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Abstract

In this study, I examine the links between demographic change and fiscal policy in MENA countries, focusing specifically on the economic impacts coming from the conflict between social security and education, which are two of the most government programs in any country. The paper is unique as it incorporates a political economy model of education given expected increases in social security spending in the background. Labor movements and growth results are expected to depend significantly on the return to education. A sensitivity analysis on the parameter that shows the return to education spending reveals that MENA countries would suffer significantly from a lower return to education. This scenario highlights the importance of returns to education for the growth results in the MENA region. It is also important to note that the MENA region could potentially experience significant positive economic growth if it can maintain a high return to education and also attract more capital, despite a rising fiscal burden coming from the social security system.

JEL Classifications: E62, F21, F22, F43, H30, J10

Keywords: population aging, overlapping generations, endogenous fiscal policy, international labor mobility, international capital mobility, Middle East and North Africa region.

ملخص

في هذه الدراسة، نقوم بدراسة الروابط بين تغير الديموغرافي والسياسة المالية في بلدان المنطقة، مع التركيز بشكل خاص على الآثار الاقتصـادية القادمة من الصـراع بين الضـمان الاجتماعي والتعليم، وهما من أكثر البرامج الحكومية في أي بلد. هذه الورقة فريدة من نوعها لأنها تشـتمل على نموذج الاقتصـاد السـياسـي للتعليم والزيادات المتوقعة الواردة في الإنفاق على الأمن الاجتماعي في الخلفية. ومن المتوقع أن تعتمد إلى حد كبير على عوائد التعليم والحركات العمالية ونتائج النمو. وباجراء تحليل حسـاسـية تظهر عودة الإنفاق على التعليم غير انها تكشف عن أن دول المنطقة ستعاني بشكل كبير من انخفاض العائد على التعليم. هذا السيناريو يسلط الضوء على أهمية العودة إلى التعليم لنتائج النمو في منطقة الشرق الأوسط. ومن المهم أيضـا أن نلاحظ أن منطقة الشرق الأوسط من المحتمل أن تواجه نمو اقتصـادي إيجابي إذا كان يمكن الحفاظ على عائد مرتفع على التعليم، وكذلك جذب المزيد من رؤوس الأموال، على الرغم من الأعباء المالية المتزايدة القادمة من نظام الضمان الاجتماعي.

1. Introduction

Middle East and North Africa (MENA) region countries have unique demographic characteristics. Within the MENA region, Arab countries have higher fertility and population growth rates and a significantly younger age structure than other countries and regions. This can be a "demographic gift or a demographic curse" depending on whether the high population growth and fertility can be transformed into economic growth. The unique demographic characteristics of MENA countries show stark contrast to the developed world where countries are going through a serious population aging trend.[1] Table 1 shows the significant demographic differences between MENA, and other developed countries. MENA countries stand out as the group that is clearly different from European countries. Hence, MENA makes an excellent case for studying the impact of demographic changes.

In this study, I examine the links between demographic change and fiscal policy in MENA countries, focusing specifically on the economic impacts coming from the conflict between social security and education, which are two of the most government programs in any country. Pension systems in MENA countries have structural problems. To start with, they are financially unsustainable. While MENA countries have relatively young populations, they are not immune from demographic changes and some already show signs of aging populations. As MENA countries go through demographic transition to lower fertility rates, lower population growth rates and aging populations, their social security systems will be under even greater pressure in the near future. Such pressure could bring about serious conflict between government programs such as social security and education.

There is extensive literature on the link between population changes and international capital mobility[2], but only few studies examined such changes with labor migration (Tosun, 2005; Leers, Meijdam and Verbon, 2004; Storesletten, 2000). Galor (1992) argued that capital and labor have asymmetric characteristics. Labor mobility has a dual effect in the sense that it exhibits the characteristics of capital mobility as well. Young migrant workers contribute to the economy both as laborers, and as savers. What the aging literature has not addressed is that, when allowed to vote, migrant workers will change the political structure composed of young and elderly voters in both labor-receiving and labor-sending countries. In a majority voting mechanism for fiscal policy decisions, political shifts resulting from labor migration may have sizeable impacts on government programs such as education. Since education is a major input to human capital accumulation, aging is expected to have significant growth consequences. This paper uses a two-region, two-period overlapping generations model with international labor mobility and a politically responsive fiscal policy to examine the labor movements from the MENA countries to the aging developed countries. The goal is to examine the economic growth consequences of demographic differences and the labor movements. The paper brings out the political economy of aging through the aging-education-human capital link. This is particularly important in the context of international labor mobility, with young migrant workers from the MENA region participating in the political system of developed countries. The paper examines the significance of factor mobility as a policy choice by comparing the labor mobility model to an alternative open economy model with international capital mobility. The paper also allows us to discuss policy implications through migration and education policies in both MENA countries and developed countries.

The paper is structured as follows. The next section provides a demographic outlook of the MENA region and compares it to European countries to the North of the Mediterranean. This

[1] See Heller (2003) and CSIS (2002) for recent discussions on the aging trend in developed countries.

[2] This literature generally argues that demographic differences can lead to capital flows from low population growth to high population growth regions. For examples, see Börsch-Supan (1996), Kenc and Sayan (2001), Tosun (2003, 2001) and Van Groezen and Leers (2000).

is followed by a description of a two-region, two-period overlapping generations model with international labor mobility. A transition analysis is provided in section 3 that shows results from various numerical simulation exercises. The last section presents summary and concluding remarks.

2. Demography of the MENA Region: A Comparative Outlook

The MENA region has been going through significant demographic change. Table 1 shows the basic demographic statistics for the combined Northern and Southern Mediterranean regions for the years 1960, 2010 and 2050.[3] This shows the magnitude of the aging of the populations in a broader Mediterranean region. While the population is expected to reach about 590 million by 2050, population growth rate decreases almost to zero for the region. This is explained by the decrease in the total fertility rate to well below the replacement rate of 2.1. Substantial increases in the median age, share of population 65 and older, and the old-age dependency ratio are clear evidence of the demographic deficit through population aging. The demographic change in the region is also shown in the population pyramids in Figure 1.

As shown in Figures 2 and 3, MENA countries in the Southern Mediterranean Region, however, have and will continue to have significantly younger populations than the European countries, while this gap between these countries is expected to close to some extent by 2050. For those countries, the key age group in terms of size is the 15-29 age group, indicating the youth bulge. For the European counterparts, the population pyramid in Figure 3 already looks different in 2010, with 35-39 as the largest age group. By 2050, we expect the 65-69 and 70-74 age groups to be the biggest groups together with the 40-44 age group. This variation between regions can also be illustrated in Figures 4 and 5, where the two opposite extreme cases are shown for Palestinian Territories, and Spain, respectively. It is interesting that the region will continue to have these vast demographic differences, where the West Bank and Gaza will continue to have a population pyramid that is typical for a developing country and Spain will have a population that looks almost nothing like an actual pyramid. For Spain, the projections in Figure 5 show that 70-74 age group will become the largest population age group.

The demographic divide between the two sub-regions can also be seen in the maps in Figures 6 and 7. Figure 6 shows that the fertility rate is higher in the MENA countries with an average total fertility rate of 2.1 for the Mediterranean region, which also happens to be the replacement rate of a population. Among these countries Turkey has a total fertility rate that is roughly equal to the region average. We also see that while the average total fertility rate in the Mediterranean region is significantly smaller than the one for the MENA region or the Arab world, it is still higher than the one for the OECD countries or the European Union (EU) countries. When we look at the old-age dependency ratio, it is now the European countries in the North of the Mediterranean that have significantly higher old-age dependency ratio. Most of the MENA countries have a ratio less than 10%. Mediterranean countries on average have a higher old-age dependency ratio than the Arab world and the MENA region, but still a lower ratio than the OECD countries and the EU countries.

The flow and stock of migrants in the region are shown in Figures 8 and 9, respectively. While the Southern European (or the Northern Mediterranean) countries were home countries during the "guest worker" migration in the 1950s and 1970s, they became mainly host countries for migration starting the 1980s. Among the original guest worker home countries, Greece, Italy, Portugal and Spain now have positive net migration rates, and Turkey's net migration rate is very close to zero. On the other hand, most of the MENA countries have negative net migration rates, which indicates that they are net senders of migrants. Countries like Jordan, Libya, and Syria and the Palestinian Territories are exceptions due to large Palestinian refugee populations

[3] This table shows data for countries that have a Mediterranean Sea coast. Figures shown for 2050 are UN projections based on medium-fertility scenario.

in those countries. Figure 9 shows that Southern European (or Northern Mediterranean) countries now have a large stock of migrants compared to most of the MENA region. The Mediterranean region as a whole is a net recipient of migrants, with an average rate less than the averages for the OECD countries and the EU countries, but the region has a higher stock of migrant population as a share of total country population than all other regions compared in Figure 9.

In the next section, the economic and fiscal consequences of such demographic differences are presented in a numerical simulation model with international labor mobility.

3. The Two-Region Model

The model builds on an overlapping generations model first developed by Diamond (1965)[4]. To examine open economy issues, the standard framework is extended to a two-region model with international labor mobility similar to Galor (1986, 1992) and Crettez et al. (1996, 1998)[5]. Another major extension is the modeling of fiscal policy decision-making through a political process.

Recent discussions on population aging have noted the potential generational conflict generated by the need to share society's resources between non-working elderly and the younger working population. Hence, it is argued that increasing number of elderly voters may render changes in public expenditure patterns in favor of the elderly. Empirically, Poterba (1997) provides evidence from the United States that older citizens prefer lower levels of public spending for education — an expenditure that primarily benefits the young. A recent study by Harris, Evans, and Schwab (2001) confirms this finding using school-district-level data, however with a smaller estimated impact than Poterba's estimates.

Social security payments to old also constitute an important source of conflict between generations. However, the focus here is government spending that enhances the productivity of the working young. One good example of this is government spending on public education. For simplicity, the productivity enhancing public program will be referred to as "education" throughout the text. It should be noted that any other government program that is directed towards increasing the labor productivity of the young could easily be used. The goal is to highlight the strong link between this type of government spending and human capital accumulation, which is considered to be one of the most important avenues for economic growth. Besides, this link is even more pronounced taking into consideration the migration of young workers. To make the political process of fiscal policy determination for public education rich, interesting, yet tractable, a median-voter framework with voter heterogeneity is used. Voter heterogeneity is introduced by assuming a distribution of genetic ability levels for the working generation. The ability level of the individual will, in turn, determine the value she receives from public education. A social security program is also introduced by having an exogenously fixed level of social security spending in the model. An income tax that is earmarked for social security adjusts through the periods to balance the social security budget. Thus, there are separate taxes for education and social security spending with voters deciding only on the education tax rate.[6] For clarity, the model is presented for one region only. This is followed by a description of the two-region world equilibrium.

[4] However, the earliest overlapping generations models are described by Allais (1947) and Samuelson (1958).

[5] A two-country model with international capital mobility is shown by Buiter (1981).

[6] The political process is modeled through a median voter framework because the conditions for the median voter theorem are satisfied. The choice of voters is over a single dimension, since the preferred education tax rate is the only choice variable, and the voter preferences are single peaked. The property of single-peakedness has been demonstrated to ensure existence of a voting equilibrium (Black 1948).

3.1 Households

Individuals live for two periods and seek to maximize a utility function based on discretionary consumption in the first and second period of their lives,

$$U = \ln C_{jt} + \left(\frac{1}{1+\delta}\right)\ln C_{jt+1}, \tag{1}$$

here *j* indexes individuals, C_{jt} is consumption when young, C_{jt+1} is consumption when old, and δ is the pure rate of time preference. The period-specific budget constraints in the first and the second periods are:

First period: $C_{jt}\left(a_j\right) + S_{jt}\left(a_j\right) = \left(1-\tau_t-\mu_t\right) w_t l_t\left(a_j\right)$

Second Period: $C_{jt+1}\left(a_j\right) = \left(1+\left(1-\tau_{t+1}-\mu_{t+1}\right) r_{t+1}\right) S_{jt}\left(a_j\right),$ (2)

where $S_{jt}\left(a_j\right)$ is first period saving, w_t is the wage rate individual *j* faces, $l_t\left(a_j\right)$ is effective labor,[7] where a_j is the ability level of individual *j*, r_{t+1} is the rate of return to capital, τ_t is the rate of income taxation that is applied to both capital and labor income. This tax is used entirely to finance the productivity enhancing public good. An additional tax (μ_t) is also applied to capital and labor income to finance social security spending by the government.

It is assumed that there is a continuous distribution of abilities that is replicated in each new generation. The ability level of individual *j* is indexed by a_j, which ranges from 0 to 1. The density function of abilities is denoted by *f(a)* where by definition:

$$\int_0^1 f\left(a\right) da = 1 . \tag{3}$$

Human capital is accumulated from the interaction of ability level (a_j) of the individual and government spending per young (g_t^e) on a productivity enhancing public good such as education:

$$l_t\left(a_j\right) = \Phi\left[a_j g_t^e + 1\right]^{\psi}, \tag{4}$$

where, Φ denotes an index on human capital efficiency and ψ is a parameter indicating the return to human capital from the inputs (a_j and g_t^e).[8] The form of the human capital function is chosen so that even individuals with the lowest ability $(a_j = 0)$ will contribute to the economy in terms of human capital (see Holtz-Eakin, Lovely, and Tosun 2004). From the maximization of (1) subject to (2) and (4); we get the familiar first order condition:

$$C_{jt}\left(a_j\right) = \frac{1+\delta}{\left(1+r_{t+1}\left(1-\tau_{t+1}-\mu_{t+1}\right)\right)} C_{jt+1}\left(a_j\right). \tag{5}$$

Using (5) and (2), we derive the optimal saving of an individual *j*:

$$S_{jt}\left(a_j\right) = \frac{1}{2+\delta}\left(1-\tau_t-\mu_t\right) w_t l_t\left(a_j\right). \tag{6}$$

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[7] Here, young supplies one unit of time to the economy. Note that, making the allocation of time between "schooling" and supplying labor endogenous does not change this analysis.

[8] ψ should be less than unity to prevent increasing returns from government spending.

The saving of an individual depends on net labor earnings but it is independent of the interest rate. This is due to the Cobb-Douglas form of the utility function. Given (5) and (6), it is straightforward to derive consumption functions in each period:

$$C_{jt}\left(a_j\right)=\frac{1+\delta}{2+\delta}\left(1-\tau_t-\mu_t\right)w_t l_t\left(a_j\right)$$

$$C_{jt+1}\left(a_j\right)=\frac{\left(1+r_{t+1}\left(1-\tau_{t+1}-\mu_{t+1}\right)\right)\left(\left(1-\tau_t-\mu_t\right)w_t l_t\left(a_j\right)\right)}{2+\delta}. \tag{7}$$

3.2 Political process of fiscal policy

It is assumed that there is a predetermined level of social security spending. Thus, the social security tax μ_t is simply determined by the government budget constraint ($\mu_t y_t = g_t^s$) where g_t^s is the social security spending per young person.[9]

However, the fiscal policy for the productivity enhancing public good is determined through a political process for which a median-voter framework with voter heterogeneity is used. Voter heterogeneity is introduced by assuming a distribution of genetic ability levels for the working generation. The ability level of the individual will, in turn, determine the value she receives from the public good.

The consumption and saving decisions, as seen above, depend on human capital, which is in turn determined by government spending (see equation 4). By plugging these into (1), we get the indirect utility function, which each voter maximizes, in determining his or her preferred tax rate, subject to the government budget constraint for this type of government spending ($\tau_t y_t = g_t^e$).[10] The preferred tax rate of individual *j* when young is:

$$\tau_{jt}\left(a_j\right)=\frac{a_j\psi y_t\left(1-\mu_t\right)-1}{\left(1+\psi\right)a_j y_t}\ . \tag{8}$$

Equation (8) is the tax rate each individual prefers based on her ability level. This preferred tax rate is increasing in both ability level a_j and in income per young y_t but decreasing in the social security tax μ_t. Thus, the existence of a social security system depresses education spending through a lower preferred education tax rate. In addition, because the old do not derive any benefit from publicly provided education and there are no bequests in the model, they incur a cost without enjoying any benefits. Therefore, their preferred education tax rate will always be zero, regardless of their ability.

Total population in each period is $N_{t-1}+N_t$ where N_t is composed of both newly born nationals and migrant workers. Given this, the median voter is defined by

$$N_{t-1}+N_t\int_0^{a_m} f\left(a\right)da=\frac{N_{t-1}+N_t}{2}, \tag{9}$$

here a_m is the ability level of the median voter.

[9] Social security spending consists of equal payments to the elderly population to finance a programmed elderly consumption such as health care. This consumption is assumed to be separate from the discretionary consumption decision and therefore it is not shown as part of households' utility maximization depicted in equations (1) through (7).

[10] It is assumed in each period that government uses the entire revenue from this tax to finance the public good for all young equally, regardless of their ability level (Bearse, Glomm, and Ravikumar 2000).

In the absence of migration, the median voter becomes a person with lower ability when population ages. In turn, the preferred tax rate of the median voter is lower. In other words, with population aging older people need fewer young voters to form a majority. Since these young voters are the ones at the lower end of the ability distribution, they prefer lower taxes than higher ability people because their return from public education is lower.

When labor migration is allowed, an aging country will experience an inflow of labor due to a higher wage rate than the rest of the world. This will change the age distribution of population in favor of the young generation. The identity of the median voter will be different from the case without migration. Now, the ability of the median voter will be higher compared to median voter's ability in the case without migration. However, whether the ability of median voter with migration can be greater than the pre-aging level is uncertain[11].

3.3. Producers

Each country produces a single good using a Cobb-Douglas production technology.

$$Y_t = \Lambda K_t^{\alpha} H_t^{1-\alpha} \ , \tag{10}$$

here Λ is the productivity index, K is capital stock and H is aggregate supply of human capital. The aggregate supply of human capital is:

$$H_t = N_t \int_0^1 l(a)\, f(a)\, da. \tag{11}$$

Human capital per worker, using (4) and (11), is

$$h_t = \Phi \int_0^1 (ag_t + 1)^{\psi}\ f(a)\, da. \tag{12}$$

Competitive factor markets require that real wage and interest rates are equal to the marginal products of labor and capital respectively. Therefore, factor demand equations are:

$$w_t = (1-\alpha)\Lambda \left(\frac{k_t}{h_t}\right)^{\alpha} \tag{13}$$

$$r_t = \alpha\Lambda \left(\frac{k_t}{h_t}\right)^{\alpha-1} \ . \tag{14}$$

Here, $k_t = K_t / N_t$ and $h_t = H_t / N_t$ are capital stock per worker and human capital per worker, respectively.

Using (6) and (12), saving per worker can be expressed as

$$s_t = \left(\frac{1}{2+\delta}\right)(1-\tau_t-\mu_t)\, w_t \Phi \int_0^1 (ag_t + 1)^{\psi}\ f(a)\, da. \tag{15}$$

3.4. International goods market equilibrium and labor flows

In the absence of international capital mobility, capital market equilibrium requires that saving in each period equals to accumulated capital in the following period. Capital market equilibrium conditions for each region can be depicted as

[11] In reality, there are barriers to labor migration that may rule out such a case.

$$k_{t+1}^{A} = \frac{N_t^{A} s_t^{A}}{N_{t+1}^{A}} \tag{16}$$

$$k_{t+1}^{B} = \frac{N_t^{B} s_t^{B}}{N_{t+1}^{B}}, \tag{17}$$

where, superscripts *A* and *B* denote regions.

To close the dynamic model, international labor market equilibrium must be specified. For simplicity, I assume that there is perfect international labor mobility.[12] International labor market equilibrium requires

$$N_{t+1}^{A} + N_{t+1}^{B} = \left(1+\eta_{t+1}^{A}\right) N_t^{A} + \left(1+\eta_{t+1}^{B}\right) N_t^{B}. \tag{18}$$

where, η_{t+1}^{A} and η_{t+1}^{B} are the population growth rates in region A and region B, respectively. Labor income is taxed where income is earned. Thus, source based income taxation is used for both regions.[13] This implies that net-of-tax wage rates are equalized in equilibrium. Therefore, the international labor flow constraint is:

$$w_{t+1}^{A} h_{t+1}^{A} \left(1-\tau_{t+1}^{A}-\mu_{t+1}^{A}\right) = w_{t+1}^{B} h_{t+1}^{B} \left(1-\tau_{t+1}^{B}-\mu_{t+1}^{B}\right). \tag{19}$$

It is assumed that only the members of the young generation moves between regions. Additionally, migration is assumed to have no effect on the ability distribution in both regions. This means that migration of labor affects the size rather than the composition of the young generation in these regions.

3.5 Model recap

The model incorporates the interaction of household behavior, firm behavior, political process, and international labor flows. Because the population growth rate changes, the median voter also changes. This leads to a change in government spending for the productivity enhancing public good, human capital accumulation, capital accumulation, and income per worker. When the population growth rate falls the ability level of the median voter will be lower. All else equal, this political transition would reduce provision of the public good. However, if the public good tax rate decreases, national saving, and thus, physical capital accumulation will be enhanced. This will create a positive effect on income per worker, government spending per worker and human capital per worker. When this positive feedback effect through human capital accumulation dominates the negative effect of a lower preferred public good tax rate, the demographic shift may induce higher income per worker, higher capital stock per worker, and higher human capital and government spending per worker. However, in an international setting, changes in the wage rate due to changes in income per worker and human capital per worker will lead to labor flows between regions, thus complicating the growth process even further.

4. Demographic Changes and Labor Migration

4.1. Population projections and simulation description

Simulations in this section are based on the population projections for developed and the MENA countries derived from the 2002 revision of the "World Population Prospects"

[12] A recent study by National Research Council shows that total stock of migrants increased quite dramatically in late 1980s and early 1990s (see National Research Council, 2000, pp. 157-159). In addition, in my model one period corresponds to 30 years, which makes perfect labor mobility a viable assumption.

[13] Under a source system, labor income is taxed where income is earned. The model tax treaties of the OECD and the United Nations both give source countries the first rights to tax income accrued within their borders.

published by the United Nations (United Nations, 2002a). The two world regions consist of 28 developed and 21 MENA region countries. Population growth rates implied by the projections are shown in Figure 10. The simulations will be shown for two 30-year periods, 2000–30 and 2030–60 and for the entire period 2000–60. The average population growth rates for the 1970–2000 period are used as a starting point. The population growth rate in developed countries decreases from an initial annual average rate of 0.8 percent to 0.67 percent for the 2000–2030 period and then to 0.38 percent for the 2030–60 period. In the MENA region countries, this rate goes down from an initial annual average rate of 3.98 percent to 2.29 percent for the 2000–30 period and then to 1.03 percent for the 2030–2060 period.

The elasticity of output with respect to capital input is set equal to one-third ($\alpha = 0.33$).[14] The annual rate of time preference is chosen to be 4 percent.[15] The two parameters, the rate of time preference in the utility specification and the population growth rate, are adjusted to the length of the model period (30 years). In the simulations, the ability level, *a*, is assumed to be distributed uniformly on the interval [0,1].

A critical parameter in the model is the elasticity of human capital with respect to government spending on education and ability level (ψ). Laitner (2000b) used a human capital function that is similar to (4) and set his human capital elasticity with respect to education equal to 0.1967. Based on an initial value of the ability of the median voter, Laitner's estimate corresponds approximately to $\psi = 0.4$ in our model. However, series of studies (and updates) by Psacharopoulos (1985, 1994 and 2004) estimated a significantly higher rate of return to education for low income and developing countries compared to developed countries. Hence, $\psi = 0.5$ is chosen as a compromise given Laitner's estimate and the MENA countries used in population projections.

The numerical simulations are shown for the following economic variables: number of workers, capital per worker, government spending (on education) per worker, education tax rate, human capital per worker, income per worker, consumption of a young person, consumption of an old person, and total consumption. To address the research questions mentioned in the outline, various simulation scenarios will be considered. First, the full (or perfect) labor mobility model is compared to an alternative open economy model where capital is internationally mobile without international labor mobility. This shows the significance of the choice of factor mobility in growth results. To examine the impact of migration policies of developed countries, the full (or perfect) labor mobility model is compared to two variants of this model. The first is the case where labor mobility is only allowed after 2030. This scenario considers the possibility that doors remain closed in the developed region until aging becomes an even bigger problem in the developed region. The next scenario allows for free labor mobility but puts a constraint on the political participation of migrant labor in the developed region for the first period. This simulates an extended delay in the naturalization of foreign workers into the political system of a country. Finally, for the significance of education policies, a sensitivity analysis will be conducted to show growth results from a different rate of return on education in MENA and the developed countries.

4.2. Full labor mobility simulation results

The full labor mobility simulation has perfect international labor mobility with migrant labor participating in the political system. Based on the population projections mentioned above, labor migrates from the MENA region to the developed region. Figure 11 shows this in

[14] This elasticity estimate is consistent with the data from the United States. See Laitner (2000a) for an argument.

[15] Caldwell, Favreault, Gantman, Gokhale, Johnson, and Kotlikoff (1999) argue that a premium of riskiness should be added to the widely used 2 percent rate. They use 3.5 percent as the discount rate, which is the real safe return on indexed Treasury bonds. See Coronado, Fullerton and Glass (2000) for a recent argument on the variety of discount rates used in studies of social security. They assert that the selection of discount rates ranges between 2 to 5 percent.

reference to the change in the number of workers in both regions. The developed region experiences a major boom in foreign workers, particularly between 2000 and 2030. On the other hand, MENA countries send labor to the developed region and thus experience significantly lower domestic labor growth despite a high population growth.

Figure 12 shows that this labor movement leads to opposite changes in capital stock per worker in developed and MENA regions between 2000 and 2030. The influx of labor into the developed region does not translate into capital growth in that period since capital stock is determined by saving in the previous period (1970–2000), leading to a decrease in that period's capital stock per worker. The MENA region experiences a significant rise in the capital stock per worker since the capital stock in the period 2000–2030 is utilized by fewer workers. The contribution of new labor to the growth in the developed region shows itself in the next period with a considerable 54 percent growth in capital stock per worker. While the MENA region still exhibits a strong growth in capital stock per worker between 2030 and 2060, this is significantly smaller than the growth recorded between 2000 and 2030. This is mainly due to considerable population growth decrease (from 3.98 percent to 2.29 percent) in the MENA countries coupled with labor emigration between 2000 and 2030 leading to significant saving per worker and capital per worker increases. While this population loss gave an initial boost to the MENA region in 2000–30, it eventually showed itself in lower capital growth in 2030–2060 period. The outlook for the sixty year period from 2000 to 2060 shows a small overall decline in capital stock per worker in the developed region but a strong increase in the MENA region.

The other important component of growth is the human capital accumulation. As shown in equations (4) and (12), human capital is a function of the government spending on education. Changes in human capital are shown first in Figure 13, which is followed by figures that show changes in the education tax rate and education spending. Figure 13 shows that both regions experience decreases in human capital per worker between 2000 and 2030 and during the entire 2000-2060 period. The developed region records a slight increase between 2030 and 2060, mainly due to migrant labor offsetting the negative effect of a decrease in the median voter ability, which would mean lower support for education spending, caused by aging. On the other hand, the MENA suffers from losing labor to the developed world by having significant decreases in the human capital per worker in all periods, particularly between 2000 and 2030.

As mentioned above, the link between labor growth and human capital can be better understood with an examination of the changes in the education tax rate and education spending. These are shown in Figure 14 and Figure 15, respectively. As discussed in the political process of fiscal policy, aging causes the median voter to become a lower ability person putting a downward pressure on the education tax rate. However, labor migration offsets this negative effect by increasing the number of young voters. The migrant workers do not only contribute to domestic production but they also participate in the political system by voting for fiscal policy decisions. Since they are young, they change the political scene in favor of the young generation. Thus, with labor migration the choice of the tax rate changes in favor of the young voters despite the aging trend. Figure 5 shows this for the developed region between 2000 and 2030. The education tax rate increases considerably in the developed region while it falls quite dramatically in the MENA region. However, the education tax rate decreases in the developed region in the following period as labor growth diminishes. The developed region experiences a slight decrease in the education tax rate between 2000 and 2060, while the MENA region records a significant decrease. This decrease in the MENA region is also partially due to significant decrease in the population growth rate in the region during the entire period as shown in Figure 10. Changes in education spending in Figure 15 closely match the tax rate changes in Figure 14 and the human capital changes in Figure 13. As in human capital and tax rate decreases in Figures 13 and 14, education spending in the MENA region decreases

considerably in all periods between 2000 and 2060. This is mainly due to decreases in the number of productive workers through lower population growth rates and emigration.

Results in Figure 12 and 13 for capital per worker and human capital per worker provide a good background for examining changes in income per worker. Figure 16 shows that the MENA region exhibits income growth in all periods between 2000 and 2060. This is mainly due to strong growth in capital per worker, which dominates decreases in human capital per worker. The developed region suffers from a decrease in both capital per worker and human capital per worker between 2000 and 2030, which shows itself in a significant decrease in income per worker in this period. This region exhibits an overall decrease in income per worker for the entire period. On the other hand, the MENA region benefits from strong growth in capital per worker, which leads to an income growth in all periods considered.

In addition to income per worker, consumption as a measure of welfare is examined in Figures 17 through 19. Figure 17 presents the change in the consumption of young in developed and MENA regions. As shown in equation 7, consumption of a person when young depends on the net labor earnings. As also seen in equation 19, perfect labor mobility dictates that the net labor earning of a young worker gets equalized between the two regions. Since labor flows from the MENA region to the developed region, net labor earnings must have gone up in the MENA region and must have gone down in the developed region. This would increase consumption of young in the MENA region and decrease it in the developed region. This is seen clearly in Figure 17. Since labor migration to the developed region occurs in both 2000-2030 and 2030-2060 periods, a similar consumption pattern is observed in the MENA region in both periods and in the entire period from 2000 to 2060.

Old-age consumption, different from the young-age consumption, also depends on the net return on saving. The increase in the capital per worker in the MENA region shown in Figure 12 depresses the interest rate in this region, leading to a decrease in the net return on saving. Figure 18 shows that this leads to a decrease in the old-age consumption in this region between 2000 and 2030. The developed region experiences the opposite and has an increase in the old-age consumption in that period. In the following period, the old-age consumption in the MENA region (developed region) increases (decreases) due to an increase (decrease) in the net saving income. However, the old-age consumption decreases in the MENA region and increases in the developed region between 2000 and 2060.

Figure 19, brings the results shown in Figure 17 and 18 together and shows changes in the sum of consumptions, in a given period, of representative persons from young and old generations. The figure shows that the MENA region experiences an increase in the sum of consumptions in all periods from 2000 to 2060. However, the developed region has an increase in the sum of consumptions only between 2000 and 2030. It has a slight overall decrease between 2000 and 2060.

4.3. Model comparisons, labor mobility scenarios, sensitivity analysis

In this section, full labor mobility model is compared to an alternative open economy model where capital is internationally mobile without international labor mobility. Further comparisons are also made using alternative assumptions about labor mobility and the political process of fiscal policy. The goal is to shed light on the choice of factor mobility in the presence of population aging. Table 2 presents simulation results for these comparisons. Results shown in Figure 11 through 19 are reproduced in columns 1 and 2 of Table 2.

Columns 3 and 4 in Table 2 show that the capital mobility model produces inferior outcomes for the developed region, in terms of the economic variables used in the analysis, compared to the full labor mobility model. It appears that labor flows to the developed region offset the adverse effect of population aging particularly on the human capital per worker. As explained

earlier, migrant workers participate in the political process of fiscal policy by voting favorably for the education tax, leading to enhanced education spending and human capital in the developed region. The MENA region exhibits strong capital and income growth throughout the periods under both full labor mobility and capital mobility (without labor mobility) models. In the capital mobility model without labor mobility, the MENA region does not lose labor to the developed region and benefits from the inflow of capital from the developed region. In this model, capital inflows to the MENA region enable this region to increase investment, production and income while at the same time retain its young productive workers, voters and human capital. Thus, the capital mobility model (without labor mobility) produces more favorable results for the MENA region compared to the full labor mobility model.

The next set of comparisons is between the full labor mobility model and variants of this model shown in columns (5) through (8) in Table 2. The first is the case where labor mobility is only allowed after 2030. This scenario considers the possibility that doors remain closed in the developed region until aging becomes an even bigger problem in the developed region.[16] The results for this scenario in column (5) show that the developed region may fare better if labor flow is delayed until 2030. With the relatively low labor growth, net return on labor does not decrease as much as in the full labor mobility model in column (1) leading to better capital, human capital, income and consumption results. The reverse is true for the MENA region results shown in column (6). Due to the constraint on labor migration until 2030, the MENA region experiences significantly lower growth particularly in capital per worker.

The next scenario allows for free labor mobility, but puts a constraint on the political participation of migrant labor in the developed region for the first period. This simulates an extended delay in the naturalization of foreign workers into the political system of a country. After a thirty-year delay, workers eventually become citizens with eligibility to vote. Column (7) shows that this scenario produces rather adverse outcomes for both regions. These are mostly driven by greater decreases in education tax rate, education spending and human capital per worker compared to the results in columns (1) and (2). With aging in the developed region, lack of young migrant votes for the education tax rate leads to a decrease in this tax rate such that net labor earning differential between the regions can only be closed by a greater flow of labor from the MENA to the developed region. This is the reason behind the interesting result of substantially high labor growth in the developed region.

The final scenario considers the effect of lower returns to education to the simulation results. This is done by choosing a lower value for the elasticity of human capital with respect to government spending on education and ability level (ψ). The results in column (10) of Table 2 show a substantially adverse outcome for the MENA region. Due to lower productivity of the MENA region workers, migration from the MENA to the developed region is significantly lower which in turn leads to lower capital growth. At the same time, lower return on education discourages human capital accumulation which explains the significant decrease in human capital per worker in the MENA region throughout the period from 2000 to 2060. These produce significant decreases in income per worker and sum of young and old consumption. This scenario highlights the importance of returns to education for the growth results in the MENA region.

5. Implications and Conclusions

This paper examines the economic effects of demographic trends using the population projections for the developed countries and the MENA region. Unlike the majority of studies on aging, the paper addresses the political economy of those demographic changes and education spending through a median voter model. It is argued that labor mobility has a dual

[16] For example, in the U.S., the effect of the baby boom generation retirement will not be fully seen for another decade.

effect on the economy. Besides the contribution of young migrant workers to the economy as laborers, these workers also contribute to capital accumulation as savers. This paper highlights another effect through migrant workers' involvement in the political process of fiscal policy. When allowed to vote, migrant workers change the political structure composed of young and elderly voters in both labor-receiving and labor-sending countries. In a majority voting mechanism for fiscal policy decisions, political shifts resulting from labor migration may have sizeable impacts on government programs such as education, and in turn may have strong growth and welfare effects.

For the analysis, a two-region, two-period overlapping generations model with international labor mobility and a politically responsive fiscal policy is used. The numerical simulations based on United Nations population projections for the developed and MENA regions show significant labor movements from the developed to the MENA region throughout the 2000–60 period. While labor inflows seem to help the developed region recover from the aging trend, this region incurs an overall decrease in income per worker and consumption. On the other hand, the MENA region experiences significant increases in income per worker and consumption.

There are three sets of policy implications from this paper. The first is about the comparison of internationally mobile factors of production. The policymakers in the MENA region would benefit from knowing the consequences of the policy choice by the developed countries of making capital or labor mobile in the region. The developed region suffers from substantial income and consumption decreases under the capital mobility model without labor mobility, which is averted, to a large extent, in the labor mobility model. The MENA region, on the other hand, seems to benefit more in the capital mobility model. These comparisons show that the choice between labor and capital mobility indeed matters for the analysis of the effects of population aging.

The second regards migration policies of developed countries. For this, further comparisons are made using alternative assumptions about labor mobility and the political process of fiscal policy. The full labor mobility model performed quite well compared to a scenario where labor migration from MENA to developed is restricted until 2030 and another scenario where labor migrates to the developed region but does not participate in the political system for the first thirty-year period. The latter scenario gives inferior economic results for both the developed and the MENA regions. Constraining political participation of young migrant workers does not seem to help when these young workers can vote for greater education spending that sets a growth process through human capital enhancement.

The third is about social security and education policies. The paper is unique as it incorporates a political economy model of education, given expected increases in social security spending in the background. Labor movements and growth results are expected to depend significantly on return to education. A sensitivity analysis on the parameter that shows the return to education spending reveals that the MENA countries would suffer significant decreases in income per worker and sum of young and old consumption from a lower return to education. This scenario highlights the importance of returns to education for the growth results in the MENA region. It is also important to note that MENA region could potentially experience significant positive economic growth if it can maintain a high return to education and also attract more capital despite a rising fiscal burden coming from the social security system.

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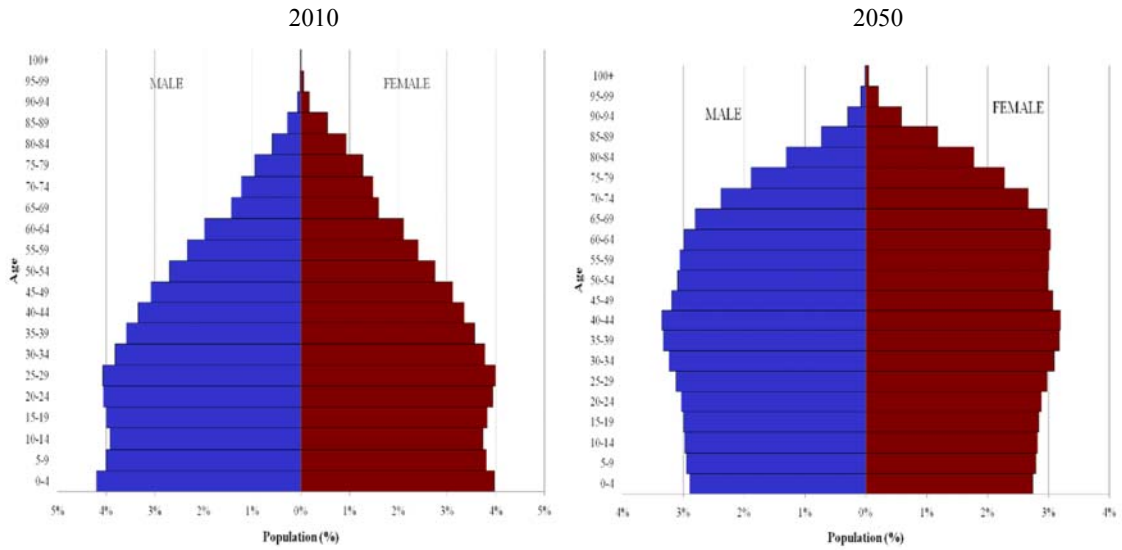
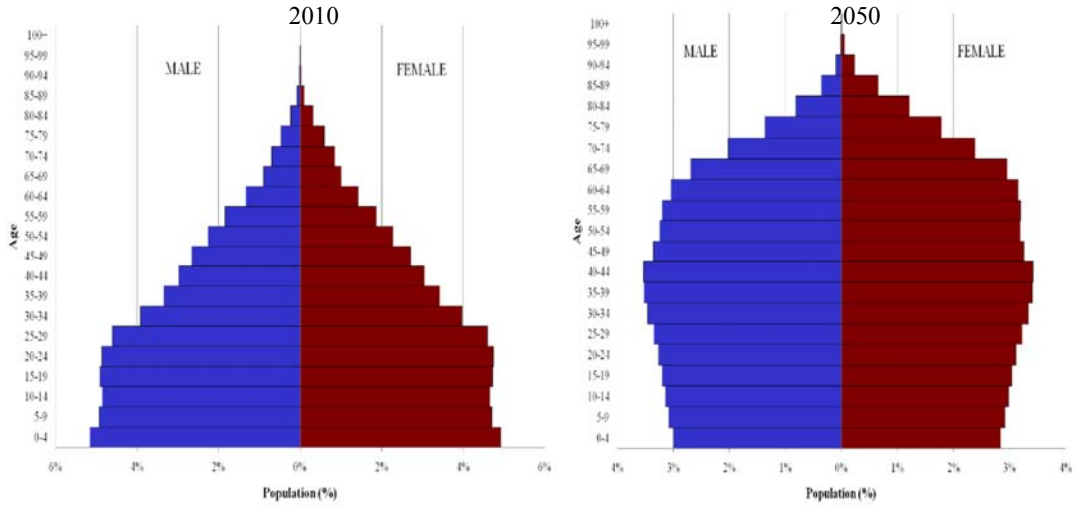
Figure 1: Population Pyramid of the Mediterranean Region (2010 and 2050)



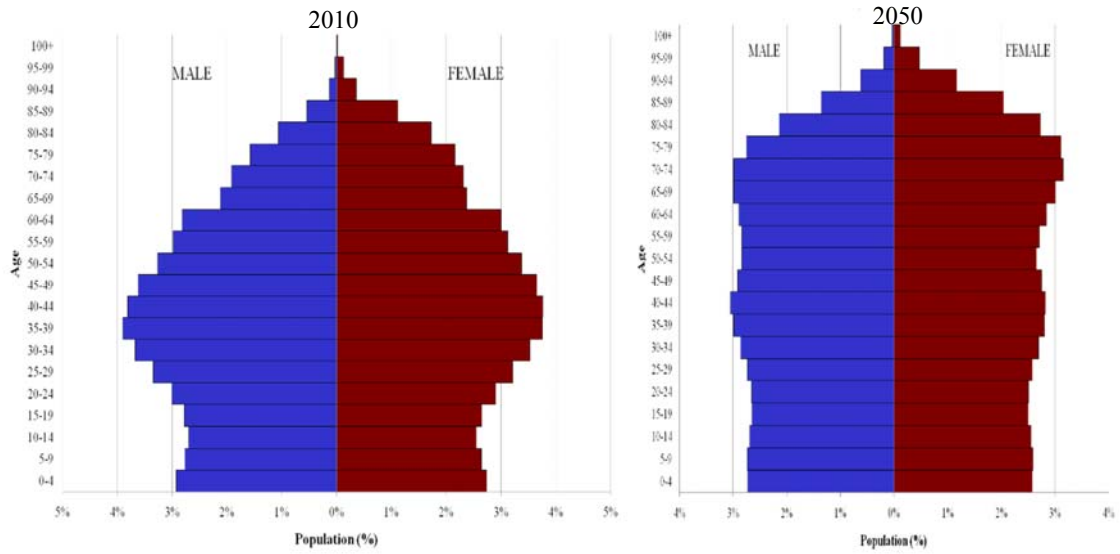
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

Figure 2: Population Pyramid of the Southern Mediterranean or MENA Sub-Region (2010 and 2050)



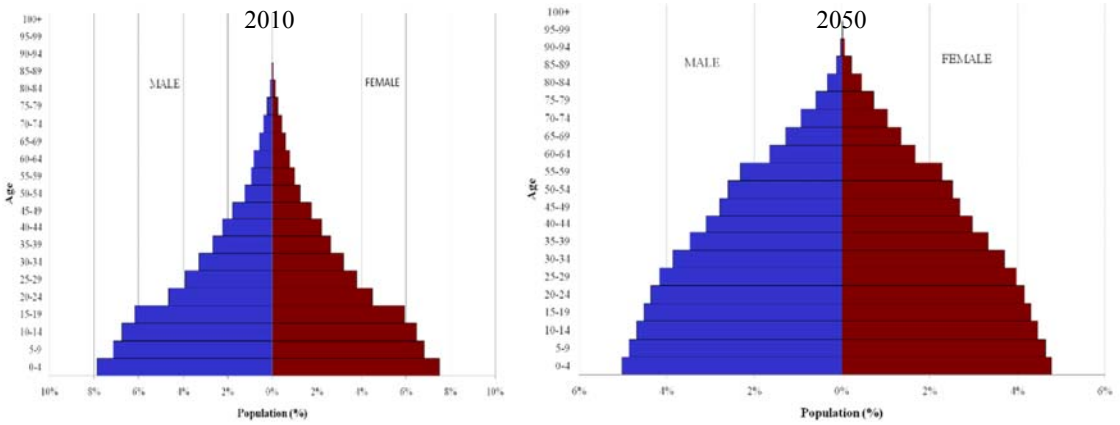
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

Figure 3: Population Pyramid of the Northern Mediterranean Sub-Region (2010 and 2050)



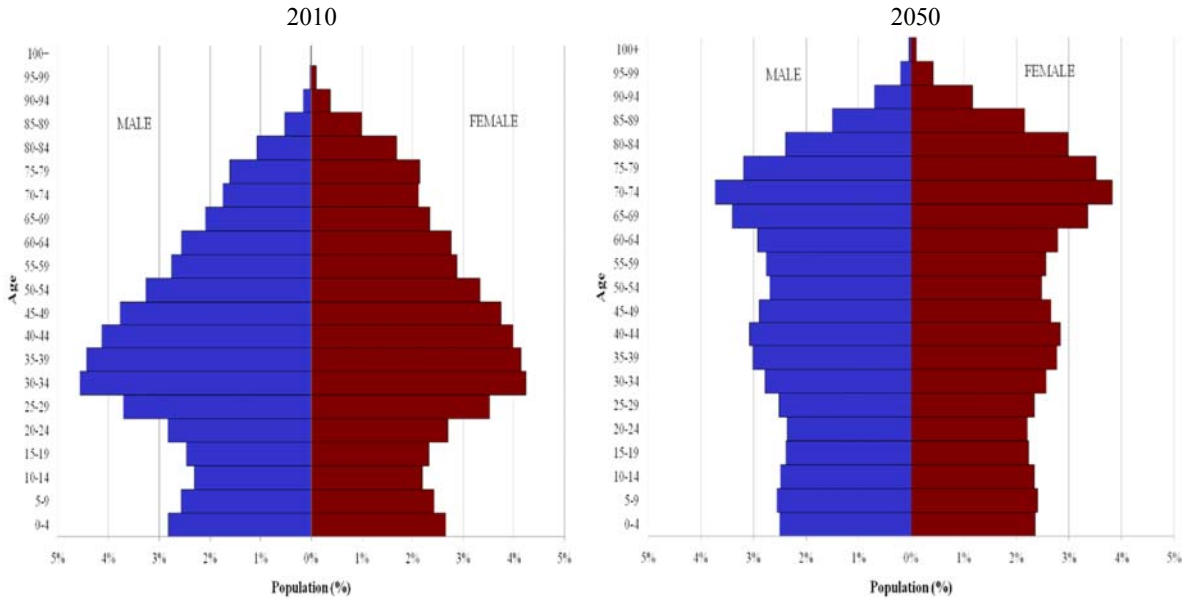
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

Figure 4: Population Pyramid of the Palestinian Territories (2010 and 2050)



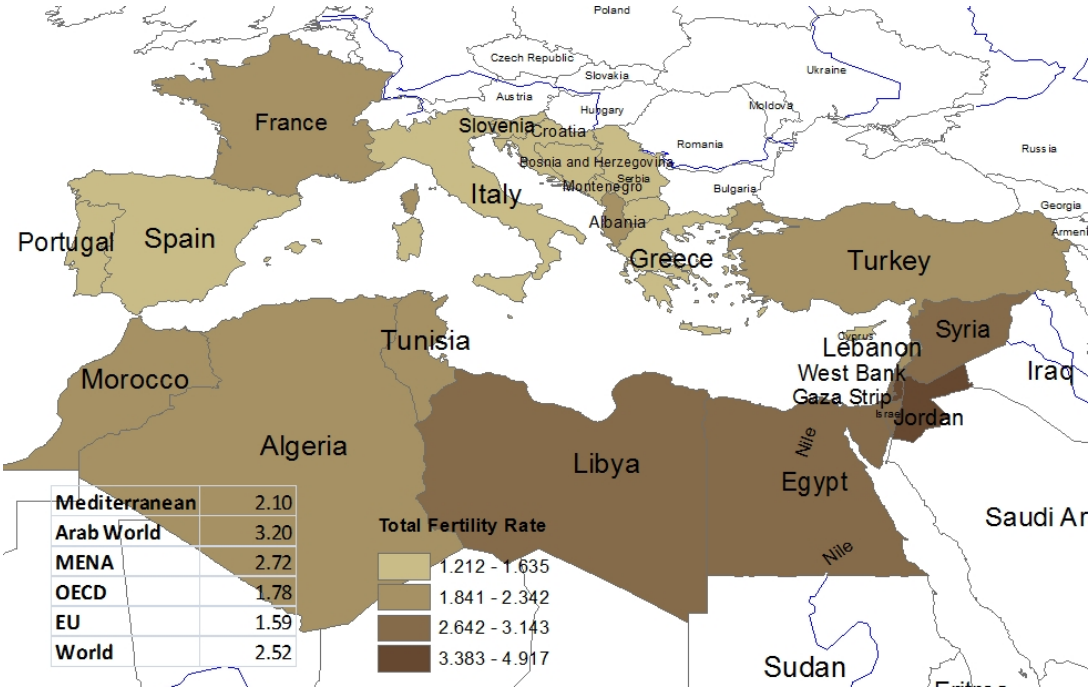
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

Figure 5: Population Pyramid of Spain (2010 and 2050)



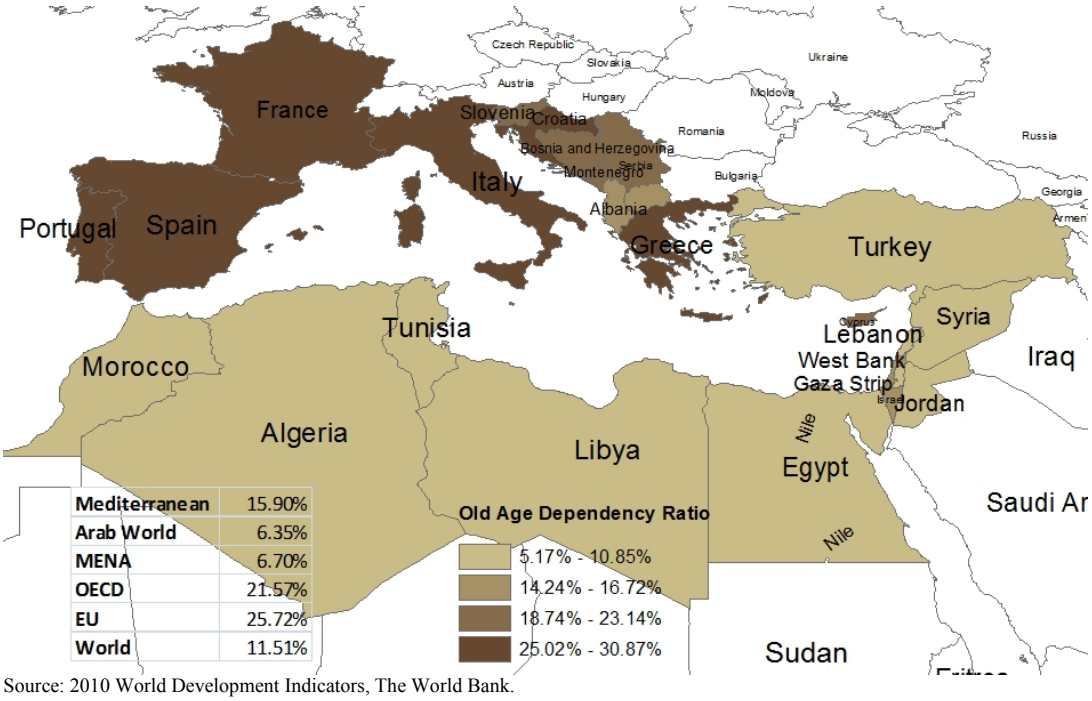
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

Figure 6: Total Fertility Rate in the Mediterranean (2009)



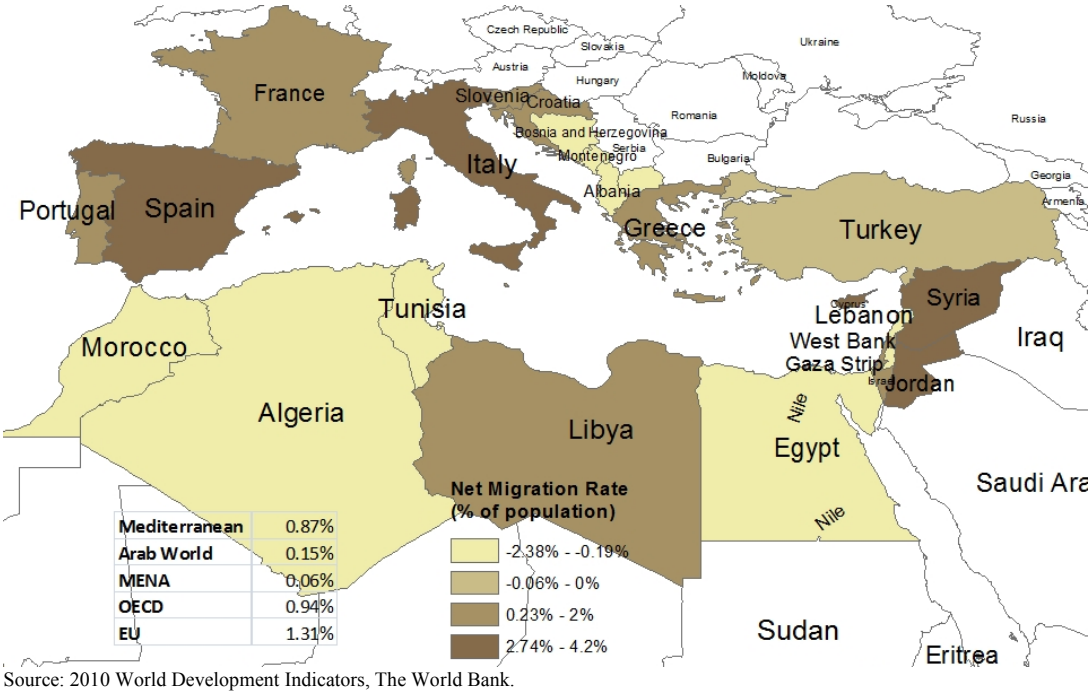
Source: 2010 World Development Indicators, The World Bank.

Figure 7: Old-Age Dependency Ratio in the Mediterranean (2009)



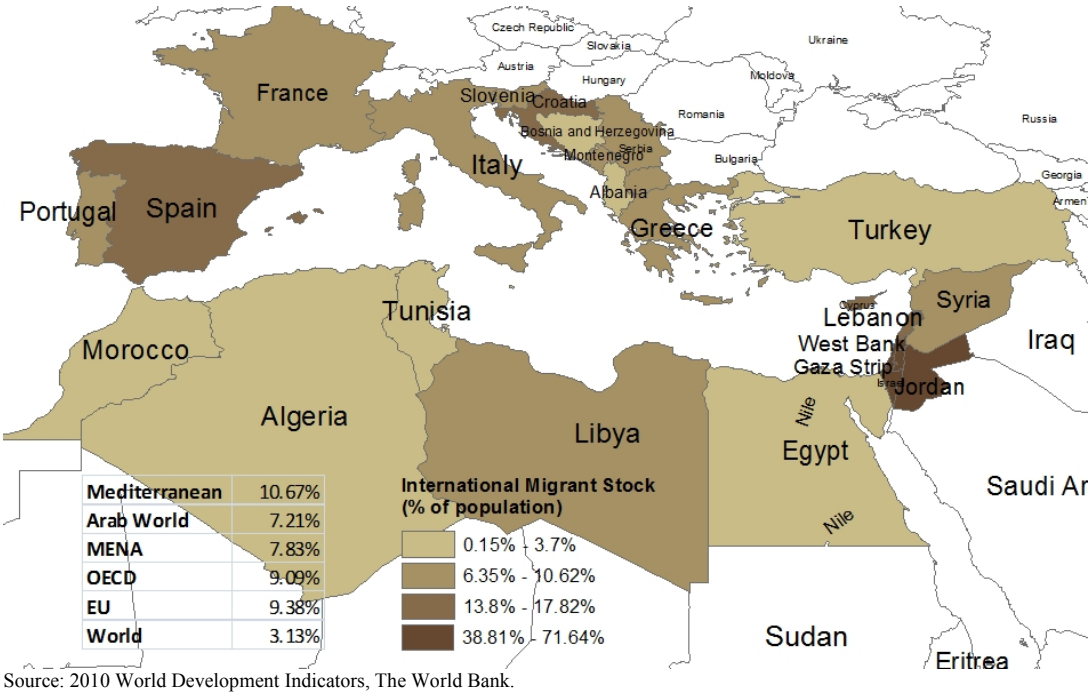
Source: 2010 World Development Indicators, The World Bank.

Figure 8: Net Migration Rate in the Mediterranean (2009)



Source: 2010 World Development Indicators, The World Bank.

Figure 9: International Migrant Stock in the Mediterranean (2009)



Source: 2010 World Development Indicators, The World Bank.

Figure 10: Population Growth Rates in Developed and MENA Regions

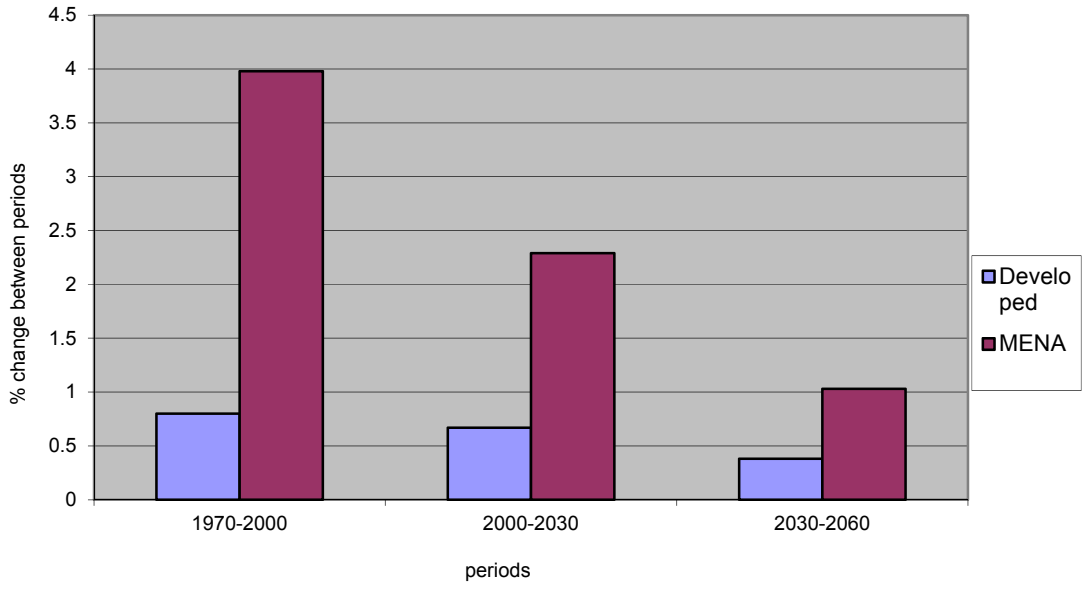


Figure 11: Change in Number of Workers

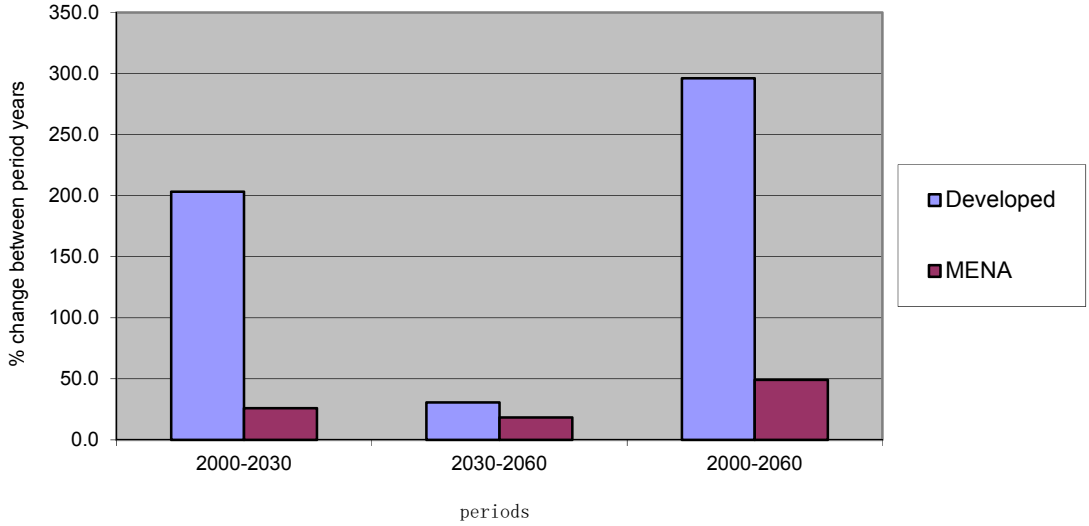


Figure 12: Change in Capital Stock Per Worker

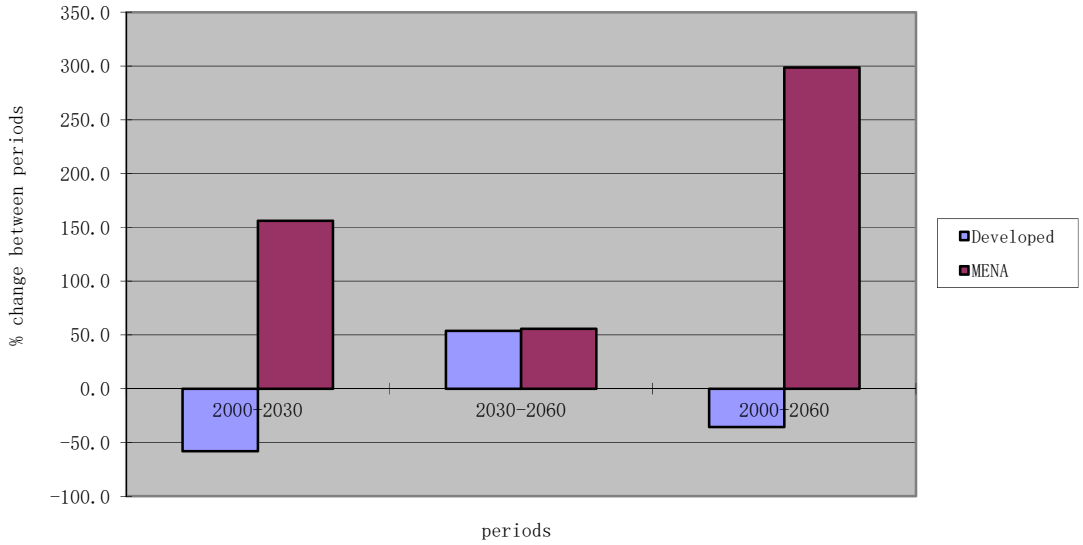


Figure 13: Change in Human Capital Per Worker

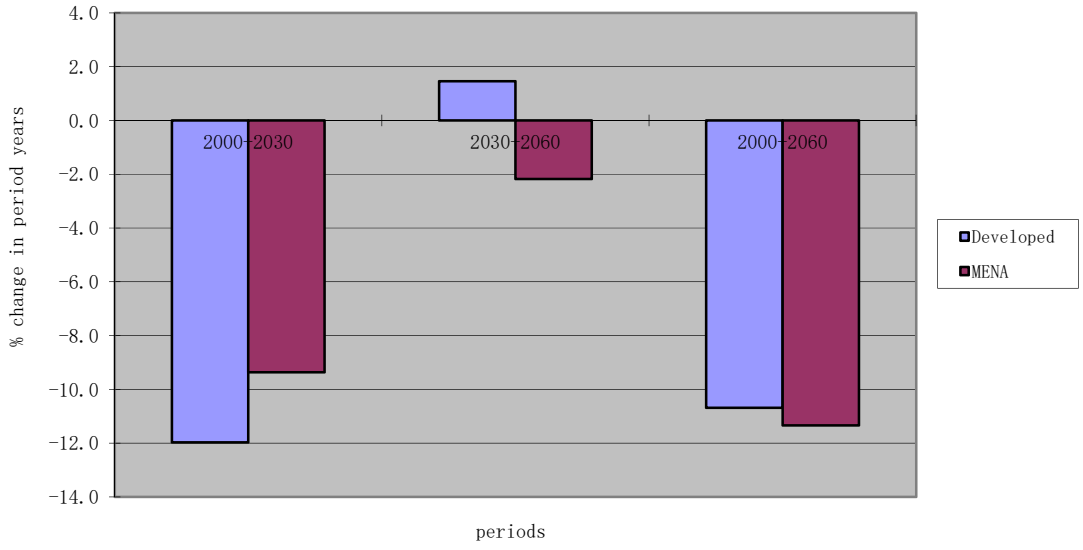


Figure 14: Change in Education Tax Rate

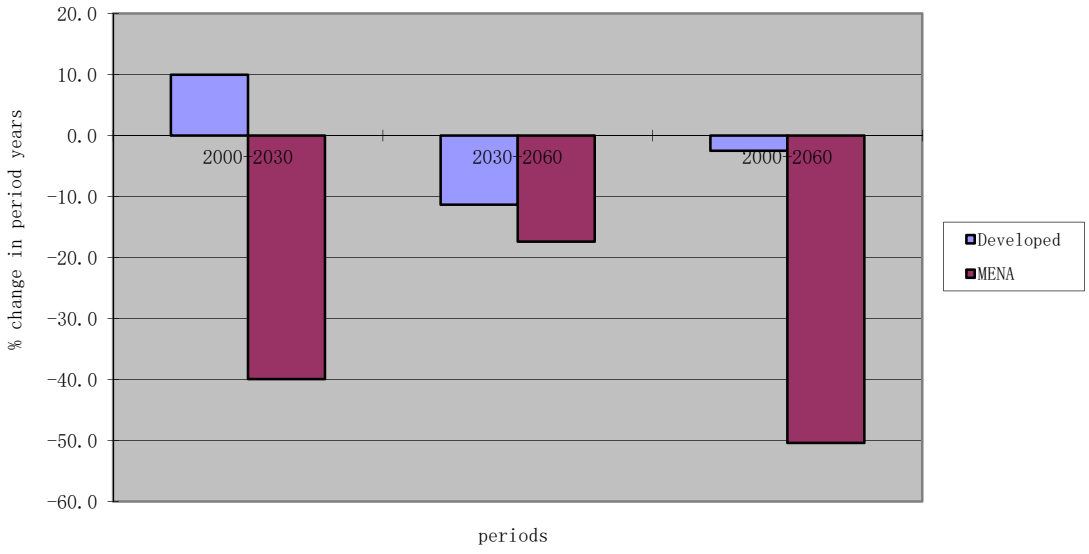


Figure 15: Change in Education Spending Per Worker

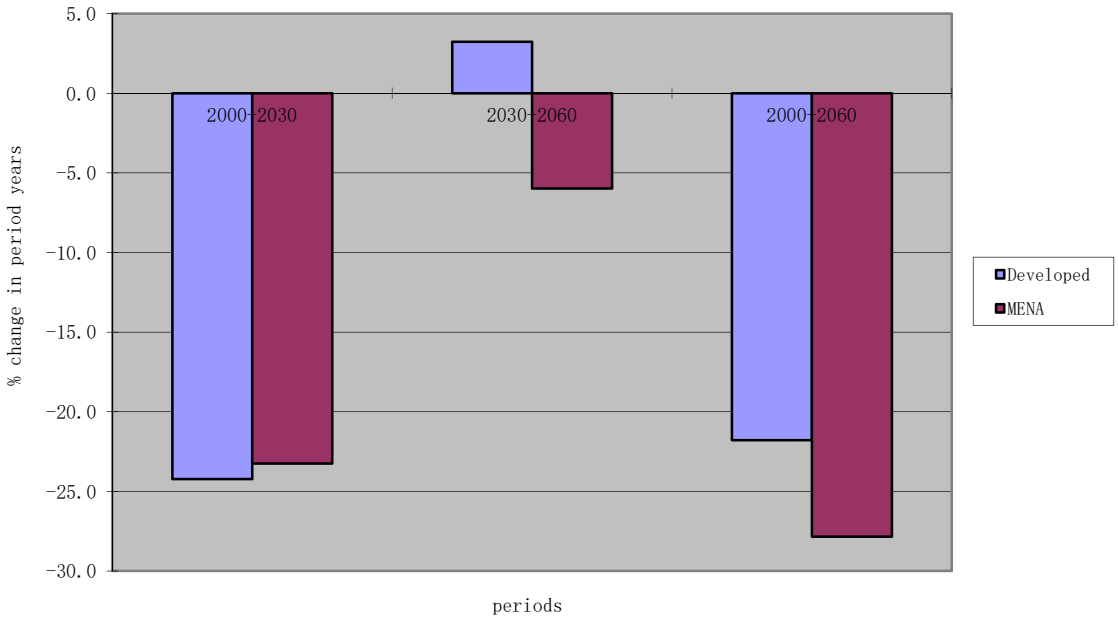


Figure 16: Change in Income Per Worker

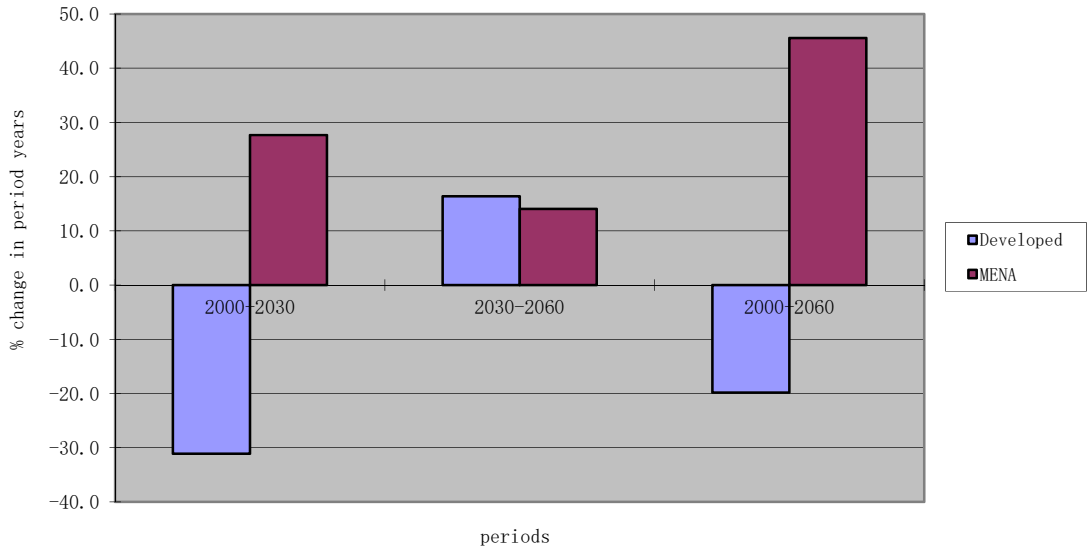


Figure 17: Change in Consumption of Young

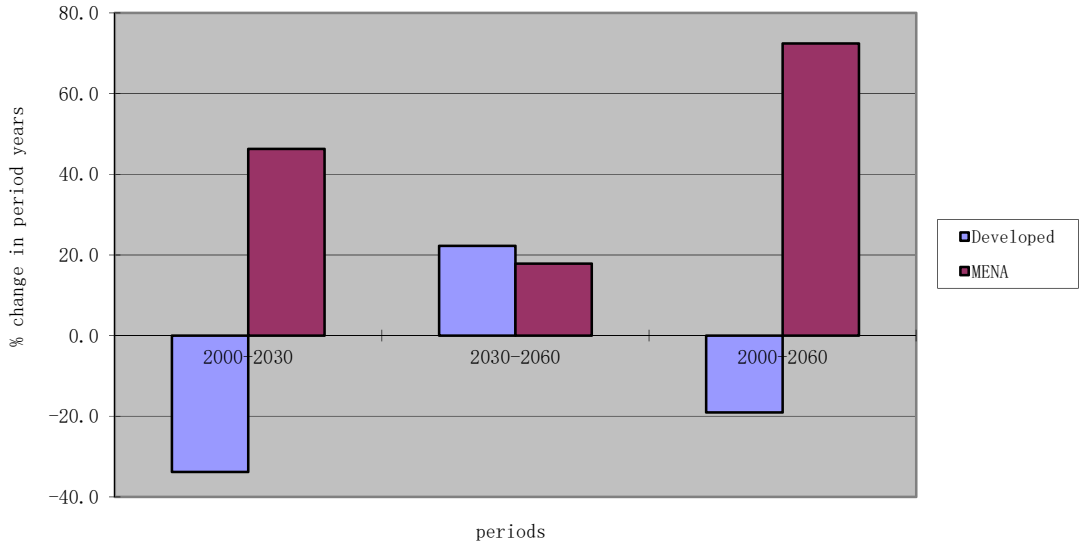


Figure 18: Change in Consumption of Old

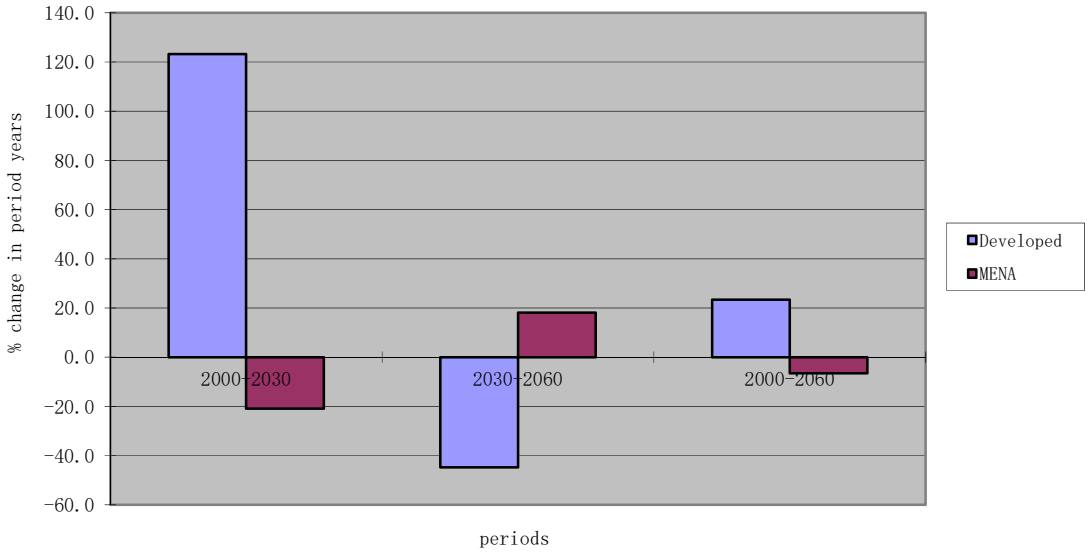


Figure 19: Change in Sum of Young and Old Consumption

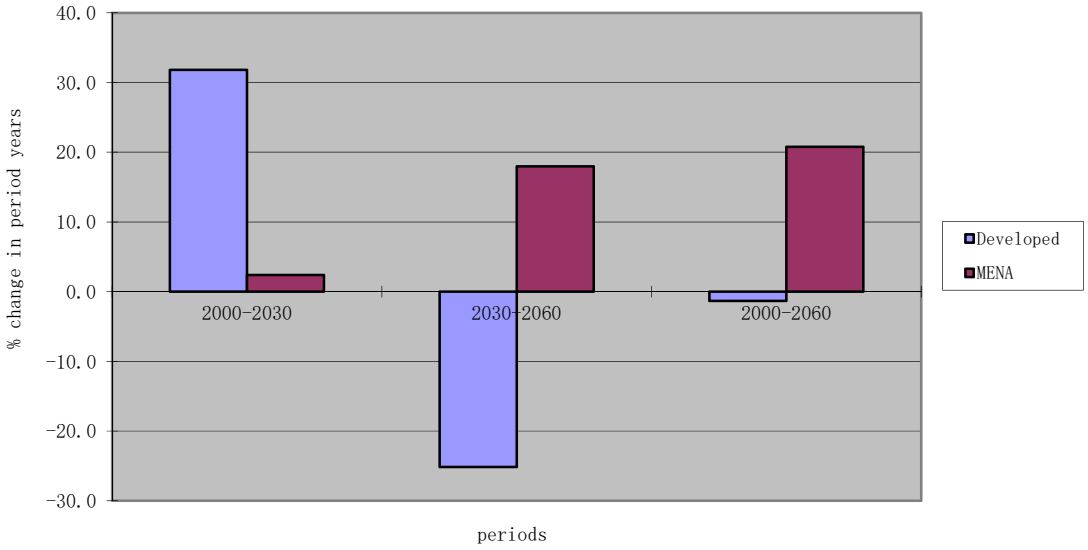


Table 1: Demographic Differences Between Europe and Middle East and North Africa

	2000		2030		2060	
	Share of Population 15 - 64 (%)	**Share of Population 65 and Older (%)**	**Share of Population 15 - 64 (%)**	**Share of Population 65 and Older (%)**	**Share of Population 15 - 64 (%)**	**Share of Population 65 and Older (%)**
Austria	61.86	15.50	56.40	26.33	48.75	31.59
Belgium	59.62	17.01	54.63	25.02	51.02	27.92
Cyprus	57.34	11.49	56.57	19.82	52.46	26.51
Denmark	61.54	14.99	55.31	23.59	53.36	25.20
Finland	60.54	14.93	53.15	25.81	51.33	27.33
France	58.63	15.96	54.32	23.63	52.18	26.88
Germany	62.39	16.31	54.86	26.42	50.39	28.43
Greece	60.89	17.50	57.37	25.87	48.82	32.44
Iceland	57.45	11.70	56.36	20.00	52.45	26.38
Ireland	58.21	11.31	58.46	17.64	53.40	25.03
Italy	62.33	18.07	56.00	28.22	48.40	33.17
Luxembourg	61.61	13.79	59.44	18.23	54.23	24.13
Netherlands	62.16	13.62	55.74	23.28	53.22	25.24
Norway	58.93	15.36	55.22	23.26	52.04	27.32
Portugal	61.10	15.61	58.87	22.48	51.25	29.00
Spain	62.19	16.79	58.33	25.45	47.69	34.05
Sweden	58.60	17.40	53.47	25.17	50.01	28.91
Switzerland	61.86	15.99	52.47	29.78	48.92	31.13
United Kingdom	58.90	15.86	57.18	21.11	52.98	25.15
Algeria	49.26	4.12	62.12	8.71	56.44	20.89
Bahrain	59.97	2.51	63.56	10.78	58.73	19.39
Djibouti	43.54	3.00	49.95	4.38	59.60	7.92
Egypt	48.01	4.45	58.07	8.03	59.03	16.63
Iran (Islamic Republic of)	46.85	4.46	62.42	8.39	54.63	23.04
Iraq	44.32	2.80	54.98	4.96	60.82	12.06
Jordan	47.33	2.82	60.28	6.19	58.94	16.98
Kuwait	64.84	1.34	63.24	11.84	57.25	21.18
Lebanon	53.45	6.10	62.34	10.76	55.45	22.31
Libyan Arab Jamahiriya	50.32	3.53	61.96	8.19	56.48	20.43
Morocco	51.80	4.25	60.41	8.92	57.77	18.57
Oman	50.29	1.99	55.20	5.92	59.29	12.64
Qatar	64.54	1.55	57.86	15.23	59.28	17.99
Saudi Arabia	48.49	2.53	57.67	6.04	60.64	13.91
Syrian Arab Republic	44.54	2.92	60.06	6.24	58.34	17.72
United Arab Emirates	64.75	1.21	59.12	16.25	54.97	23.19
Tunisia	53.24	5.64	62.02	11.61	53.62	24.78
Turkey	52.70	5.47	62.01	10.76	56.27	21.50
Yemen	37.37	2.37	42.29	2.66	55.15	5.11
Average of 19 European Countries	60.32	15.22	56.01	23.74	51.21	28.20
Average of 19 MENA Countries	51.35	3.32	58.71	8.73	57.51	17.70
Average of 9 Southern Medit. Countries	50.07	4.37	61.03	8.82	56.93	19.98

Source: United Nations.

Table 1: Cont'd

	Average Annual Population Growth Rate in % (2000-2030)	Average Annual Population Growth Rate in % (2030-2060)
Austria	-0.08	-0.39
Belgium	0.08	-0.17
Cyprus	0.49	-0.09
Denmark	0.09	-0.21
Finland	0.05	-0.28
France	0.30	-0.09
Germany	-0.03	-0.21
Greece	-0.10	-0.49
Iceland	0.57	-0.04
Ireland	0.82	0.10
Italy	-0.35	-0.69
Luxembourg	1.33	0.61
Netherlands	0.28	-0.13
Norway	0.33	-0.10
Portugal	-0.10	-0.43
Spain	-0.07	-0.44
Sweden	0.07	-0.20
Switzerland	-0.24	-0.61
United Kingdom	0.31	0.08
Algeria	1.53	0.39
Bahrain	2.06	0.59
Djibouti	2.04	1.37
Egypt	2.03	0.74
Iran (Islamic Republic of)	1.40	0.44
Iraq	3.17	1.25
Jordan	2.39	0.75
Kuwait	2.89	0.58
Lebanon	1.16	0.17
Libyan Arab Jamahiriya	1.84	0.54
Morocco	1.53	0.44
Oman	3.34	1.35
Qatar	1.38	0.26
Saudi Arabia	3.17	1.18
Syrian Arab Republic	2.45	0.80
United Arab Emirates	1.46	-0.03
Tunisia	0.99	0.11
Turkey	1.15	0.22
Yemen	6.03	3.35
Average of 19 European Countries	0.20	-0.20
Average of 19 MENA Countries	2.21	0.76
Average of 9 Southern Mediterranean Countries	1.68	0.46

Source: United Nations.

Table 2: Comparisons with Alternative Factor Mobility Models 1

		Labor Mobility Model (No Capital Mobility)		Capital Mobility Model (No Labor Mobility)	
		Developed Region	MENA Region	Developed Region	MENA Region
	Time Periods	**(1)**	**(2)**	**(3)**	**(4)**
Number of workers	2000–2030	203.2	25.9	22.2	97.2
	2030–2060	30.6	18.4	12.0	36.0
	2000–2060	296.1	49.1	36.9	168.2
Capital stock per worker	2000–2030	-58.1	156.2	-48.8	194.9
	2030–2060	53.7	55.6	32.9	40.5
	2000–2060	-35.6	298.7	-31.9	314.4
Human capital per worker	2000–2030	-12.0	-9.4	-21.1	24.4
	2030–2060	1.5	-2.2	-10.5	-2.1
	2000–2060	-10.7	-11.3	-29.3	21.7
Income per worker	2000–2030	-31.1	27.7	-31.5	65.3
	2030–2060	16.4	14.0	2.0	10.3
	2000–2060	-19.8	45.6	-30.2	82.4
Education tax rate	2000–2030	10.0	-39.9	-13.2	3.7
	2030–2060	-11.3	-17.4	-23.8	-14.0
	2000–2060	-2.5	-50.4	-33.8	-10.8
Education spending per worker	2000–2030	-24.2	-23.2	-40.5	71.6
	2030–2060	3.2	-6.0	-22.3	-4.9
	2000–2060	-21.8	-27.8	-53.8	63.1
Consumption of young	2000–2030	-33.8	46.3	-28.0	63.1
	2030–2060	22.2	17.9	9.9	16.2
	2000–2060	-19.1	72.4	-20.9	89.4
Consumption of old	2000–2030	123.2	-20.9	21.7	-38.9
	2030–2060	-44.7	18.1	-37.9	40.8
	2000–2060	23.4	-6.5	-24.4	-14.0
Sum of young and old consumption	2000–2030	31.8	2.4	-0.9	-8.8
	2030–2060	-25.2	18.0	-22.1	27.8
	2000–2060	-1.3	20.8	-22.8	16.6

Table 2: Comparisons with Alternative Factor Mobility Models 1/ (concluded)

		Labor Mobility Model with Mobility After 2030 (No Capital Mobility)		Labor Mobility Model with Migrants Voting After 2030 (No Capital Mobility)		Labor Mobility Model with Lower Returns to Education (No Capital Mobility)	
	Time Periods	Developed Region (5)	MENA Region (6)	Developed Region (7)	MENA Region (8)	Developed Region (9)	MENA Region (10)
Number of workers	2000–2030	22.2	97.2	217.1	20.5	116.5	60.1
	2030–2060	78.6	19.7	29.0	18.5	16.6	33.5
	2000–2060	118.3	136.2	308.9	42.7	152.4	113.8
Capital stock per worker	2000–2030	3.9	63.6	-59.9	167.7	-41.3	101.4
	2030–2060	-30.5	105.2	56.8	41.4	44.2	34.9
	2000–2060	-27.7	235.6	-37.2	278.6	-15.4	171.7
Human capital per worker	2000–2030	-1.2	7.0	-27.5	-26.3	-5.6	-36.3
	2030–2060	-0.5	-20.7	21.5	16.5	-7.1	-15.3
	2000–2060	-1.7	-15.2	-11.9	-14.2	-12.3	-46.0
Income per worker	2000–2030	0.4	23.1	-40.4	12.7	-19.3	-6.9
	2030–2060	-11.6	8.5	32.1	24.2	7.4	-1.2
	2000–2060	-11.2	33.6	-21.2	40.1	-13.3	-8.0
Education tax rate	2000–2030	-2.8	-3.4	-17.8	-63.8	9.6	-57.1
	2030–2060	11.7	-51.0	17.3	29.9	-20.8	-64.3
	2000–2060	8.5	-52.6	-3.6	-53.0	-13.2	-84.7
Education spending per worker	2000–2030	-2.6	18.9	-51.0	-59.3	-11.7	-59.9
	2030–2060	-1.1	-46.5	54.8	61.4	-14.9	-64.7
	2000–2060	-3.7	-36.4	-24.2	-34.2	-24.8	-85.8
Consumption of young	2000–2030	1.7	24.6	-36.2	39.1	-22.3	12.5
	2030–2060	-15.6	27.7	25.3	20.2	17.3	7.0
	2000–2060	-14.2	59.1	-20.1	67.2	-8.8	20.4
Consumption of old	2000–2030	54.5	0.1	124.5	-26.6	94.0	-25.9
	2030–2060	17.4	-14.8	-46.6	22.9	-33.6	-5.9
	2000–2060	81.4	-14.7	19.9	-9.8	28.9	-30.2
Sum of young and old Consumption	2000–2030	23.7	8.6	30.9	-3.9	26.3	-13.0
	2030–2060	1.6	2.1	-26.2	21.6	-15.3	-0.3
	2000–2060	25.8	10.8	-3.4	16.9	6.9	-13.3

Notes: 1/ All numbers refer to percentage changes between the years indicated in the time period.
Source: Computed by author.