap between national income and total survey income) so that the average income in the survey (augmented by the imputation) represents 50, 70 or 100% of the average national income, and combine survey, fiscal, wealth and national accounts data. We also consider a conservative variant where the missing income is proportionally attributed to both foreigners and nationals."

Figure 9c: Top income shares in the Middle East, 1990-2016 (Variants for Gulf countries)

Legend:
- Top 10% (Variant Gulf Countries, 100%)
- Top 10% (Variant 70%)
- Top 10% (Benchmark, 50%)
- Top 10% (proportional allocation)
- Top 1% (Variant 100%)
- Top 1% (Variant 70%)
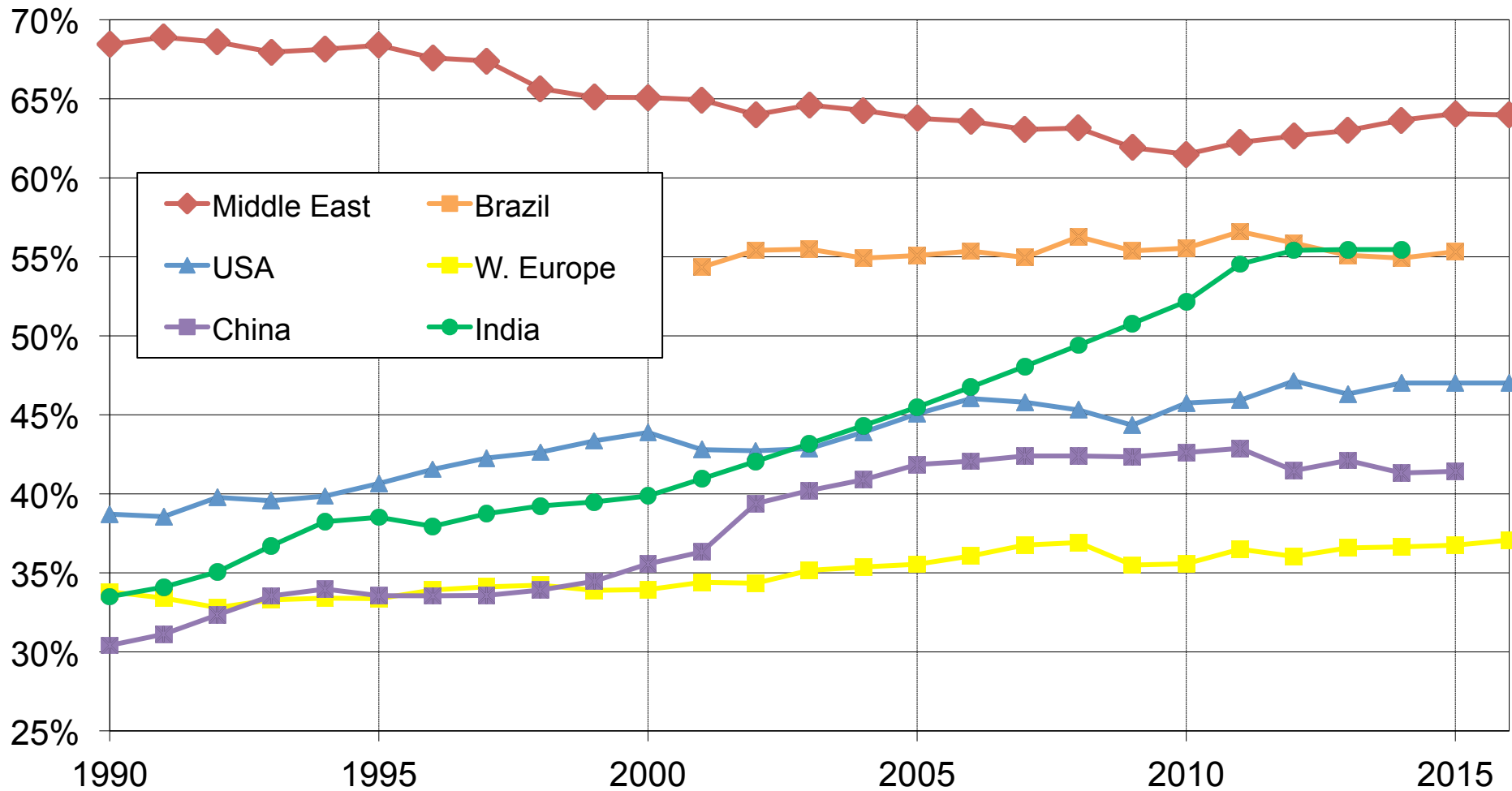- Top 1% (Benchmark 50%)
- Top 1% (proportional allocation)

Distribution of income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Final estimates (with variants) combine combine survey, fiscal, wealth and national accounts data. Variants estimates are the result of imputing a fraction of missing income (the gap between national income and total survey income) so that the average income in the survey (augmented by the imputation) represents 50, 70 or 100% of the average national income, and combine survey, fiscal, wealth and national accounts data. We also consider a conservative variant where the missing income is proportionally attributed to both foreigners and nationals."

Figure 10a.Top 10% income share 1990-2016:Middle East vs other countries

Legend: Middle East, Brazil, USA, W. Europe, China, India

Distribution of pretax national income (before taxes and transfers, except pensions and unempl. insurance) among equal-split adults (income of households divided equally among adult members). Sources for USA and France: WID.world.

Figure 10b. Top 1% income share 1990-2016: Middle East vs other countries

Distribution of pretax national income (before taxes and transfers, except pensions and unempl. insurance) among equal-split adults (income of households divided equally among adult members). Sources for USA and France: WID.world.

Figure 10c.Top 10% income share 1990-2016:Middle East vs other countries

Distribution of pretax national income (before taxes and transfers, except pensions and unempl. insurance) among equal-split adults (income of households divided equally among adult members). Sources: WIR, 2018.

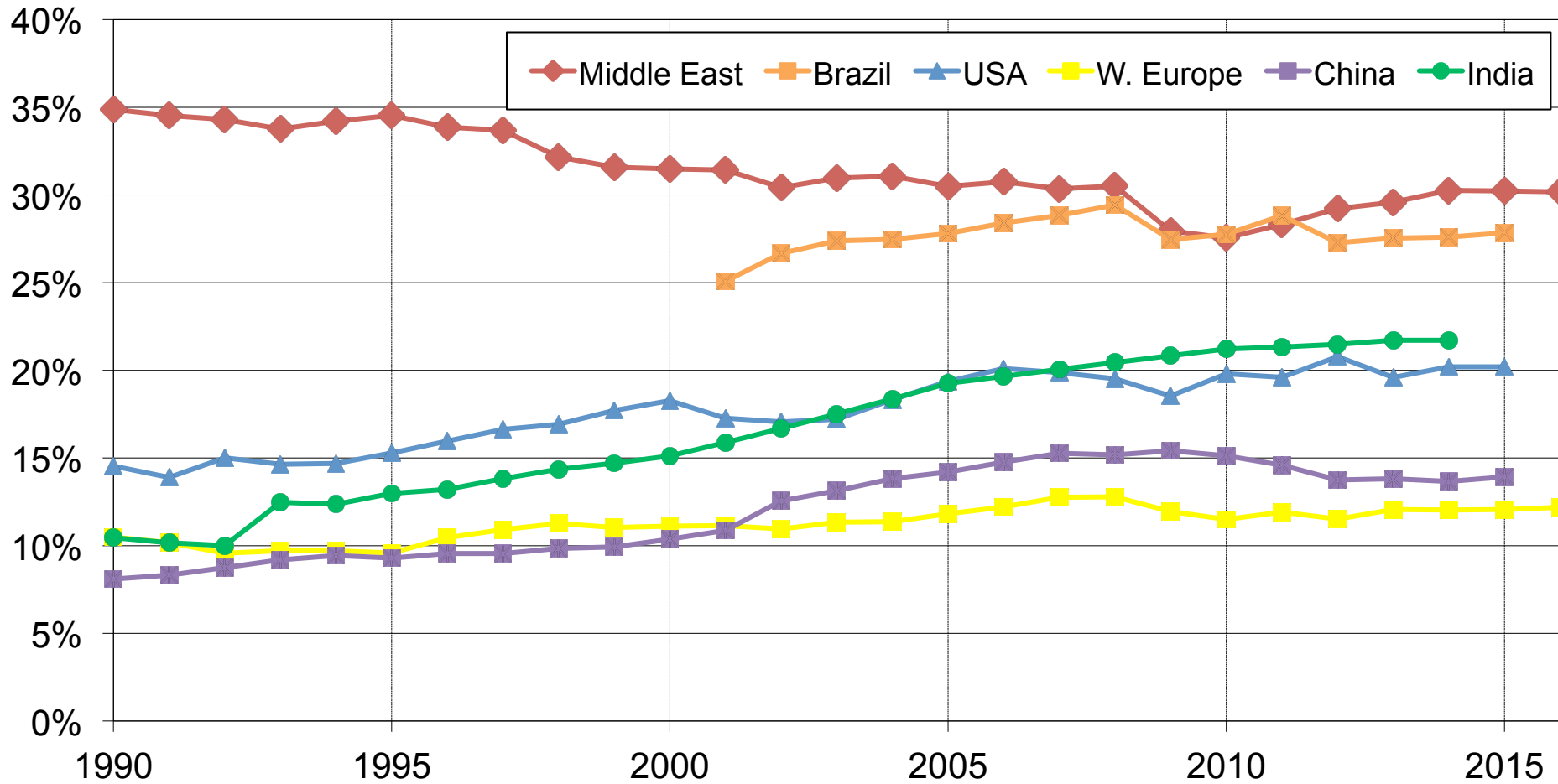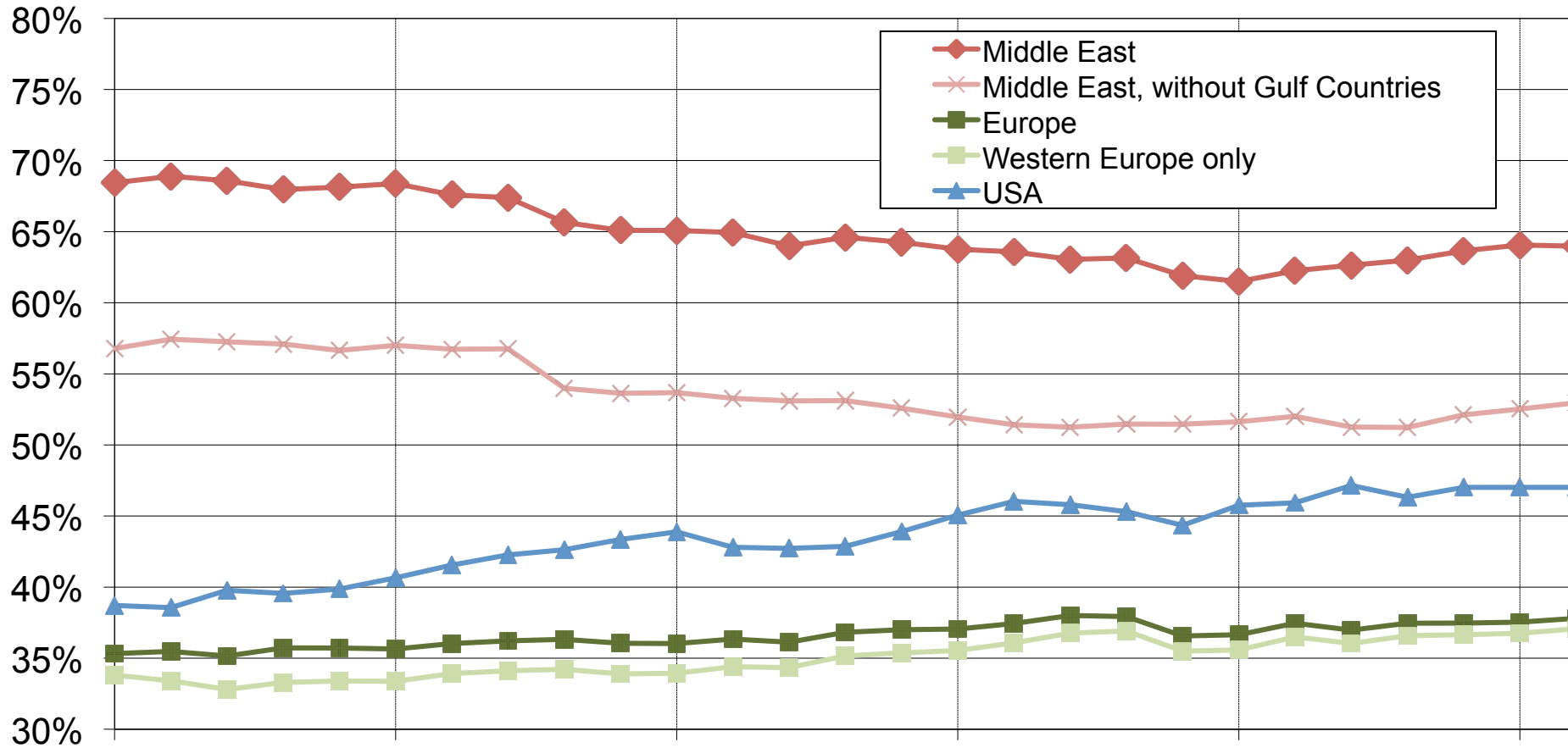# Figure 11a. Decomposing the level of Middle East top 10% income share

Distribution of income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Pretax national income estimates combine survey, fiscal, wealth and national accounts data. Fiscal income estimates combine survey and income tax data (but do not use wealth data to allocate tax-exempt capital income). Survey income series solely use self-reported survey data (but anchors national distributions to per adult national income). Survey income with fixed-average-income series assume same average income for all countries (thereby neutralizing between-country inequality).

Figure 11b. Top 1% income share in the Middle East, 1990-2016

Legend:
- Top 1% (national income)
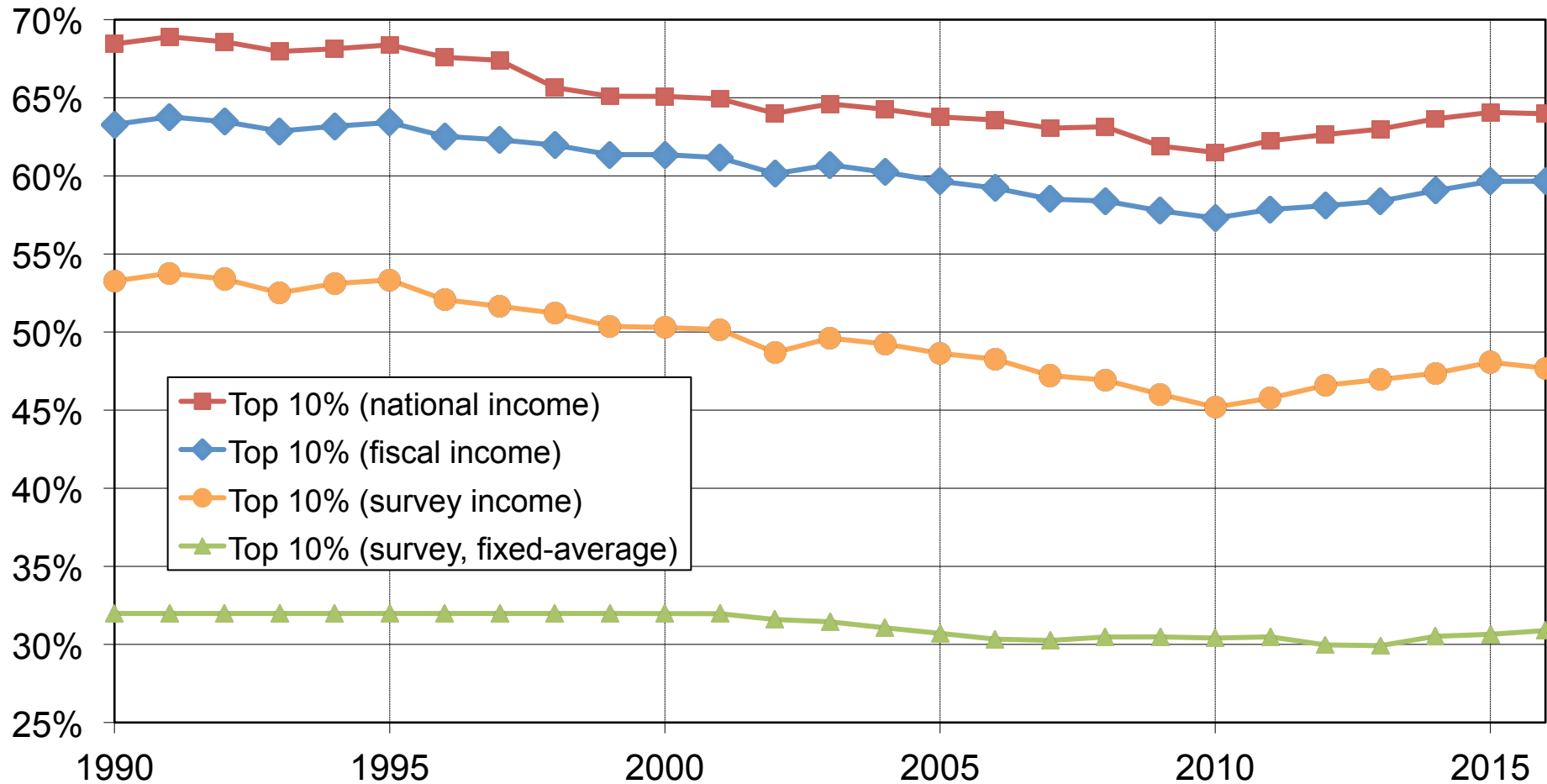- Top 1% (fiscal income)
- Top 1% (survey income)
- Top 1% (survey, fixed-average)

Distribution of income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Pretax national income estimates combine survey, fiscal, wealth and national accounts data. Fiscal income estimates combine survey and income tax data (but do not use wealth data to allocate tax-exempt capital income). Survey income series solely use self-reported survey data (but anchors national distributions to per adult national income). Survey income with fixed-average-income series assume same average income for all countries (thereby neutralizing between-country inequality).

Figure 11c. Decomposing Gini coefficients in the Middle East, 1990-2016

Distribution of income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Pretax national income estimates combine survey, fiscal, wealth and national accounts data. Fiscal income estimates combine survey and income tax data (but do not use wealth data to allocate tax-exempt capital income). Survey income series solely use self-reported survey data (but anchors national distributions to per adult national income). Survey income with fixed-average-income series assume same average income for all countries (thereby neutralizing between-country inequality).

Figure 12a. Decomposing the evolution of Mid. East top 10% income share

Legend:
- Top 10% (observed, benchmark)
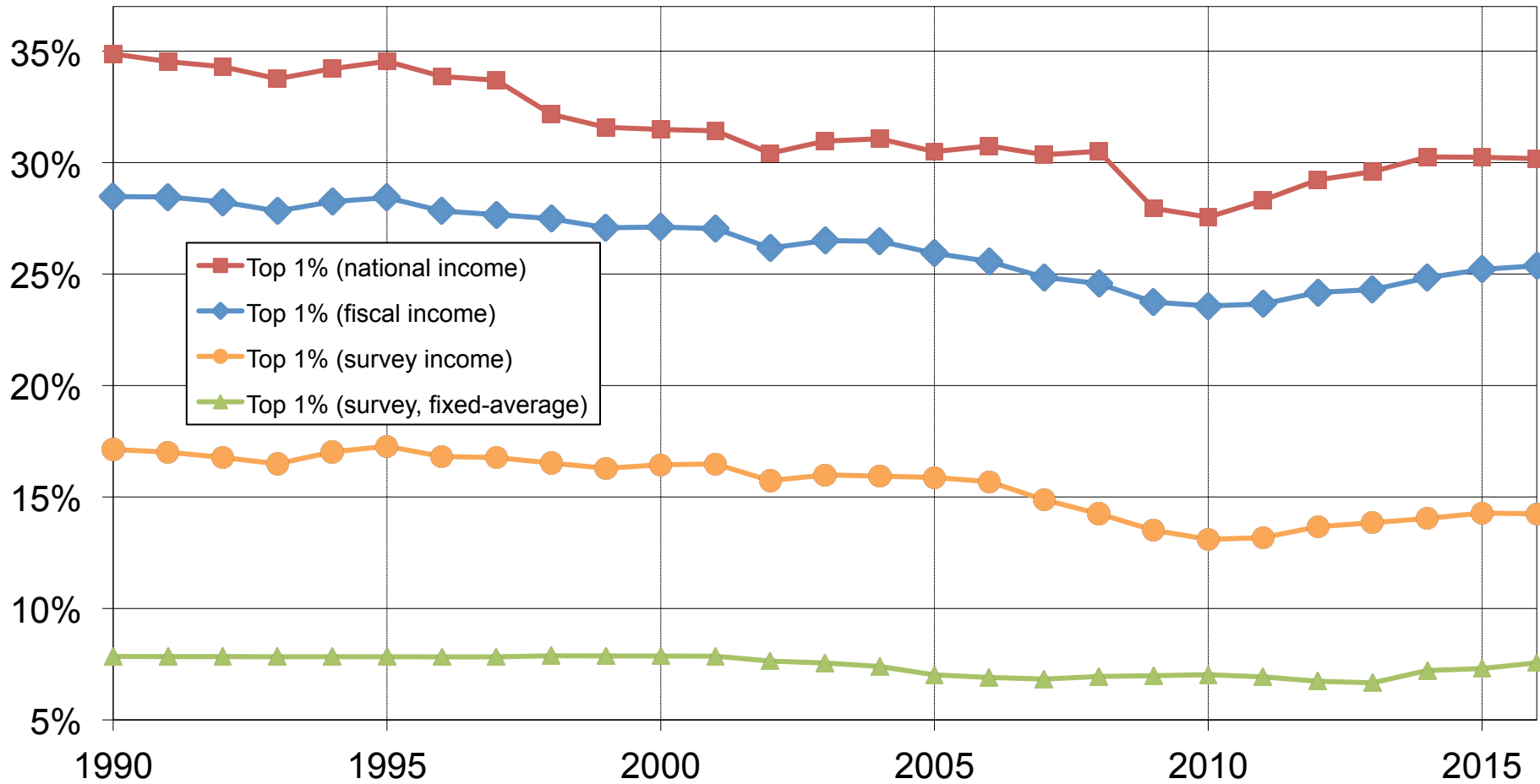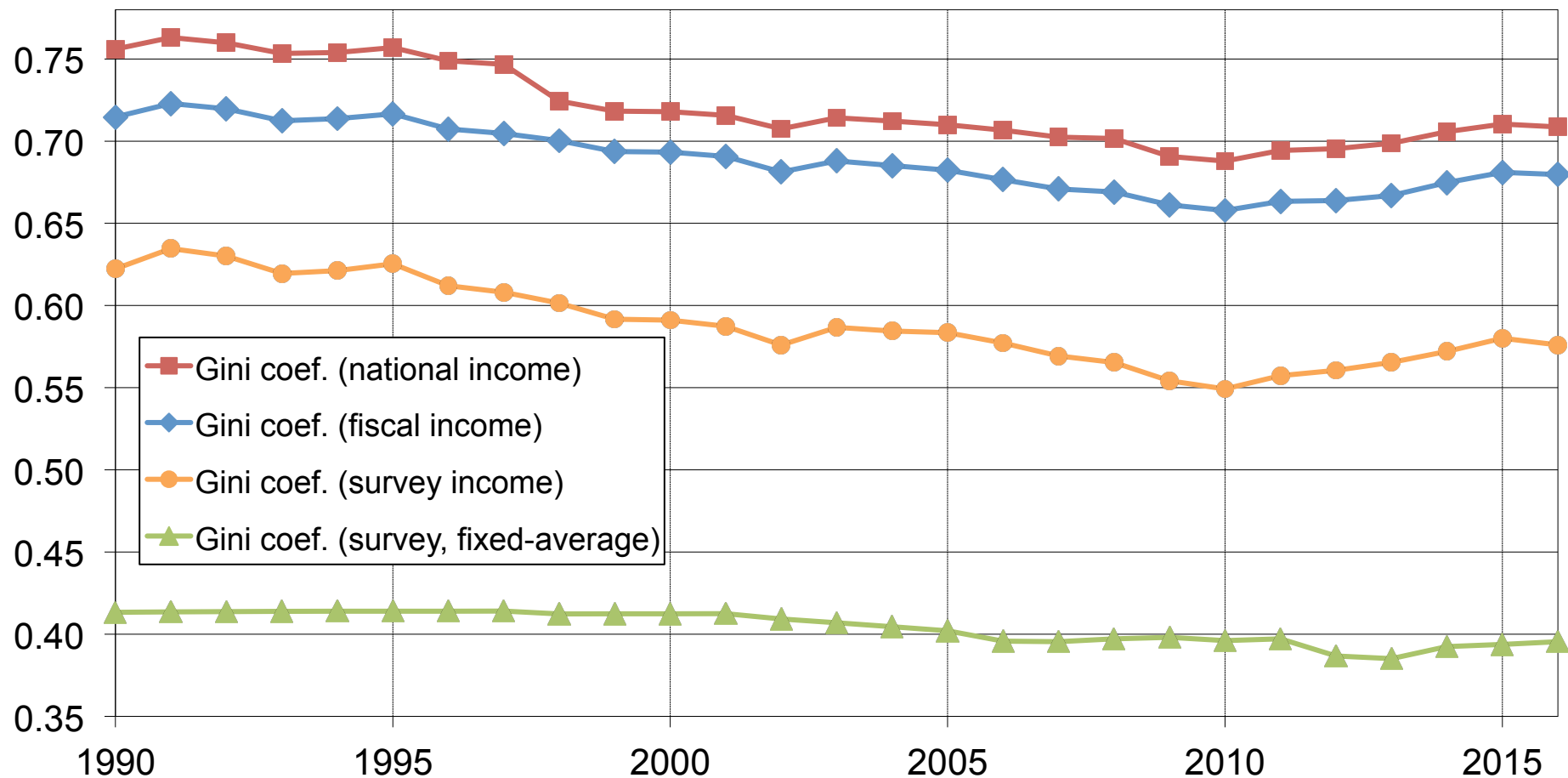- Top 10% (simulated, within-country inequality fixed at 1990 level)

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Corrected estimates combine survey, fiscal, wealth and national accounts data. Simulated series assume within-country inequality fixed at 1990 level (so that evolution is entirely driven by trends in between-country inequality).

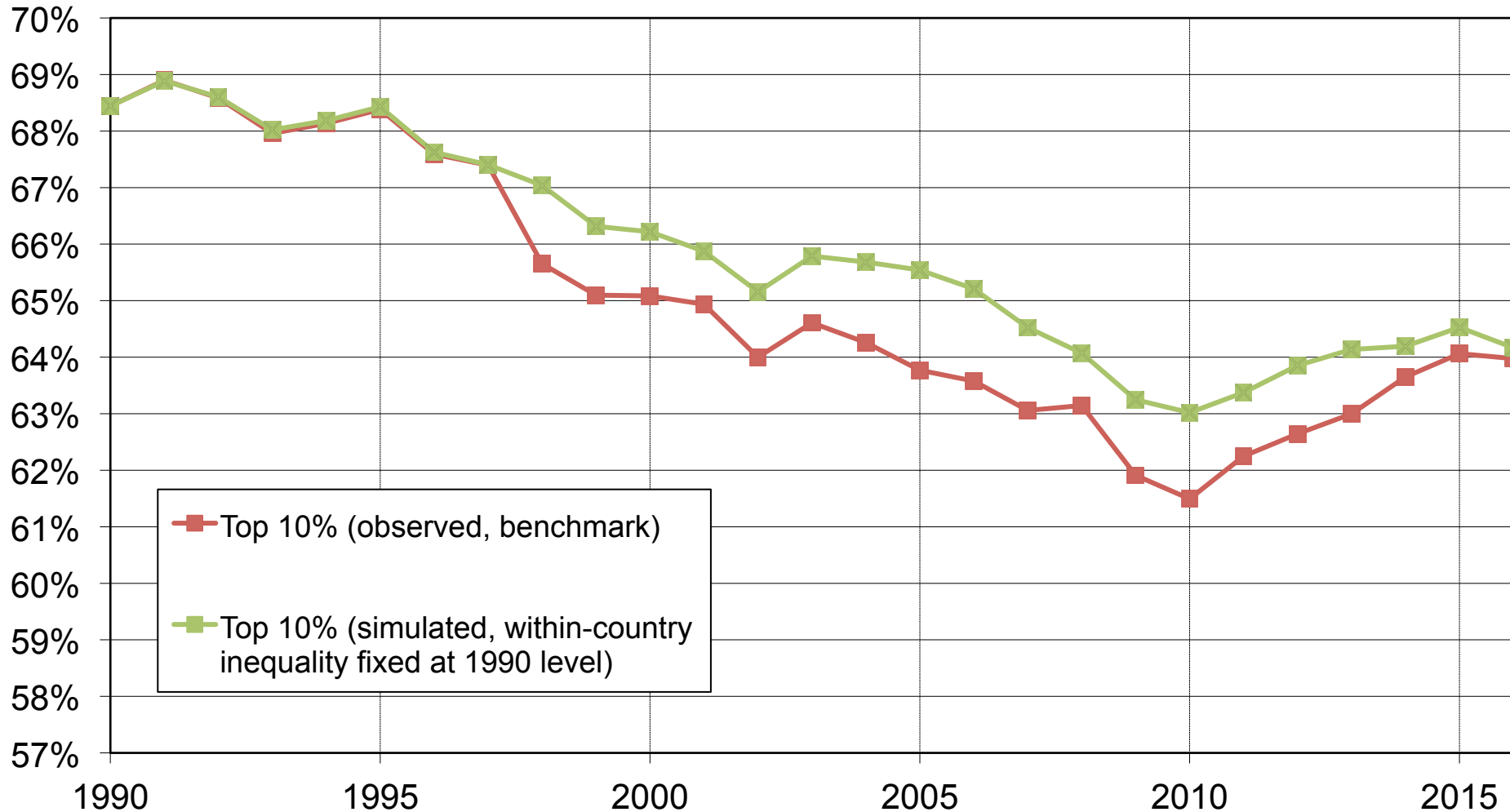# Figure 12b. Decomposing the evolution of Mid. East top 1% income share

Distribution of national income (before taxes and transfers, except pensions and unempl. insurance) among equals-plit adults (income of households divided equally among adult members). Corrected estimates combine survey, fiscal, wealth and national accounts data. Simulated series assume within-country inequality fixed at 1990 level (so that evolution is entirely driven by trends in between-country inequality).

Legend:
- Top 1% (observed, benchmark)
- Top 1% (simulated, within-country inequality fixed at 1990 level)

Table 3. Country-level Income Inequality Series: Income Shares and Other Indicators

Country	Year	Bottom 50%	Middle 40%	Top 10%	Top 1%	Gini	P10/ average	P50/ average	P90/ average	P99/ average	Pareto b(10%)	Pareto b(50%)	Pareto b(90%)	Pareto b(99%)
Bahrain	1995	13%	33%	53%	19%	61%	16%	46%	188%	849%	6.7	3.8	2.7	2.2
	2005	13%	35%	51%	17%	60%	16%	52%	183%	791%	6.9	3.3	2.6	2.2
	2015	12%	36%	53%	18%	62%	14%	48%	190%	803%	7.8	3.7	2.6	2.2
Egypt	1999	17%	32%	51%	19%	56%	25%	50%	165%	814%	4.3	3.3	2.9	2.4
	2002	18%	33%	49%	18%	55%	26%	53%	169%	783%	4.2	3.1	2.7	2.3
	2014	18%	33%	49%	19%	54%	27%	54%	163%	762%	4.0	3.0	2.8	2.5
	2008	18%	34%	49%	19%	54%	27%	53%	167%	761%	4.1	3.1	2.7	2.4
	2009	19%	35%	46%	17%	52%	28%	56%	170%	719%	3.9	2.9	2.6	2.3
	2015	18%	33%	49%	19%	54%	27%	54%	163%	762%	4.0	3.0	2.8	2.5
Iran	2010	14%	35%	51%	18%	59%	17%	51%	183%	779%	6.4	3.4	2.6	2.3
	2013	17%	35%	48%	16%	55%	22%	54%	180%	748%	4.9	3.1	2.5	2.2
Iraq	2007	15%	32%	53%	22%	59%	20%	50%	165%	823%	5.4	3.4	3.0	2.7
Jordan	1992	15%	33%	51%	20%	58%	21%	50%	170%	780%	5.3	3.4	2.8	2.6
	2002	18%	36%	46%	15%	53%	25%	56%	182%	674%	4.3	2.9	2.4	2.2
	2006	17%	36%	47%	15%	54%	23%	55%	186%	700%	4.8	3.0	2.4	2.2
	2008	18%	35%	47%	16%	54%	25%	56%	178%	707%	4.3	3.0	2.5	2.2
	2010	17%	32%	52%	22%	57%	22%	52%	158%	816%	4.9	3.2	3.1	2.7
	2013	17%	35%	48%	16%	54%	23%	55%	181%	710%	4.8	3.0	2.5	2.3
Kuwait	2007	5%	26%	69%	21%	78%	7%	16%	250%	1030%	15.3	11.8	2.6	2.1
	2013	7%	29%	64%	20%	74%	10%	20%	261%	917%	11.6	9.5	2.3	2.2
Lebanon	2005	13%	35%	52%	22%	62%	15%	48%	180%	760%	7.2	3.6	2.7	2.8
	2006	13%	35%	52%	21%	61%	16%	49%	180%	751%	7.1	3.5	2.7	2.8
	2007	11%	33%	57%	24%	66%	12%	42%	184%	847%	9.5	4.2	2.9	2.8
	2008	11%	32%	57%	24%	66%	11%	42%	184%	856%	9.7	4.3	2.9	2.8
	2009	11%	33%	57%	23%	66%	12%	42%	185%	855%	9.5	4.2	2.9	2.7
	2010	11%	32%	57%	23%	66%	12%	42%	185%	863%	9.6	4.3	2.9	2.7
	2011	11%	32%	57%	23%	66%	11%	41%	185%	867%	9.7	4.3	2.9	2.7
	2012	10%	32%	58%	24%	67%	11%	41%	186%	874%	9.8	4.4	2.9	2.7
	2013	11%	32%	57%	23%	67%	11%	41%	186%	873%	9.7	4.4	2.9	2.7
	2014	11%	32%	57%	23%	66%	12%	42%	185%	861%	9.6	4.3	2.9	2.7
Oman	2010	8%	35%	57%	18%	68%	6%	40%	212%	878%	18.2	4.5	2.5	2.0
Palestine	1996	15%	37%	48%	14%	57%	17%	54%	201%	701%	6.3	3.2	2.3	2.0
	1997	15%	37%	48%	14%	57%	17%	53%	201%	706%	6.4	3.2	2.3	2.0
	1998	15%	37%	49%	14%	58%	17%	53%	200%	714%	6.6	3.2	2.3	2.0
	2004	15%	36%	49%	15%	58%	16%	53%	191%	751%	6.8	3.2	2.4	2.0
	2005	14%	37%	50%	16%	59%	15%	51%	203%	743%	7.4	3.4	2.3	2.1
	2006	14%	36%	50%	15%	59%	16%	51%	193%	761%	7.0	3.4	2.5	2.0
	2007	13%	35%	52%	17%	62%	14%	47%	198%	790%	8.1	3.7	2.5	2.1
	2008	14%	36%	50%	14%	59%	16%	50%	199%	739%	7.0	3.5	2.4	2.0
	2010	13%	35%	52%	17%	61%	14%	48%	196%	782%	7.6	3.7	2.5	2.2
	2011	13%	36%	51%	16%	60%	15%	49%	198%	745%	7.3	3.5	2.4	2.1
Qatar	2007	8%	26%	66%	23%	73%	9%	31%	178%	1112%	12.6	6.0	3.5	2.1
	2012	10%	23%	67%	27%	71%	12%	33%	133%	1281%	9.0	5.6	4.7	2.1
SaudiArabia	2008	8%	30%	62%	20%	72%	9%	28%	223%	964%	12.1	6.5	2.6	2.0
Syria	2004	14%	37%	49%	15%	58%	16%	51%	201%	624%	6.7	3.3	2.3	2.4
Turkey	1994	8%	31%	61%	28%	71%	7%	36%	165%	970%	15.4	5.1	3.5	2.9
	2002	14%	31%	55%	22%	62%	17%	45%	169%	909%	6.3	3.8	3.1	2.5
	2003	14%	31%	55%	22%	61%	18%	46%	167%	910%	6.1	3.8	3.1	2.4
	2004	14%	32%	53%	21%	60%	18%	48%	173%	815%	6.1	3.6	2.9	2.6
	2005	15%	34%	51%	19%	58%	19%	51%	177%	797%	5.9	3.3	2.7	2.4
	2006	16%	34%	50%	18%	57%	21%	52%	176%	793%	5.3	3.2	2.7	2.3
	2007	16%	35%	49%	17%	56%	21%	53%	176%	751%	5.2	3.1	2.6	2.3
	2008	16%	34%	50%	18%	57%	20%	53%	173%	748%	5.4	3.2	2.7	2.4
	2009	15%	33%	52%	19%	58%	20%	51%	171%	858%	5.6	3.3	2.8	2.3
	2010	16%	33%	51%	20%	58%	21%	51%	171%	793%	5.3	3.3	2.8	2.5
	2011	16%	33%	51%	19%	58%	20%	50%	173%	811%	5.4	3.4	2.8	2.4
	2012	16%	33%	51%	20%	58%	21%	50%	172%	772%	5.2	3.3	2.8	2.6
	2013	16%	33%	51%	19%	57%	22%	51%	169%	761%	4.9	3.3	2.8	2.5
	2014	15%	33%	52%	21%	59%	21%	50%	166%	793%	5.3	3.4	2.9	2.6
	2015	15%	33%	53%	22%	59%	20%	50%	165%	802%	5.4	3.4	3.0	2.7
	2016	15%	31%	54%	23%	60%	20%	48%	159%	814%	5.4	3.5	3.2	2.9
UAE	1998	9%	30%	61%	20%	69%	11%	32%	210%	953%	9.7	5.7	2.7	2.1
	2009	11%	33%	56%	16%	65%	18%	36%	219%	798%	6.1	5.0	2.4	2.0
Yemen	2006	14%	37%	50%	16%	59%	15%	51%	201%	658%	7.2	3.4	2.3	2.4

Distribution of national income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates combining survey, fiscal, wealth and national accounts data. Equal-split series (income of married couples divided by two). For similar series on the distribution of raw survey income (before any correction) and fiscal income (before wealth correction), see appendix.