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Henriette Engelhardt, Florian Schulz & Zafer Büyükkeçeci

Demographic and Human Development in the Middle East and North Africa

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Preface

It is with great that we present the second volume of the series "Population and Family Studies". In this book, we study demographic developments in the Middle East and North Africa (MENA). In the past, the demographic developments in the Middle East and North Africa have been described as "peculiar" and "unique". In particular, the development of fertility got attention from a western point of view because it did not show the sharp decline with increasing development as the western countries did. Moreover, the growing population size and the bulk of young people caused worries, particularly in Europe, where a discussion about "the death of the West" has started. Thus, the demographic processes in the Middle East and North Africa call for a closer inspection of the recent levels and tends. Surprisingly, there is not much literature on these countries, leading us to compile essential descriptive findings.

In the present book, we evaluate the current state and recent demographic developments in the MENA countries by presenting comparable and recent data on changes since 1950 and on the current characteristics of the population in the 22 countries of the Arab League (Algeria, Bahrain, the Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, State of Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen) plus three neighboring countries (Israel, Turkey, and Iran) using databases of various United Nations agencies and the World Bank. We deliberately refrain from discussing population forecasts which, due to assumptions underlying to them, would be worth to be discussed separately.

In the first chapter, we provide a comprehensive demographic picture of the region by discussing various indicators jointly which yield additional insights in the demographic processes of the individual countries. In particular, we take the level and trends of fertility, mortality and natural increase into account. We analyze how migration processes contribute to annual population growth and investigate age structures as well as demographic dividends and demographic potentials. Our main findings are: (a) a natural increase in population in all countries; (b) an increase in fertility in three countries; (c) changing age structures that do not support the notions of a 'youth bulk' or population aging; (d) substantial migration but diverging patterns of refugee migration; (e) no guarantee of a demographic dividend; and (f) a heterogeneous picture in terms of the country-specific phases of demographic transition. Our findings underline that the MENA countries have to respond to demographic developments to benefit from both the demographic dividend and the population momentum by adapting their economic, social and political institutions.

In the second chapter, we take a closer look on the association of fertility and human development by analyzing various dimensions of development including wealth, health, education and gender equity. We present both cross-level associations for different points in time and time-series associations for the individual countries. We also apply fixed-effects models to investigate to what extent fertility can be explained net of unobserved country and time effects by various components of development. The results show that education, especially average years of female schooling and share of females with no education, and other non-economic components of development (i.e., health and gender equity) have a greater impact on fertility than economic progress. The negative association between the Human Development Index and fertility becomes J-shaped at higher levels of Human Development and reverses to positive. In the same way, the negative relationship between gender equity and fertility turns positive above a certain threshold. Similar to Western countries, some MENA countries with higher levels of development experienced a reversal on the fertility-development link, suggesting that other countries in the region will experience an increase in fertility, if the social and economic development continues. On the other hand, fertility declines in countries where the share of females with no education are relatively high may continue until reaching a certain level of development.

With this volume, we also aim at stimulating further research on the MENA countries. While we concentrated here on aggregated macro data from various international agencies, there is also – at least for some MENA countries – excellent micro data available both for cross-sectional and for longitudinal analysis. These data are not sufficiently known by the scientific community and thus underanalyzed. We hope for more research in the near future on the world's probably fastest growing region.

Bamberg, January 2018

Henriette Engelhardt

Chapter 1

Demographic Developments

1.1 Introduction

The demographic developments in the Middle East and North Africa (MENA) have previously been described as "peculiar" (Obermeyer 1992: 33) and "unique" (Omran 1980: 97). This is due to its differing nature with the concept of demographic transition which suggests a transition from high birth and death rates to lower birth and death rates leading to an accelerating population growth (Thompson 1929). This transition is expected to occur in every society experiencing modernization including educational, economic and social progress (Kirk 1996: 365).

There have basically been two succeeding streams of literature on the demographics in MENA countries. First, in the 1980s, demographers described the Arab Middle East as a region with poor demographic performance (Cleland and Wilson 1987; Fargues 1989). Unlike the negative relationship between fertility and development in Western countries, which has also been discussed within the framework of the "death of the West" (Coleman and Basten 2015), the association was weak and sometimes positive in the Arab region (Omran 1980: 97). Moreover, the overall declines in mortality lagged behind expectations based on levels of economic development (Caldwell 1986; Courbage 1999). Obermeyer (1992) counterargued that mortality fit well with models of demographic transition, although regional trends in fertility rates lagged behind economic development. Thus, demographers have disagreed on the timing of mortality decline, with some even suggesting that fertility declines have lagged behind improvements in the economy. In the last two decades, others claimed that birth and death rates declined, while educational facilities increased (Rashad 2000; Eltigani 2009; Casterline 2009; Courbage 2015; Loichinger et al. 2016); whereas, more recently, Courbage (2015) and Samari (2017) have documented increased fertility in Egypt and Algeria. Using comparative, as well as country-specific analysis, Groth and Souza-Poza (2012: 9) even summarized "that few stylized observations apply uniformly to Muslim countries, whose heterogeneity is enormous" and that the demographic developments resemble a jigsaw puzzle.

A second stream of literature has stressed the effect of declining fertility and mortality levels on the age-structure resulting in a youth bulk (Roudi-Fahimi and Kent 2007; Courbage 2015; Courbage and Puschmann 2015), population ageing (Rashad and Khadr 2002; Yount and Sibai 2009; Hussein and Ismail 2016), economic growth (Jones 2012; Loichinger et al. 2016), and migration (Fargues 2006, 2008). According to economic literature, the demographic transition can boost economic growth by increasing the size of the labor force (Bloom and Williamson 1998; Birdsall et al. 2001; Bloom et al. 2003). The positive effect the country-specific age structure has on economic performance should occur during the intermediate phase of the demographic transition. This "demographic dividend" or "bonus" has been assessed using age dependency ratios, as well as growth rates of working-age population (Jones 2012; Loichinger et al. 2016). Decreasing demographic support ratios and growth of the working-age population between 1990 and 2010 point to a demographic dividend in the MENA region (Jones 2012, Loichinger et al. 2016). Furthermore, age-structure not only affects economic growth, but also the future demographic potential of a country (Billeter 1954). Although this relation seems obvious, there is – according to our knowledge – no empirical evidence on this issue for the MENA countries.

Several years have passed since these two debates about the demographic transition (for an overview see Tabutin and Schoumaker 2005, 2012), and the demographic profiles of many Arab countries have changed. Previous findings, of which some are surprising from a western perspective, call for a closer inspection of the actual levels and trends of demographic processes, as well as of the demographic dividend and potential in the region. To evaluate the current state and recent demographic development in the MENA countries, we present comparable and recent data on changes since 1950, and on the current characteristics of the population in 25 countries using the databases of various United Nations agencies (Population Division, Statistics Division). We consciously resign from discussing forecasts due to the strong underlying assumptions (United Nations 2015b; Loichinger et al. 2016), but provide a comprehensive demographic picture of the region.

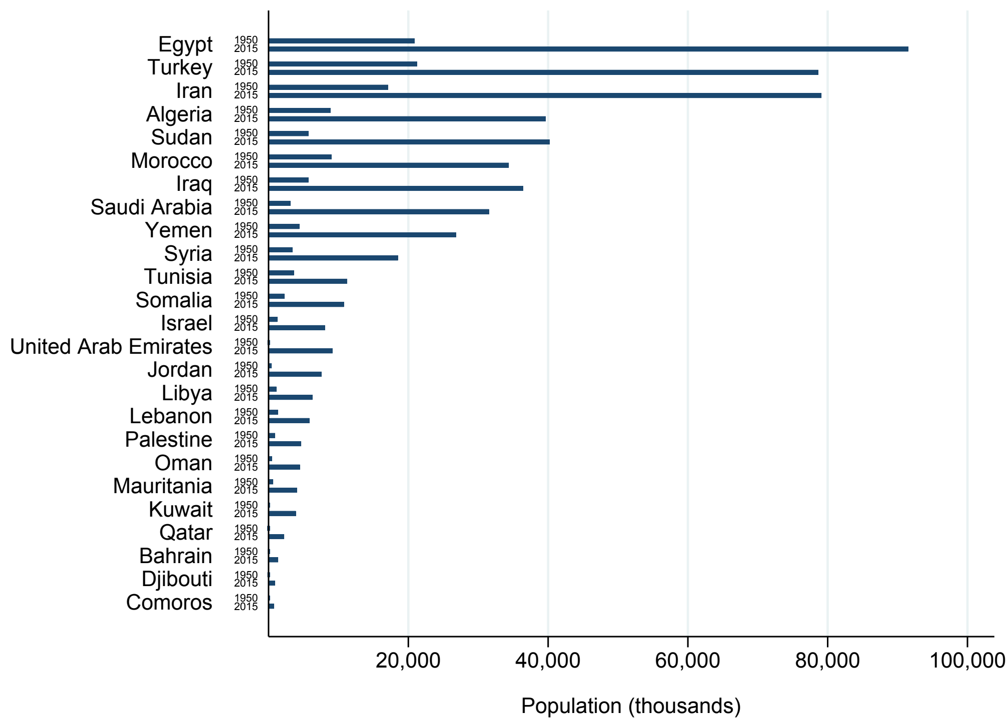
We discuss various indicators jointly which yield additional insights in the demographic processes and present self-calculated indicators to assess the demographic potential. In doing so, we add to the literature in five ways: first, we describe the socioeconomic and geographical context with indicators of gross domestic product, urbanization, and population density. Second, we consider the level and trends of crude fertility and mortality, and natural increase. Third, against this background, we analyze how migration processes have contributed to annual population growth since 1950. Fourth, we inspect fertility and mortality processes using more specific demographic indicators. Fifth, we discuss the level and trends of the resulting age structures, demographic dividends, and demographic potentials. We close with a discussion of the observed processes and identify issues that call for closer inspection in the near future.

1.2 The region

There have been several approaches to choose the countries for MENA region analyses (Tabutin and Schoumaker 2005, 2012; Casterline 2009; Crane et al. 2011; Courbage 2015; Loichinger et al. 2016). We use a broad definition of the MENA region and consider the 22 members of the "Arab League", plus three neighboring countries (Israel, Turkey, and Iran). We analyze each of these 25 countries separately. Additionally, we perform regional comparisons considering (1) the Arab least developed countries (Comoros, Djibouti, Mauritania, Somalia, Sudan, Yemen); (2) the countries of the Gulf Cooperation Council (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates); (3) the Mashreq countries (Egypt, Iraq, Jordan, Lebanon, Palestine, Syria); and (4) the Maghreb countries (Algeria, Libya, Morocco, Tunisia) (Loichinger et al. 2016: 1). As the neighboring countries Israel, Turkey, and Iran did not clearly fit into any of these groups, we dropped these three countries from the regional comparison. The regional demographic profiles are displayed in the Appendix.

Except for Israel, Islam is the dominant religion throughout the region. The 25 countries strongly differ regarding their economic and social conditions and are, moreover, culturally diverse, particularly because of numerous religious and ethnic minorities (Tabutin and Schoumaker 2005: 505). The demographic weight of these countries varies substantially (Figure 1.1, cf. Tabutin and Schoumaker 2005: 511). The region includes three countries with large populations, each with more than 70 million inhabitants (Egypt, Iran, Turkey). The region also includes

Figure 1.1: Demographic weight of the MENA countries in 1950 and 2015.

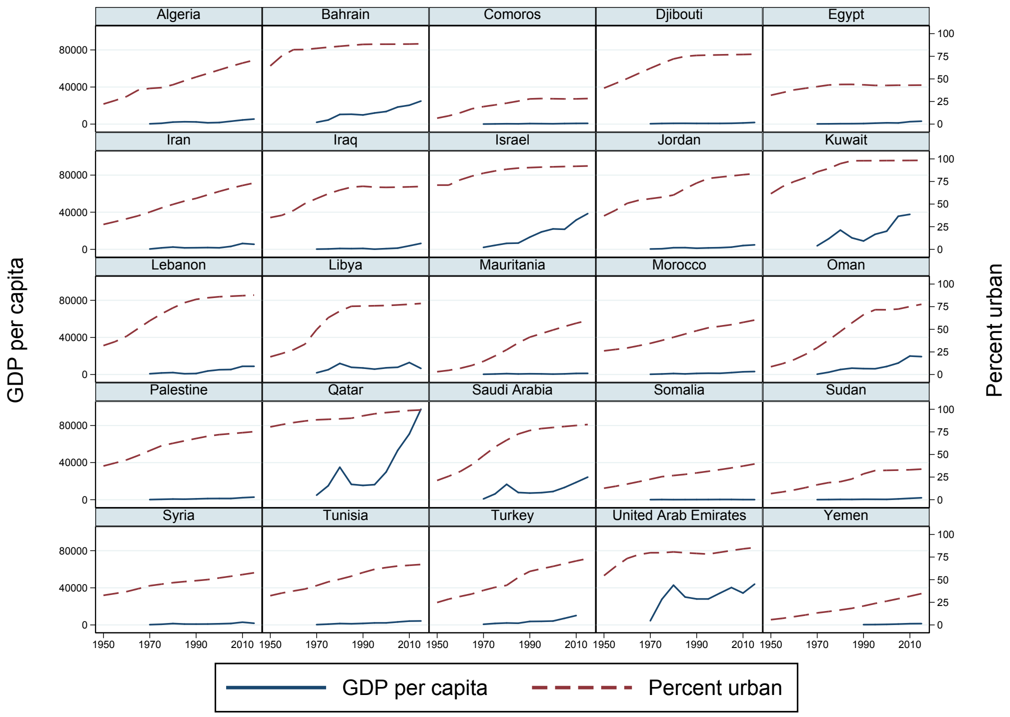


Data: United Nations (2015a).

two countries with less than one million inhabitants (Comoros, Djibouti), and two countries with less than two million inhabitants (Bahrain, Qatar). In sum, the MENA region was home to 1,279 million people, with a population of 224 million in North Africa. For comparison, in 2015 the United States had 322 million and Western Europe 445 million inhabitants (Figure A1). However, the Arab world has grown rapidly over the past decades. In 1950, only 66 million people were living in the region, whereas by 2015, the population was nearly twenty times that size. On the level of single countries, Qatar and the United Arab Emirates experienced huge increases of their population over the last 60 years. In Tunisia, Turkey, and Morocco, the population increased by factors between 3 and 4 over this period. This makes the region the second-fastest growing in the world over that period, lagging only behind Sub-Saharan Africa.

The 25 countries of the MENA region have also extremely contrasting geographical features in terms of surface areas and population densities (Tabutin and Schoumaker 2005: 510). Their land areas range from 6,220 square kilometers in Palestine to almost 2.4 million square kilometers in Algeria. In many coun-

Figure 1.2: GDP per capita at current prices in US Dollars and share of urban population, 1950–2014.

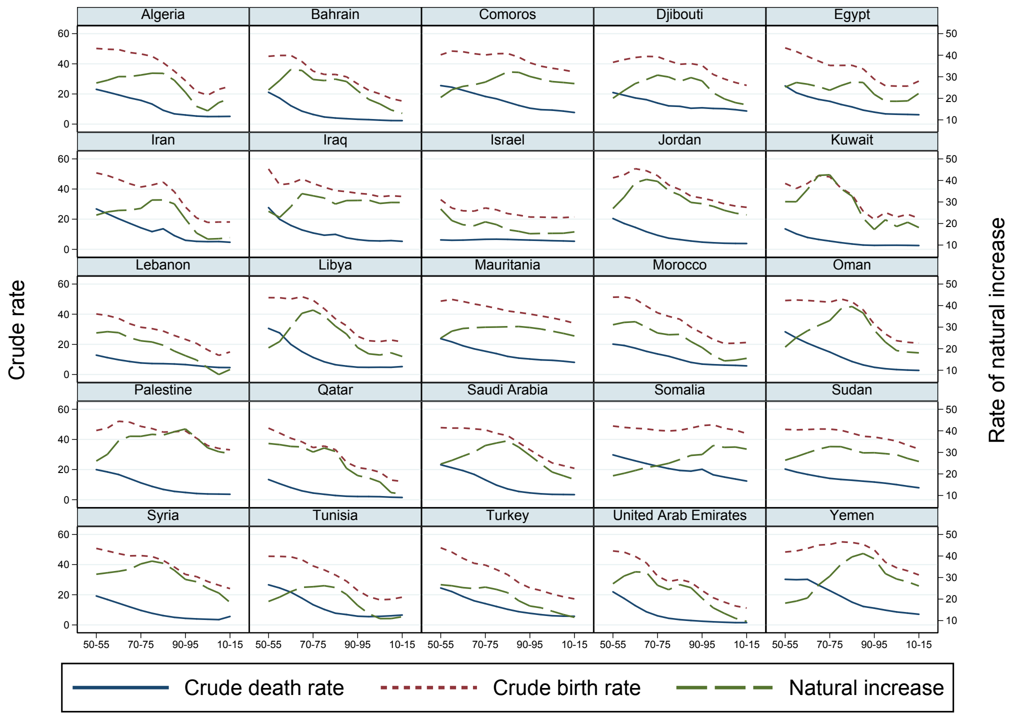


Data: United Nations (2014, 2016).

tries, vast regions are covered by deserts and steppes, and population is mainly distributed in the coastal zones (Mediterranean, Red Sea, Persian Gulf), or along rivers (e.g., Nile, Tigrus, Euphrates). Thus, crude densities of population (inhabitants per square kilometers) as reported by the United Nations Population Division (2015a) – ranging from 3.6, 14.5 and 14.7 inhabitants per square kilometer in Libya, Oman, and Algeria, respectively, to 373 in Israel 572 in Lebanon, 765 in Palestine and 1,812 in Bahrain – may not elicit the real crowding of the population. Moreover, they are poor indicators of the relationship between agricultural resources and population (Mathieu and Tabutin 1996). Very different pictures emerge when looking at the population densities based on arable and permanent crop land areas (Tabutin and Schoumaker 2005: 511).

Alternatively, the share of urban population as reported by the United Nations Population Division can be considered. Note that these numbers are based on country-specific definitions of cities. Bahrain, for instance, defines agglomerations with more than 2,500 inhabitations as cities, whereas Lebanon takes 5,000

Figure 1.3: Crude death and birth rates and rates of natural increase (per 1,000 population), 1950-55 to 2010-15.



Data: United Nations (2015a).

inhabitants as a threshold for urban population (UN 2014: Sources for Urban Population). As shown in Figure 1.2, the share of urban population increased remarkably in all MENA countries. In 2014, the majority of the population in many of these countries lived in cities. In Lebanon, Jordan, Bahrain, and in the United Arab Emirates, up to 80% of inhabitants lived in cities. In Qatar, Kuwait, and Israel, only 10% of the population was residing in rural areas. In Western Europe and in the United States, about 80% of the population were living in urban areas in 2014 (Figure A2).

1.3 Demographic transition

Figure 1.3 shows the mortality and fertility patterns for the 25 countries from 1950-55 to 2010-15 based on crude death rates and crude birth rates per 1,000 inhabitants. As the model of demographic transition suggests, the entire region experienced a decline in mortality in the 1950s and 1960s. The initially very high mortality, ranking between 30,592 in Libya and 6,261 in Israel, fell to values ranging from 12,386 in Somalia to 1,489 in Qatar. In 2015, the crude death rates of Western Europe and the United States were 9,699 and 8,238, respectively.

Birth rates, also initially very high, ranging between 53,321 in Iraq and 32,976 in Israel, decreased much more slowly until the 1980s. The birth rate then started to fall more quickly, while mortality levelled off. In the period 2010-15, crude birth rates varied between 43,912 in Somalia and 11,199 in the United Arab Emirates. Most interestingly, crude birth rates suggest an increase in fertility in Algeria, Egypt, and the Lebanon since 2010, when the “Arab Spring” occurred in these countries. In 2015, the crude birth rates of Western Europe and the United States were 10,218 and 12,601, respectively (Figure A3).

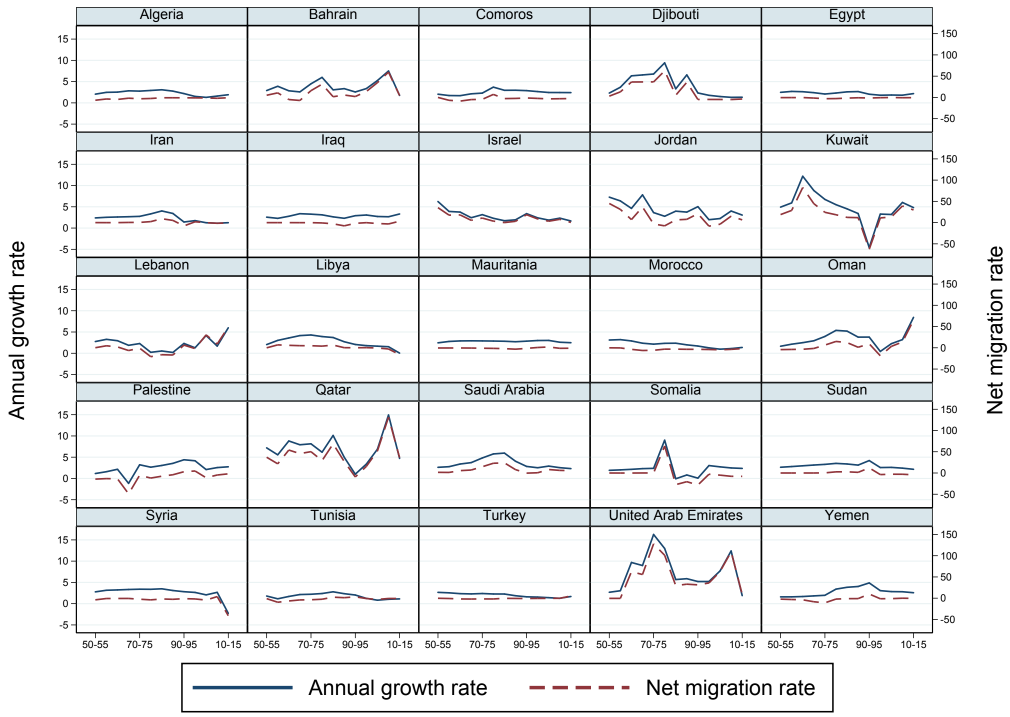
Although reported regularly in studies on the demographic transition, the crude birth rate, as well as the crude death rate, gives only a vague hint on the pace of fertility and mortality in a country. This is because it depends strongly on the country-specific age structure, as well as on the country- and age-specific mortality rates. Therefore, we inspect the fertility and mortality per country in more detail based on more specific demographic indicators.

The different patterns of onset and speed of decline in mortality and fertility yield differences in the shape of the demographic transition. Tabutin and Schoumaker (2005: 521f., 2012: 2) have grouped countries according to their latest birth and growth rates and labeled these patterns as ‘traditional’, ‘classical’, or ‘advanced’. However, the heterogeneous patterns found in Figure 1.3 do not support such classifications in a longitudinal perspective and only a few countries indeed show similar patterns (e.g., Mauretania and Sudan, or Libya and Oman).

1.4 Population growth and international migration

The annual rate of population growth between two points in time – conventionally expressed in percentage units per year (United Nations 1983) – is calculated as an exponential rate of growth. Obviously, in almost all countries the annual growth rate does not follow the shape of the natural population growth. As Figure 1.4 shows, the shape of annual population growth is closely linked to the rate of net migration (defined as difference between in and out migration per 1,000 population). The estimates of net international migration are calculated as the difference between overall population growth and natural increase (United Nations 2015b);

Figure 1.4: Annual growth rate and net migration rate (per 1,000 population), 1950-55 to 2010-15.



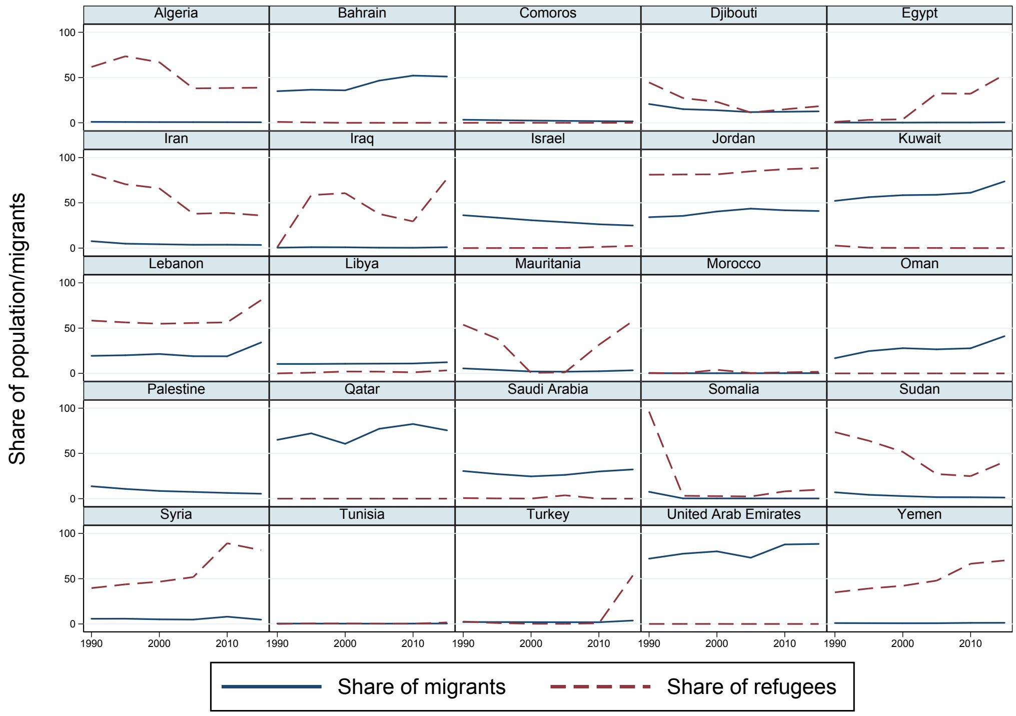
Data: United Nations (2015a).

it is not possible to calculate net migration from counts of in- and out-migration with the existing country-specific data.

Compared to Western Europe and the US, the annual growth rate in all four MENA regions is considerably higher (Figure A4). In the region of the Gulf Cooperation Council, the annual growth rate declined sharply from 1970-75 to 1990-95, increased till 2005-10 and decreased sharply thereafter. This increase and decline is closely linked to the flow of migrants, in particular labor migrants, generated by a strong demand for labor due to the oil boom in the 1970s. The increase of the annual growth rate in the least developed Arab countries is driven by the influx of refugees at the beginning of the 1970s.

In the literature, the Maghreb- and Mashreq-countries apart from Jordan are regarded as sending areas, the Gulf States are looked upon as net-receivers (Puschmann and Matthijs 2015: 130). Thus, in Jordan, Kuwait, Oman, Saudi Arabia, Qatar, and the United Arab Emirates, immigration would reinforce annual population growth, while in Algeria, Morocco, Tunisia, Libya, Egypt, Syria, Lebanon, Pales-

Figure 1.5: International migrant stock as a percentage of the total population and refugees as percentage of international migrant stock, 1990 to 2015.



Data: United Nations (2015c).

tine, and Iraq, emigration would temper annual population growth. However, this assessment in the literature is not supported by Figure 1.4.

Economic and political situations strongly shape country-specific net migration rates. For example, the Lebanese Civil War (1975-90) produced a high increase in the annual flow of Lebanese emigrants; the Iranian Revolution in 1979 resulted in a large wave of emigration; and the Iraqi invasion of Kuwait and the ensuing first Gulf War (1980-88) were responsible for the expulsion of temporary migrants working in Iraq and the Gulf States. In the end, net migration in the MENA region is similar to net migration in the US and Western Europe, while annual growth is considerably higher.

Figure 1.5 shows data on international migrant stock as a percentage of the total population (measuring the number of foreign-born population in a country at a particular point in time) and refugees as a percentage of international migrant stock. In 2015, 34.5 million international migrants, including refugees, were residing in the MENA region (International Organization for Migration 2016). The destinations with most international migrants in the MENA region are Saudi Arabia, the United Arab Emirates, Jordan, Kuwait, and Lebanon in descending order. Nearly three quarters (74%) of international migrants reside in the countries of the Gulf Cooperation Council. This includes over 10 million in Saudi Arabia and 8 million in the United Arab Emirates, which together host over 50% of all international migrants in the MENA region.

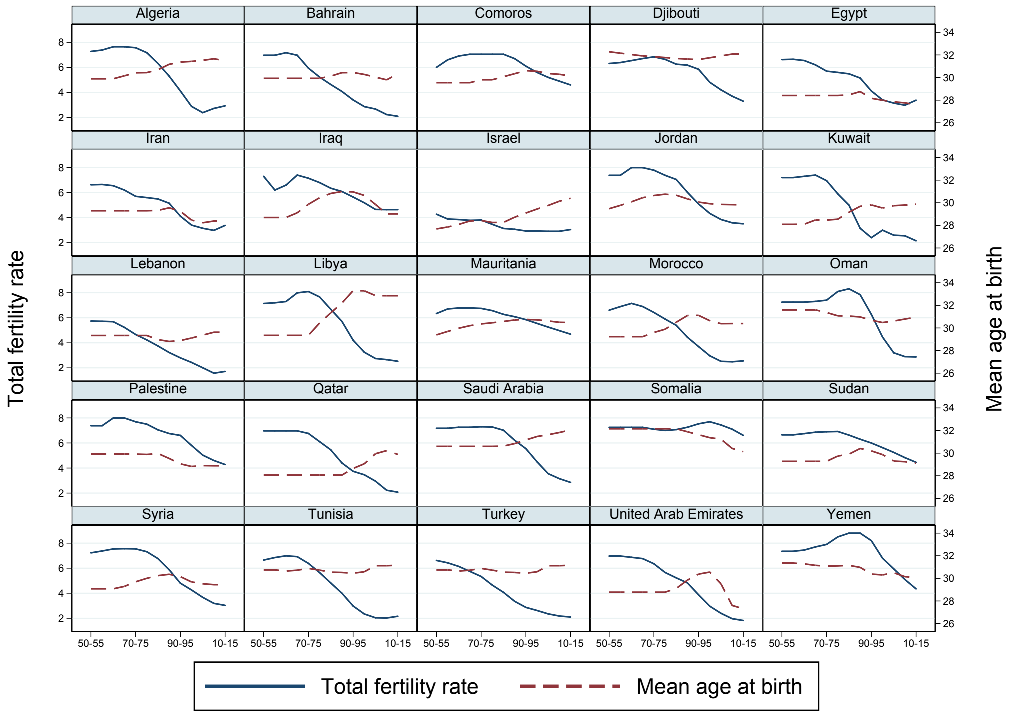
Compared to Western Europe and the US, the stock of international migrants in the Gulf Cooperation countries is considerably higher (Figure A5). The highest share of migrants is in the United Arab Emirates with 88.4% of all inhabitants being migrants in 2015 (Figure 1.5). Despite the sizeable share of migrants, the share of refugees as a percentage of international migrant stock in the individual countries of the Gulf Cooperation countries amounts to zero (Figure 1.5). The MENA countries with lower stocks of international migrants obviously have a higher percentage of refugees. In particular Lebanon, with a share of international migrants among a total population of 34.1 percent, has a particularly high percentage of refugees (80.1 percent).

1.5 Fertility

In the Arab League, the average number of children per woman has declined markedly since 1950. For example, total fertility in Northern Africa declined by 3.47 children per women (from 6.74 in 1950-55 to 3.27 in 2010-15). However, fertility across the region is considerably heterogeneous. The United Arab Emirates experienced the sharpest decline: fertility fell by 5.15 children, from 6.97 in 1960-55 to 1.82 children per woman in 2010-15 (Figure 1.6). Kuwait's fertility decline was similar, falling from 7.20 children in 1950-55 to 2.15 children in 2010-15. As in the United Arab Emirates and Kuwait, fertility declined by more than 50% in Algeria, Bahrain, Jordan, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, and Turkey during this period.

In some of these countries, however, the pace of fertility decline has stagnated. In three countries, Egypt, Syria, and Jordan, fertility remains at three or four children per women. In four countries, fertility is already close to replacement (Bahrain, Kuwait, Tunisia, Turkey) and in two countries below replacement level (Lebanon, United Arab Emirates). Not all the countries have experienced sharp declines in fertility. In seven countries, fertility remains above 4 children

Figure 1.6: Total fertility and mean age at birth, 1950-55 to 2010-15.



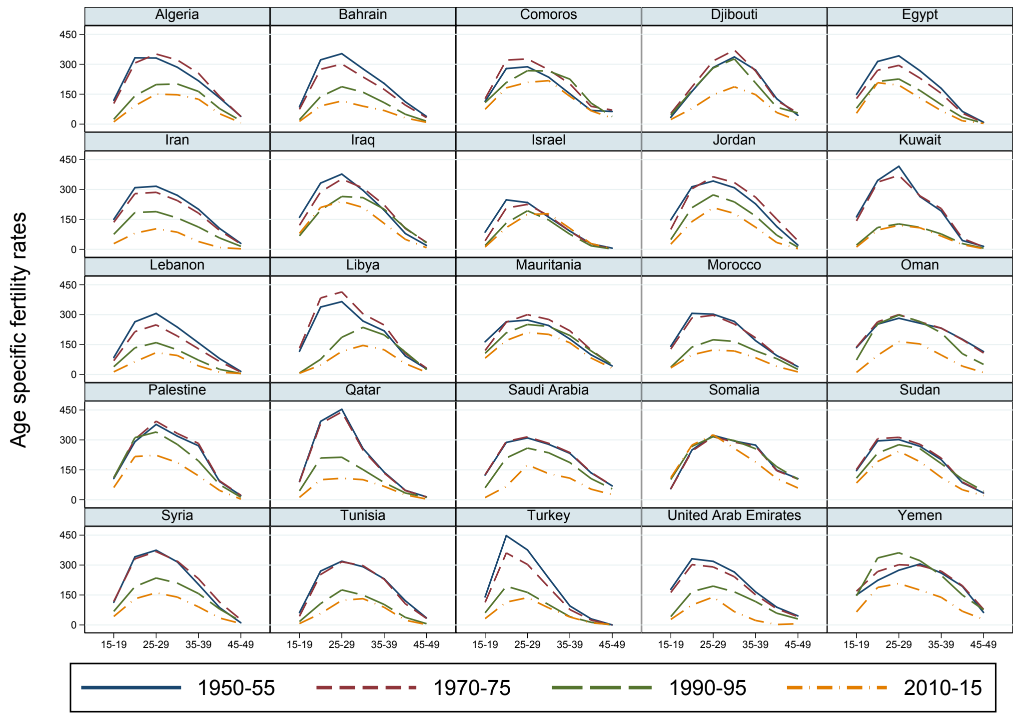
Data: United Nations (2015a).

per women. Somalia, with a total fertility of 6.61 children, has the highest total fertility in the region. On average, the total fertility rates of the MENA region are still higher than in Western Europe (1.66) and in the US (1.89).

The sharp decline in fertility in many of the MENA countries has been attributed to several factors, including the rising age at marriage for women and men, delayed childbearing (see Figure 1.6), increased availability and use of modern contraceptive methods, higher levels of female education, increased female labor force participation, improved status of women, and urbanization (Mirkin 2010: 13f.).

However, the trend of the age-specific fertility rates shows that the decline in total fertility is caused mainly by a change in the quantum of fertility at all ages, rather than a change in the tempo of fertility (Figure 1.7). Delayed child-bearing is only the case for selected countries during the years 2010-15 (e.g., Algeria, Saudi Arabia, Tunisia, Turkey, and the United Arab Emirates). Thus, a change of fertility in MENA countries is very different from the patterns of change in Western Europe and in the US (Figure A7), which show quantum and tempo effects of fer-

Figure 1.7: Age-specific fertility rates (births per 1,000 women), 1950-55 to 2010-15.



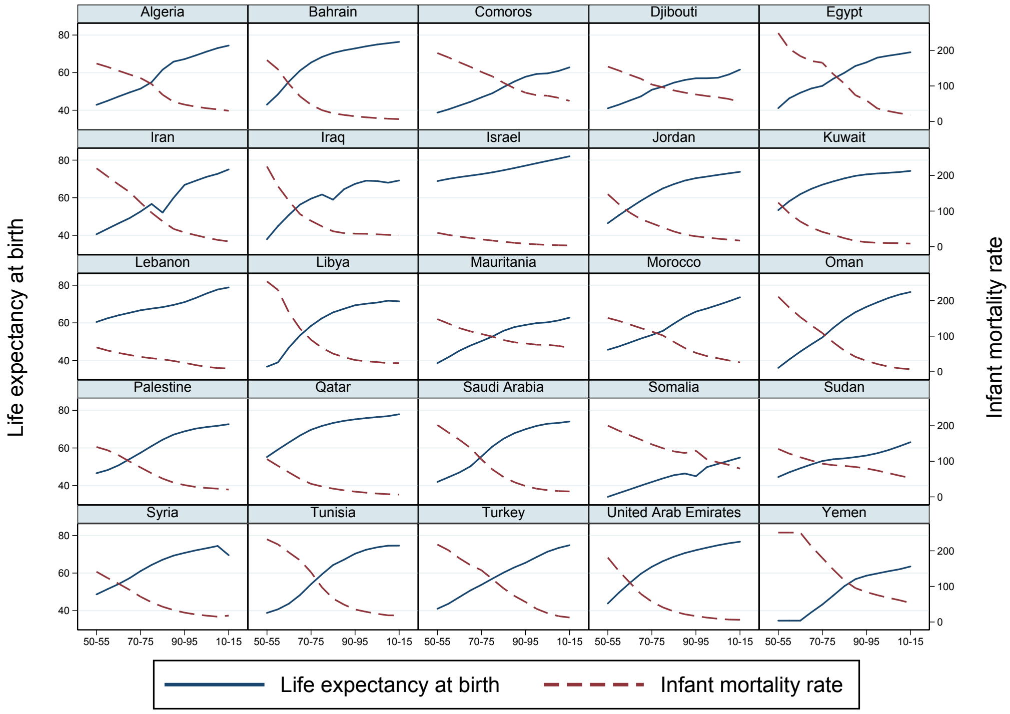
Data: United Nations (2015a).

tility similar to Libya: a decline in the level of fertility at all ages and postponed childbearing to higher ages.

1.6 Mortality

Throughout our observation period, considerable advances in life expectancy at birth have emerged in the MENA countries (Figure 1.8). In 1950-55, 8 of 25 countries had life expectancies below 40 years at birth. In 12 of the 25 countries, life expectancies at birth ranged from 40 to 49 years, and in only 3 countries life expectancies at birth reached 50-59 years. By 2010-15, life expectancies had dramatically shifted upwards across all MENA countries, so that only 4 countries had life expectancies of less than 60 years. The majority of these countries had life expectancies between 70 and 79 years. In Western Europe and the United States, life expectancy at birth was at about 81 and 79 years, respectively, in 2015.

Figure 1.8: Life expectancy at birth and infant mortality rate (both sexes combined per 1,000 live births), 1950-55 to 2010-15.

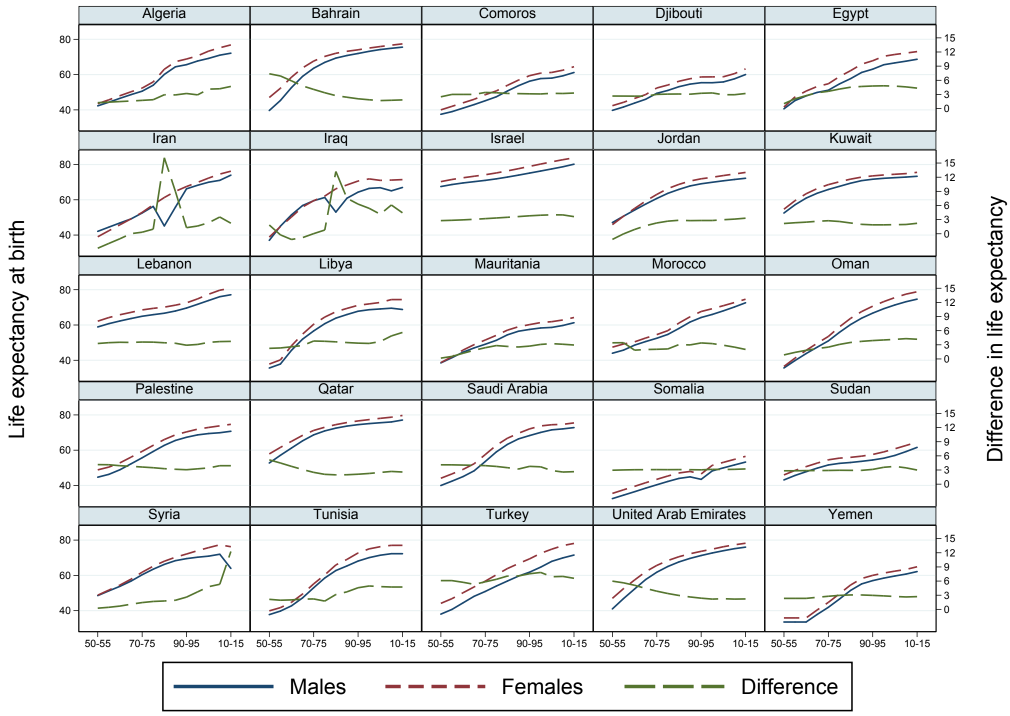


Data: United Nations (2015a).

The advances in life expectancy at birth during the last decades is mainly due to the improvement of life expectancy at higher ages, whereas at the beginning of the 1950s, infant mortality still was part of life. As Figure 1.8 shows, infant mortality (i.e., infant deaths per 1,000 live births) decreased considerably during the last decades. In 2010-15, Comoros, Djibouti, Somalia, Sudan, and Yemen had infant mortality rates between 79 and 50, while all other MENA countries ranged well below 50 cases. In Western Europe and the United States, the infant mortality rate was at 3 and 6, respectively, in 2015 (Figure A8).

Concerning the male and female differences in life expectancy, the MENA countries show the well-known gender gap with male excess mortality (Figure 1.9). However, while in many Western countries the gender gap has narrowed over time (Luy and Gast 2014), this seems only the case for Bahrain, the United Arab Emirates, and to a smaller extent to Qatar and Saudi Arabia. In Bahrain, the difference in life expectancy at birth in 2010-15 was 1.84 years, while it was 7.38 years in 1950-55. In the United Arab Emirates, the difference decreased from 5.99

Figure 1.9: Male and female life expectancy at birth, 1950-55 to 2010-15.



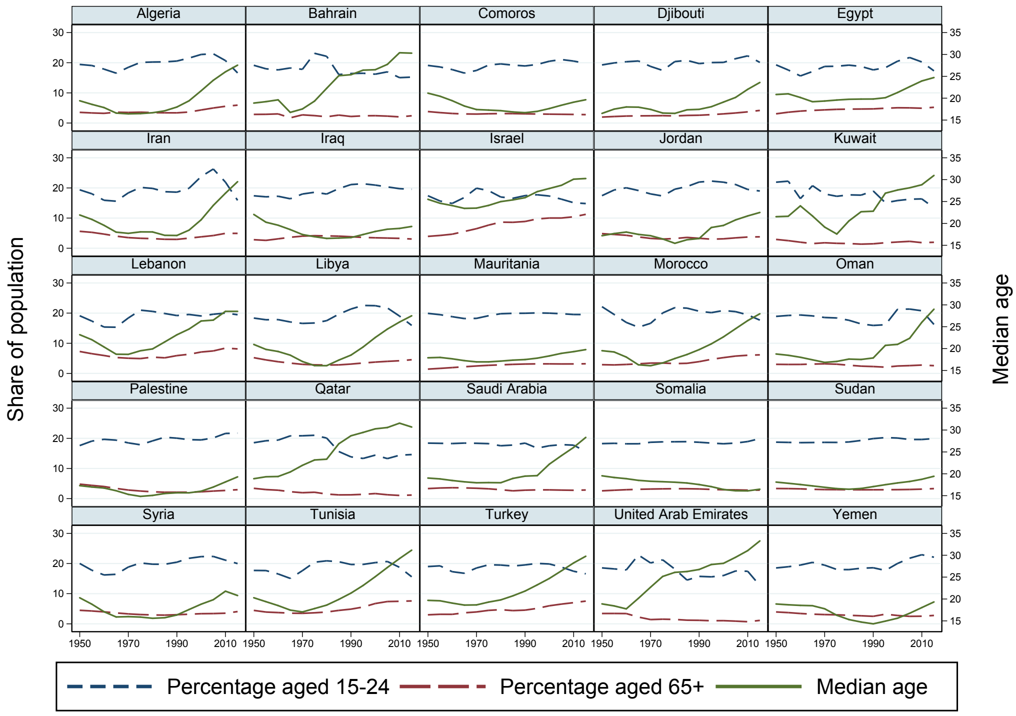
Data: United Nations (2015a).

to 2.21 years during the same period. In a minority of MENA countries, the gender gap in life expectancy remained constant over time, whereas the difference in longevity increased in many others, suggesting that women gained more from medical progress compared to men. In Western Europe and in the United States, the difference in life expectancy at birth was about five years to the advantage of women in 2015 (Figure A9). Most interestingly, the difference in life expectancy in all MENA regions except the Mashreq suggests less gender specific mortality compared to Western Europe and the United States.

1.7 Age structure and demographic dividend/potential

Over the course of the demographic transition, declines in fertility and mortality cause important changes in a population's age composition. In general, countries in the early stages of the transition have a younger age structure than countries in the later stages.

Figure 1.10: Median age, share of population age 15 to 24 and 65+, 1950 to 2015.

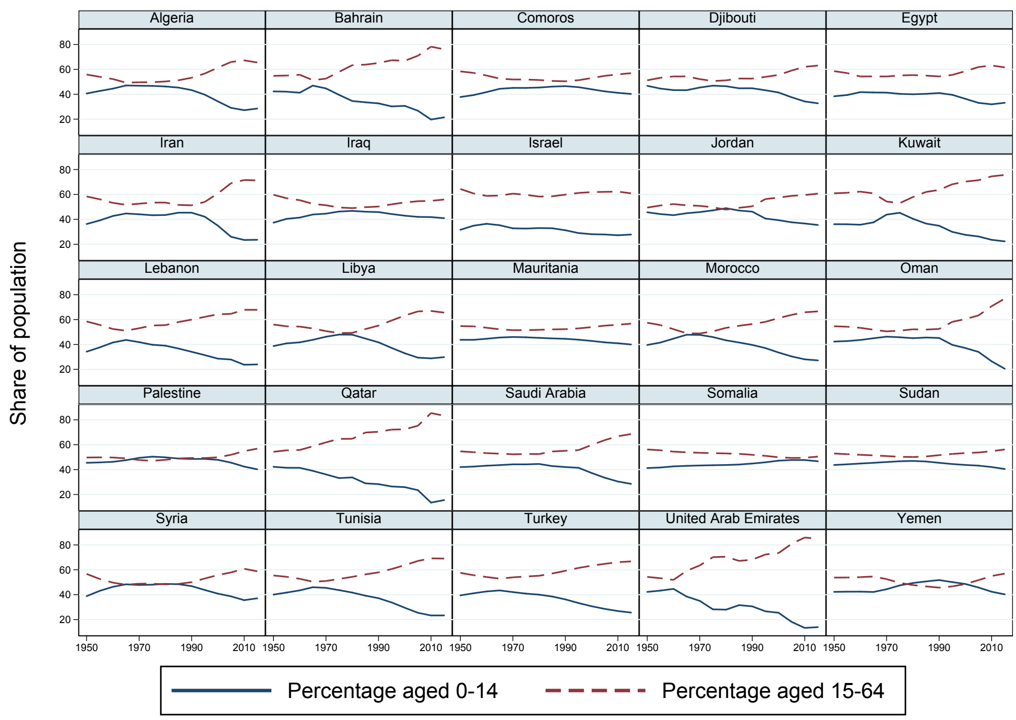


Data: United Nations (2015a).

As can be seen in Figure 1.10, most MENA countries have J-shaped median age throughout the period of investigation. The countries, though, differ with respect to the reversal of the trend. Although it was earlier in Bahrain, Lebanon, Morocco, Qatar, and the United Arab Emirates, it was quite late in Algeria, Iran, Iraq, Jordan, Libya, Saudi Arabia, and Yemen. In the year 2015, the median age ranged between 16.5 in Somalia and 30.7 in Qatar. This is quite young compared to the median age of 43.7 years in Western Europe, or 38.0 years in the United States in 2015 (Figure A10).

Despite the increase in median age, population ageing measured by share of population aged 65+ can only be observed for Algeria, Egypt, Israel, Lebanon, Tunisia, and Turkey (Figure 1.10). However, the increase in median age is closely linked to a declining share of the population under age 15 in most MENA countries (Figure 1.11). Exceptions to this pattern are Comoros, Djibouti, Israel, Mauretania, Somalia, and Sudan, where there is no visible clear downward trend in the share of younger population.

Figure 1.11: Share of population under age 15 and 15 to 64, 1950 to 2015.



Data: United Nations (2015a).

The share of the working age population is usually used as a measure of the demographic dividend. Figure 1.11 shows that in all MENA countries the share mirrors inverted the share of children under age 15. In most countries, we clearly observe an increasing share of the working-age population and a decreasing share of the young population. This trend is particularly pronounced in Kuwait, Lebanon, Oman, Qatar, and the United Arab Emirates. In countries such as Algeria, Bahrain, Egypt, Libya, and Tunisia, the increase has leveled off in recent years. Somalia is the only country in which the working-age population is decreasing slightly, and in Israel, the population aged 15-64 has been rather stable over the last decades.

The share of the 15 to 24 years old in relation to the total population (or to the population aged 25 to 64 years) is usually used as the measure of the youth-bulge. Figure 1.10 clearly shows that the youth bulge already belongs to the past in most MENA countries. For instance, Lebanon reached its maximum in 1976, Saudi Arabia in 1999, Libya and Morocco in 2000, Algeria in 2004, Egypt and Iran in 2005. Only Palestine, Somalia, Sudan, and Mauritania have shown a sustained youth-bulk for many decades.

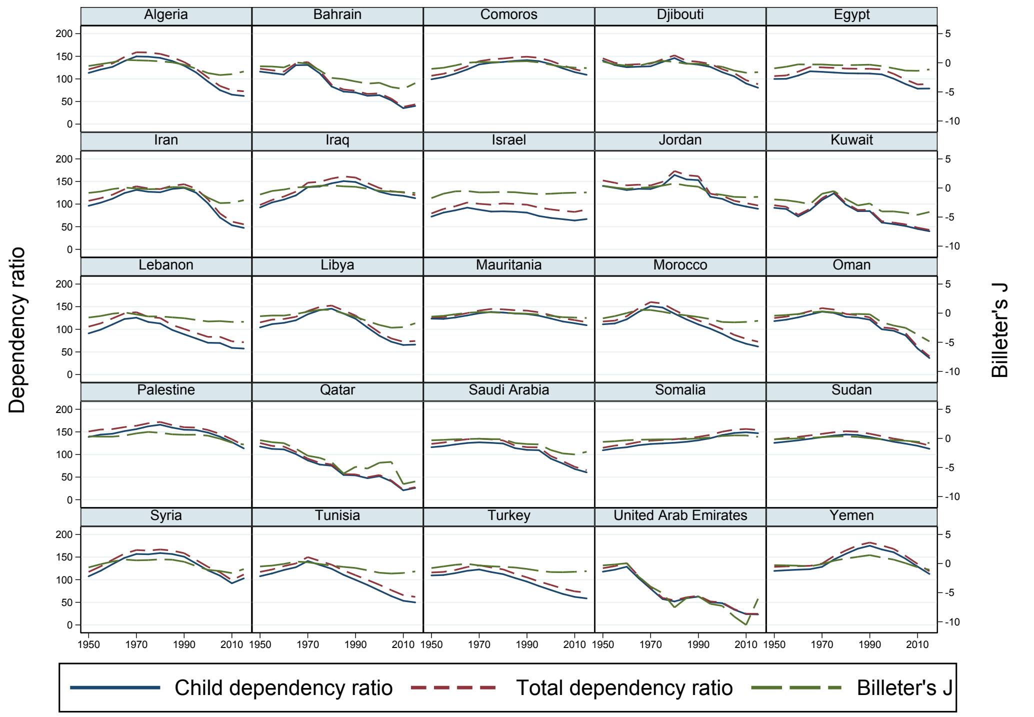
A changing age distribution has significant social and economic consequences, such as the allocation of education, healthcare, and social security resources to the young and old (Bongaarts 2009). Assessments of this impact often rely on the so-called total age-dependency ratio which summarizes key changes in the age structure. In this study, the total age-dependency ratio at a given point in time equals the ratio of population aged below 20 and over 64 to the population of age 20-64. This ratio aims to measure how many "dependents" there are for each person in the "productive" age group. Obviously, not every person below 20 and over 64 is a dependent, and not every person between ages 20 and 65 is productive. Despite its crudeness, this indicator is widely used to document broad trends in the age composition. Additionally, the young-age dependency ratio (the ratio of population aged below 20 to the population of age 20-64), or the old-age dependency ratio (the ratio of population aged over 65 to the population of age 20-64) can be considered.

Over the course of a demographic transition, the total age-dependency ratio is supposed to show a characteristic pattern of change. Figure 1.12 presents this pattern as observed in the MENA countries from 1950 to 2015. Early in the transition, the age-dependency ratio typically rises slightly, as improvements in survival chances of children raise the number of young people. Following this, the age-dependency ratio falls sharply, as declines in fertility reduce the proportion of the population under age 15. This decline has important economic consequences because it creates a so-called demographic dividend, which boosts economic growth by increasing the size of the labor force relative to dependents and by stimulating savings (Birdsall et al. 2001). In Western countries that are at the end of the transition, the age-dependency ratio finally increases again, as the proportion of the population over age 65 rises. This is not yet the case in the MENA countries.

Figure 1.12 additionally plots the young age dependency ratio from 1950 to 2015. Most interestingly, it follows almost the same pattern with the total age-dependency ratio. Even though forecasts by the United Nations Population Division (2015b) expect population aging for the MENA countries, albeit to a lower degree than in the western world, ageing does not seem a major problem for the MENA countries until now.

Finally, Figure 1.12 plots Billeter's J (Billeter 1954) for the 25 MENA countries. This indicator divides the difference of the population aged under 15 and over 50 (under and over reproductive age) by the population aged between 15 and under 50 (reproductive age). Billeter's J follows the country-specific patterns of the child

Figure 1.12: Child dependency and total dependency ratio and Billeter's J, 1950 to 2015.



Data: United Nations (2015a).

dependency and total dependency ratio. Most interestingly, in all countries except Somalia, there is negative demographic potential in the year 2015. In Bahrain, Kuwait, Qatar, and the United Arab Emirates, this trend of a negative demographic potential already started in the 1970s. For many countries, though, the number of persons under a reproductive age more or less equals the number of persons above a reproductive age until 1990 (Egypt, Iran, Joran, Libya, Morocco, Oman, Syria, Tunisia). The negative values of Billeter's J in all MENA countries in 2015 clearly oppose the continuously increasing shares of persons of a reproductive age and suggesting an end of population growth in MENA countries due to a declining demographic potential.

1.8 Discussion

In recent years there has been a growing interest in the demographic developments in the Middle East and North Africa. Against the background of earlier discussions about poor demographic performance of this region or the demographic transition model, we provided recent data on demographical change in MENA countries. By rearranging standard indicators and adding self-calculated measures of demographic development, we highlight five important aspects which call for closer inspection in the recent future.

First, as suggested by the model of demographic transition, we find a decline in fertility and mortality in the MENA countries. The observed patterns (i.e., time of onset and speed of decline) are very heterogeneous across the countries and do not strictly follow the transition model. In all countries under investigation we can still observe a natural increase in population. This increase in population, however, is declining in all countries; exceptions are Algeria, Egypt, Iraq, and Israel. Moreover, the annual growth of the population is strongly linked to the net migration in all MENA countries. This result stresses the important role of migration for further population growth – a point which can be addressed in population projections only with strong assumptions.

Second, the age-specific fertility patterns suggest that the decline in fertility in most countries is due to a decline in the quantum of fertility rather than in the timing of fertility. Nevertheless, it is interesting to observe an increase in fertility in Algeria, Egypt, and Lebanon in recent years. Whether this increase is due to early births (tempo effect), or will result in an increase in completed fertility (quantum effect), is a topic for future research. Another surprising finding is the increasing difference between male and female life expectancy which also calls for further investigation.

Third, the demographic transition from high fertility and low life expectancy to low fertility and high life expectancy results in changing age structures. Previous literature has strongly emphasized the importance of youth bulk and population ageing (Roudi-Fahimi and Kent 2007; Courbage 2015). According to the concept coined by political scientists (Fuller 1995; Goldstone 1991), "an excess of young adult males in a population leads to social unrest, war and terrorism, as 'third and fourth sons' (within the same family) find nor prestigious positions in their existing societies. Therefore, these 'lost sons' rationalize their impetus to compete with religion a political ideology" (Courbage and Puschmann 2015: 213). Contrary to this literature, we do not find a youth bulk in the MENA countries with the latest available data. Furthermore, our finding is supported by the decrease in child dependency in all countries apart from Somalia. While the median age is increasing in all countries, except Somalia, population ageing in terms of an increased share of population aged 65+ is not an issue yet for most MENA countries, except Israel.

Fourth, the changing age-structure suggests, but does not guarantee, a demographic dividend. Nevertheless, a demographic dividend does not conform economic development on its own. To reap the benefits and to capitalize on the growing pool of potential workers, MENA countries will have to adapt their economic, social, and political institutions. "Educational systems, labor markets, housing supply, and health systems will need to expand and adapt to meet the needs of young people and the countries' economies. A demographic bonus can only occur when a large young population is healthy, educated, trained, and ready to be absorbed into a market economy" (Roudi-Fahimi and Kent 2007: 16). Thus, to reap the demographic dividend, sufficient jobs, a skilled labor force, housing and health care is required. Without such investments, the demographic bonus will not be realized, or could even become a burden when an increasing working-age population cannot gain access to productive employment (Khadr 2012: 139). In other words: "Without the right policy environment, countries will be too slow to adapt to their changing age structure and, at best, will miss an opportunity to secure high growth. At worst, where an increase in the working-age population is not matched by increased job opportunities, they will face costly penalties, such as rising unemployment and perhaps also higher crime rates and political instability" (Bloom et al. 2007: 4). Moreover, increased emigration processes and "brain drain" will be likely (Winkler 2009).

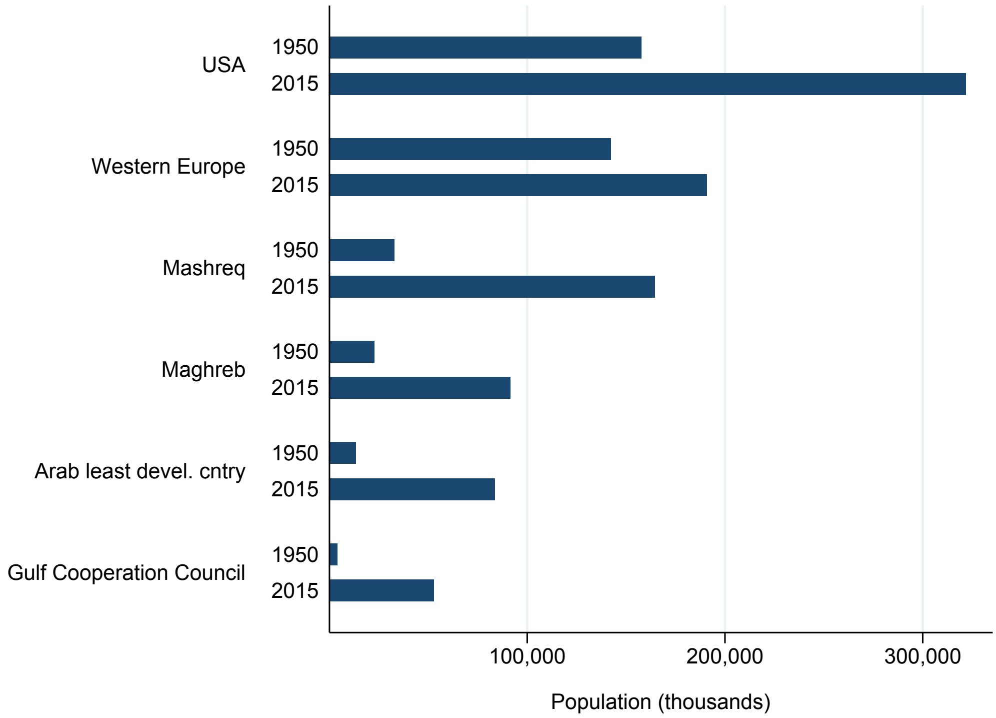
Fifth, as has been shown, the MENA countries are in different phases in the process of demographic transition. At the end of the demographic transition – when fertility levels-off at replacement level, and mortality stops declining – natural population growth reaches zero. Therefore, the age structure needs to be adjusted to the post-transitional levels of fertility and mortality (Bongaarts 2009). This adjustment is a slow process and takes many decades to complete. Thus, in cases of relatively young populations, population growth continues for many years after replacement fertility is reached. This tendency is referred to as population momentum (Bongaarts and Bulatao 1999). The population momentum inherent in the age structure at a certain point in time can be estimated using a population projection. Therefore, future fertility must be set to the replacement level, while mortality is held constant and migration is assumed to be zero. To our knowledge, estimations of the population momentum for MENA countries are not available, but would add to our understanding of future demographic developments in the region.

Sixth, we observed substantial migration in the MENA countries. In all countries the annual growth rate is closely connected to net migration. This result might be partially caused by the estimation of net migration as the difference between population growth and natural increase in most countries (United Nations 2015b). Country specific data on international migrant stocks at any particular point in time show that the MENA countries with the highest share of migrants are those with zero refugees. It should be noted that the interpretation of the international migration data becomes more complicated when looking at country-specific definitions: "When does a visitor become a shortterm migrant, and when does a short term migrant become a long-term migrant? When does a temporary migrant become a permanent immigrant? When does a migrant become a national?" (Johansson de Silva and Silva-Jáuregui 2004: 5). Questions such as these, as well as the inconvenient situation of available migrant-flow data, make it difficult to assess the issue of migrations (with-)in the MENA regions. However, there is plausible evidence of migration triggers in the MENA countries (e.g., Fargues 2008), such as the 'demographic gift' of sharply declining birth rates, which creates intertemporal benefits for those who do not have to support future generations, lacking labor-market opportunities, or environmental conditions. Together, this evidence outlines the actual situations, though they are hardly testable with existing data (a shortcoming that researchers normally admit).

Finally, we need to comment on the data of our analysis. We have used the most recent data from different United Nations agencies for each of the presented indicators. This data is sourced from censuses, sample surveys, national estimates based on population register data, or estimates based on census or survey data (United Nations 2015a). The survey data include survey programs, such as the Demographic and Health Surveys (DHS), Multiple Cluster Surveys (MICS), Reproductive Health Surveys (RHS), Pan-Arab Project for Child Development Surveys (PAPCHILD), Pan-Arab Project for Family Health Survey (FAPFAM), as well as other national surveys. It should be clearly noted that an indicator for one country could be based on census data, while for another country the same indicator is calculated from survey data. For instance, total fertility is based on annual birth registers for Bahrain, Qatar and Kuwait, while it is based on DHS data from different years for Comoros. For other countries, such as Egypt, Iran, Iraq, Oman, total fertility is based on a mixture of different sources. These different sources of data apply to each one of our indicators. Thus, the country comparisons are all based on the assumption of internal and external validity of all indicators, as are all other studies using this kind of international comparative macro data. Evaluating this assumption is far beyond the scope of our paper; nevertheless it should be kept in mind when concluding on our results.

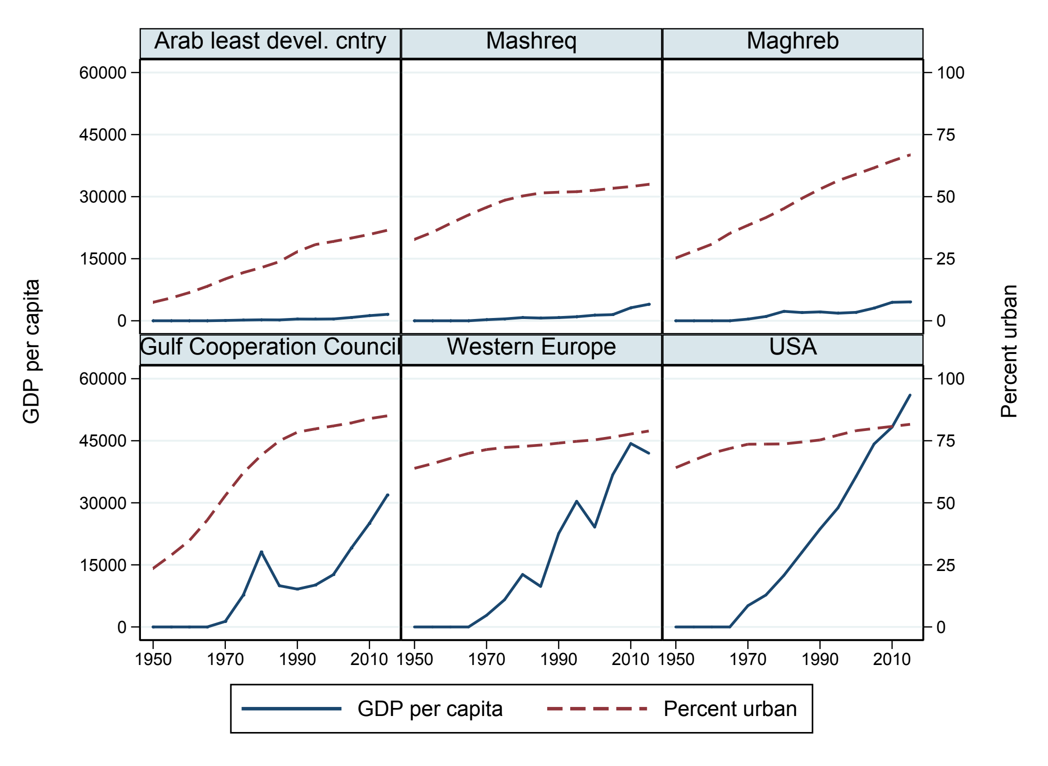
Appendix to Chapter 1

Figure A1: Demographic weight of the MENA regions, Western Europe and the USA in 2015.



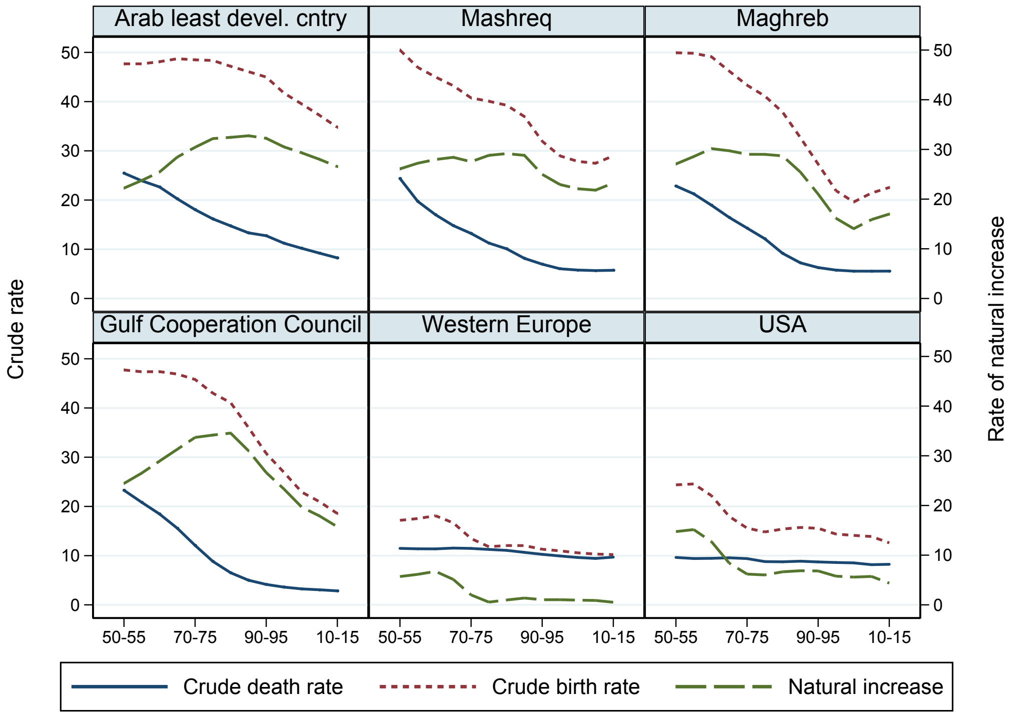
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A2: GDP per capita at current prices in US Dollars and share of urban population of the MENA regions, Western Europe and the USA, 1950-2014.



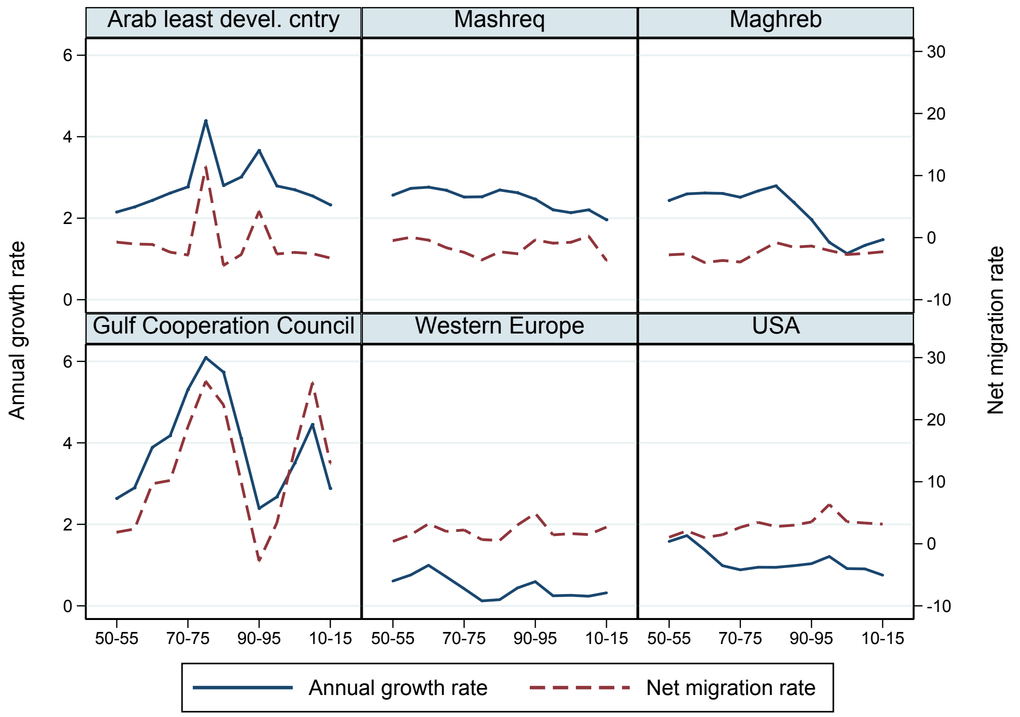
Data: Own calculations based on total population weighted country-specific data (United Nations 2014, 2016).

Figure A3: Crude death and birth rates and rates of natural increase (per 1,000 population) of the MENA regions, Western Europe and the USA, 1950-55 to 2010-15.



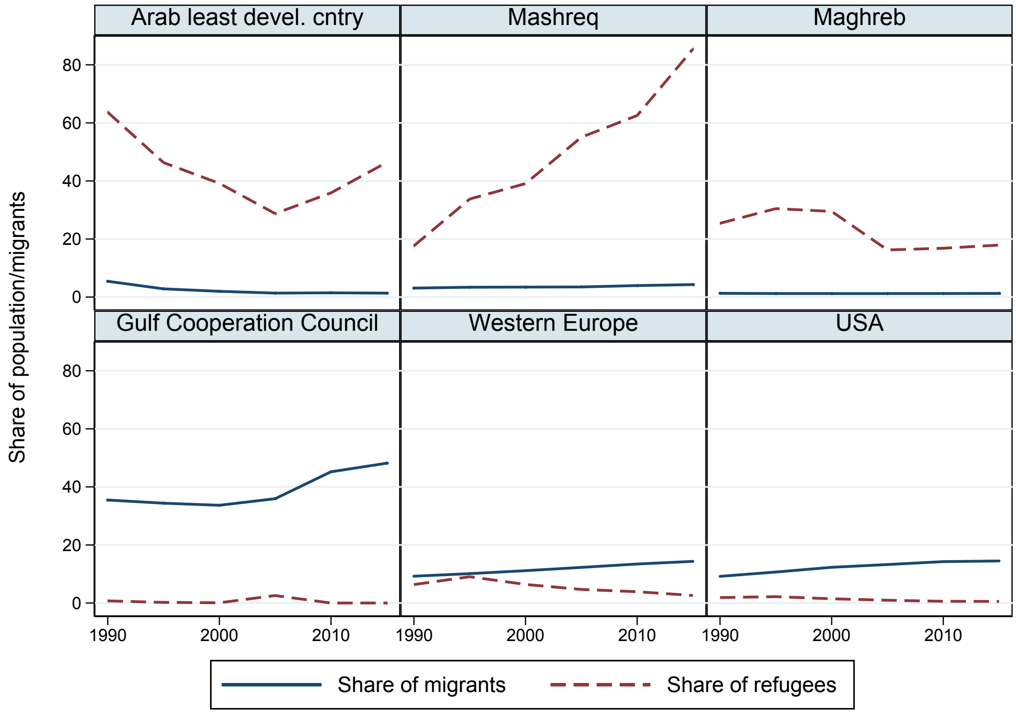
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A4: Annual growth rate and net migration rate (per 1,000 population) of the MENA regions, Western Europe and the USA, 1950-55 to 2010-15.



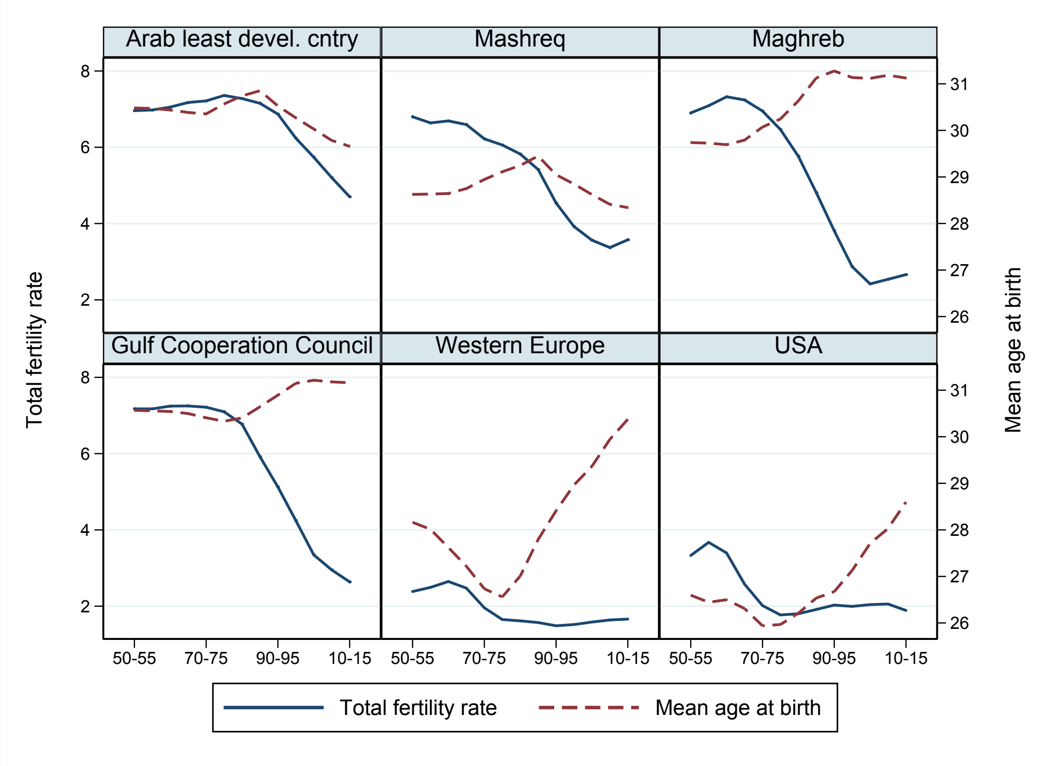
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A5: International migrant stock as percentage of total population and refugees as percentage of international migrant stock of the MENA regions, Western Europe and the USA, 1990 to 2015.



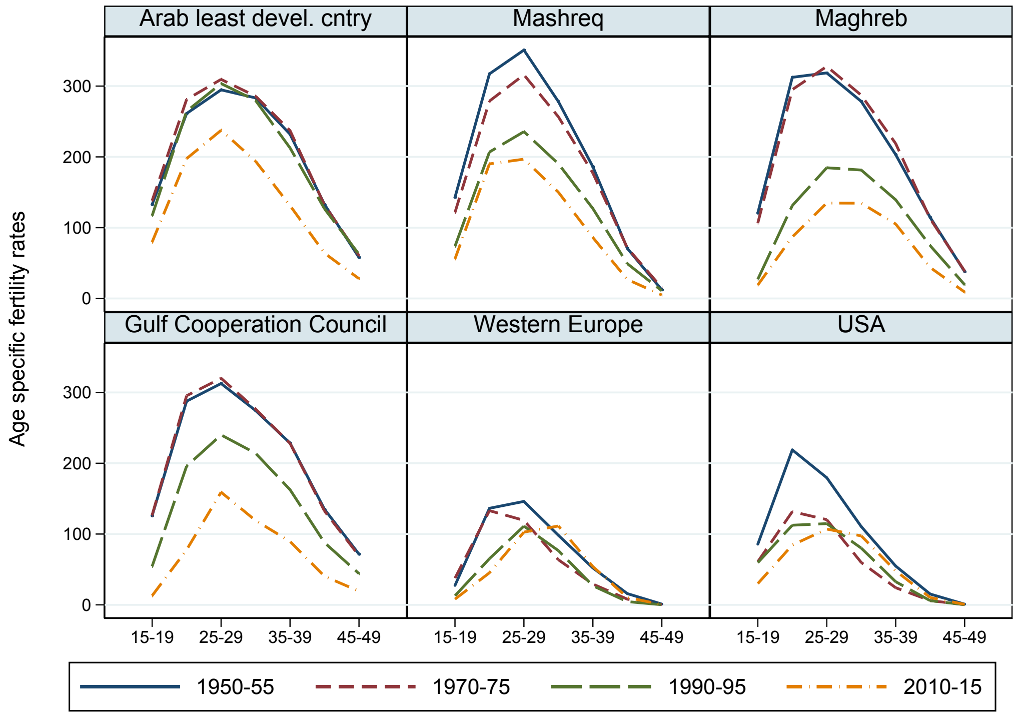
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A6: Total fertility and mean age at birth of the MENA regions, Western Europe and the USA, 1950-55 to 2010-15.



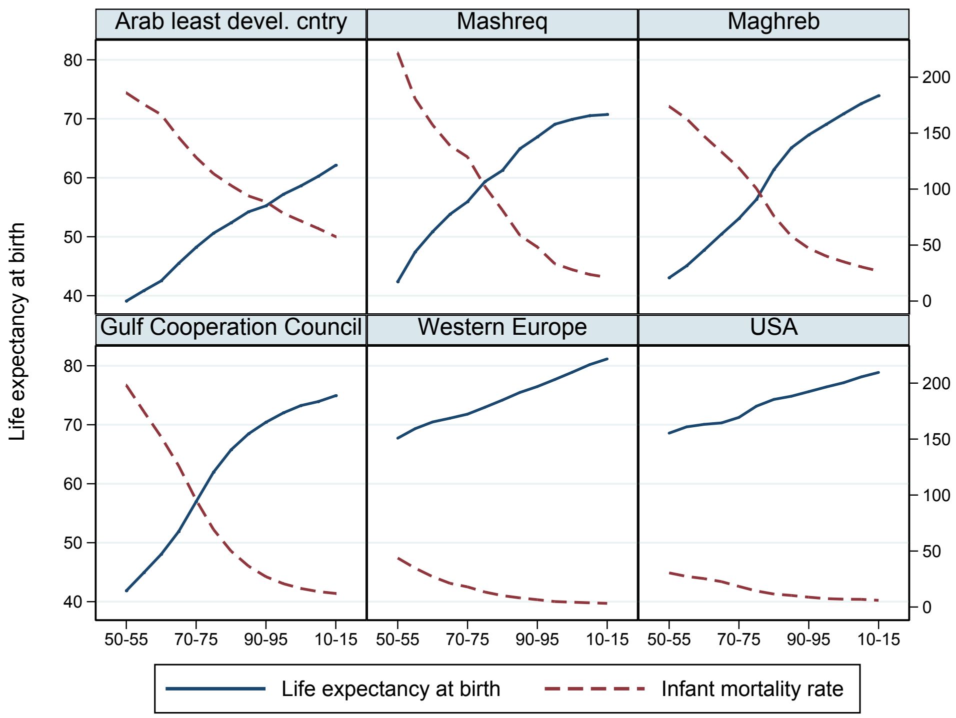
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A7: Age-specific fertility rates (births per 1,000 women) of the MENA regions, Western Europe and the USA, by selected years, 1950-55 to 2010-15.



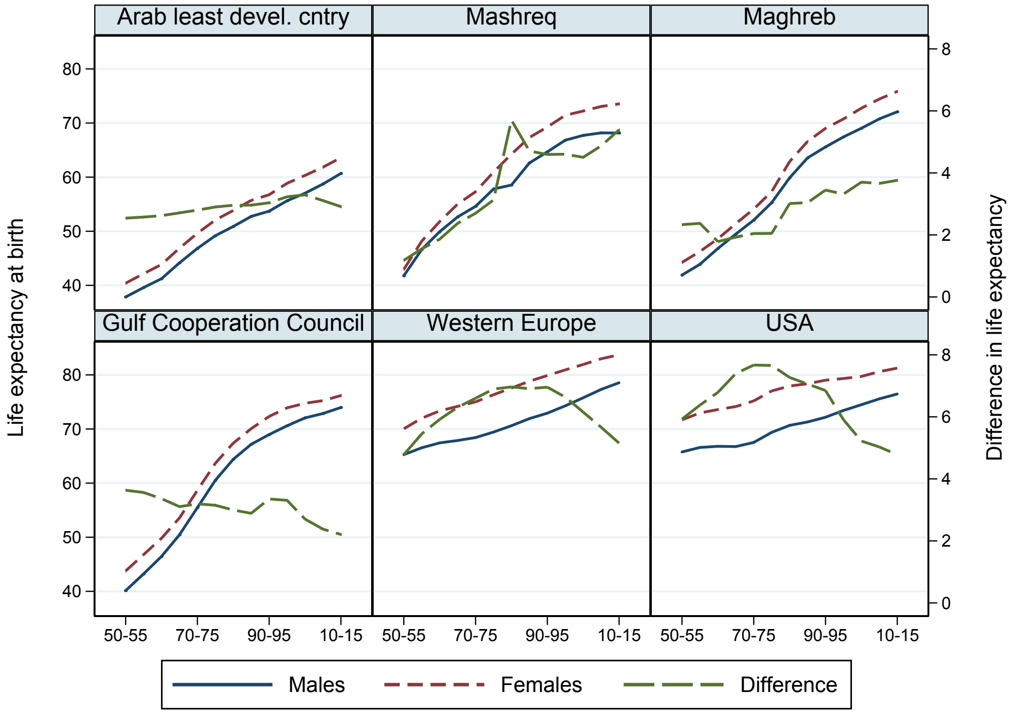
Data: Own calculations based on age-specific female population weighted country-specific data (United Nations 2015a).

Figure A8: Life expectancy at birth and infant mortality rate (both sexes combined per 1,000 live births) of the MENA regions, Western Europe and the USA, 1950-55 to 2010-15.



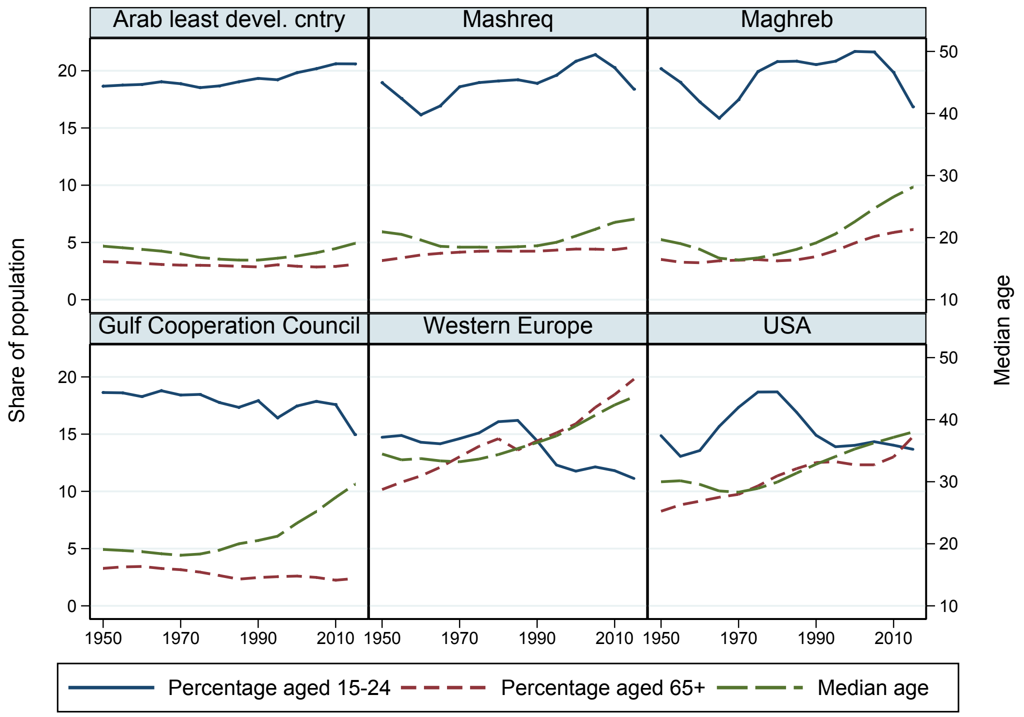
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A9: Male and female life expectancy at birth of the MENA regions, Western Europe and the USA, 1950-55 to 2010-15.



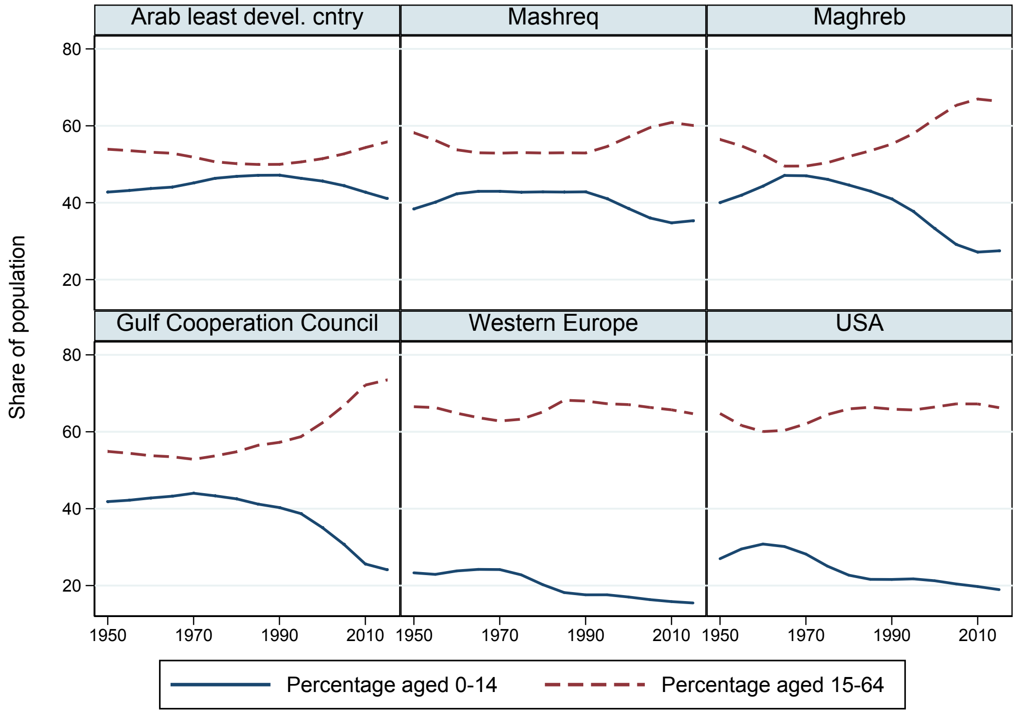
Data: Own calculations based on male and female population weighted country-specific data (United Nations 2015a).

Figure A10: Median age, share of population age 15 to 24 and 65+ of the MENA regions, Western Europe and the USA, 1950 to 2015.



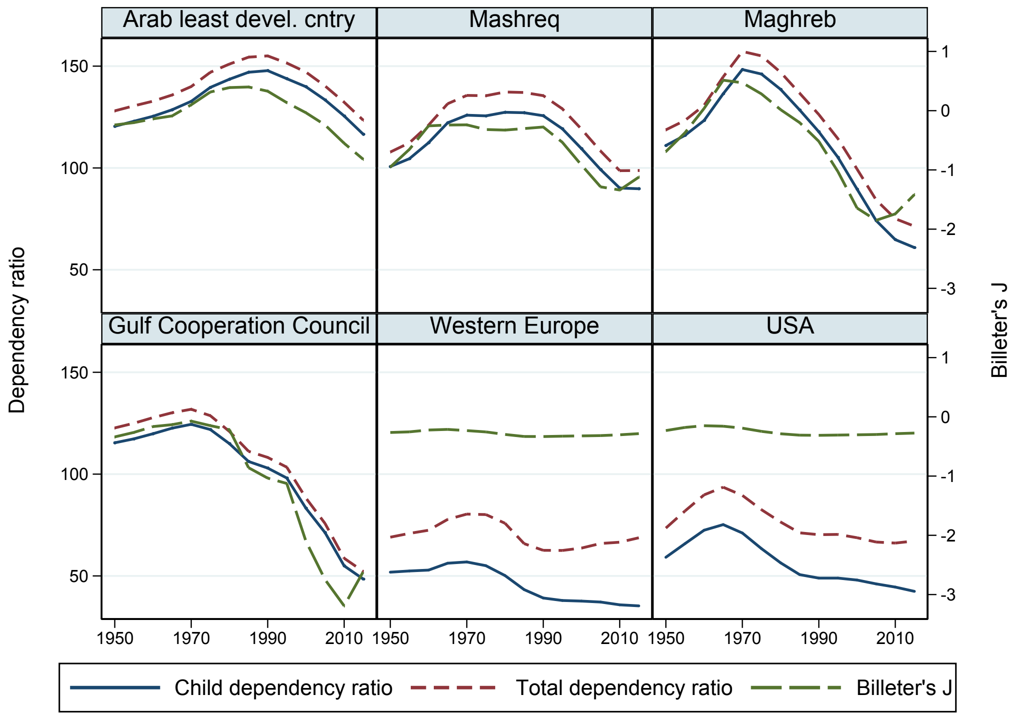
Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A11: Share of population under age 15 and 15 to 64 of the MENA regions, Western Europe and the USA, 1950 to 2015.



Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Figure A12: Child dependency and total dependency ratio and Billeter's J of the MENA regions, Western Europe and the USA, 1950 to 2015.



Data: Own calculations based on total population weighted country-specific data (United Nations 2015a).

Chapter 2

Fertility and Human Development

2.1 Introduction

Until recently, the negative association between fertility and development was both common empirical and theoretical knowledge (Bongaarts and Watkins 1996; Bryant 2007; Lee 2003). The substantial declines in fertility during the last century coincided with substantial increases in economic and social development. Starting already with Malthus (2013[1789]), it has been assumed that fertility decreases with increasing levels of development. Along the same lines, demographic transition theory argued that in countries undergoing modernization, long-term economic growth should lead to a transition from high to low birth and death rates (Davis 1945; Notestein 1945). Later, the theory of demographic transition was expanded to predict ever-decreasing fertility rates with economic growth in various kinds of contexts (Caldwell 1976, 1982; Kirk 1996; Lee 2003).

In recent years, questions have been raised about the relationship between fertility and development. In their study published in "Nature", Myrskylä et al. (2009) reported stimulating results on the fertility-development link, despite employing the same socioeconomic progress and development measure (i.e., Human Development Index) as used in past research (e.g., Bongaarts and Watkins, 1996). Based on data for over 100 countries they found that the negative relationship between the Human Development Index (HDI) and the total fertility rate (TFR) (i.e., increases in HDI are associated with decreases in TFR) can be reversed at advanced HDI levels with HDI being positively related to TFR. This observation has been referred to as "the income/development-fertility reversal", "inverse J-shaped association", or "convex relationship between income/development and fertility" (Fox et al. 2015).

Using time series from 1960 onwards, Luci-Greulich and Théveonen (2014) also found a change in the relation between fertility and GDP per capita above a certain threshold of economic development for 30 OECD countries. Moreover, by decomposing GDP per capita into several components, they identified female employment as a co-varying factor for the fertility rebound. Pointing to differences in the compatibility of childbearing and female employment, their results suggest that fertility increases are likely to be small if economic development is not accompanied by institutional changes that improve parent's opportunities to combine work and family life. This conclusion is consistent with Myrskylä et al. (2011), who argued that the reversal of fertility trends is conditional on gender equality: countries ranking high in development, as measured by health, income, and education, but low in gender equality, continue to see declining fertility.

Theoretically, the impact of human development on fertility remains ambiguous (Lacalle-Calderon et al. 2017). Indicators of this new positive association include rising female employment (Luci-Greulich and Thévenon 2014), changing attitudes towards female employment and childbearing behaviors (Lestheaghe 2010; Goldstein et al. 2009), delay of childbearing to older ages (Myrskylä et al. 2011), the end of postponement of births (Goldstein et al. 2009), changing norms of contraceptive use and childbearing behavior (Myrskylä et al. 2011; Esping-Andersen and Billari 2015; Anderson and Kohler 2015), and increasing gender equality both at an institutional, as well as on a household level, which reduce work-family conflicts (Anderson and Kohler 2015; Myrskylä et al. 2011).

Empirically, authors such as Furuoka (2009, 2013) and Harttgen and Vollmer (2014) have questioned the change in the fertility-development association. Furuoka (2009, 2013) found a negative association between fertility and development in countries with lower levels of development, whereas the relationship remained negative, albeit weak, in countries with a high HDI. In the same vein, using the recent revision of the HDI calculation, Harttgen and Vollmer (2014) have found no evidence of the inverse J-shaped association, and the relation between HDI and fertility could not withstand the recent HDI calculation revision. Moreover, they reported that the use of a composite measure masks the individual contribution of the economic and social components.

Regardless of the long history of research, there is no consensus on the relative importance of different human development components for fertility change (Bryant 2007; Lee 2003; McDonald 2000b; Ryabov 2015). Traditionally, the main focus has been placed on economic fertility determinants in Western societies

(Lesthaeghe and Surkyn 1988; Becker et al. 1994; Mason 1997; Bryant 2007). However, recent publications also focus on the social, non-economic components of human development, including education, health, and gender equity as predictors of trends in fertility, at least in developed countries (e.g., Goldstein et al. 2009; McDonald 2000b; Myrskylä et al. 2013).

Until recently, research on the fertility-development link described above has focused on highly developed Western societies and produced mixed results. Less is known about the association and its development over time for other regions, and findings are limited to pooled analyses suggesting fertility declines at low and medium development levels (Furuoka 2009; Myrskylä et al. 2009). A noteworthy gap of knowledge concerns countries of the Middle East and North Africa (MENA), which have been among the fastest growing regions in the last decades that do not clearly follow the demographic patterns as suggested by the transition theory (cf. Chapter 1).

In this study, we aim to shed light on the longitudinal relationship between fertility and development in the MENA countries. Specifically, we examine to what extent fertility trends in the MENA countries can be explained by development. Taking into consideration the various development dimensions, we analyze both the association of human development and its components (wealth, health, and education). In doing so, we further assess the importance of these various development indicators in explaining fertility and question how the prevailing patterns of HDI and its components may influence fertility trends in the MENA region. Our empirical analysis is based on graphical depictions of the time series association of fertility and development, as well as on a panel analysis to account for country- and time-specific heterogeneity.

The chapter is organized as follows: Section 2.2 presents our empirical findings on the association of human development and fertility. Sections 2.3 to 2.6 focus on wealth, health, and human capital, as well as gender inequality on the four dimensions of human development. Section 2.7 estimates the effects of the various dimensions of human development under control of country and time-specific heterogeneity. Section 2.8 concludes by summarizing the main findings and identifying directions for further research.

2.2 Progress in human development

Our empirical analysis of the fertility-development association is based on a time series for the 22 countries of the Arab League – Algeria (DZ), Bahrain (BH), Comoros (KM), Djibouti (DJ), Egypt (EG), Iraq (IQ), Jordan (JO), Kuwait (KW), Lebanon (LB), Libya (LY), Mauritania (MR), Morocco (MA), Oman (OM), State of Palestine (PS), Qatar (QA), Saudi Arabia (SA), Somalia (SO), Sudan (SD), Syrian Arab Republic (SY), Tunisia (TN), United Arab Emirates (AE), and Yemen (YE), plus three neighboring countries – Israel (IS), Turkey (TR), and Iran (IR).[1] The different time series vary in length, depending on data availability.

Fertility is measured by the country-specific annual total fertility rate (World Bank 2017). The total fertility rate reflects the number of children that would be born to a woman during the considered age window if she experienced the age-specific fertility rates observed in a particular year. The main weakness of the TFR is that it is subject to tempo effects of fertility (Bongaarts and Feeney 1998; Sobotka and Lutz 2011). Tempo adjusted fertility measures may provide a more comprehensive overview of the fertility trends and may (partly) explain changing TFR (Bongaarts and Sobotka 2012).

While acknowledging this critique, the TFR is the only available fertility measure for most of the MENA countries which allows a longitudinal analysis of the association of fertility and development. Moreover, it is plausible that the TFR provides extensive insight on fertility for MENA countries for two reasons. Firstly, "TFR is the most widely used indicator of fertility, as TFR is a key determinant of the number of children born in a calendar year, and thus of population ageing and population growth/decline", and most public debates on fertility trends focus on the TFR (Myrskylä et al. 2011: 38). Secondly, as reported by Engelhardt and Schulz in Chapter 1 of this volume, changes of fertility in MENA countries are very different from the changes of fertility in advanced societies (see Balbo et al. 2013 for a review of fertility in advanced societies). Age-specific fertility rates have not experienced a shift towards the right for most MENA countries, suggesting that the mean age at first birth has not changed considerably in this region.

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1 As Israel has different demographic patterns to the rest of the MENA region and stands as an outlier in most of the analyses, cross-countries analyses were also conducted by excluding Israel (not shown). Significant differences of these additional analyses are reported in the related sections.

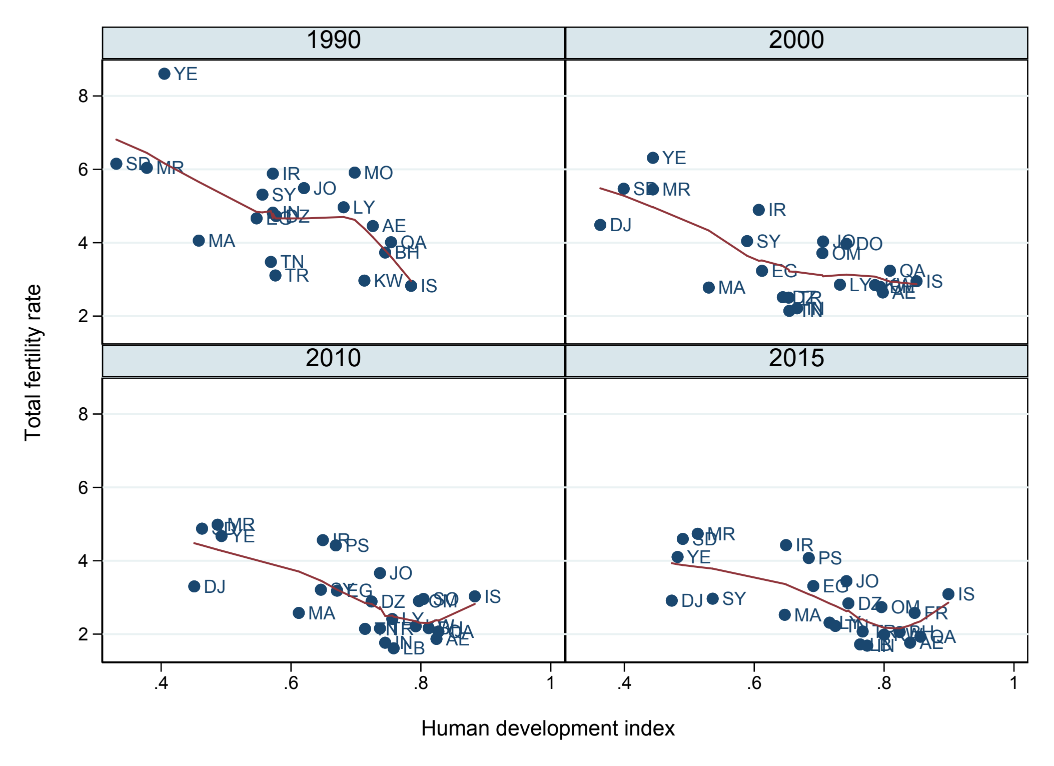
As in previous studies (Bongaarts and Watkins 1996; Myrskylä et al. 2009, 2011), we measure the level of socioeconomic development using the human development index (UNDP 2015). The United Nations Development Programme (UNDP) occasionally updates the exact definition of the HDI, which makes time-series analysis challenging. As explained by Myrskylä et al. (2011: 7), the sub-indexes' arithmetic mean was used to calculate HDI until 2010. With the 2011 revision, items in the sub-indexes were re-defined and the calculation method was changed into the geometric mean.

The 2011 HDI revision provided consistent measurements that are comparable over time, and this time consistent index included: (i) annual life expectancy at birth, referring to the health component of development. (ii) logarithm of the annual gross domestic product (GDP) per capita at purchasing power parity (PPP) in US dollars referring to the standard of living. (iii) Average of the adult literacy rate and the combined primary, secondary, and tertiary gross school enrolment ratio, referring to the human capital endowment. This index – termed the hybrid-HDI by UNDP – yields slightly different results compared to longitudinally inconsistent HDI. For consistency and comparability, we follow Myrskylä et al. (2011) by using this index.[2]

To illustrate the association of human development and fertility, Figure 2.1 shows the relationship between HDI and the total fertility rate for the years 1990, 2000, 2010, and 2015 (cf. Pesando et al. 2017). It is apparent from this figure that all MENA countries have experienced socioeconomic progress and development since 1990. Consistent with previous studies, the graph suggests that countries undergo a unidirectional trend towards lower fertility with only limited cross-regional differences as they progress towards higher development. The negative association can be observed for different points in time (year 1990: r^2= -0.601, year 2000: r^2 = -0.663, year 2010: r^2 = -0.702, year 2015 r^2 = -0.662). However, we have observed a slight increase in fertility once a certain threshold of human development has been passed.

2 Data on human development was limited to life expectancy for Comoros, Lebanon, and Somalia. Thus, these countries are only included in the fertility-life expectancy analyses.

Figure 2.1: Relationship between total fertility rate and human development, 1990, 2000, 2010, and 2015.

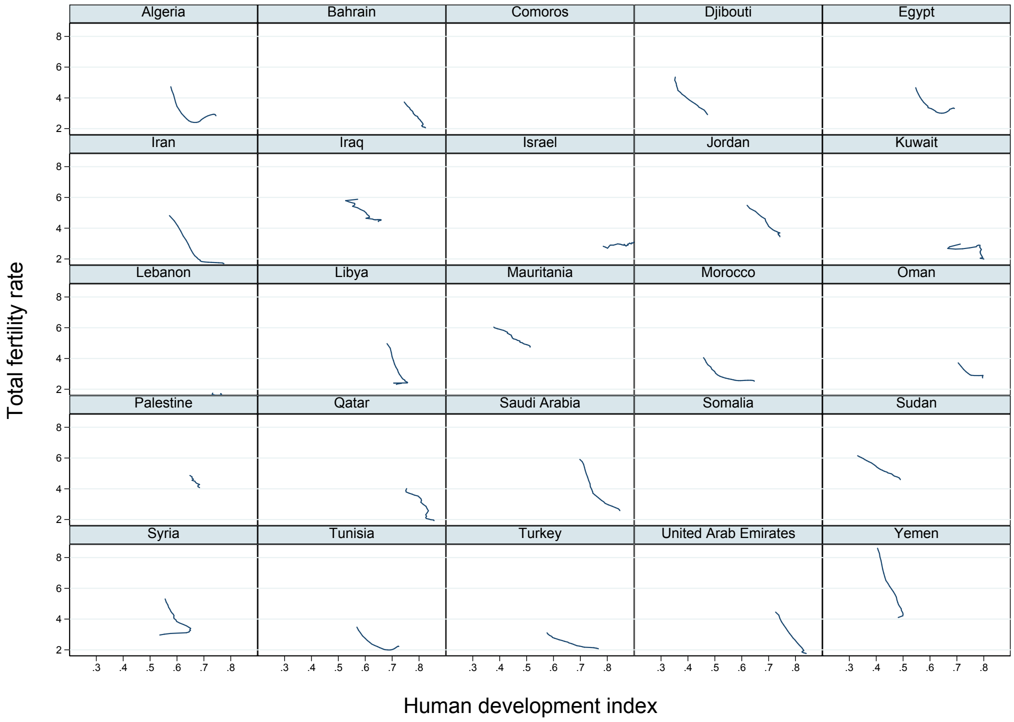


Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate: World Bank (2017); Human development index: UNDP (2017a).

These findings are also in line with the study of Myrskylä et al. (2009) which found a reversed positive relationship between HDI and TFR above a certain HDI level. Nonetheless, this increase in fertility above a certain HDI level is mainly driven by Israel. After excluding Israel in further analysis, only a stall in fertility above a certain threshold level was observable.

Can the cross-sectional pattern also be confirmed when we look at country-level trajectories? Figure 2.2 complements the cross-sectional analysis with a longitudinal perspective by showing country-specific fertility-development trajectories. Figure 2.2 confirms in a longitudinal perspective – at least for some countries – what the cross-sectional analyses suggested: For Algeria, Egypt and Tunisia, fertility increased after a certain level of development. But, when the country-level trajectories are examined specifically, the turning point of fertility seems to be at a lower level of development than suggested by Myrskylä et al. (2009). For MENA coun-

Figure 2.2: Time series association of total fertility and human development, 1990-2015.



Data: Total fertility rate: World Bank (2017); Human development index: UNDP (2017a).

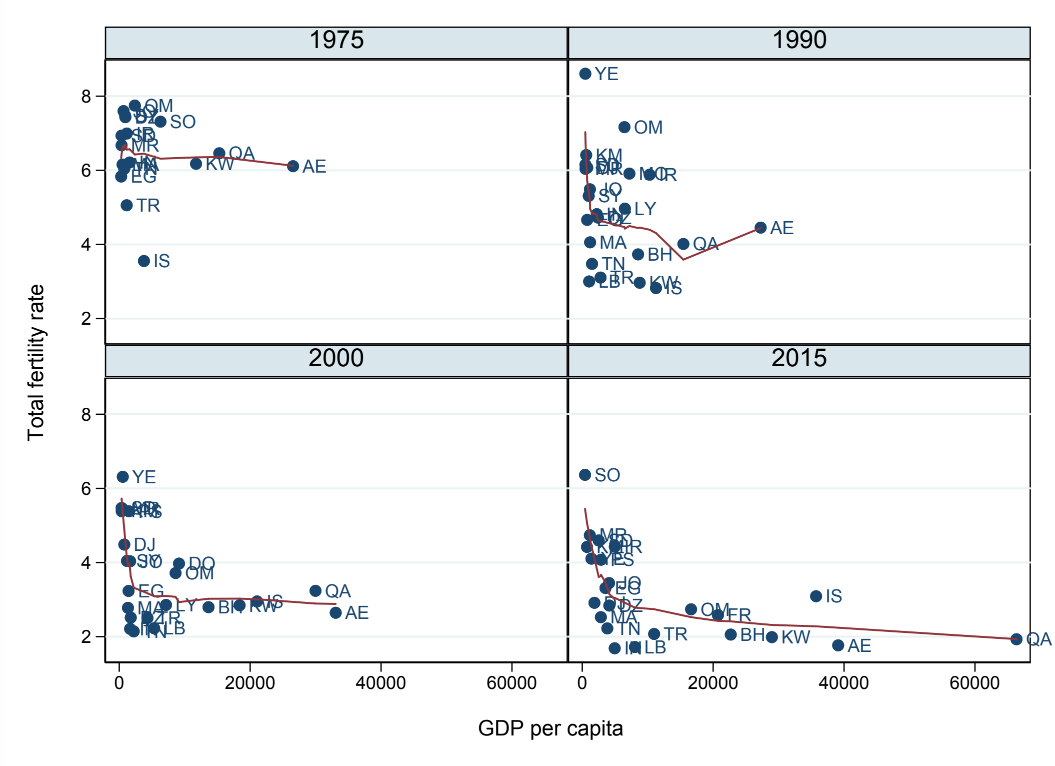
tries, fertility reversal seems to occur at a level of human development of about 0.6 to 0.7.

2.3 Economic progress

Next, we investigate the economic component of human development, which is traditionally in the focus of fertility research (Luci-Greulich and Thévenon 2014). Figure 2.3 depicts the relation between GDP per capita and the total fertility rate for the years 1975, 1990, 2000, and 2015. In 1975, the association between GDP and fertility was rather weak (r^2 = -0.118). The association increased successively over time (year 1990: r^2 = -0.261, year 2000: r^2 = -0.369, year 2015: r^2 = -0.497). But, the association was clearly non-linear, and the decline of fertility levelled off after the GDP's initial increase.

The time series association of total fertility and GDP per capita depicted in Figure 2.4 yields deeper insight into the increasingly negative relation from a lon-

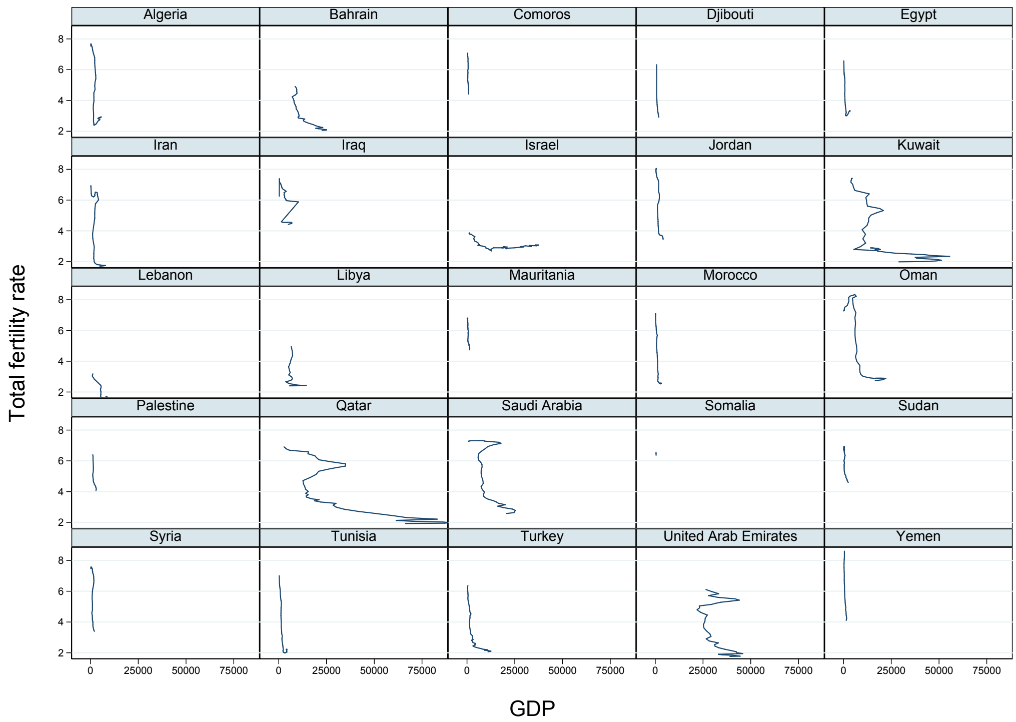
Figure 2.3: Relationship between total fertility and GDP per capita, 1975, 1990, 2000, and 2015.



Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate and GDP per capita: World Bank (2017).

gitudinal perspective. For most MENA countries, a strong decline in fertility was associated with little progress in the development of GDP per capita. With a strong increase in GDP per capita, the decline in fertility levelled off. In general, unlike the HDI, there was no increase of fertility associated with improving economic progress at any level.

Figure 2.4: Time series association of total fertility and GDP per capita, 1980-2015.

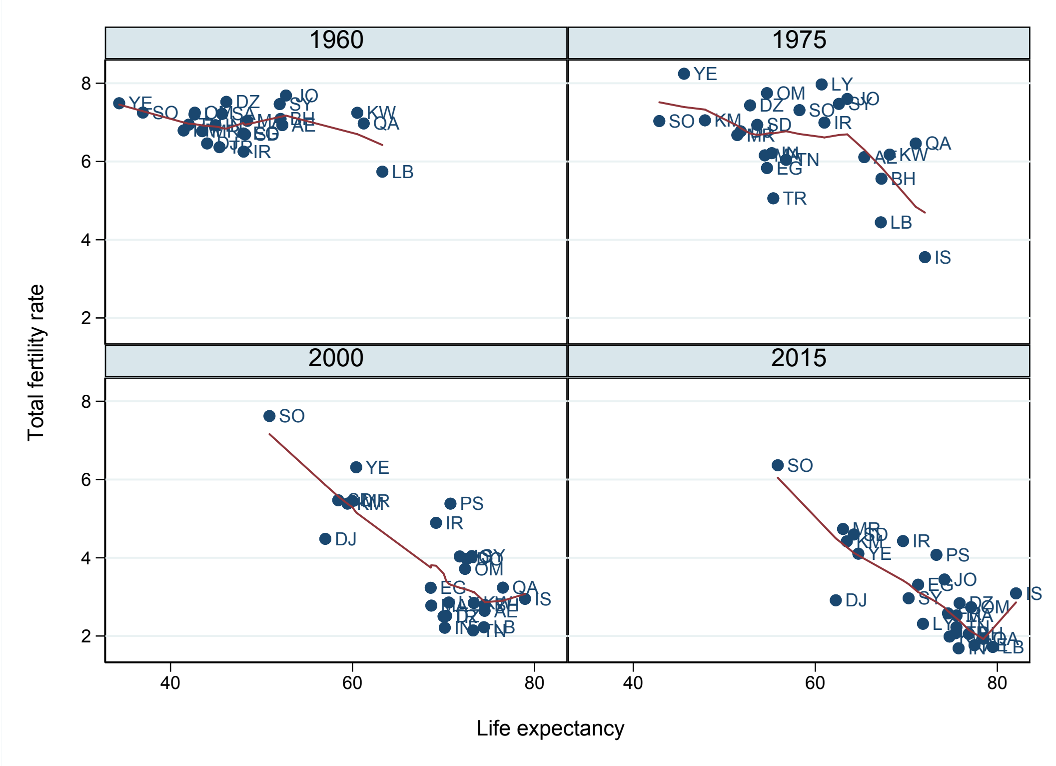


Data: Total fertility rate and GDP per capita: World Bank (2017).

2.4 Progress in health

Another component of human development in the focus of demographic transition theory is morbidity and mortality (Davis 1945; Notestein 1945). Here, we measure mortality using total life expectancy at birth, as well as female life expectancy at birth. The cross-sectional association of total life expectancy with fertility for the years 1960, 1975, 2000, and 2015 is shown in Figure 2.5. Obviously, fertility declined with increasing life expectancy. The association between life expectancy and fertility increased strongly over time (year 1960: r^2 = -0.255, year 1975: r^2 = -0.496, year 2000: r^2 = -0.785, year 2015: r^2 = -0.807). Furthermore, the slight increase at higher ages of life expectancy found in 2015 disappeared after excluding Israel.

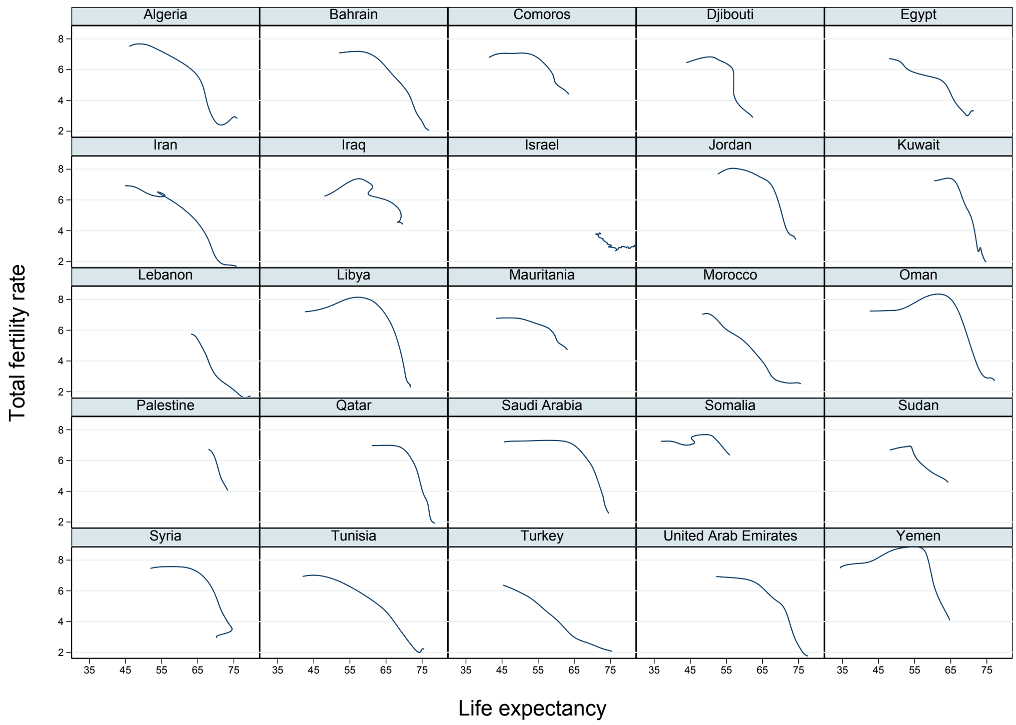
Figure 2.5: Relationship between total fertility and life expectancy at birth, 1960, 1975, 2000, and 2015.



Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate and life expectancy at birth: World Bank (2017).

Again, the time series association of total fertility and life expectancy at birth shown in Figure 2.6 yield deeper insight into the increasingly negative cross-sectional relation. For many MENA countries (e.g., Bahrain, Comoros, Mauritania, Qatar, Saudi Arabia, and Syria), the increase in life expectancy was not immediately followed by a decline in fertility as suggested by the theory of demographic transition. Accordantly, fertility decline started after a certain level of life expectancy was exceeded, but with varying levels of life expectancy. In other MENA countries (Djibouti, Iraq, Libya, Oman, and Yemen), fertility was still increasing while life expectancy was falling. In a third group of countries (Egypt, Iran, Lebanon, Morocco, and Turkey), increase in life expectancy was accompanied by an increasing fertility from 1960 onwards.

Figure 2.6: Time series association of total fertility and life expectancy at birth, 1960-2015.



Data: Total fertility rate and life expectancy at birth: World Bank (2017).

2.5 Progress in human capital

The third component of human development is human capital. To measure human capital, we draw on the Barro-Lee educational attainment data which includes different measures of education both for the total population and for females (Barro and Lee 2013; Lee and Lee 2016). In particular, we consider the percentage of female population aged 15+ with no education, the percentage of female population aged 15+ with completed tertiary education, and on the average years of schooling of females aged 15+.[3]

[3] No data was available for Comoros, Lebanon, Oman, Palestine, and Somalia. For all other countries, quinquennial data is available from 1970 to 2010.

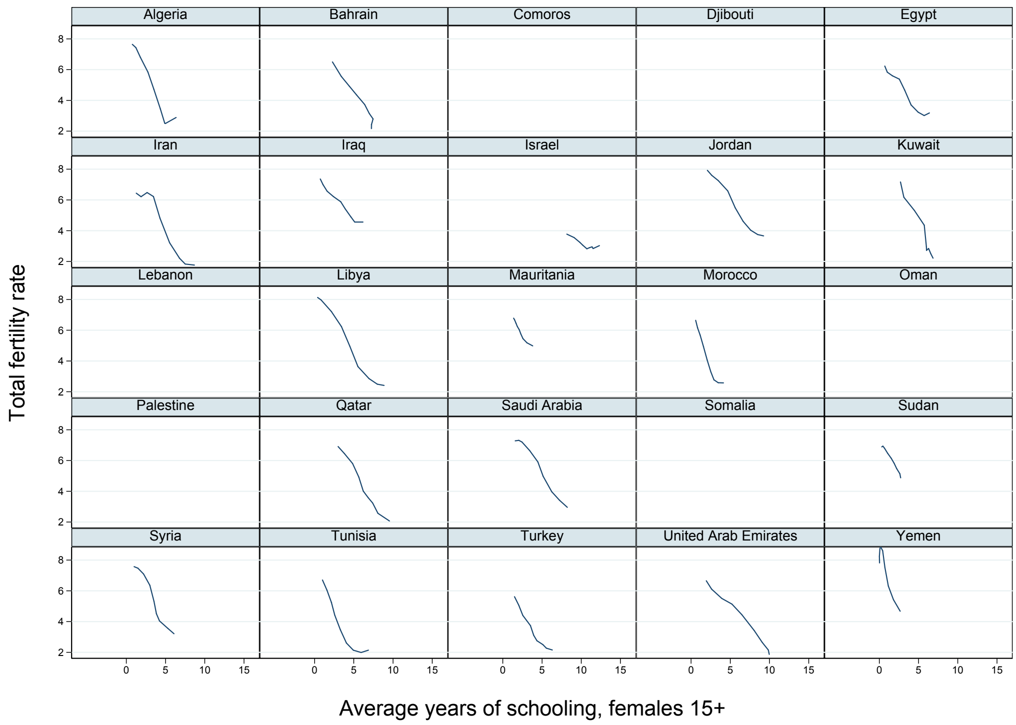
Figure 2.7: Relationship between total fertility and average years of schooling among females aged 15+, 1970, 1985, 2000, and 2010.

Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate and average years of schooling, females 15+: World Bank (2017).

Figure 2.7 depicts the relation between the average years of schooling of females aged 15+ for the year 1970, 1985, 2000, and 2010. Females' average years of schooling has been increased in all MENA countries, but in different rates. Nevertheless, all the countries experienced a decline in fertility rates with the increase of female schooling. In 1970, the association between the average years of schooling was very strong (r^2 = -0.738), whereas it decreased slightly over time (year 1985: r^2 = -0.683, year 2000: r^2 = -0.590, year 2010: r^2 = -0.594). Moreover, the relationship between female average years of schooling and fertility seemed to be strongest in the first years of schooling (i.e., 0 to 5 years). Further analyses showed that the declines in fertility after the first years of schooling found in 1970 and 1985 were mainly driven by Israel. After excluding Israel, a decrease in fertility was observed only in the very first years of schooling.

The time series association of total fertility and average years of female schooling shown in Figure 2.8 illustrates country-level trajectories. For all MENA coun-

Figure 2.8: Time series association of total fertility and average years of schooling among females aged 15+, 1970-2010.

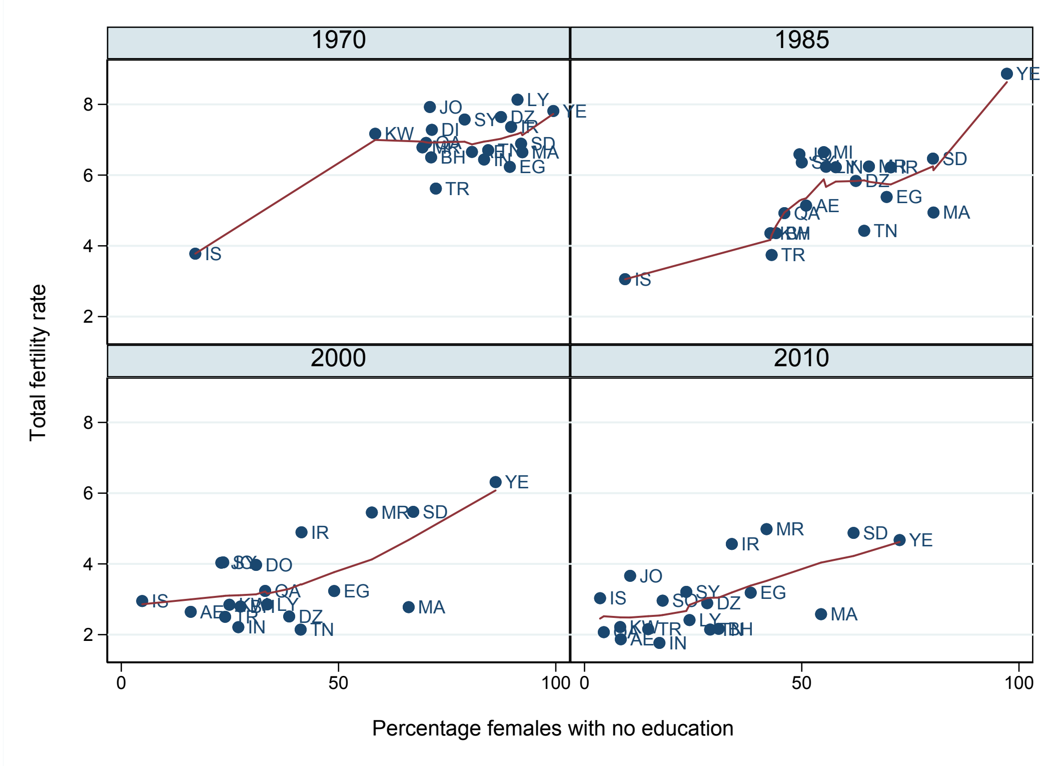


Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate and average years of schooling, females 15+: World Bank (2017).

tries, a strong increase in average years of schooling of females aged 15+ was associated with a strong decrease in fertility. However, with the increasing years of schooling, the negative association seemed to become weaker and some countries even experienced a stall in their declining fertility depending on the country-specific average years of female schooling. In general, the negative association between total fertility and average years of female schooling is stronger in the first years of education which supports the findings of Figure 2.7.

Figure 2.7 and 2.8 point out the importance of the first years of education on fertility. It is likely that the share of females without education, as compared to the females with (at least) some education, drives the observed fertility patterns in MENA countries.

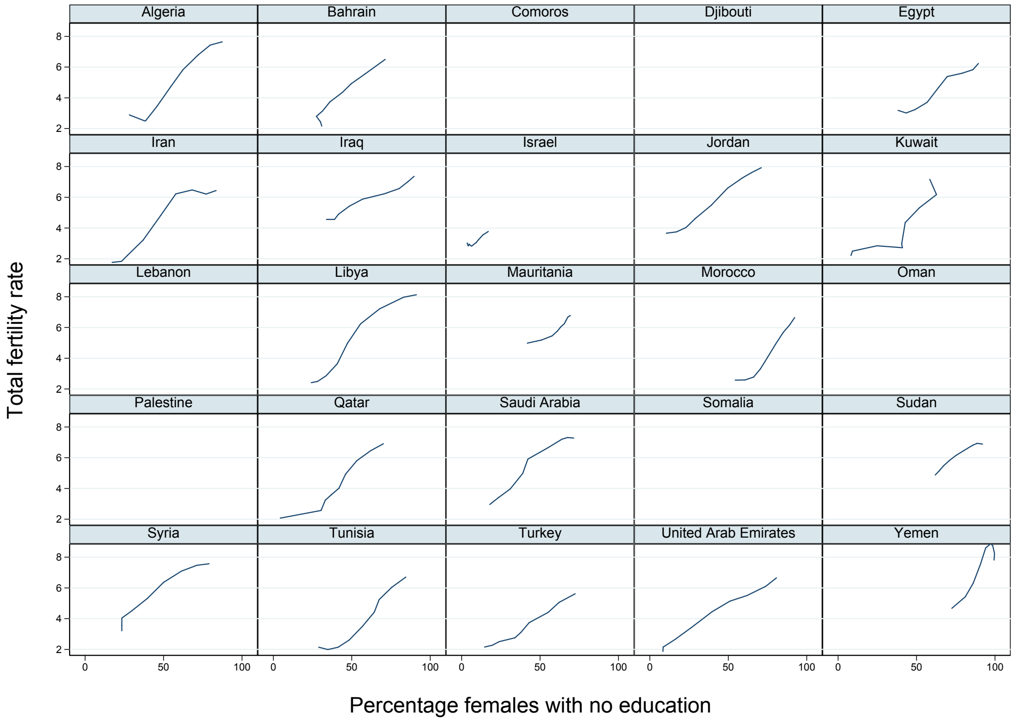
Figure 2.9: Relationship between total fertility and percentage female population age 15+ with no education, 1970, 1985, 2000, and 2010.



Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate and percentage females 15+ with no education: World Bank (2017).

Figure 2.9 depicts the association between the percentage of females age 15+ with no schooling and fertility for the year 1970, 1985, 2000, and 2010. In 1970, the association between the average years of schooling was very strong (r^2 = -0.738). We observe almost linear associations with decreasing correlations since 1985 (year 1985: $r^2 = 0.712$, year 2010: $r^2 = 0.636$). With an increasing share of females with no education, fertility rates increase substantially.

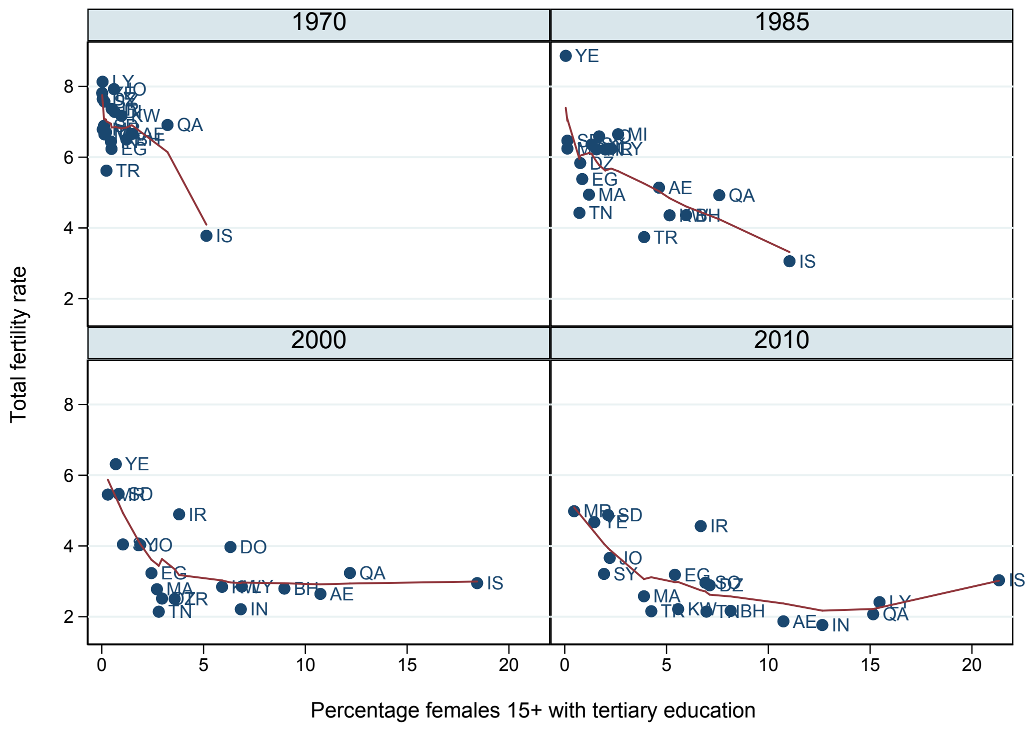
Figure 2.10: Time series association of total fertility and percentage female population age 15+ with no education, 1970-2010.



Data: Total fertility rate and percentage females 15+ with no education: World Bank (2017).

The country-specific time-series associations shown in Figure 2.10 confirm the cross-sectional picture found in Figure 2.9: Fertility decreased almost linearly with a decreasing percentage of females aged 15+ without education. These results suggest that the share of females with no schooling has considerable consequences on fertility rates in all the MENA countries.

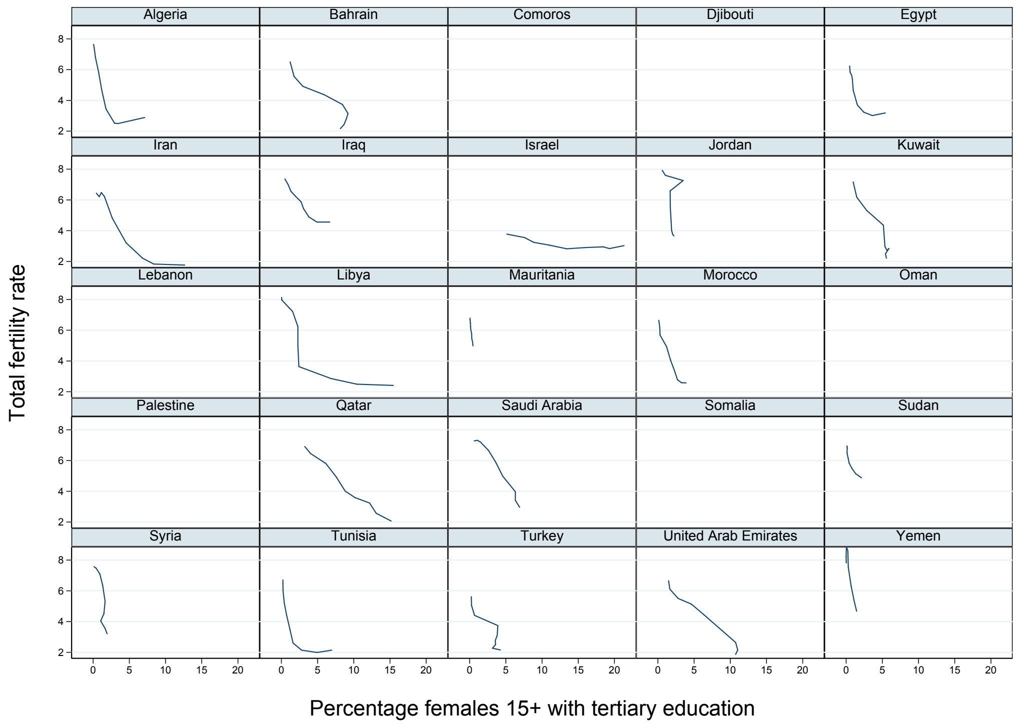
Figure 2.11: Relationship between total fertility and percentage of female population age 15+ with tertiary schooling; 1970, 1985, 2000, and 2010.



Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate and percentage females 15+ with tertiary education completed: World Bank (2017).

A complementary indicator of human capital is the proportion of females aged 15+ with completed tertiary education. Figure 2.11 shows that this proportion increased over time in all MENA countries, while fertility decreased. After an initial increase in female tertiary participation associated with a decline in fertility, the negative relation levelled off after a certain degree of female participation in tertiary education. Thereafter, a further increase in tertiary education did not seem to be followed by further declines in fertility. Also, further declines with the increase in tertiary education found in 1970 and 1985 disappeared with the exclusion of Israel.

Figure 2.12: Time series association of total fertility and percentage tertiary education, females aged 15+, 1970-2010.



Data: Total fertility rate and percentage females 15+ with tertiary education competed: World Bank (2017).

The time series association of the percentage of females with completed tertiary education and fertility shown in Figure 2.12 yields deeper insight into the relation from a longitudinal perspective. For most MENA countries, an initial increase of the percentage of females aged 15 with tertiary education was associated with strongly declining fertility. In some countries, the relation levelled off, though: In Algeria, Iran, Iraq, Libya, and Tunisia, further increase of female tertiary education was not followed by a continuing decline in fertility.

2.6 Gender Inequality

A further non-economic component of human development is gender equality, which has been shown to be associated with fertility in developed countries. To capture country-specific gender inequality we use the Gender Inequality Index (GII) which "measures gender inequalities in three important aspects of human

Figure 2.13: Total fertility and gender inequality, 1995, 2000, 2010, and 2015.

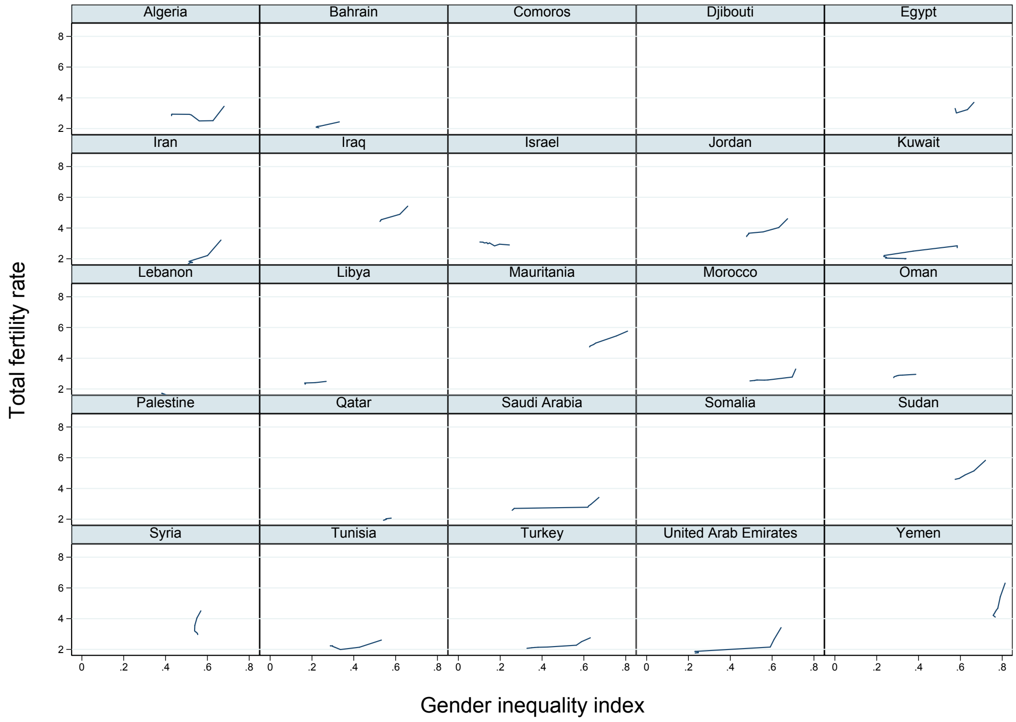
Note: The solid line represents the overall trend computed using a Lowess smoother.
Data: Total fertility rate: World Bank (2017); Gender inequality index: UNDP (2017b).

development – reproductive health, measured by maternal mortality ratio and adolescent birth rates; empowerment, measured by proportion of parliamentary seats occupied by females and proportion of adult females and males aged 25 years and older with at least some secondary education; and economic status, expressed as labor market participation and measured by labor force participation rate of female and male populations aged 15 years and older. Higher levels of the GII indicates more disparities between females and males and more loss to human development" (http://hdr.undp.org/en/content/gender-inequality-index-gii).[4]

The cross-sectional association of gender inequality with fertility for the years 1995, 2000, 2010, and 2015 is shown in Figure 2.13. Obviously, there is a trend towards decreasing gender inequality in all MENA countries accompanied by declining fertility. The cross-sectional association is clearly non-linear and almost

4 Data on gender inequality is not available for Comoros, Djibouti, Lebanon, Oman, Palestine, and Somalia. For most of the other countries, data is available for the years 1995, 2000, 2005, and 2010-2015.

Figure 2.14: Time series association of total fertility and gender inequality, 1995-2015.



Data: Total fertility rate: World Bank (207); Gender inequality index: UNDP (2017b).

U-shaped. With decreasing gender inequality, the decline in fertility levelled off. Furthermore, some slight increases in fertility rates after the 2000s are also observed with very low levels of gender inequality.

The time series association of gender inequality and fertility shown in Figure 2.14 yields insight into the country-specific longitudinal relation. For all MENA countries, except Israel, declines in gender inequality have been associated with declines in fertility. However, there is a level off in fertility decline after a certain threshold of gender inequality has been passed. This threshold seems to be country-specific.

2.7 Controlling for country heterogeneity and time trends

The preceding graphical analyses look at the evolution of the cross-sectional and country-specific time-series association between fertility and human development. In the analyses conducted so far, we could not establish the average effect of human development on fertility net off country-heterogeneity and time trends, which might confound the fertility-development association. Therefore, we estimate panel regression models that account for unobserved country-specific heterogeneity. Moreover, the multivariate approach allows us to check on gender specific effects in human capital and to quantify its impact on fertility.

In the model a country's total fertility rate is specified as the dependent variable, while the indicator of development (here HDI) and its square are the independent variables:

$$TFR_{t,c} = \chi_c + \lambda_t + \beta_1 HDI_{t,c} + \beta_2 HDI^2_{t,c} + \epsilon_{t,c},$$

where t indicates the year and c the country. The first two terms (χ_c and λ_t) represent country-specific effects and year-specific effects common to all countries (country and year fixed effects). The error term is assumed to be zero. The inclusion of the square term is required to identify a reversal in the relationship.

In the empirical analyses we add the various indicators of human development (i.e., HDI, GDP, life expectancy, difference in life expectancy, and GII) separately to the model due to high multicollinearity. The comparison of model fit parameters yields evidence on the magnitude of the effect of each development indicator. The estimated coefficients for human and economic development, progress in health, and gender inequality are listed in Table 2.1. Table 2.2 includes the estimates for our various human capital indicators.

Model 1 in Table 2.1 estimates the association between TFR and HDI. The estimated coefficients of HDI and HDI squared confirm what the graphical analyses suggested. Net of unobserved country-specific heterogeneity and shared time trends, fertility declines with increasing human development. At higher levels of human development, the association reverses to positive. The estimated coefficients are both significantly different from zero (p = .001).

Model 2 estimates the association between TFR and logged GDP per capita. Most interestingly, the association between this economic aspect of human development and fertility is not significantly different from zero under control of

Table 2.1: Fixed country- and year-effects panel regression of fertility on human and economic development, progress in health and gender inequality.

	(1)	(2)	(3)	(4)	(5)	(6)
HDI	-6.065**					
	(-3.08)					
HDI^2	7.499***					
	(5.08)					
ln(GDP)		0.183				
		(1.01)				
$\ln(GDP)^2$		0.268				
		(0.39)				
Life Expectancy			0.442***			
			(18.95)			
Life Expectancy^2			-0.00442***			
			(-22.87)			
Female life Expectancy				0.446***		
				(18.83)		
Female life Expectancy^2				-0.00428***		
				(-22.23)		
Difference in Life Expectancy					0.0833*	
					(2.33)	
Difference in Life Expectancy^2					-0.00319	
					(-1.06)	
Gender Inequality Index						-3.458**
						(-3.04)
Gender Inequality Index^2						4.232**
						(3.31)
Constant	5.683***	4.615**	-3.840***	-4.397***	6.725***	4.170***
	(7.94)	(3.25)	(-5.47)	(-6.04)	(41.63)	(16.12)
N	554	1068	1366	1366	1366	164
r^2	0.747	0.844	0.876	0.872	0.814	0.643
BIC	512.7	2288.5	2709.8	2753.7	3258.1	-9.243

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; t statistics in parentheses.
Data: TFR, GDP per capita, and life expectancy at birth: World Bank (2017);
Human Development Index: UNDP (2017a); Gender inequality index: UNDP (2017b).

unobserved country-and time-specific heterogeneity. Thus, as the graphical analysis has suggested, fertility in MENA countries does not decrease with an increase in GDP.

Concerning progress in health, Model 3 estimates the association between TFR and life expectancy at birth for the total population and Model 4 for females. Similar to the relationship found in the bivariate models in Figure 2.5 and 2.6, both models reveal significantly increasing fertility with developments towards longevity. Furthermore, with higher levels of life expectancy, fertility decreased significantly. Concerning the measures for model fit (r^2 and BIC), total life expectancy slightly better predicts fertility compared to female life expectancy.[5]

As an indicator for gender inequality, we consider the difference in life expectancy at birth between males and females (Model 5). Bigger differences in life expectancy between males in females are significantly associated with higher fertility. The estimated parameter of the squared term is not significantly different from zero indicating a linear relationship and no reversal in the association.

Moreover, fertility significantly decreases with an increasingly decreasing gender inequality index (Model 6). After a certain threshold of gender inequality has been reached, fertility increases again significantly.

Model 1 in Table 2.2 estimates the association between TFR and the average years of total schooling, population aged 15+; and Model 2 the association between TFR and the average years of total schooling, female population aged 15+. The estimated coefficients indicate a significantly nonlinear relation between fertility and human capital net of unobserved country- and year-specific heterogeneity. With an increase in years of schooling, fertility declined and increased significantly for higher levels of schooling. Most importantly, female average years of schooling yields a better model fit compared to average years of schooling of the total population.

Model 3 and Model 4 estimate the association between TFR and the percentage of total respective female population age 15+ with no education. For both indicators we find significant linear relations to total fertility, indicating increasing fertility with a rising share of the population with no education, both total and female population. Both indicators of model fit, r^2 and BIC, indicate that total

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5 Additionally, we estimated comparable models using male life expectancy at birth. The model yielded similar results. Concerning the measures of model fit (r^2 and BIC), life expectancy was predicted slightly better compared to male life expectancy.

Table 2.2: Fixed country- and year-effects panel regression of total fertility rate on human capital.

	(1)	(2)	(3)	(4)	(5)	(6)
Average years of total schooling	-0.871*** (-6.82)					
Average years of total schooling^2	0.0212* (2.49)					
Average years of female schooling		-0.941*** (-10.44)				
Average years of female schooling^2		0.0345*** (5.49)				
Share of population with no education			0.0578*** (5.00)			
Share of population with no education^2			-0.000164 (-1.55)			
Share of females with no education				0.0426*** (4.37)		
Share of females with no education^2				0.000155 (1.71)		
Share of population with tertiary educ.					-0.394*** (-7.72)	
Share of population with tertiary educ.^{2}					0.0197*** (7.98)	
Share of females with tertiary educ.						-0.376*** (-7.99)
Share of females with tertiary educ.^{2}						0.0176*** (8.13)
Constant	8.747*** (31.77)	8.203*** (51.88)	3.779*** (7.03)	2.568*** (5.41)	7.349*** (53.42)	7.115*** (57.54)
N	171	171	171	171	171	171
r^2	0.904	0.927	0.883	0.911	0.901	0.902
BIC	281.5	233.6	314.9	268.0	286.7	284.7

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; t statistics in parentheses.
Data: TFR and all schooling indicators: World Bank (2017).

fertility is better explained by the share of the female population without formal education compared to the share of the total population.

Our third measure of human capital is the share of total and female population aged 15+ with completed tertiary schooling. The estimated associations with TFR are listed in Model 5 and Model 6, respectively. Net of unobserved country- and year-specific heterogeneity, the estimated coefficients indicate a significantly non-linear relation between the shares of total, as well as female, population with completed tertiary education. With increasing shares, fertility declined and increased significantly for higher shares. Compared to the share of the total population with tertiary education, the female share yields only a moderately better model fit.

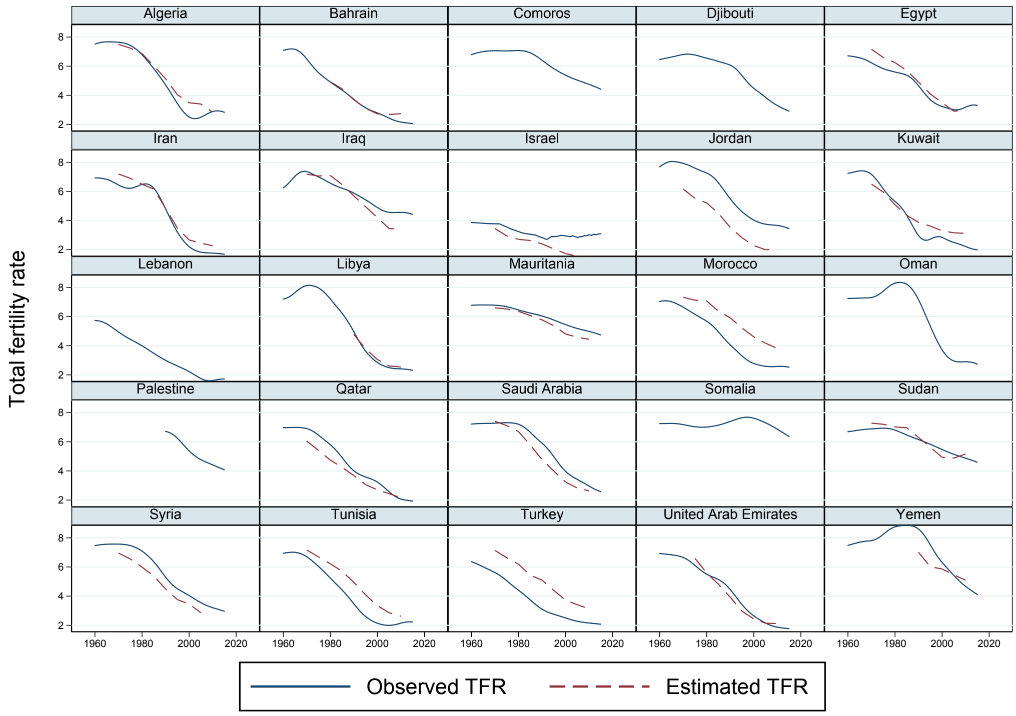
Comparing our different indicators for human capital, female participation in education seems to be more strongly associated with fertility compared to total participation (i.e., more than 90% of the within country variation was explained). Among the female human capital indicators for females, the average years of schooling is more strongly associated with fertility decline compared to the share of females with no education or completed tertiary education. Most interestingly, though, the share of females with no education is associated most strongly with the decline in fertility as compared to the share of females with completed tertiary education.

To have better insight into the relationship between various development components and fertility, other than the continuous quadratic terms, we alternatively used dummies for human development indicators with varying cut-off points (not shown). Our findings further confirmed the reversed relationship found for HDI and GII after a certain threshold, suggesting that the reversing relationship found did not depend on the quadratic specification.

To evaluate the overall fit of selected human development indicators, we additionally present graphs which are preferable to summary statistics to show the precise nature of discrepancies between model and data (cf. Bryant 2007). The statistical model for the graphs includes the natural logarithm of GDP per capita, female life expectancy, and average years of female schooling, as well as the squared terms of these variables. Gender inequality is not considered in this analysis due to the short time series of the data.

Figure 2.15 shows actual fertility rates and fertility rates predicted by the model for each country according to the country's development indicators. Due to missing data, no predictions are available for Comoros, Djobouti, Lebanon, Oman, Palestine, and Somalia. For some countries (Bahrain, Morocco, Tunisia, and Tur-

Figure 2.15: Actual and predicted fertility rates based on human development.



Note: Predicted fertility rates were calculated using a panel model with fixed country and time effects and the natural logarithm of GDP per capita, life expectancy, and average years of female schooling, as well as the squared terms of these variables.
Data: See Table 2.1 and Table 2.2.

key), we observe systematic over-prediction of fertility, in other countries (Israel, Jordan, Mauritania, Saudi Arabia, and Syria), we observe systematic under-prediction. Under-prediction indicates that these countries lay behind human development and have higher fertility than human development would suggest. Contrary, over-prediction indicates that these countries show fertility rates which are advanced to their human development. For the other countries (Algeria, Egypt, Iran, Iraq, Kuwait, Libya, Qatar, Sudan, United Arab Emirates, and Yemen), the trend in fertility is both advanced and behind human development, depending on time.

2.8 Discussion

Pioneering studies have shown the negative relationship between fertility and development (Bongaarts and Watkins 1996; Bryant 2007; Lee 2003). More recently, researchers have further questioned the fertility-development link and found that the relationship between development and fertility reverses from negative to positive above a certain threshold (Luci-Greulich and Théveonen 2014; Myrskylä et al. 2009). Nevertheless, research on fertility and development have mainly been limited to the developed countries and less is known about developing countries. Using health, wealth, and economic components, as well as the gender equality dimension of development, we investigated the relationship between development and fertility for the MENA region, which is among the fastest growing regions in the world (cf. Chapter 1).

Similar to Myrskylä et al. (2009), our results showed that the relationship between development, measured by HDI, and fertility followed an "inverse J-shaped" pattern for MENA countries, and fertility started to increase with higher development above a certain threshold. Most MENA countries have experienced considerable improvements in their development levels and these findings suggest that the association between HDI and fertility will reverse from negative to positive in the future.

We further investigated to what extent the relationship found between development and fertility can be explained by various development components. When we assessed the impact of economic development on fertility, the negative relationship between economic progress and fertility was found only during the transition from very low levels of economic progress to low levels of economic progress. Thus, economic progress is not likely to have considerable consequences on fertility in the future, as most of the MENA countries have already achieved certain levels of wealth.

As compared to the economic component of development, the non-economic components of development were more strongly associated with fertility. In line with the Demographic Transition Theory, country-specific analyses showed that the increase in life-expectancy was not immediately followed by a decline in fertility for most countries (exceptions were Lebanon and Turkey which showed instant decreases in fertility with the increase in life expectancy). Fertility rates started to decline after a certain level of life-expectancy had been achieved.

Furthermore, the relationship between education and fertility was substantially strong. Specifically, the higher share of women with no education seemed to be strongly related to high levels of fertility, whereas the share of females with tertiary education was influential on fertility decline in the first transition stage (i.e., from no females with tertiary education to some females with tertiary education). According to the World Bank (2017), half of the countries (i.e., 11/22) included in this study had female literacy rates lower than 80 percent in 2010. This points out that the notable share of women living in these countries is illiterate or with no education. If this share of women continues to decrease in the future, fertility should further decline.

Apart from health and education, gender inequality was correlated to fertility. As MENA countries are becoming more gender egalitarian, we have found declines in fertility rates. However, similar to the HDI, the relationship was reversed after reaching a certain threshold. One explanation of these changing trends could be that advancing gender equity in social institutions helps men and women to combine employment with having children, rather than leaving women with distinct choices between either children or employment (McDonald 2000a).

Our fixed-effects models provided further support to the bivariate analyses and indicated that the relationships found for various development indicators and fertility were not due to the unobserved country and time characteristics. Our alternative measure for gender inequality (i.e., difference in life expectancy between men and women) included in the fixed-effect models also confirmed that higher gender inequality was associated with higher fertility. Moreover, different specification methods (i.e., models using continuous quadratic functions and development dummies, respectively) further supported the reversing relationships found for HDI and GII in the bivariate analyses.

Overall, fixed-effect models indicated that education, especially average years of female schooling and share of females with no education, had the strongest association with fertility. Gender inequality, on the other hand, was less strongly related to fertility as compared to the other indicators of development.

Combined all these findings suggest that investing in human capital and other non-economic development components has more of an impact on fertility than economic progress. A "J-shaped" fertility-development relationship also exists in MENA countries. If advances in economic and social development continues (i.e., increasing HDI and gender equality), some MENA countries with higher levels of development may experience an increase in their fertility rates after reaching a certain threshold level of development. On the other hand, countries in which the level of development is relatively low in comparison to the others, and where the shares of females with no schooling are rather high, may have declining fertility rates until they reach a certain level of development.

Despite its contributions we acknowledge some limitations when interpreting the results of this study. Firstly, we only used the TFR to measure fertility, since TFR is the only available fertility measure for most of the MENA countries. As suggested by the literature (Bongaarts and Feeney 1998; Sobotka and Lutz 2011), TFR may be biased in the presence of tempo effects, e.g. delayed childbearing to higher ages. Nonetheless, as shown by Engelhardt and Schulz in Chapter 1 of this volume, changes of age-specific fertility patterns in MENA countries are considerably different to Western countries, which have shown a rising mean age at first birth since the 1970s (Balbo et al. 2013). There is not much evidence suggesting a shift in childbearing to higher ages. Therefore, it is plausible that the TFR captures fertility trends in MENA countries well.

Secondly, we acknowledge the fact that migration may have consequences on fertility, as immigrants have different fertility patterns compared to the natives (Sobotka 2008; Goldstein 2009; Myrskylä et al. 2011) and we could not rule out these factors in the analyses.

Third, Bongaarts (2010) pointed out the high share of individuals with unmet need for contraception and unwanted pregnancies in developing countries. Research on fertility and development could be further improved by taking these factors into consideration.

Lastly, we found that some countries' predicted and actual TFR showed significant discrepancies. For some countries (e.g., Morocco, Tunisia, Turkey), fertility was overestimated using different indicators of human development, whereas it was underestimated for some others (e.g., Jordan, Saudi Arabia, Syria). Why such patterns are observed is still a riddle and future research needs to be undertaken to understand these patterns more clearly.

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