Demographic Divide and Labour Migration in the Euro-Mediterranean Region*

Working paper 1011

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Abstract

This paper provides a demographic outlook of the Euro-Mediterranean region and then shows the economic and fiscal consequences of such demographic differences within a two-region model with international labour mobility. International labour mobility is also examined through an externalities framework where brain drain from migration could be taxed by the home countries. Taxing the brain drain has a substantial limiting effect on labour migration and a small negative effect on per worker growth. On the other hand, it could be a solution to the negative externality problem associated with brain drain. It is also found that such tax can raise substantial tax revenue for the SMCs which could be used to enhance human capital in the region.

JEL Classification: E62, F22, H23, H24, H41

Keywords: Demographic divide, demographic deficit, population aging, youth bulge, labour mobility, brain drain, overlapping generations, endogenous tax policy, Mediterranean region.

1. Introduction

There is a significant demographic divide in the Euro-Mediterranean Region between European countries in the North and the Southern Mediterranean Countries (SMCs) in the South. The SMCs have higher fertility and population growth rates and a significantly younger age structure than the Northern Mediterranean countries and most other countries and regions. The 2002 Arab Human Development Report notes that this can present a "demographic gift or a demographic curse" depending on whether the high population growth and fertility can be transformed into human wealth through capital investments and technological progress. Similarly, Dhonte, Bhattacharya and Yousef (2000) and Dhillon and Yousef (2009) argued that the "explosion" in the working-age population in the Middle East presents challenges as well as opportunities for those countries. The similarly unique demographic characteristics of the SMCs show a stark

contrast to their European counterparts, where countries are experiencing a serious demographic deficit through population aging.[1]

An important outcome of the demographic differences mentioned above has been substantial labour migration from the Southern Mediterranean to the European countries in the North.[2] According to the United Nations' 2005 revision of international migration trends, Europe has been host to about 34 per cent of all migrants in 2005. Fargues (2006) showed that "Europe is the single largest destination of first-generation Arab emigrants, and hosts 59% of all such emigrants worldwide" (Fargues, 2006: 8, 25). While such labour migration has been driven mainly by economic and demographic differences between these two regions, it has created important externalities. These externalities took the form of negative externalities through brain drain in the SMCs, and both positive externalities through brain gain and negative externalities through congestion and social problems for the European countries.[3] Bhagwati (1972, 1976a, 1976b) argued that taxing this brain drain could be a solution to the negative externality problem. He also argued that the current system of income taxation based on residence instead of citizenship leads to representation of immigrant workers in home countries without taxation. This brain-drain tax idea is resurfacing again in the recent literature where several papers have argued the virtues of such a tax for developing countries (Desai, Kapur and McHale, 2004; Straubhaar, 2000).

[1] In an entry in the forthcoming *Encyclopedia of Global Human Migration*, Tosun (forthcoming) defines demographic deficit as "an imbalance or shortage in the human population of a country, province or any other regional or local jurisdiction that arises mainly from differences in age, sexes, and geographic concentration of that population, such as rural-urban or suburban population differences."

[2] These demographic differences can also lead to capital flows between regions. See Börsch-Supan, Ludwig and Winter (2005), Tosun (2003) and Tosun (2007) for studies on examining the link between population aging and capital flows.

[3] One may argue that workers' remittances to the SMCs are positive externalities from labour migration to Europe. However, these are pecuniary externalities and hence do not fall under the category of technological externalities examined by the public finance literature.

This paper describes the demographic and migration trends in the Euro-Mediterranean region and then shows the economic and fiscal consequences of such demographic differences within a two-region model with international labour mobility. International labour migration is examined also through an international externalities framework that has recently been popularized by Kaul *et al*. (1999, 2006). At the same time, the paper contributes to the literature on brain drain and taxation that dates back to Bhagwati's original proposal in mid-1970s. The paper uses a two-region, two-period overlapping generations model with international labour mobility to examine the efficacy of using tax policy to internalize the externalities created by international labour migration. The goal is to examine the human capital, growth and welfare consequences of labour movements and a "brain-drain tax" similar to what was originally proposed by Bhagwati (1972).

The paper is structured as follows. The next section provides a demographic outlook of the region. This is followed by a description of a stylized two-region, two-period overlapping generations model with international labour mobility in Section 3. A dynamic transition analysis in Section 4 shows results from a numerical simulation exercise. Section 5 shows budgetary implications of a brain drain tax and discusses issues related to the administration of such a tax. The last section presents summary and concluding remarks.

2. Demographic Outlook of the Mediterranean Region

The Mediterranean region has undergone a significant demographic change in the past fifty years and is also expected to go through more changes in forthcoming decades.

Table 1 shows the basic demographic statistics for the Mediterranean region for the years 1960, 2010 and 2050.[4] This shows the magnitude of the aging of the populations in the 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 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 on the demographic deficit through population aging. The demographic change in the region is also shown in the population pyramids in Figure 1.

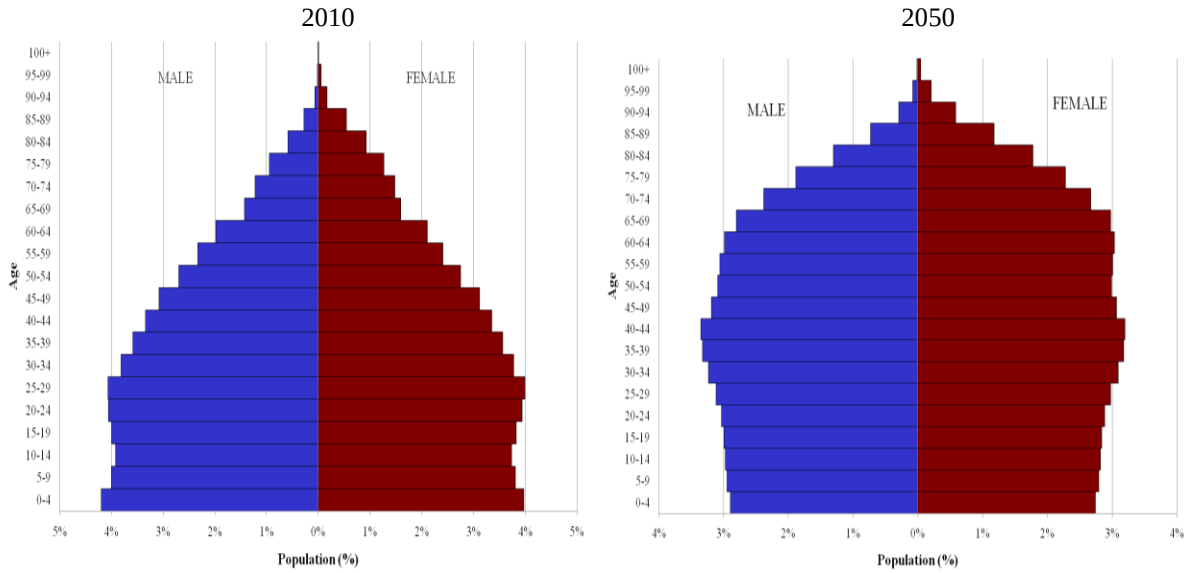
Table 1. Demographic Outlook of the Mediterranean Region

	1960	**2010**	**2050**
Total Population	239 million	471 million	590 million
Population Growth	1.88%	1.01%	0.07%
Total Fertility Rate	4.67	2.10	1.83
Death Rate	12.58	7.15	10.7
Median Age	23	32.6	43.8
Population 65 and older	5.80%	10.67%	22.87%
Old Age Dependency Ratio	10%	15.90%	38.60%
Share of Urban Population	41.31%	67.55%	81.44%

Source: United Nations World Population Prospects (2010 Revision).

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

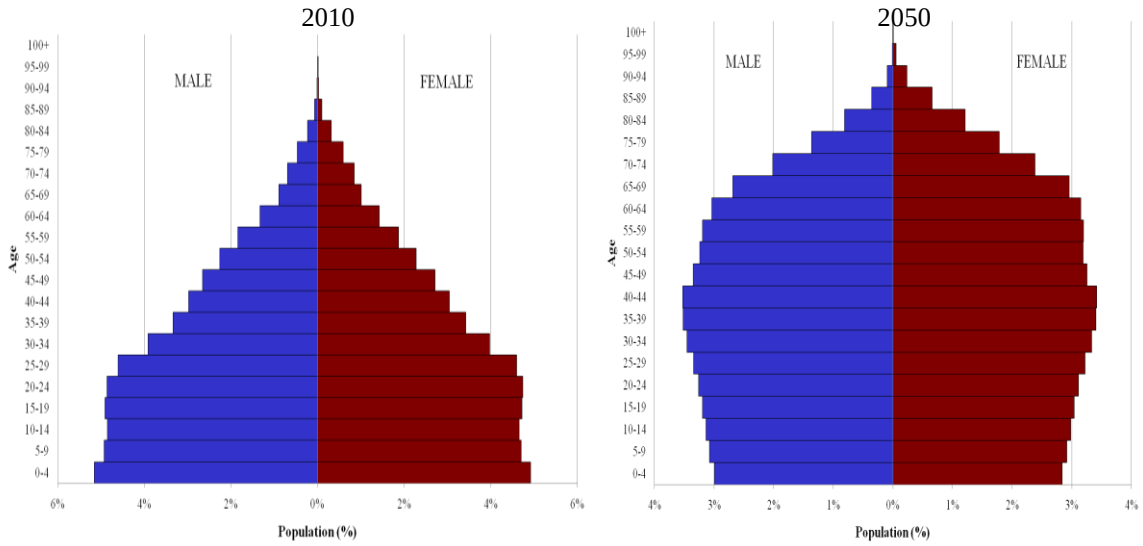
Figure 1. Population Pyramid of the Mediterranean Region (2010 and 2050)



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

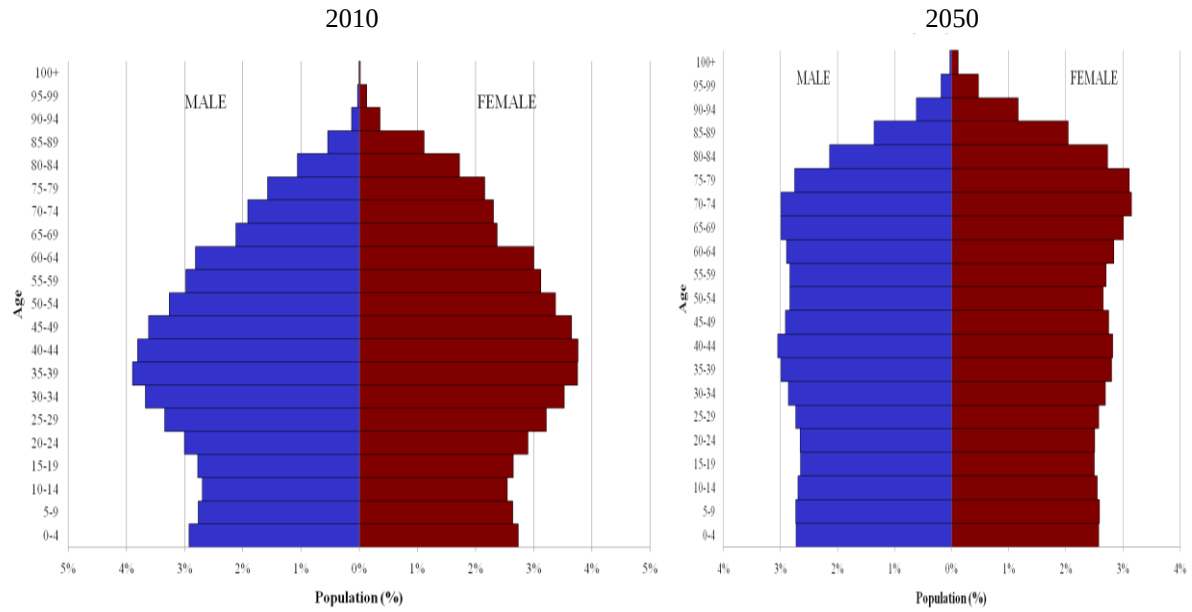
As shown in Figures 2 and 3, Southern Mediterranean Countries (SMCs), however, have and will continue to have significantly younger populations than the European countries, though this gap is expected to close to some extent by 2050. For those countries the key age group in terms of size is the 15-29 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 as West Bank 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 the 70-74 age group will become the largest population age group.

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



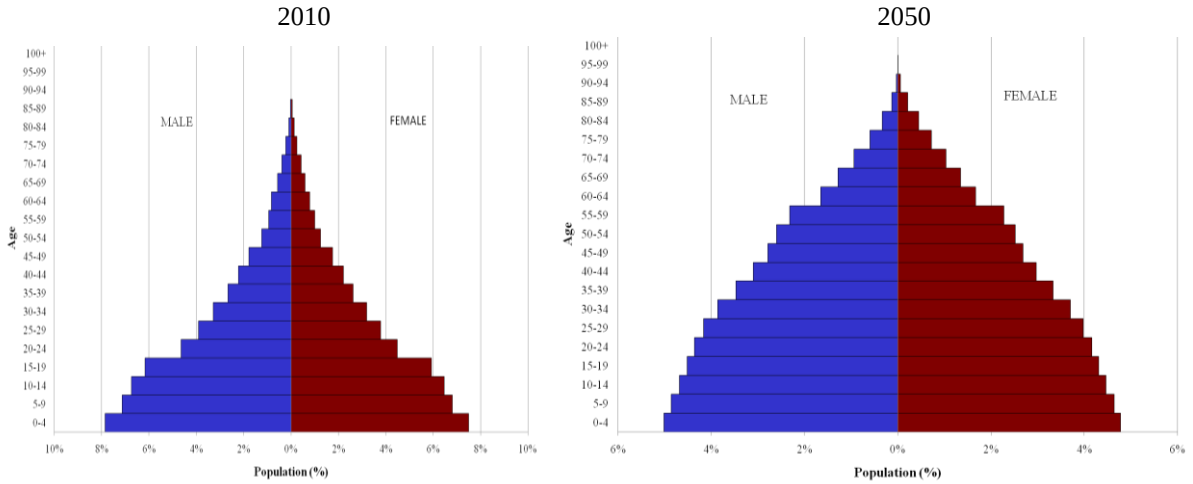
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

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



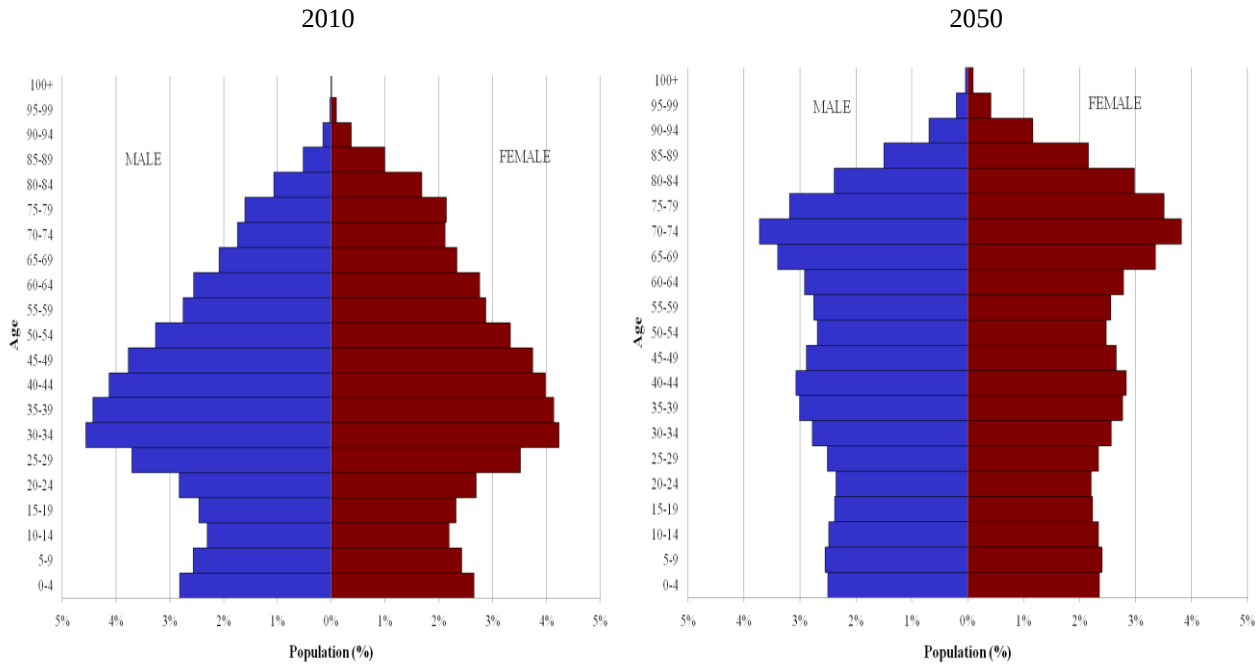
Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

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)

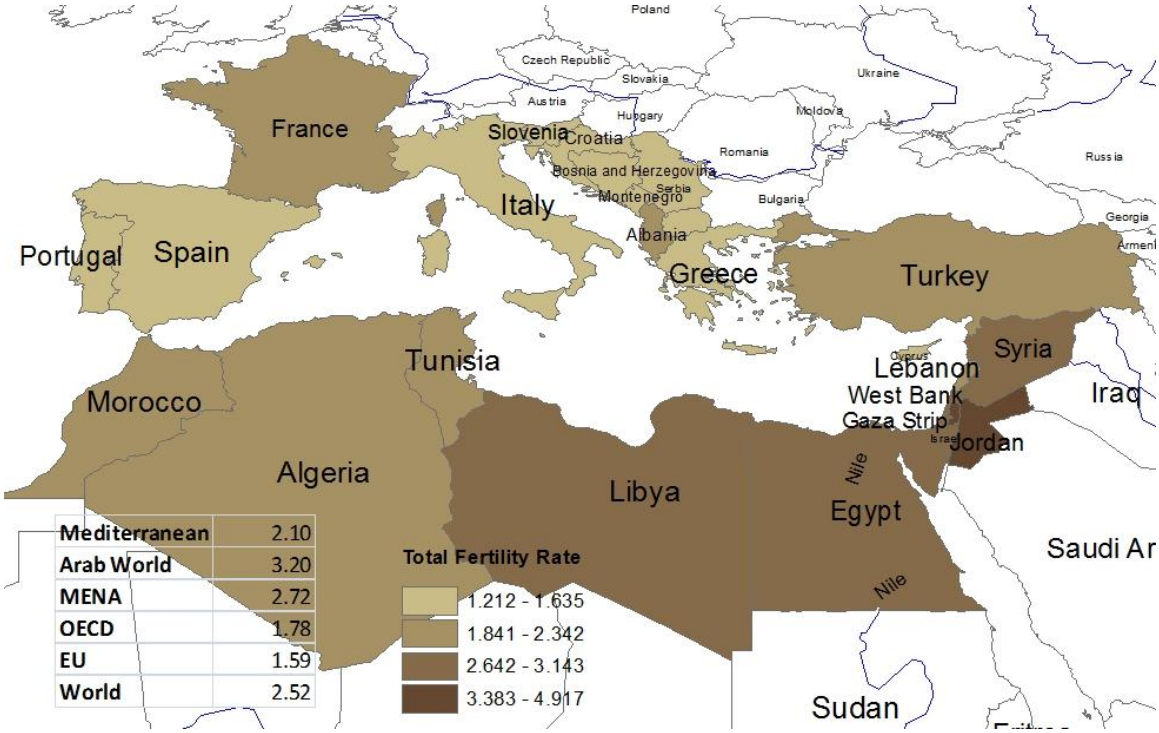


Source: United Nations World Population Prospects (2010 Revision). Population share calculations were computed by the author.

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 SMCs with an average total fertility rate of 2.1 for the Mediterranean region, which also happens to

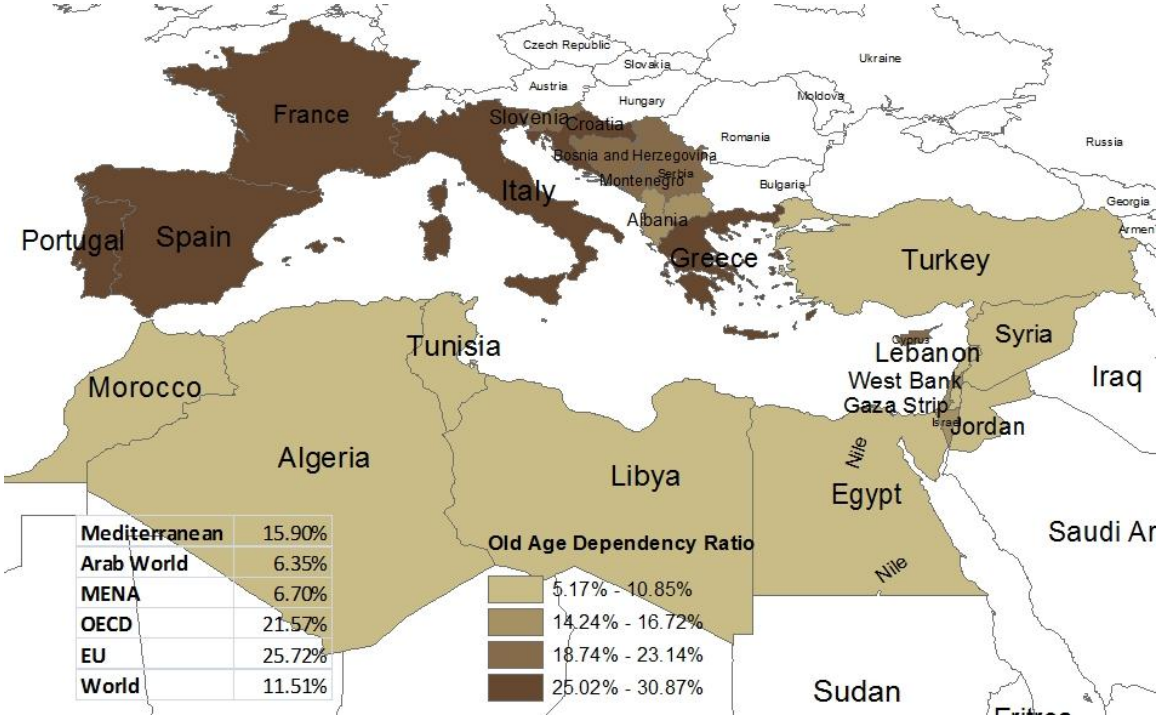
be the replacement rate of a population. Among the Mediterranean countries, Turkey has a total fertility rate that is roughly equal to the region average. We also see that while the average total fertility rate in the region is significantly smaller than the one for the Middle East and North Africa (MENA) region or the Arab world, it is still higher than the one for the OECD or 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 SMCs have a ratio of 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.

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)

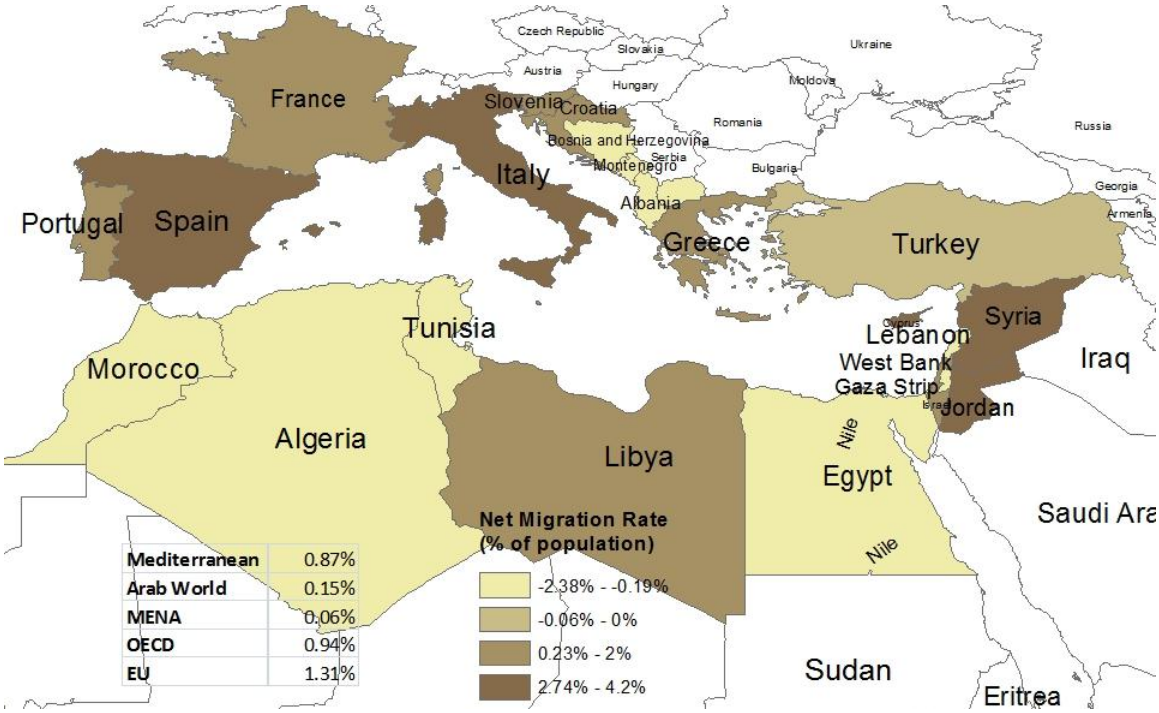


Source: 2010 World Development Indicators, The World Bank.

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 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 SMCs have negative net migration rates, which indicates that they are net senders of migrants. Countries like Jordan, Libya, Syria and Palestinian Territories are exceptions due to large Palestinian refugee populations in those countries. Figure 9 shows that Southern European (or Northern Mediterranean) countries now have a large stock of

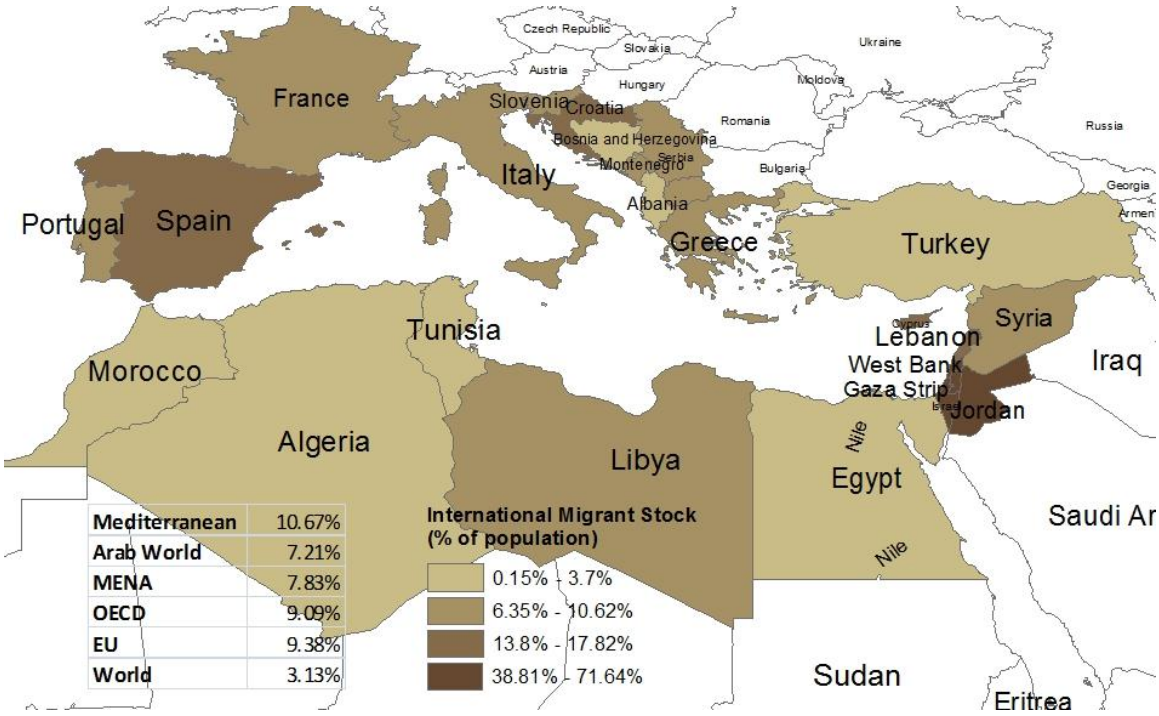
migrants compared to most of the SMCs. The Mediterranean region as a whole is a net recipient of migrants, with an average rate less than the averages for the OECD countries and the EU countries, but the region has a higher stock of migrant population as a share of total country population than all other regions compared in Figure 9.

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.

In the next section, the economic and fiscal consequences of such demographic differences are presented within a two-region model with international labour mobility.

3. The Two-Region Model of Labour Mobility, Brain Drain and Taxation

The model builds on a two-period overlapping generations model first developed by Diamond (1965).[5] To examine open economy issues, the standard framework is extended to a two-region model with international labour mobility similar to Galor (1986, 1992) and Crettez *et al.* (1996, 1998)[6]. Labour mobility has a dual effect in the sense that

[5] However, the earliest overlapping generations models are described by Allais (1947) and Samuelson (1958). Children are not modelled in a two-period model.
[6] A two-country model with international capital mobility is shown by Buiter (1981).

it exhibits the characteristics of capital as well. Young migrant workers contribute to the economy both as labourers through their human capital, and as savers through their supply of capital. Another major extension is modelling the link between human capital accumulation and tax policy to address the brain drain and taxation issues. Brain-drain tax is assumed to be just the home country's income tax rate imposed on the migrant workers. Hence, it is really not a separate tax. For clarity, the model is presented for one region only. This is followed by a description of the two-region world equilibrium.

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:

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

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

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 labour,[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 labour income. This tax is used entirely to finance a productivity enhancing public programme. For

[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.

simplicity, this public programme will be referred to as "education" throughout the text.[8] 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.[9]

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:

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

Human capital is accumulated from the interaction of ability level (a_j) of the individual and government spending per young (g_t^e) on education:

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

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).[10] 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:

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

[8] It should be noted that any other government program that is directed towards increasing the labor productivity of young could easily be used.

[9] Tosun (2009) introduced a social security programme in the model by having an exogenously fixed level of social security spending. 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. The results from that paper showed that modelling social security in this way only affected the magnitude of the effects, not the qualitative results.

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

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

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

Saving of an individual depends on net labour 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:

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

3.2. Political Process of Tax Policy and Brain Drain

To make the process of tax policy determination for education rich, interesting, yet tractable, a median-voter framework with voter heterogeneity is used.[11] This framework suggests that public sector responds to voter preferences over the long period (thirty years) assumed in the two-period overlapping generations model. Voter heterogeneity is introduced by assuming a distribution of genetic ability levels for the working generation.[12] The ability level of the individual will, in turn, determine the value she receives from education.

The consumption and saving decisions, as seen section 2.1, depend on human capital, which is in turn determined by government spending (see equation 4). By

[11] The political process is modelled 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).

[12] While not very realistic, uniform distribution is used for its simplicity in deriving analytical results.

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 $(\tau_t y_t = g_t^e)$.[13] The preferred tax rate of individual *j* when young is:

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

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. 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

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

where a_m is the ability level of the median voter.

With lower population growth (due to lower fertility or labour outflow), the median voter becomes a person with lower ability, and the preferred tax rate of the median voter is lower. This, in turn, leads to lower government spending on public education which has a negative impact on human capital accumulation. Hence, for

[13] 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).

example, the impact of labour outflows on human capital in the SMCs would be twofold: first through loss of total human capital due to the emigration of workers and second through reduced average human capital for each remaining worker. While the former effect is the typical brain drain argument, the latter is an additional brain drain effect from loss of productive political participation of young workers in home country. This latter effect is a novel aspect of the model which has not been widely addressed in the previous literature. A brain drain tax enables representation with taxation. By paying the home country's income tax, migrant workers are allowed to vote for the tax rate and thereby help improve the provision of education in the home country.

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

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

Competitive factor markets require that real wage and interest rates are equal to the marginal products of labour 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

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

3.4. International Equilibrium with and without a tax on Brain Drain

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

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

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

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

To close the dynamic model, international labour market equilibrium must be specified. In the case of perfect international labour mobility, international labour 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. In the perfect labour mobility model, labour income is taxed where income is earned. Thus, source based income taxation is used for both regions.[14] This implies that net-of-tax wage rates are equalized in equilibrium. Therefore, the international labour flow constraint is:

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

It is assumed that only the members of the young generation move between regions. Both regions are assumed to have "uniform" ability distributions, which mean that migration does not have any effect on the ability distribution in these regions.[15]

When a brain drain tax is imposed, the international labour flow condition above changes. To see this change, assume that region A is Europe and region B is the Southern Mediterranean. In that case, the income tax rate of region B will be imposed as a brain drain tax on the workers that migrate to region A.[16] Hence, labour from region B will flow to region A according to the following condition:

$$w_{t+1}^{A}\left(1-\tau_{t+1}^{A}-\tau_{t+1}^{B}\right)=w_{t+1}^{B}\left(1-\tau_{t+1}^{B}\right) \tag{20}$$

The model incorporates the interaction of household behaviour, firm behaviour, political process, and international labour flows. The model explained above will be used to examine the labour flows between two regions that have strong population differences

[14]Under a source system, labour 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.

[15] A more realistic case is allowing for migration of workers that have certain abilities (unskilled vs. skilled). However, this would conflict with the uniform ability distribution which assumes that ability levels in the distribution are chosen at random.

[16] It's assumed here that brain drain tax is a tax that is only imposed by the SMCs (region B). This is in line with the main negative externalities argument based on brain drain from the SMCs.

such as Europe and Southern Mediterranean and the impact of these flows on the human capital accumulation in both regions.

4. Aging Europe and Brain Drain from SMCs

4.1. Closed Economy and Labour Mobility Simulation Results

Simulations in this section are based on the population projections for European countries and the SMCs derived from the 2002 revision of the "World Population Prospects" published by the United Nations (United Nations, 2002a). 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.

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 SMCs used in population projections.

We start with the "perfect labour mobility model" where there is perfect international labour mobility with migrant labour participating in the political system of

the host country but not the home country. Based on the population projections for the two regions, labour migrates from the SMCs to the European countries. Figure 10 shows this in reference to the change in the number of workers in both regions. European countries experience a major boom in foreign workers, particularly between 2000 and 2030. This boom is almost about six times greater than the growth attributed to the native worker population. Figure 11, on the other hand, shows that the SMCs send labour to Europe and thus experience significantly lower domestic labour growth despite a high population growth.

Figure 10. Composition of the Change in Number of Workers in Europe (Perfect Labour Mobility)

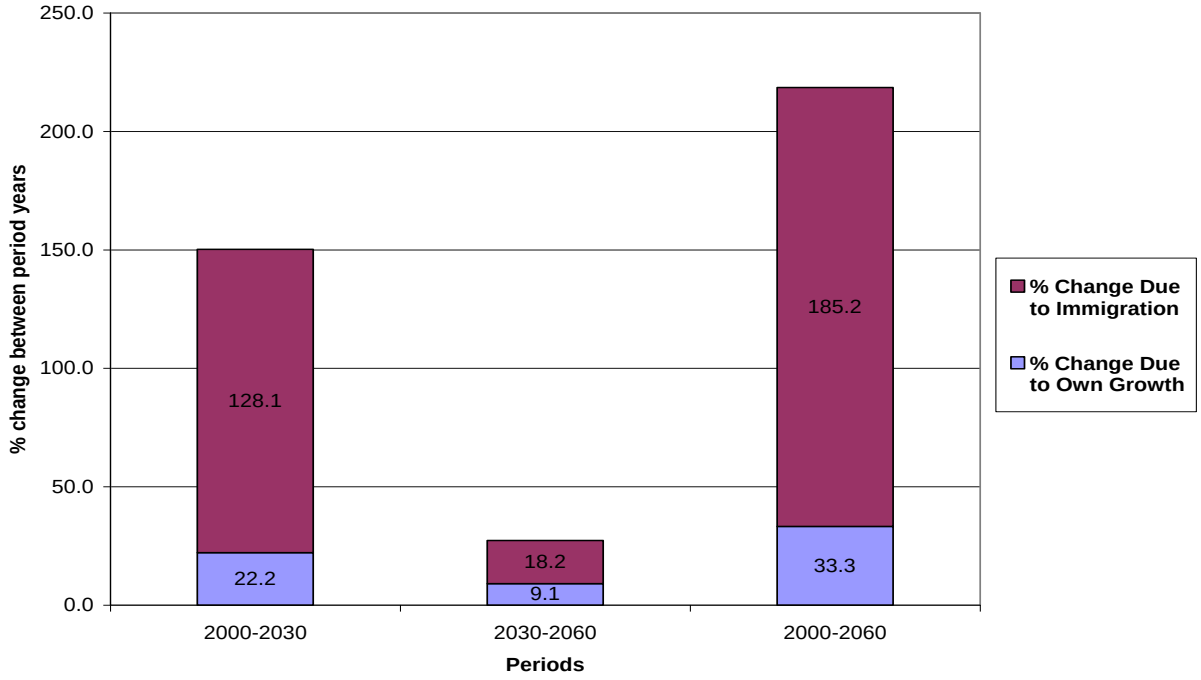
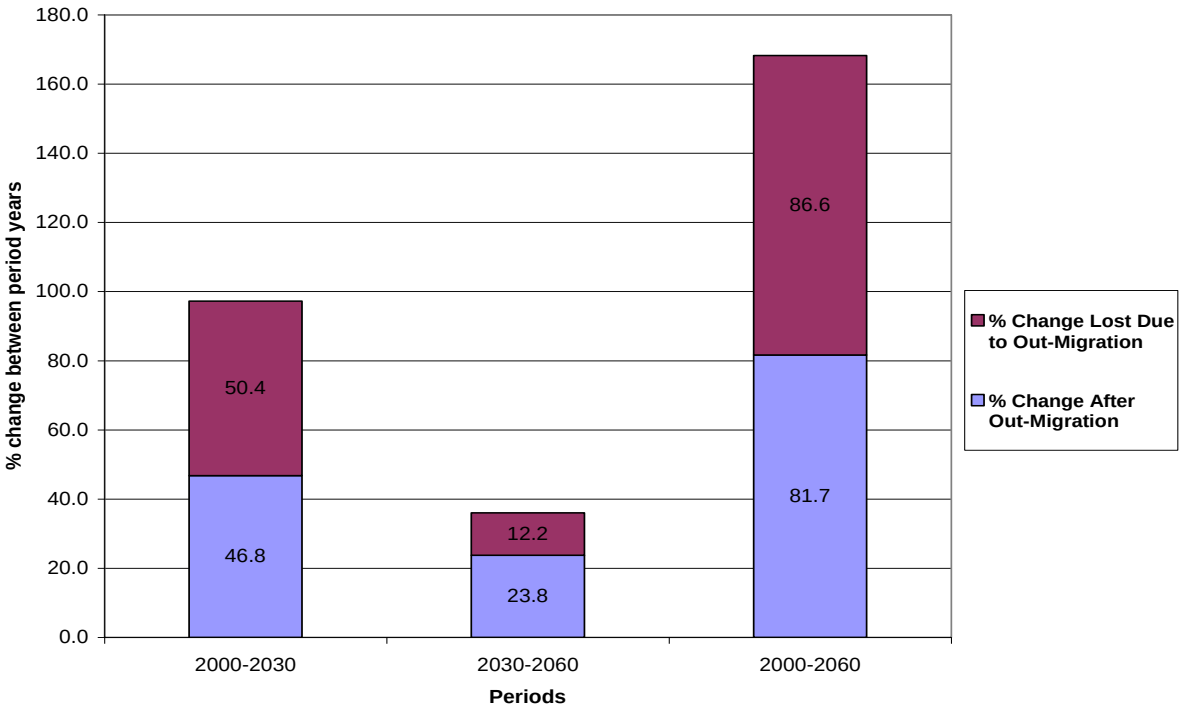


Figure 11. Composition of the Change in Number of Workers in SMCs (Perfect Labour Mobility)



We now compare this to our alternative "labour mobility model with brain drain tax", where migrant workers participate in the political system of both host and home countries but at the same time remit the additional income tax (brain drain tax) to the home country. Figure 12 shows that this leads to a significant decrease in the number of workers migrating to Europe in both periods. Figure 13 mainly confirms this by showing that the growth in the number of workers lost to out-migration is very small compared to the overall growth in number of workers. Apparently, brain drain tax acts as a very strong migration control mechanism.

Figure 12. Composition of the Change in Number of Workers in Europe (Labour Mobility w/Brain Drain Tax)

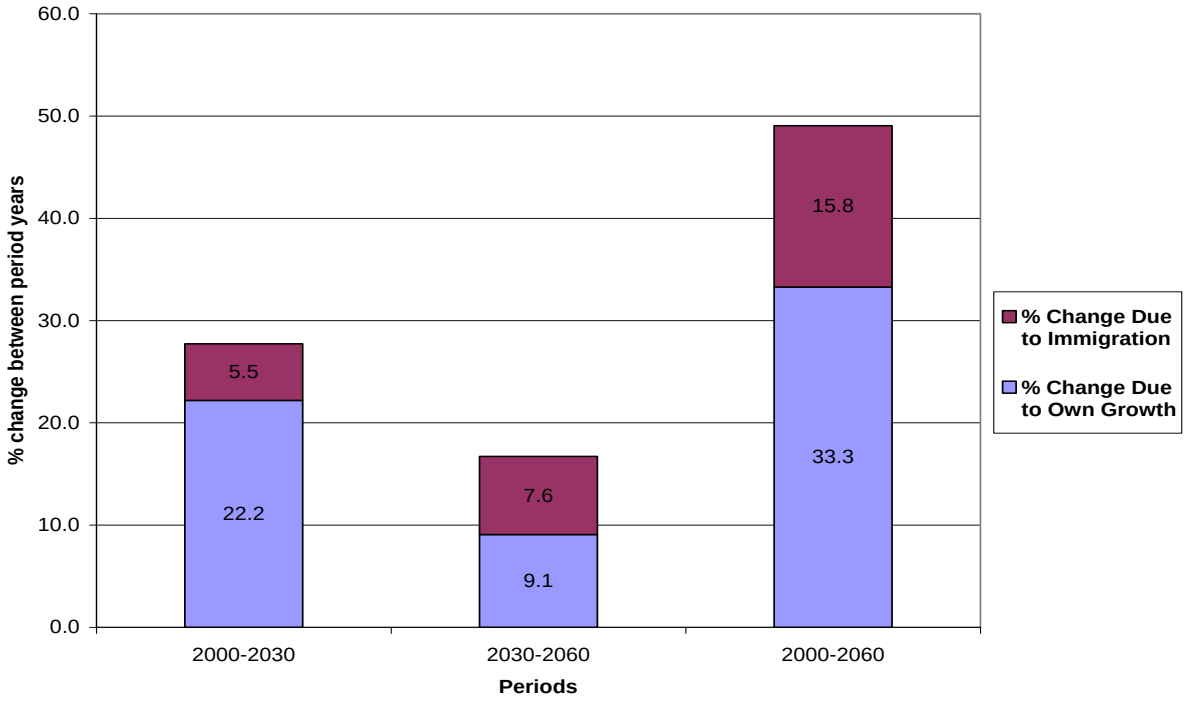
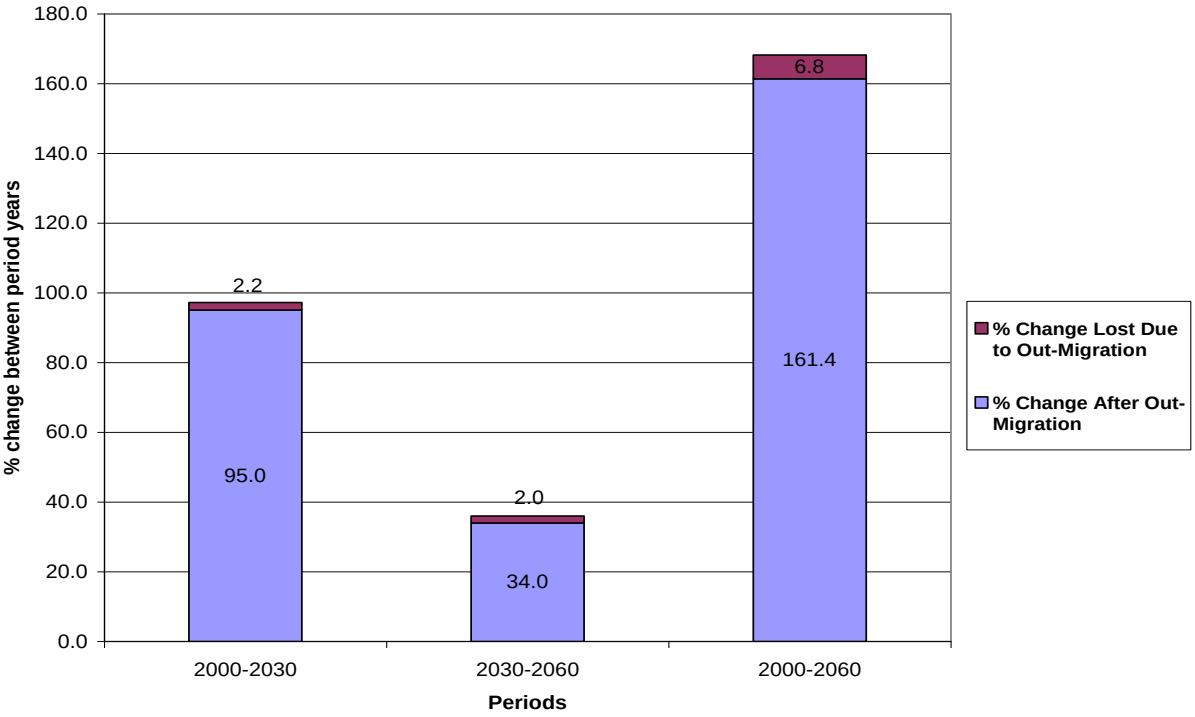


Figure 13. Composition of the Change in Number of Workers in SMCs (Labor Mobility w/Brain Drain Tax)



4.2. Model Comparisons

To understand the economic and fiscal impact of brain drain through labour flows, we first compare the perfect labour mobility model to a closed economy model. These simulation results are shown in columns (1)-(4) of Tables 2 and 3. Table 2 shows the per worker values of selected economic variables. European countries benefit from labour migration from the SMCs particularly in terms of education spending per worker and human capital per worker. However, they are adversely impacted by the large influx of foreign workers in the 2000-2030 period. The benefits of the labour migration to Europe are even clearer when we look at the aggregate economic values shown in Table 3. Ageing Europe clearly benefits from the economic expansion made possible by the contributions of migrant workers as labourers, savers and participants in the policymaking process that determines the provision of productivity-enhancing public good (education). SMCs, on the other hand, suffer economically (lower capital, human capital and income growth) mainly due to loss of workers to the European countries. As aforementioned, the impact of the loss of workers on human capital in the SMCs is twofold: first through loss of total human capital from outflow of workers, and second through reduced average human capital for each remaining worker due to the loss of productive political participation of young workers in their home country. We see the clear evidence of this in the sharp decreases in the income tax rate in the SMCs in both periods.

The next comparison is with the labour mobility model with brain drain tax. Simulation results for this model are shown in columns (5) and (6) of Tables 2 and 3.

European countries seem to benefit from such a tax through smaller labour flows that lead to more stable changes in the per worker values of their economic variables, particularly in capital per worker and income per worker. On the other hand, their aggregate economic expansion is also less pronounced. Hence, while the brain drain tax has a negative impact on the overall economic activity in European countries, it also triggers a relatively more stable economic growth by limiting large influx of workers. For the SMCs, the brain drain tax improves on both the human capital per worker and total human capital accumulation. While it seems to limit economic growth slightly in per worker terms, it contributes significantly to aggregate economic expansion as seen in Table 3. By limiting harmful out-migration of workers, the brain drain tax functions like a Pigouvian tax which is considered a first-best solution to the negative externality problem.

Table 2. Model Comparisons 1/

(per worker values)

		Closed Economy Model (No Labour Mobility)		Perfect Labour Mobility Model with Migrants Voting Only in Host Country		Labour Mobility Model with Migrants Voting in Both Countries and Income Tax on Brain Drain	
	Time Periods	European Countries (1)	SMCs (2)	European Countries (3)	SMCs (4)	European Countries (5)	SMCs (6)
Number of workers	2000–2030	22.2	97.2	150.2	46.8	27.7	95.0
	2030–2060	9.1	36.0	27.3	23.8	16.7	34.0
	2000–2060	33.3	168.2	218.5	81.7	49.1	161.4
Capital stock per worker	2000–2030	6.2	144.8	-49.2	119.7	-0.5	65.4
	2030–2060	-1.6	97.4	44.6	67.8	9.2	82.2
	2000–2060	4.5	383.3	-26.6	268.8	8.6	201.3
Human capital per worker	2000–2030	-2.7	18.6	-2.4	5.2	0.4	7.3
	2030–2060	-25.8	7.7	-7.5	-2.6	-12.1	2.3
	2000–2060	-27.8	27.7	-9.7	2.5	-11.8	9.8
Income per worker	2000–2030	0.2	50.6	-21.3	34.1	0.1	23.7
	2030–2060	-18.5	31.5	7.2	16.6	-5.6	23.8
	2000–2060	-18.4	98.1	-15.7	56.4	-5.5	53.1
Income tax rate	2000–2030	-6.2	1.5	20.6	-15.3	0.8	-3.4
	2030–2060	-40.8	-9.2	-22.2	-19.8	-21.6	-14.7
	2000–2060	-44.4	-7.8	-6.2	-32.1	-21.0	-17.5
Education spending per worker	2000–2030	-6.1	53.3	-5.4	13.9	0.8	19.8
	2030–2060	-51.8	19.3	-16.7	-6.5	-26.1	5.8
	2000–2060	-54.7	82.8	-21.2	6.6	-25.5	26.7

Source: Computed by author.

1/ All numbers refer to percentage changes between the years indicated in the time period.

Table 3. Model Comparisons 1/
(aggregate values)

		Closed Economy Model (No Labour Mobility)		Perfect Labour Mobility Model with Migrants Voting Only in Host Country		Labour Mobility Model with Migrants Voting in Both Countries and Income Tax on Brain Drain	
	Time Periods	European Countries (1)	SMCs (2)	European Countries (3)	SMCs (4)	European Countries (5)	SMCs (6)
Number of workers	2000–2030	22.2	97.2	150.2	46.8	27.7	95.0
	2030–2060	9.1	36.0	27.3	23.8	16.7	34.0
	2000–2060	33.3	168.2	218.5	81.7	49.1	161.4
Total capital stock	2000–2030	29.8	382.8	27.0	222.5	27.0	222.5
	2030–2060	7.3	168.5	84.0	107.7	27.5	144.2
	2000–2060	39.2	1196.4	133.7	570.0	61.9	687.7
Total human capital	2000–2030	18.9	134.0	144.3	54.4	28.2	109.3
	2030–2060	-19.0	46.5	17.7	20.6	2.6	37.1
	2000–2060	-3.7	242.6	187.6	86.2	31.5	186.9
Total income	2000–2030	22.4	197.1	96.9	96.9	27.8	141.4
	2030–2060	-11.1	78.9	36.4	44.3	10.2	65.9
	2000–2060	8.7	431.5	168.6	184.0	40.8	300.3
Income tax rate	2000–2030	-6.2	1.5	20.6	-15.3	0.8	-3.4
	2030–2060	-40.8	-9.2	-22.2	-19.8	-21.6	-14.7
	2000–2060	-44.4	-7.8	-6.2	-32.1	-21.0	-17.5
Total education spending	2000–2030	14.7	202.3	136.8	67.2	28.8	133.6
	2030–2060	-47.4	62.2	6.0	15.8	-13.7	41.8
	2000–2060	-39.7	390.3	151.0	93.6	11.1	231.3

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

5. Budgetary Implications of the Brain Drain Tax and Some Administration Issues

Simulations in the previous section give us an idea about the budgetary implications of such a tax for the SMCs. Considering the results for number of migrants, the income tax rate in the SMCs and the income per worker in the European countries, the share of the brain drain tax in total income tax revenues in the SMCs is calculated as 2% for the 2000-2030 period and 3% for the 2030-2060 period. Using actual tax revenue figures from the International Monetary Fund's Government Finance Statistics (GFS),

these shares translate to about $1.3 billion in average annual income tax revenue for total of SMCs until 2030 and about $2.8 billion between 2030 and 2060.[17] These are sizeable revenues that SMCs can potentially use to provide enhanced education to the existing workforce and in turn help improve human capital accumulation in the SMCs. A recent study by Desai, Kapur and McHale (2004) shows a similarly substantial potential revenue gain to India from such taxation. However, there can be significant issues related to the administration and use of such a brain drain tax. First, this tax requires a tax system based on citizenship (the American model) rather than residence in the SMCs. Currently these countries use a residence-based income tax system and switching to a citizenship-based system would bring significant administrative costs. Involvement of international institutions and creation of new international migration regimes have also been discussed (Straubhaar, 2000; Pastore, 2005). Additionally, government sector inefficiencies due to corruption in the SMCs could also become a hindrance to the productive use of this new revenue stream.

6. Conclusions

This paper describes the demographic and migration trends in the Euro-Mediterranean region and then shows the economic and fiscal consequences of such demographic differences within a two-region model with international labour mobility. International labour mobility is also examined through an externalities framework where brain drain from migration could be taxed by the home countries. The paper used a two-region, two-period overlapping generations model with international labour mobility to examine the efficacy of using such tax policy.

[17] GFS revenue figures come from IMF (2003) and are for eight of the nine SMCs. Libya is excluded due to lack of data. Tax revenues are averaged for the last three available years (1995-97) and then converted to constant 1995 dollars.

Demographic outlook of the region shows substantial expected increases in the median age, share of population 65 and older, and the old-age dependency ratio which are clear evidence of demographic deficit through aging of the population in the region. There is however a significant demographic divide in the region largely between North and South where the SMCs have and will continue to have significantly younger populations than the European countries while the gap between the two sub-regions is expected to close to some extent by 2050.

A tax on the brain drain has a substantial limiting effect on labour migration and a small negative effect on per worker growth. It can, however, also raise substantial tax revenue for the SMCs which could be used to enhance human capital in the region. Administrative costs involved with the tax system required to implement a brain-drain tax constitute the biggest obstacle to the use of such a tax.

References

Allais, M. (1947) *Economie et Intérêt*, Paris: Imprimerie Nationale.

Bearse, P., G. Glomm, and B. Ravikumar. (2000) "On the Political Economy of Means-Tested Education Vouchers," *European Economic Review*, Vol. 44, pp. 904–15.

Bhagwati, J. N. (1972). "The United States in the Nixon Era: The End of Innocence," *Daedalus*.

Bhagwati, J. N. (1976a). *Taxing the Brain Drain, Vol. 1: A Proposal*, Amersterdam: North-Holland.

Bhagwati, J. N. (1976b). *The Brain Drain and Taxation, Vol. 2: Theory and Empricial Analysis*, North-Holland.

Bhagwati, J. N., and Dellafar (1973). "The Brain Drain and Income Taxation," *World Development* 1.

Black, D. (1948) "On the Rationale of Group Decision-Making," *Journal of Political Economy*, Vol. 56, pp. 23–34.

Börsch-Supan, A., A. Ludwig and J. Winter. (2005). "Aging, Pension Reform and Capital Flows: A Multi-Country Simulation Model," NBER Working Paper No. 11850. Cambridge, MA: National Bureau of Economic Research.

Buiter, W. H. (1981). "Time Preference and International Lending and Borrowing in an Overlapping Generations Model," *Journal of Political Economy*, Vol. 89, No. 4, pp. 769–97.

Center for Strategic and International Studies. (2002). "Meeting the Challenge of Global Aging: A Report to World Leaders from the CSIS Commission on Global Aging," CSIS Panel Report (March) (Washington: The CSIS Press).

Crettez, B., P. Michel, and J. Vidal. (1996). "Time Preference and Labor Migration in an OLG Model with Land and Capital," *Journal of Population Economics*, Vol. 9, pp. 387–403.

Crettez, B., P. Michel, and J. Vidal. (1998) "Time Preference and Capital Mobility in an OLG Model with Land," *Journal of Population Economics*, Vol. 11, pp. 149–58.

Desai, Mihir A., D. Kapur and J. McHale. (2004). "Sharing the Spoils: Taxing International Human Capital Flows," *International Tax and Public Finance*, Vol.11, pp.1-31.

Dhillon, N. and T. Yousef. (2009) *Generation in Waiting: The Unfulfilled Promise of Young People in the Middle East*. Washington, D.C.: The Brookings Institution.

Diamond, P. A. (1965) "National Debt in a Neoclassical Growth Model," *American Economic Review,* Vol. 55, pp. 1126–50.

Fargues, P. (2006). "International Migration in the Arab Region: Trends and Policies," contributed paper, United Nations Expert Group Meeting on International Migration and Development in the Arab Region, Beirut, 15-17 May, 2006.

Galor, O. (1986) "Time Preference and International Labor Migration," *Journal of Economic Theory,* Vol. 38, pp. 1–20.

Galor, O. (1992) "The Choice of Factor Mobility in a Dynamic World," *Journal of Population Economics,* Vol. 5, pp. 135–44.

Holtz-Eakin, D., M. E. Lovely, and M. S. Tosun. (2004) "Generational Conflict, Fiscal Policy, and Economic Growth," *Journal of Macroeconomics,* Vol. 26, No. 1, pp. 1–23.

International Monetary Fund. (2003). *Government Finance Statistics CD-ROM* (Washington).

Kaul, I. and P. Conceicao. (2006). *New Public Finance*. The United Nations Development Programme. New York: Oxford University Press.

Kaul, I., P. Conceição, K. Le Goulven, and R. U. Mendoza. (2003) *Providing Global Public Goods: Managing Globalization.* New York: Oxford University Press.

Kaul, I., I. Grunberg, and M. A. Stern. (1999). *Global Public Goods: International Cooperation in the 21st Century.* New York: Oxford University Press.

Pastore, F. (2005). "The Policies for the Management of International Migrations from the 20th to the 21st Century: A Tale of Territorial Sovereignties and People on the Move," *Genus*, 61 (3-4): 347-367.

Samuelson, P. A. (1958). "An Exact Consumption-Loan Model of Interest with or without the Social Contrivance of Money," *Journal of Political Economy,* Vol. 66, pp. 467–82.

Straubhaar, T. (2000). "Why Do We Need a General Agreement on Movements of People (GAMP)?" in *Managing Migration: Time for a New International Regime?*, ed. Ghosh, Bimal, Oxford, UK: Oxford University Press: 110-136.

Tosun, M. S. (2003) "Population Aging and Economic Growth: Political Economy and Open Economy Effects," *Economics Letters,* Vol. 81, No. 3, pp. 291–96.

Tosun, M. S. (2007). "Endogenous Fiscal Policy and Capital Market Transmissions in the Presence of Demographic Shocks," *Journal of Economics Dynamics and Control,* Vol. 32, No. 6, pp. 2031–60.

Tosun, M. S. (2009) “Global Aging and Fiscal Policy with International Labor Mobility: A Political Economy Perspective,” IZA Discussion Paper, DP 4166. Bonn, Germany: Institute for the Study of Labor.

Tosun, M. S. (Forthcoming). “Demographic Deficit” *Encyclopedia of Global Human Migration*. Chichester, UK: Wiley Blackwell.

United Nations. (2002). *World Population Prospects: The 2002 Revision*, Department of Economic and Social Affairs, Population Division (New York: United Nations).