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Demographic and Human Capital Heterogeneity in Selected Provinces of Turkey: A Scenario Analysis Using the Multi-dimensional Population Projection Model

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Contents

Abstract

Turkey is a geographically diverse country and two important components of that diversity are demography and education levels. Regions of the country vary markedly in the age structure of the population and even more conspicuously in such characteristics as fertility, mortality, and migration and the level of educational attainment. The purpose of this study is mainly to explore the effect of various demographic and education scenarios on the size and the structure of the population in five selected provinces that are representative of four fertility regions of Turkey. Three scenarios were defined namely: “Euro” in which Turkey joins European Union, “Medium” as a continuation of trend, and “3-Child” in which Turkey becomes more conservative. Based on our knowledge about the past and expectation in the future for each scenario, we defined set of assumptions for fertility, mortality, migration, and education and these assumptions were implemented in a multi-state population projection model to project the population by age, sex and educational attainment in five selected provinces from 2010 to 2050. Under all scenarios, population in the five provinces will grow between 2010 and 2050. Under Euro and Medium scenario, the population of children will diminish and the population of elderly and those in the age-group 15-64 will increase in all scenarios. In terms of education, as expected a rapid transformation will take place under Euro scenarios with more homogenous and higher level of human capital across Turkey, whereas, under 3-Child scenario Turkey will continue to be a heterogeneous society with a lower level of human capital. The result of this exercise reveals the extent to which Turkey’s population can evolve in the future and provides policy makers and planners with a tool to look into the future and test the implication of certain policies and expectations on the development of population.

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The authors thank Wolfgang Lutz for very helpful comments and suggestions. Partial funding for this work was made possible by an Advanced Grant of the European Research Council received by Wolfgang Lutz titled“ Forecasting Societies Adaptive Capacities to Climate Change,” grant agreement ERC-2008-AdG 230195-FutureSoc.

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1. Introduction

The term 'human capital' can be defined as the sum of competencies, knowledge, social and personality attributes, including creativity embodied in the ability to perform labour so as to produce economic value. Many theories demonstrably draw the attention to the relationship between investment in human capital development and education, economic development, productivity growth, and innovation. This relationship has frequently been cited as a justification for government subsidies for education and job skills training (Weeks, 2002). In light of human capital theory, participation in education can be seen as an investment in human capital made with the expectation of returns later in life and thus the process of education has a central role in the production of human capital (Becker, 1964; Smits & Hoşgör, 2006). At the macro-social level, more education tends to imply improved productivity and income, and economic development implies a better quality of life. At the micro-social level, more education tends to imply a healthier and better-nourished population and greater autonomy for women (Basu, 2002; Flandorfer & Fliegenschnee, 2010; Goujon & Lutz, 2004; Jejeebhoy, 1995; Joshi & David, 2006; KC et al., 2010; Lutz & Goujon, 2001; Martin & Juarez, 1995).

Almost universally, women with higher levels of education demonstrably limit their births and in general have greater access to birth control. Typically, in all societies, better educated individuals or parents have lower mortality rates and their children have better chances of survival and attainment of education (Lutz & KC, 2011). Education is also an important determinant for a wide range of demographic behaviour of individuals, as it powerfully affects fertility, mortality, and migration (Bongaarts, 2010; Jejeebhoy, 1995; KC et al., 2010). This effect of education on fertility is particularly apparent in countries or regions that are in the early phases of their fertility transition or countries that have prominent regional-socio-economic and cultural differences. Spatially, the patterns in the relationship between education and demographic behaviour are diverse, varying by world region as well as by the level of socio-economic development and cultural conditions (Bongaarts, 2003; Jejeebhoy, 1995). These patterns and relationships raise certain questions, in some contexts (Turkish), about whether or to what extent modest increases in education, especially among females, lead to differences in demographic behaviour. Capturing the differences in the distribution of educational attainment categories and inter-cohort changes across different spatial levels

has a particular importance for regional development and to study the consequence of improving human capital on society and economy (Lutz & KC, 2011).

Turkey has experienced many socio-economic and cultural changes in the last century. These changes can be seen as a "modernisation" of state, institutions and society, and as a whole, shaping the social structure and improving the human capital (Ediev, Yavuz & Yüceşahin, 2012). These significant changes can be observed in some of the historical-basic demographic measures of the country. At the beginning of the last century Turkey had a population of only 13.6 million, however, it has with a current population of roughly 75 million (Turkish Statistical Institute[1](TSI), TSI, 2012a,b) Since the early 1960s, Turkey has experienced steep fertility declines, as in most other developing countries (Yüceşahin & Özgür, 2008). While the total fertility rate (TFR) in the early 1960s was around 6 children per woman, by 2012, Turkey had fallen slightly below replacement level, with an estimated TFR of 2.08 children per woman (TSI, 2013b). While now still in transition, the country is widely expected to continue further declines in fertility levels in the near future. A number of studies note that the last period of demographic transition of Turkey will be completed by the middle of this century (Ediev, Yavuz & Yüceşahin, 2012; HUIPS, 2010; Koray, 1997; Unalan, 1997; Yüceşahin, 2009).

In contrast with past demographic behaviour, Turkey has now become a country with low fertility and mortality rates and an ageing population (HUIPS, 2010; Yüceşahin, 2009). In particular, the demographic trajectory of the 2000s represents the final stage in Turkey's demographic transition, ushering in a number of associated risks observed in Western European countries such as an ageing population and diminished number of working age citizens. This new status quo is largely responsible for the formulation of a new population policy intended to mitigate the perceived harmful effects of a post-transition demographic reality. Thus, the prime minister's plea for women to raise at least 3 children can be seen as attempt to achieve socioeconomic and political goals through demographic change (Yüceşahin, Türkyılmaz & Adalı, 2013).

Since the proclamation of the Turkish Republic in 1923, successive Turkish governments have implemented numerous policies and reforms in order to spread modernisation, to provide socio-economic development equally to all sectors of society, and to eliminate regional inequalities nationwide. Along these lines, for decades governments have also tried to expand education to small towns and rural settlements and organized a mass free education system. Some reforms were mainly meant to eliminate gender inequalities in education by increasing the proportion of educated girls/women, with an emphasis on ensuring that they at least had a primary school education (Rankin & Aytaç, 2006).

[1]Formerly the State Institute of statistics (SIS).

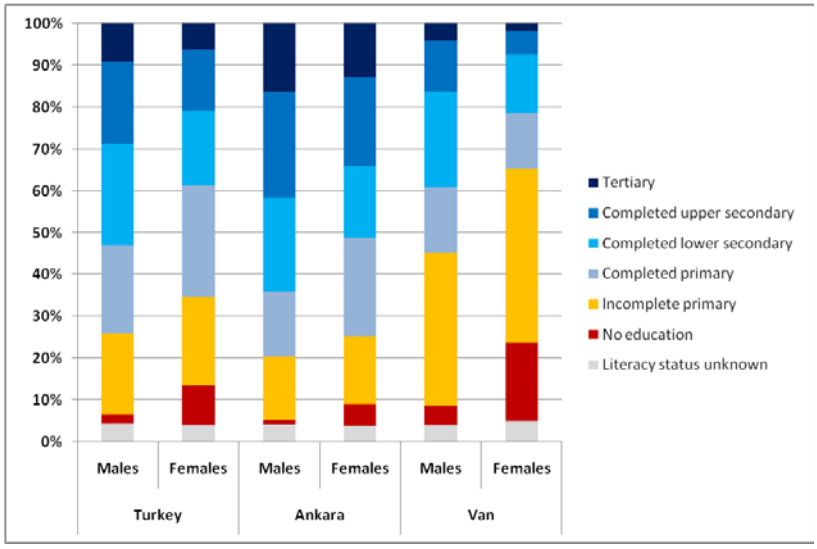

Figure 1. Population by education level and sex (6 years of age and over) in Turkey and in the provinces of Ankara and Van, 2010.

Source: Data from TSI (2013a).

Note: Foreigners are not included.

As a result of these efforts, over the years the state has made remarkable improvements in educational opportunities. For instance, while in the 1930s only 14-15 percent of villages had primary schools, nearly all did as of the early 1980s. Studies have also shown that the number of schools increased more than tenfold from 1923 to 2000s, while the number of students and teachers both rose almost 50 percent(Gökçe, 2004). From 1935 to 2010, literacy rates for both the male and female population also increased dramatically – from 29.35% to 93.45% and from 9.81% to 86.54%, respectively (Ergöçmen, Hancıoğlu & Ünalan, 1995; TSI, 2013a). Similarly, the schooling ratio for both sexes rose significantly over time. However, the gender gap in education attainment persists to this day, and Turkey still differs little from other developing countries in having low levels of education among its female population (Duman, 2010). Moreover, this gender gap is larger and more conspicuous in post-primary education (Rankin & Aytaç, 2006) (Figure 1).

Although Turkey has recently reached below replacement level fertility rates, there remain marked regional demographic differentials. Geographic patterns of variation in the country's demographic characteristics match regional variations in the levels of social and economic development. The biggest disparities are related to the socio-economic development and regional disparities between the country's east and west. Provinces or regions of the country vary markedly in the age structure of the population and even more conspicuously in such characteristics as fertility and infant and child mortality (Kocaman, 2008; Yüceşahin & Özgür, 2008). For instance, fertility varies from high levels in some provinces or regions to below-replacement levels in others[2] (Figure 2).

[2]In order to present these variations among the provinces, in Figure 3, all 81 provinces of the country were classified according to their fertility-transition stages in 2000 (SIS, 2003): provinces with TFRs below replacement levels were called post-transitional provinces (PTP); provinces with TFRs from 2.1 to 2.99 were called late transitional provinces (LTP); those with TFRs from 3.0 to 4.99 were called mid-

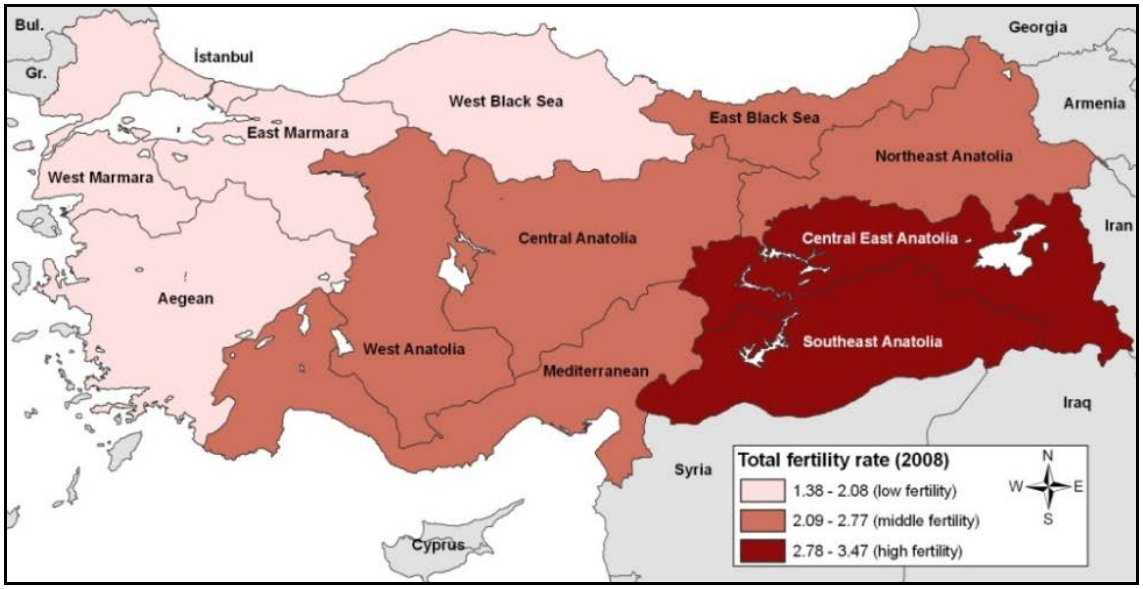

Figure 2. Distribution of TFRs by Nomenclature of Units for Territorial Statistics (NUTS-1) regions, 2008.

Source: Data from HUIPS (2009).

Education differs among the provinces or regions too. Turkey is far from homogeneous and its differentials in the level of socioeconomic development among provinces continue to affect the availability of educational resources and particularly women's access to them. Thus, geographic accessibility to educational and healthcare services, as well as ethnic composition and regional cultural patterns, exert an independent influence on the persistence of demographic diversity (Yüceşahin & Özgür, 2008). In terms of educational structure, populations in some provinces (e.g. Ankara) have a higher level of education than in other provinces such as Van (Figure 1).

In sum, Turkey experienced rapid educational expansion that yielded high upward intergenerational mobility and rapid fertility decline with decreasing fertility differentials by education in the course of time. This combination would be a very interesting implication for differential population replacement, particularly in the near future.

Although recent general fertility trends, regional inequalities, and gender disparities in education in Turkey have been well documented in research through analyses of censuses and demographic sample surveys (e.g. Turkish Demographic and Health Surveys), demographic and human capital variability has been comparatively neglected. Particularly for the future, it is worthwhile to undertake a broad portrait of regional variation in population characteristics in the Turkish context.

This study is a multi-state population projection, the aims of which include the production of a new dataset on educational attainment by age and sex for selected provinces in Turkey for the period 2010-2050 and the assessment of the likely effects of

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transitional provinces (MTP); and provinces with TFRs more than 5 children per woman were referred to as pre- or early transitional provinces (PETP).

future human capital changes in light of the three different scenarios, particularly for its possible impacts on the degree of heterogeneity between provinces.

Population estimates by age and sex make up one of the most widely used products of demographic analyses, and these estimates and projections for geographical units such as states, counties, provinces are important for planning what types of services to offer and the future structure of populations (Hoque, 2008; Jarosz, 2008; Plane & Rogerson, 1994). In addition to age and sex, disaggregation of population by education is proposed to be an important addition (see Lutz and KC, 2011). Education-specific population projections are important both because the information they produce is of intrinsic and practical interest, and because taking education into account improves the accuracy of the population projection in addition to allowing us to obtain information on the future structure of populations (KC et al., 2010).

Our main objective is to see how the population evolves in selected provinces of Turkey under different future scenarios. Thus we are interested in both the size and the structure by age, sex, and level of educational attainment of the population for selected provinces in the country. The present study is based on three sets of likely future storylines that could likely have different effects on demographic behaviour. The population at the sub national levels might respond differently under different changes in future policies and events. In order to make projections on the future of demographics in these provinces, we need to understand how these phenomena change under different scenarios. One way the society will change in the future could be due to the current momentum of change or a continuation of the currently observed trend. This possibility can be called business as usual or simply a “Medium” scenario; we will consider this as a baseline scenario. Beside the momentum factor, important events either at the internal or international level can significantly alter societal behaviours, including the demographic ones. A classic example for fertility is the baby-boom and the bust in many countries in the West after World War II. The first of the remaining two alternative scenarios is “Euro” storyline, where Turkey joins the European Union (EU) in the near future and the second one is “3-Child" storyline, where Turkey is less likely to join the EU and the government continues to implement the policy of 3-Child. The details of these storylines and their possible impacts on future demographics are discussed in the following relevant sections.

2. Approach and Methodology

In our study, we used multi-state population projection model to project the population by age, sex and educational attainment in five representative provinces in Turkey. The multi-state projection model can be considered as a generalization of the standard cohort-component model, which basically is a two state model with states “live” and “dead”. In the cohort component model, a cohort born in a geographic region during a period (e.g. a five year period) is projected forward in time (Lutz et al., 2007) (Figure3). The size of the cohort diminishes as members emigrate or die and the size increases when people born in the same year living outside the country immigrate into the country. This is repeated for all age-groups until mortality. In addition, new members enter in the population as newborns to females typically of the age-group 15-49. Fittingly, each cohort needs to be disaggregated by sex because fertility only applies to women. As with fertility, the mortality and migration rates also differ by sex. The

results of the cohort component method therefore will be a distribution of population by the two basic demographic factors namely, age and sex at a specific point of time.

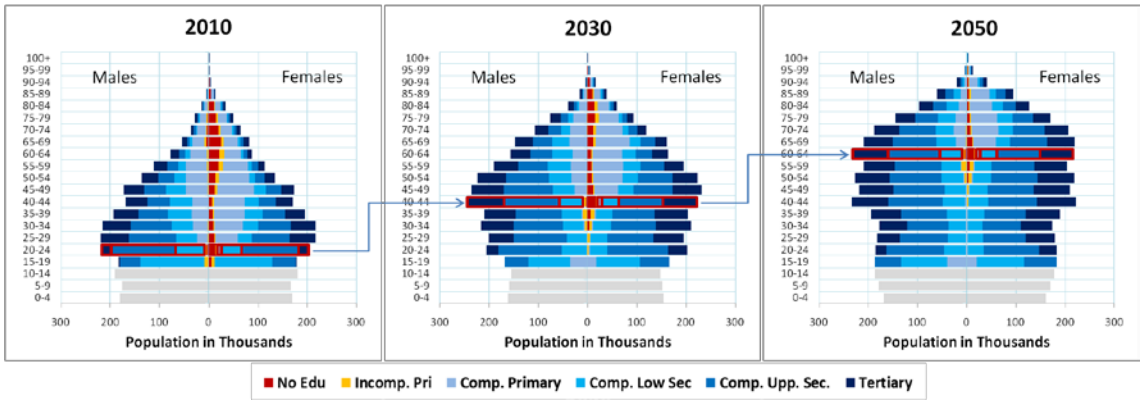

Figure 3. Age and education pyramids for the province of Ankara in 2010, 2030, and 2050.

Note: Colours indicate highest level of educational attainment of the population. Children aged 0 to 14 are marked in gray.

It has been shown that in addition to age and sex, population heterogeneity can be attributed to many other factors such as education attainment, health status, labour force participation, place of residence, etc. The multi-state population projection model is used when additional factors need to be considered in the projection of the population. The methodology of the multi-state model was developed in 1970s in the International Institute for Applied System Analysis (IIASA) (Keyfitz, 1985; Lutz & KC, 2011; Rogers & Land, 1982). This methodology originates from a geographic perspective in which states are defined to be regions of a country, with the populations interacting through internal migration; later this approach was generalized, and states were defined to include marital status, health or different types of households. Lutz and KC (2011) demonstrate that multi-state methods are particularly appropriate for modelling changes in educational attainment with upward transitions from lower to higher attainment levels, typically concentrated at younger ages. In applying the method for projecting backward (reconstruction) or forward, into the future, one has to have at least one data point for which the size and structure of the population by age, sex, and level of educational attainment is available (Lutz & KC, 2011). Education specific rates of fertility, migration, and mortality are applied to each cohort separately for males and females to obtain a population projection during a period, usually of 1 or 5 years (Figure 3). During the projection, some members of the cohort might transit to a higher educational attainment level. The end product is a new set of age-sex-education structures for a population.

2.1. Selected Provinces

Turkey has 81 provinces. We have selected five provinces from the 4 fertility regions by their TFRs level in 2000 (Figure 4). Provinces of *Ankara* and *Izmir* represent the low fertility (or post-transitional) region. These two provinces are developed socially and economically. However, *Ankara* has the most educated population proportionately in the country and *Izmir* is one of the provinces with the lowest fertility levels in the

country. *Kayseri* represents the mean fertility (or late transitional) region. *Gaziantep* represents the relatively high fertility (or mid-transitional) region. And *Van* represents the high fertility (or early transitional) region in the east.

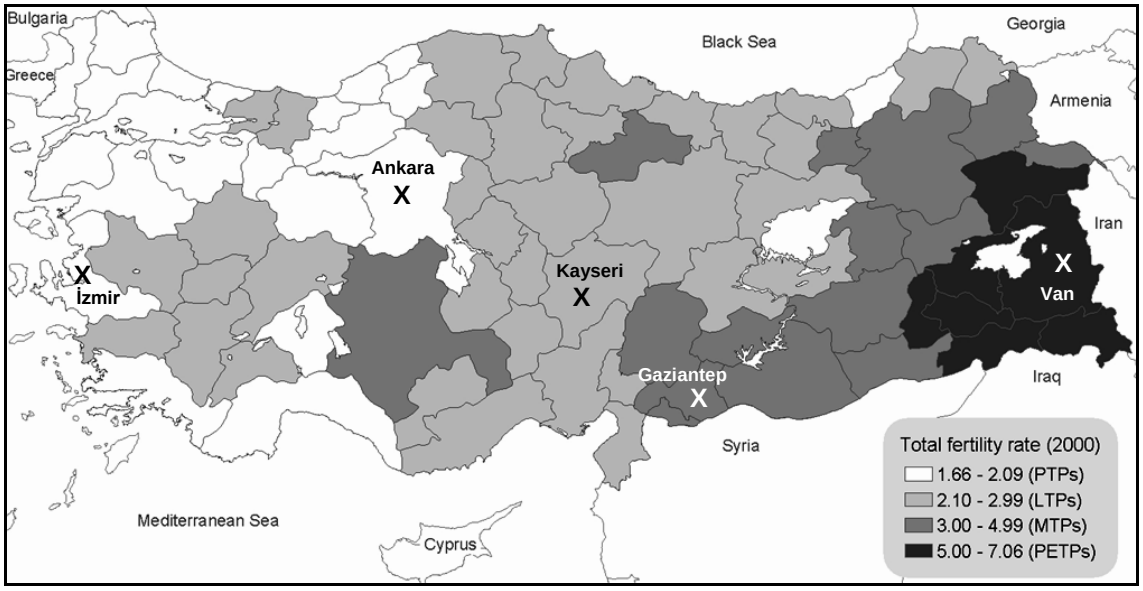

Figure 4. Fertility regions of Turkey: Distribution of post- (PTP), late (LTP), mid- (MTP), and pre- or early (PETP) transitional provinces in 2000 and the selected provinces.

Source: Data from SIS (2003).

Note: Selected provinces-*Ankara, Gaziantep, Izmir, Kayseri, and Van*- were showed with cross (X) on the map.

We also take into account other criteria when selecting the representative provinces including: (i) Salient differences among the provinces in the distribution of population by age, sex, and the level of educational attainment; (ii) population size within these provinces (Figure 5); (iii) distinctive mortality and migration patterns among the provinces; and (iv)data availability and quality.

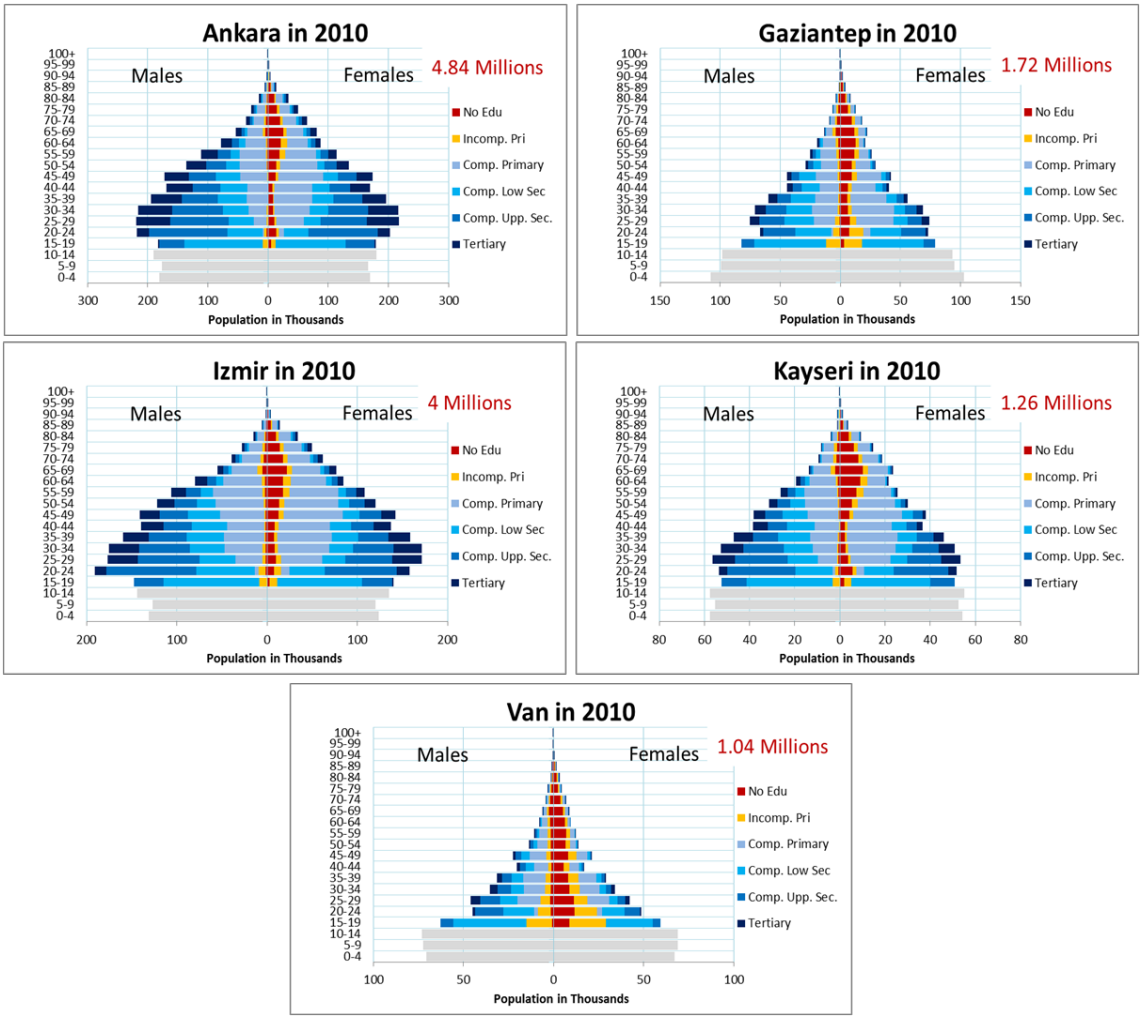

Figure 5. Distribution of population by age, sex and level of educational attainment in selected provinces in 2010.

Source: Data from TSI (2013a).

2.2 Raw Data

There are no data sources that include province-specific demographics. As such, the data were derived from different statistical sources by different indicators as follows: As baseline data for the provinces we used the 2010 data for the population distribution by age, sex, and educational attainment, birth statistics, and internal migration from the Address Based Population Registration System (TSI, 2013a). Other base provincial-population data were taken from the latest national census in 2000 (SIS, 2003, 2002a–e), which includes information on TFRs (from 1980 to 2000 with ten-year intervals), infant mortality rates and population distribution by age, sex, and educational attainment. For detailed information about characteristics of the migrated population between 2000 and 2005, data were taken from the latest migration statistics based on a 2000 national census (TSI, 2005). We used region-specific demographic data from the latest Turkey Demographic and Health Survey 2008 (HUIPS, 2009). For other data, life

tables were taken from United Nations (United Nations, 2011) and migration assumptions were taken from the Wittgenstein Centre (WIC).

2.3 Scenarios

In order to project the future population, we need to define scenarios. Typical practice is to have three scenarios, a middle one which represents a business as usual scenario, a high scenario, and a low scenario. We use three scenarios in this paper. While the Medium scenario is a continuation of the past or a business as usual scenario, the other two scenarios are based on storylines regarding potential political development in the future.

2.3.1 Medium Scenario

This is a business as usual scenario. Under this scenario we expect that the progress Turkey has made in the past will continue and socio-economic inequalities between provinces will continue to diminish. In demographic terms, fertility will continue to decline in all regions and reach some point of convergence in the long run. We assume that the current level of age-sex specific net migration rates, both internal and international, will remain constant till the end of the projection period, i.e., 2050. Life expectancy will continue increasing with some level of convergence as a continuation of the past. In terms of educational progression, we expect past improvement to continue with some level of convergence between regions. The quantification of these expectations are shown in Table 1.

2.3.2 Euro Scenario

We assume that negotiations will begin to go in a positive direction and Turkey will eventually join the EU within the next five or ten years. Under this scenario, many policies will be implemented with the goal of reducing interregional socio-economic and demographic inequality. We expect that with the opening of the borders there will be higher levels of international migration from all regions of Turkey to other European countries (Table 1). While international migration increases, internal migration in terms of net-migration will decline due to the decline in economic heterogeneity. In terms of fertility, we expect overall TFR to decline faster in all regions due to the transfer of European values that could increase the age at marriage, decrease the ideal number of children further, and increase the use of contraception. The mortality situation could be better due to technology transfers, expansion of the free market, and certain EU regulations. The rate of education progression gets a boost with a faster convergence between provinces.

2.3.3 3-Child Scenario

Considering demographic trends and the implemented long-term anti-natalist population policy from 1960s to 2000, it is evident that Turkey has moved into a new demographic regime since 2008. Turkey is no longer a country with high fertility, high mortality, and a young population; it is rather an ageing country with low fertility and low mortality. In response to this demographic change, policymakers began to pay attention to new

imbalances in the population structure (such as the increase in the elderly population), and began to state the need for a pronatalist population policy which would attempt to reverse the current trend (Eğrikavuk, 2010; Yüceşahin, Türkyılmaz & Adalı, 2013). The current Prime Minister, R. Tayyip Erdoğan, has a pro-life version of the one-child policy in China. It is his hope that each couple will have at least three children and for years he has promoted his own 'three-child policy' recommending that Turkish citizens should have at least three children to keep the country's population and workforce dynamically youthful.

Under the 3-Child scenario, we assume that Turkey is less likely to join the EU. Conservatism, religiosity, and nationalism all increase under this scenario. We expect that the socio-economic inequalities between provinces will grow stronger. In demographic terms, the three child policy will mainly affect the ideal number of children and contraceptive use. While the ideal number of children increases, contraceptive use could decline and as a result TFR will increase or remain at higher level (Table 1). We expect that internal migration will increase and more people will move to currently affluent areas such as Ankara and Izmir from places with lower levels of human development such as Van and Gaziantep. Due to the rising tension between the EU and Turkey, the EU will impose stricter rules that would lead to a decline in international migration. In terms of mortality, the increase in life expectancy will be slower than in the Medium scenario.

Scenario	Fertility	Mortality	Migration (Internal)	Migration (International)	Education
Euro	Regions with low fertility (TFR < 1.75): TFR declines to1.3 and then increases to converge to1.75; Regions with high fertility: TFR will decline and converge to 1.75	Increase in life expectancy at birth (e0) in Ankara will be 1 year per decade higher than in the Medium scenario; the remaining four provinces will follow Ankara's path such that by 2050 the current difference diminishes by 2/3rd	Net migration rate declines 50%more than in the Medium scenario	Exhibits double the rate of age-sex specific net-migration than in the Medium scenario until2020 – remaining constant thereafter	E1-E2: 99%(by 2020) E2-E3: 99%(by 2020) E3-E4: 30% faster than medium E4-E5: 30% faster than medium E5-E6:Ankara goes to 40% by 2050; other's follow by closing the gap by 75%
Medium	Regions with low fertility (TFR < 1.75): TFR declines to1.4 and then increases and converges to1.85; Regions with high fertility: TFR will decline and converge to 1.75 and then increases and converge to 2.0.	e0 for Ankara follows Turkey's path as in the UN's medium projection till 2050; the remaining four provinces will take a path such that by 2050the current difference in e0 with Ankara diminishes by 1/3rd	The rate of age and sex specific net-migration will remain constant and distributed proportionally by education	Apply WIC's net migration rate by age and sex for Turkey.	Education Attainment Progression Ratio (EAPR): E1-E2: 99%(by 2020) E2-E3: 99%(by 2020) E3-E4: Trend Extrapolation to98% E4-E5: Trend: 80% ceiling E5-E6:converges to 50% of the gap with Ankara by 2050
3-Child	Regions with low fertility (TFR < 1.75): TFR slowly reaches 1.5and then slowly converges to 2.0; Regions with high fertility: TFR converges to 2.5	Increase in e0 in Ankara will be 1 year per decade less than in the Medium scenario; the remaining four provinces will follow Ankara's path maintaining the difference	Net migration rate doubles (compared to the Medium scenario)	Half the rate of age-sex specific net-migration than in the Medium scenario until 2020 – remaining constant thereafter	E1-E2: 99%(by 2020) E2-E3: 99%(by 2030) E3-E4: 30% slower than medium E4-E5: 30% slower than medium E5-E6: No convergence (constant)

Table 1. Fertility, mortality, internal and international migration, and education assumptions for selected provinces by the scenarios.

2.4. Assumptions

As a second step, Table 1 shows how we operationalize the demographic and education scenario in terms TFRs, life expectancies at birth, migration rates, and education transition. Fertility and mortality are the fundamental components that change the population; the former creates individuals while the latter eliminates individuals. Migration is relative, in geographic terms the smaller the geographic units are, the

higher the migration rates tend to be because the movements of more people are captured.

2.4.1. Fertility Assumptions

In Turkey, diversity between provinces is huge, as pointed out earlier among the selected provinces. For example, the current fertility rate in Ankara is around 1.67, whereas it is twice that in Van, 3.52 (TSI, 2013b). Given past information, the task here is to come up with future trajectories of fertility in each province under given story lines and in this paper additional emphasis is placed on the pace of convergence between provinces. Future evolution depends mainly on how fertility behaviour among individuals in the provinces will change in the future.

NUTS-1 Region	TFR	Median age at first marriage (women aged 25-49)	Mean ideal number of children (ever-married women aged 15-49)	Contraceptive use (any method) (married women aged 15-49)
Istanbul	1.78	21.4	2.4	74.3
West Marmara	1.38	20.9	2.1	76.2
Aegean	1.91	20.6	2.4	80.0
East Marmara	1.80	21.5	2.3	76.8
West Anatolia	2.40	21.0	2.3	75.7
Mediterranean	2.09	21.1	2.8	70.4
Central Anatolia	2.09	19.4	2.4	72.2
West Black Sea	1.90	20.5	2.3	77.5
East Black Sea	2.10	21.3	2.7	68.2
Northeast Anatolia	2.59	19.8	2.6	70.4
Central East Anatolia	3.33	19.6	3.1	62.3
Southeast Anatolia	3.47	19.5	3.3	57.8
Turkey	2.16	20.8	2.5	73.0

Source: HUIPS (2009).

Table 2. Region -specific (NUTS-1) TFR, median age at first marriage, mean ideal number of children and the contraceptive use in Turkey, 2008.

We take a step back and try to list what determines the fertility rate in a region/country. In a traditional society, three factors play important roles: age at marriage, mean ideal number of children, and contraceptive use. According to the Turkish Demographic and Health Survey 2008 (HUIPS, 2009), in the West Anatolia region (NUTS1) in which the province of Ankara located (Table 2), the average age at marriage is 21.0 while it is 19.6 in the Central East Anatolia region where Van is situated. This difference is not very significant.

The mean ideal number of children is also low in the West Anatolia region (Ankara) (2.3), compared to the Central East Anatolia region (3.1) (Van). And finally, contraceptive usage (any method) and TFR are currently 75.7 and 2.40 in West Anatolia, compared to 62.3 and 3.33 respectively in Central East Anatolia. These

figures offer some explanations for why fertility is low in Ankara and high in Van. We consider this information along with the past development in other countries where the fertility transition has already occurred. Furthermore, some subjective choices were made whenever it was not possible to use any available information, all of which are clearly stated in the following scenario descriptions.

Euro: This is a scenario where Turkey's integration with EU is likely to affect the fertility behaviour of the Turkish population. In general, we expect fertility to decline very rapidly due to several reasons. Firstly, EU integration will lead to a flow of Turkish migrants to other European countries (therefore, high rate of migration) mainly for the labour reasons. More women will join the labour force within the country and education will spread in low level regions resulting in greater educational attainment of the whole country. All these factors will push overall fertility downwards. Therefore, we assume that fertility rates will further decline in all provinces; provinces with TFR of less than 2.1 will reach the minimum value of 1.3 (similar to many European experiences) and will then slowly increase to 1.75. For other regions, fertility will gradually decline to 1.75; for example, Izmir with a current level of 1.5 will reach 1.3 in 2020-25 and then will slowly increase to a level of 1.75 by 2050-55. Ankara and Kayseri will follow the path of Izmir whereas the two provinces with higher levels of fertility, namely Van and Gaziantep, will slowly converge to 1.75 by 2050 (Figure 6).

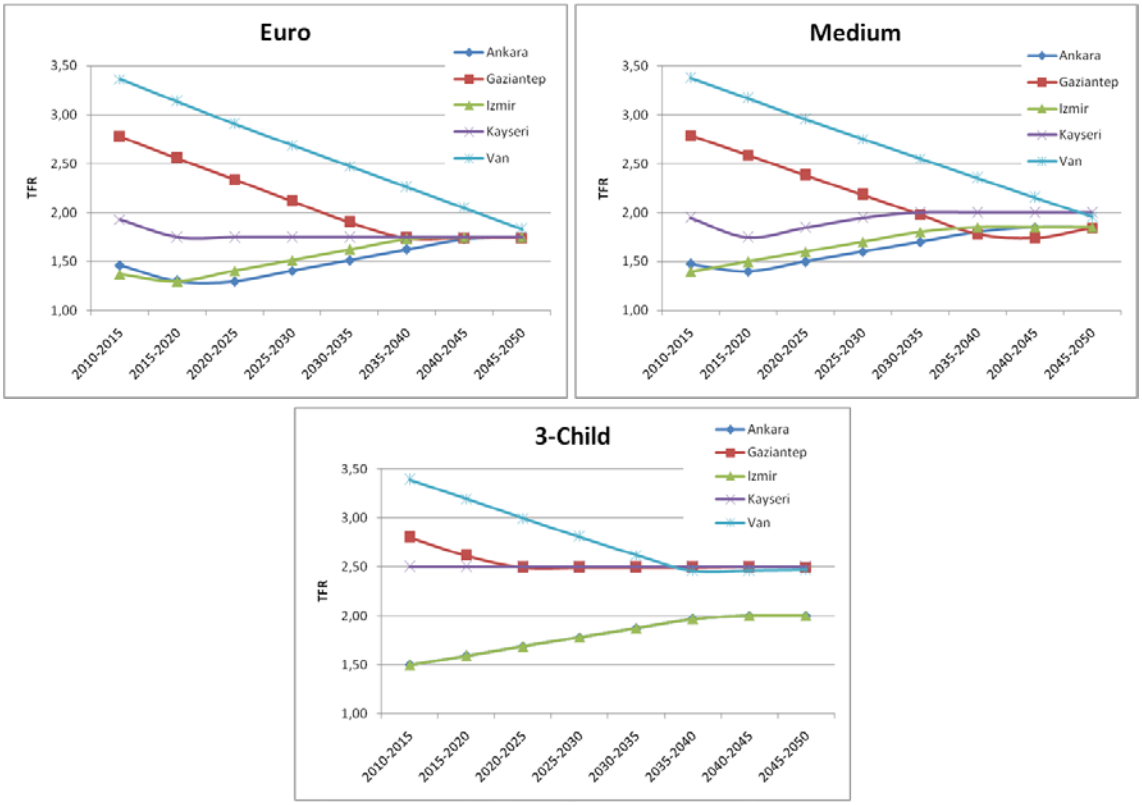

Figure 6. Assumed TFRs for Euro, Medium and 3-Child scenarios for the five provinces.

Medium: Under this scenario, which is a bit less optimistic than the Euro scenario, the decline in fertility will be slower than in the Euro scenario. Low fertility regions will reach the minimum value of 1.4 and will slowly increase to 1.85, 0.1 higher than in the Euro scenario. For other regions with higher levels of fertility, fertility will decline to a level of 1.75 before starting to increase and levelling off at a value of 2.0 (Figure 6).

3-Child: This scenario is a result of Turkey becoming more traditional due to the rise of political and religious conservatism. On the one hand Turkey is in Europe with an ambition to be in the EU, and on the other hand Turkey borders many unstable Arab and middle-Asian countries. We expect that fertility level in the regions with higher fertility will converge to a level of 2.5 (TFR) as a result of the government's push towards the target of 3. In low fertility regions, we assume that the fertility will slightly decline to a level of 1.5 and then increase to a level of 2.0 (Figure 6).

2.4.2. Mortality Assumptions

Euro: Under the Euro scenario, we assume that an improvement in life expectancy will be faster than projected by the UN by one year per decade. Ankara being a front runner, this pace is applied first to Ankara. For rest of the provinces, we expect mortality inequality between provinces to diminish by 2/3rdby 2050 (Table 1).

Medium: In this scenario, we expect that a steady pace of improvement in the overall health condition will continue, resulting in higher levels of life expectancies. We assume that such a pace will be similar to what UN assumes for Turkey in its Medium

variant. We assume that Ankara follows the UN path for Turkey and the rest of the provinces follow Ankara, diminishing the gap by 1/3rd by 2050.

3-Child: In this scenario, we expect the overall rate of increase to be slower than in the Medium scenario by 1 year per decade. The difference in life expectancy will remain the same till the end of the period.

Migration Assumptions

Euro: In terms of internal migration, we expect a decline as the rate of international migration will increase, leaving enough jobs available locally which will stop many from going to larger urban centres. We assume that by 2020-25 internal migration will decline by 50% of the observed rates covering the period of 2007-2011 and will remain constant (Table 1).

Medium: We assume that the rate of migration does not change and remains constant by age and sex until the end of the period, a business as usual scenario.

3-Child: Contrary to the Euro scenario, not being in the EU will give rise to a situation where development occurs at different levels/paces in different parts of the country. The imbalance within the country and restrictions imposed by other European countries through stringent visa rules will force people from less developed regions to migrate to developed regions. We assume that by 2020-25 internal migration will increase by 50% of the observed rate in the period of 2007-2011 and thereafter will remain constant.

2.4.3 Education Assumptions

The transition from a lower level to a higher level of education can be measured in several ways. We define the transition in terms of EAPR, which is a proportion of the population who progressed to the next level from below. The EAPR can be calculated from a population distributed by education. For example, if 40% of a population in a certain cohort have completed at least upper secondary and 80% have completed at least lower secondary then the EAPR to upper secondary is 0.5 (40%/80%). In this study we define six level of educational attainment and hence need five EAPRs.

Education Categories

The Turkish educational system is basically made up of two sections: formal and non-formal education. Formal education can be defined as the regular education of individuals of a certain age group as provided in schools. The formal educational institution consists of four levels: pre-school education, primary education (lasting 8 years total), secondary (high school) education (adding to 11 years total, including the previous levels), and higher (post-secondary / tertiary or university) education – for a grand total of 13 or more years. Formal education is free in public schools, and compulsory education in Turkey was expanded from 5 years to 8starting with the 1997-1998 educational year[3]. As for Turkey's non-formal education, it aims to assist formal

[3]Starting with the 2012-2013 educational year, compulsory education was expanded from 8 years to 12. This new educational system consists of 3 stages: 4 year for primary school education+ 4 year for junior high school education+ 4 year for high school education.

institutions and offer life-long learning opportunities for children as well as adults (Duman, 2010; Gökçe, 2004)[4].

Code	Category	Definition in Turkish Education System	Explanation
E1	No education	No education	No formal education or illiterate
E2	Incomplete primary	No education but literate	Uncompleted primary and completed reading and writing course
E3	Completed primary	Primary school education (the first level of primary education for 5 years)	Completed the first level of primary education, uncompleted the second level of primary education
E4	Completed lower secondary	Junior high school education (the second level of primary education for 3 years)	Completed lower secondary and uncompleted higher secondary, completed junior high school and vocational school at junior high school level
		Primary education	Completed primary education for 8 years, uncompleted higher secondary
E5	Completed upper secondary	Secondary education	Completed high school education, uncompleted tertiary education
E6	Tertiary	Tertiary education	Completed tertiary education for 2 years and more

Table 3. Education categories.

In our study, population was grouped into six educational categories, namely, no education, incomplete primary, completed primary, completed lower secondary, completed upper secondary and tertiary (Table 3)[5].

Euro: In the Euro scenario, education will be a priority and the government is likely to make policies to decrease inequality in the country. This will, sooner or later, result in at least universal attainment of basic education in all regions of Turkey. We are painting a very optimistic future in terms of education in Turkey and therefore we define the education scenario in "Euro" world as all children aged 10-14 attaining school by 2015. The advancement in the transitions from completed primary (E3) to completed lower secondary (E4) and E4 to completed upper secondary (E5) are assumed to be 30% faster than in the Medium scenario. Similarly, the transition rate from E5 to tertiary education (E6) for Ankara will further increase from its current stalled level of 40% to 50% and the rest of the provinces will follow Ankara by closing the gap by 75% (Table 1).

Medium: We assume a moderately optimistic education progression. Universal primary attainment will be achieved by 2020. The transition ratio from completed primary (E3) to lower secondary (E4) will continue to increase levelling at 98%. Similar continuation of the past improvement is assumed for the transition ratios between E4 and upper secondary (E5) levelling off at 80%. Finally, the progression to E6 is assumed to be constant at the level of Ankara (stalled). The remainder of the regions are assumed to close the gap with Ankara by 50% by 2050 (Table 1).

[4]Notably, many reading and writing courses for girls and women have been used by the government and non-governmental organisations alike to help narrow the gender literacy gap in undeveloped eastern regions via the non-formal education system.

[5]Due to recent change in education policy, primary education (compulsory primary education for 8 year) is not applicable for young population.

3-Child: In the "3-Child" scenario, we expect progress in educational attainment but with a slower overall speed and significantly slower in regions such as Van and Gaziantep. Under this scenario, the transition from E2 to E3 is slower than in the Euro and Medium scenarios, it will take an additional 10 years to have universal primary completion. Along the same lines, the transition from E3 to E4 and E4 to E5 will be 30% slower than in the Medium scenario. Finally, the transition from E5 to E6 will remain constant (Table 1).

3. Results

We defined three storylines for the future of Turkey. Based on our knowledge about the past and expectation in the future for each scenario, we posited set of assumptions for fertility, mortality, migration, and education. We used these sets of assumptions along with population distribution in the year 2010 and projected the population for the five selected provinces using the multi-state population projection method for the period 2010-2050. Table 4 shows the population distribution by broad age-groups for the five provinces under the three scenarios.

Under all scenarios, population in the five provinces will grow between 2010 and 2050. Overall, population growth will be the highest in the 3-Child scenario and the least in the Euro scenario. Under the Euro scenario, there are significant differences in population increases between provinces during the 40 years. At one extreme is the province Van -the least developed province- with 84% growth and in the other extreme is Izmir -a highly developed (rich, educated, etc.) province- with a very low level of growth of 17%. The growth rate is less heterogeneous under the 3-Child scenario and is different than in the Euro scenario, as provinces of Ankara (71%) and Kayseri (77%) will see faster growth and Van (50%) will see slower growth. Gaziantep will experience high growth in all scenarios (by 67% in Euro and Medium and 85% in 3-Child). In terms of population growth, the Medium scenario is closer to the Euro scenario than the 3-Child scenario (Table 4).

The results of the projection show clear differences in terms of population distribution by broad age groups under the three scenarios. The size of the 0-14 age-group will decline in all provinces during the period of 2010-2050 under the Euro and the Medium scenario (although lower in the former) as a result of an overall decline in the level of assumed fertility. Under the 3-Child scenario–due to a high level of internal migration- all provinces except Van will experience explicit growth of the population size of 0-14 years old.

Province	Age Group	Scenario								
		Euro			Medium			3-Child		
		2010	2030	2050	2010	2030	2050	2010	2030	2050
Ankara	0-14	1.06	0.78	0.81	1.06	0.93	1.04	1.06	1.17	1.55
	15-64	3.38	3.89	3.47	3.38	4.07	4.02	3.38	4.43	5.19
	65+	0.32	0.93	1.76	0.32	0.88	1.60	0.32	0.83	1.43
	Total	*4.77*	*5.61*	*6.04*	*4.77*	*5.88*	*6.66*	*4.77*	*6.43*	*8.17*
Gaziantep	0-14	0.60	0.59	0.50	0.60	0.60	0.52	0.60	0.64	0.75
	15-64	1.03	1.57	1.85	1.03	1.58	1.89	1.03	1.59	2.01
	65+	0.08	0.20	0.48	0.08	0.19	0.44	0.08	0.18	0.39
	Total	*1.70*	*2.36*	*2.84*	*1.70*	*2.37*	*2.85*	*1.70*	*2.42*	*3.15*
Izmir	0-14	0.78	0.61	0.60	0.78	0.73	0.75	0.78	0.83	1.01
	15-64	2.83	2.99	2.58	2.83	3.08	2.91	2.83	3.28	3.45
	65+	0.34	0.83	1.43	0.34	0.80	1.30	0.34	0.78	1.21
	Total	*3.95*	*4.43*	*4.61*	*3.95*	*4.61*	*4.96*	*3.95*	*4.89*	*5.67*
Kayseri	0-14	0.33	0.28	0.25	0.33	0.30	0.31	0.33	0.41	0.51
	15-64	0.82	1.02	1.02	0.82	1.04	1.08	0.82	1.10	1.33
	65+	0.08	0.21	0.41	0.08	0.20	0.37	0.08	0.19	0.35
	Total	*1.24*	*1.51*	*1.68*	*1.24*	*1.53*	*1.76*	*1.24*	*1.71*	*2.19*
Van	0-14	0.42	0.46	0.40	0.42	0.45	0.39	0.42	0.43	0.38
	15-64	0.58	0.97	1.28	0.58	0.93	1.19	0.58	0.86	1.00
	65+	0.03	0.09	0.23	0.03	0.08	0.20	0.03	0.08	0.16
	Total	*1.04*	*1.52*	*1.91*	*1.04*	*1.47*	*1.78*	*1.04*	*1.37*	*1.55*

Table 4. Population (in millions) by broad-age-groups for Euro, Medium, and 3-Child scenarios, 2010, 2030, and 2050.

Regarding the size of working age population15-64years old, salient differences can be seen among the provinces in terms of changes during the projection period. By 2030, the size of the labour-force will increase under all scenarios, mainly due to the larger younger cohorts replacing the smaller older cohorts. The growth is largest in Gaziantep and Van. By 2050, under 3-Child scenario, the population aged 15-64 will further increase. However, under the Euro scenario, the size of the 15-64 years old in Izmir and Ankara will decline compared to 2030. Same is true under Medium scenario, however to a lesser extent.

The projection of population aged 65 and over is important with respect to the different pace of aging in the provinces under the three scenarios. While the aging pattern preserves its structure among the provinces from 2010 to 2050, the size of this age group differs between the scenarios. In all provinces and under all scenarios, by 2030, the size of the elderly population increases by more than 2 to 3 folds. By definition, the Euro scenario results in the highest rate of ageing in terms of an increasing proportion of elderly. Izmir will have more than 30% of the population aged over 65 followed by Ankara (29%) and Kayseri (24%). Ageing is least pronounced

under 3-Child scenario. For Van, the proportion aged 65+ seems to be the same in all three scenarios, which is a result of a fine balance mainly between forces of migration and fertility.

Table 5 shows the number of births and deaths as well as internal and international migration corresponding to the assumed demographic trajectories under different scenarios. This table is useful in decomposing the change in the overall population. Births and positive net migration add up to the existing population whereas deaths and negative net migration takes people away from the province.

There are significantly more births than deaths in all provinces, which is the primary reason for the increase in the population in all scenarios. At the beginning 2010-2015 under Euro scenario, the births to deaths ratio is as high as 13.3 in Van and as low as 3.9 in Izmir. This ratio diminishes in the future in all provinces under all scenarios except in Van under the Euro and Medium scenario where it increases for one more quinquennium. The ratio starts diminishing faster in the Euro scenario than in the 3-Child scenario mainly due to the lower fertility assumptions of the Euro scenario. Overall, the importance of international migration is small. However, internal migration is as important a component as death, especially in the Medium and 3-Child scenario. In the provinces of Ankara and Izmir, the number of deaths can simply be compensated by a fraction of migrants coming into the province; whereas, in Van, the population diminishes by deaths and much more by those leaving the province. In Gaziantep and Izmir, the deaths are not fully replaced by the migrants.

Under the Euro scenario, the number of births will decline in all provinces except Van, while in the other two scenarios the number of births will mostly increase. The increase is much faster in provinces where a high number of people are migrating in; for example, in Ankara births will be as high as 1 million in the period 2045-2050. As expected, in all provinces and under every scenario, the number of deaths increases due to the increase in the share of the 65 and over age group. In Izmir and Ankara under the Euro scenario, the rate of change in the number of births and deaths as well as internal and international migration is similar. The provinces of Kayseri and Gaziantep have a declining trend in the number of births and a slight rise in the number of deaths. Under the Medium scenario, the numbers of births, deaths, internal and international migration have a similar pace in all provinces. More specifically, while the provinces of Ankara and Izmir will have a higher number of births and deaths, the other provinces have a higher internal migration numbers, compared to Euro scenario. However, Gaziantep, Kayseri and Van have lower international migration numbers. Under the 3-Child scenario, the number of births, deaths, internal and international migration differs markedly in all provinces compared to the other two scenarios. It can be seen that while the numbers of births, deaths and internal migration increase in Ankara and Izmir, the number of international migration decreases, comparing particularly the trends in the Euro scenario for the whole period.

Next, we compare the evolution of education in the population under Euro, Medium, and 3-Child scenarios. Figure 7 shows the population pyramid by age, sex, and level of education in the provinces for the starting year 2010 and the projected structure for the year 2050 for each scenario. As expected, with improvements in education, the overall level of education in the population rises, which partly accelerates the fertility decline in all scenarios except for the 3-child scenario (Table 6, 7, and 8),

where we expect the government policy to work to some extent resulting in some level of stagnation in the future.

As shown in the figures 7 and 8, Ankara has a universal junior secondary education; almost all children in the school going age have completed junior secondary and a majority has completed upper secondary with more than a quarter in respective age groups having completed tertiary: this is similar to what we observe in developed countries and societies. On the other hand, in Van there is a large gap in terms of educating the population and this province resembles countries in South Asia or other developing countries. Under the Euro scenario, we expect that the education policies will be aggressive to fill the inequality between the provinces. Under the 3-child scenario, progress will be done but at slower pace and much slower in provinces such as Van and Gaziantep.

Province	Period	Births			Deaths			Internal net migration			International net migration		
		Scenario											
		Euro	Medium	3-Child	Euro	Medium	3-Child	Euro	Medium	3-Child	Euro	Medium	3-Child
Ankara	2010-2015	600	608	624	105	109	114	153.9	205.2	307.8	-11.2	-7.4	-5.6
	2020-2025	502	603	731	128	143	158	92.4	192.2	414.8	-14.0	-7.2	-3.7
	2030-2035	548	668	864	159	186	213	80.7	181.3	435.2	-12.4	-6.6	-3.7
	2040-2045	534	672	965	202	242	284	71.4	174.6	470.6	-10.1	-5.5	-3.2
	2045-2050	505	665	1018	226	272	322	68.8	174.5	497.2	-8.5	-4.8	-3.0
Gaziantep	2010-2015	402	404	406	40	42	44	9.0	12.0	18.0	-3.5	-2.3	-1.7
	2020-2025	398	407	427	41	46	52	6.7	13.5	27.1	-4.9	-2.5	-1.2
	2030-2035	361	378	480	46	55	66	7.8	15.8	32.7	-5.2	-2.6	-1.3
	2040-2045	337	341	503	54	69	87	7.9	16.1	35.6	-4.9	-2.5	-1.3
	2045-2050	334	360	518	60	78	101	8.0	16.3	36.5	-4.6	-2.3	-1.2
Izmir	2010-2015	440	451	487	112	117	122	90.0	120.0	180.0	-9.1	-6.0	-4.5
	2020-2025	408	479	537	131	146	161	56.3	116.2	242.7	-11.2	-5.7	-2.9
	2030-2035	421	500	592	155	181	210	51.6	111.9	248.4	-9.4	-4.9	-2.6
	2040-2045	395	489	651	185	223	266	49.0	112.2	264.3	-7.3	-3.9	-2.2
	2045-2050	380	491	674	201	243	293	47.9	112.1	273.5	-6.2	-3.5	-2.1

Province	Period	Births			Deaths			Internal net migration			International net migration		
		Scenario											
		Euro	Medium	3-Child	Euro	Medium	3-Child	Euro	Medium	3-Child	Euro	Medium	3-Child
Kayseri	2010-2015	199	201	259	36	37	39	16.3	21.7	32.6	-2.7	-1.8	-1.3
	2020-2025	186	199	273	38	43	48	11.3	22.8	50.4	-3.5	-1.8	-0.9
	2030-2035	183	214	297	43	50	60	11.9	24.5	55.5	-3.3	-1.7	-0.8
	2040-2045	167	200	336	49	61	76	12.3	26.0	62.8	-2.8	-1.4	-0.8
	2045-2050	163	202	352	54	67	85	12.0	25.6	66.6	-2.5	-1.3	-0.8
Van	2010-2015	289	290	289	22	23	24	-31.3	-41.7	-62.5	-1.9	-1.3	-0.9
	2020-2025	323	322	312	21	25	28	-25.1	-49.3	-95.3	-3.1	-1.5	-0.7
	2030-2035	307	304	286	23	29	34	-28.6	-55.4	-102.5	-3.4	-1.6	-0.7
	2040-2045	275	273	276	28	36	44	-29.7	-56.7	-101.1	-3.1	-1.5	-0.6
	2045-2050	252	252	276	31	40	50	-29.9	-56.7	-100.4	-3.0	-1.4	-0.6

Table 5. Births, deaths, and migration numbers for Euro, Medium, and 3-Child scenarios, by selected provinces in five year-intervals, 2010-2050.

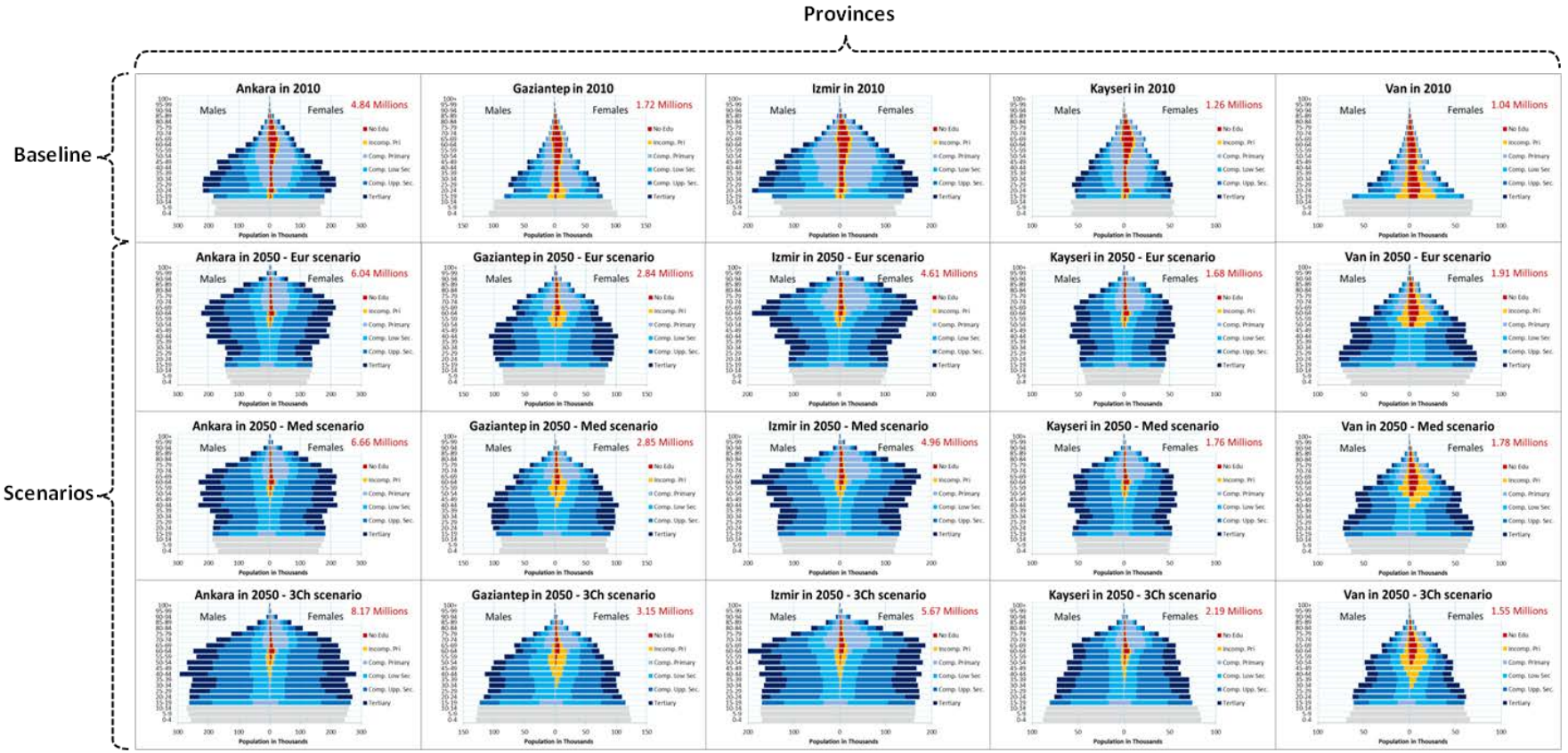

Figure 7. Distribution of population by age, sex, and level of educational attainment in the five selected/representative provinces in 2050 under the Euro (Eur), Medium (Med), and 3-Child (3Ch) scenarios.

Our purpose here is to show the outcome of the current structure of age-sex-education projected according to the future assumptions of each scenario. Since Ankara is already in an advance state of education, the difference in terms of education is not much. The population will be larger, the demand will be much higher and the government needs to respond to this demand by investing in new schools/universities. Whereas in Euro scenario, there will be less demand for education in terms of total size and this will lessen the pressure on basic educational institutions (providing an opportunity to improve quality over quantity) and people will increasingly continue to higher education. Hence more university seats need to be created. On the other hand, in the province of Van under the Euro scenario, population will benefit from aggressive education policies and will be much more educated. However, in the 3-Child scenario, the education structure will lag behind that of the Euro scenario. Mainly due to the high number of births, the government will have difficulty in meeting the demand for education (Figure 8).

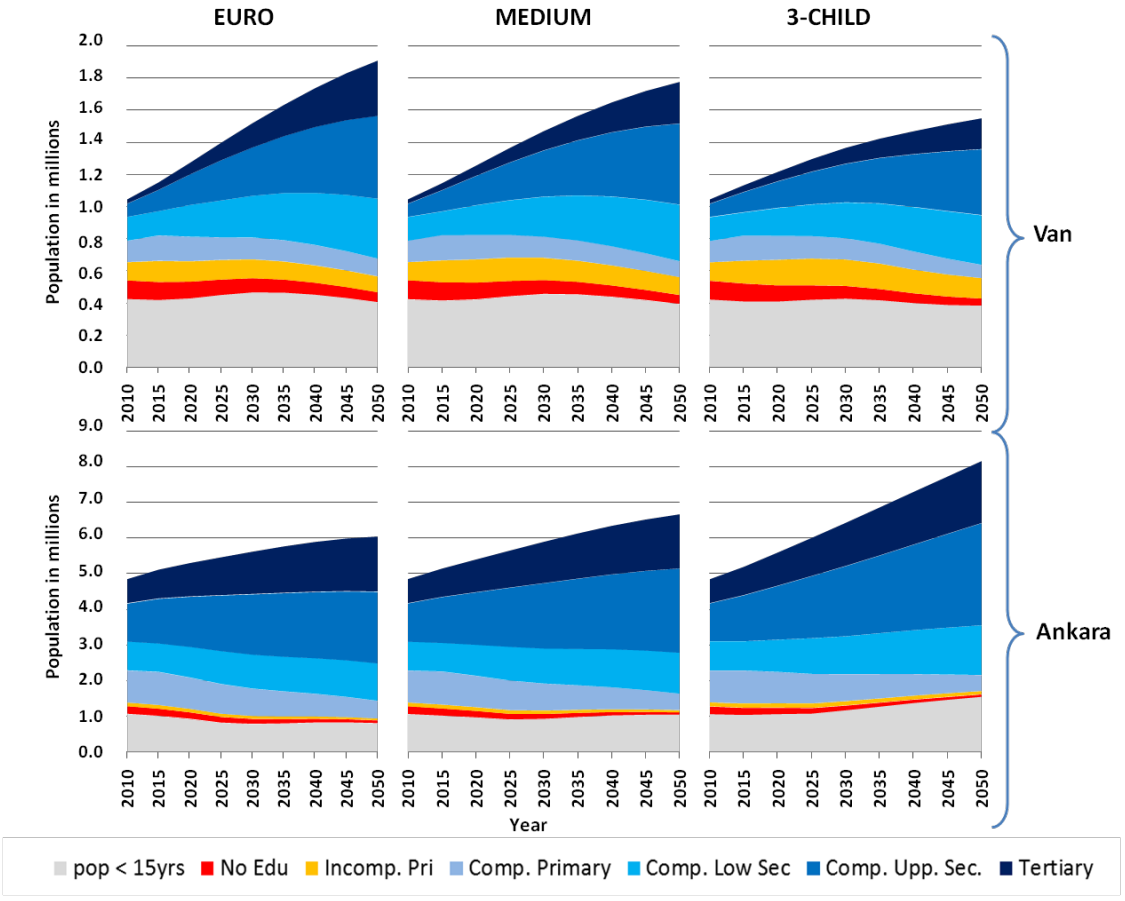

Figure 8. Population sizes in provinces of Ankara and Van by level of educational attainment projected to 2050 on the basis of three different scenarios.

Scenario		Males							Females						
Euro	Year	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39
Province		Education category							Education category						
		E1	E2	E3	E4	E5	E6	Upper Secondary+	E1	E2	E3	E4	E5	E6	Upper Secondary+
Ankara	2010	0.01	0.02	0.19	0.25	0.32	0.20	0.65	0.10	0.04	0.28	0.18	0.25	0.15	0.56
	2020	0.01	0.02	0.16	0.23	0.36	0.23	0.73	0.07	0.03	0.24	0.17	0.29	0.20	0.71
	2030	0.00	0.01	0.12	0.23	0.38	0.26	0.77	0.05	0.02	0.20	0.17	0.32	0.23	0.79
	2040	0.00	0.01	0.09	0.22	0.39	0.28	0.78	0.04	0.02	0.16	0.17	0.34	0.27	0.81
	2050	0.00	0.01	0.07	0.22	0.40	0.30	0.78	0.03	0.01	0.12	0.18	0.36	0.29	0.81
Gaziantep	2010	0.03	0.07	0.26	0.36	0.20	0.08	0.38	0.20	0.11	0.32	0.21	0.12	0.04	0.24
	2020	0.02	0.06	0.22	0.33	0.27	0.11	0.52	0.13	0.10	0.26	0.21	0.21	0.09	0.46
	2030	0.01	0.04	0.15	0.33	0.31	0.16	0.64	0.09	0.07	0.20	0.22	0.27	0.15	0.67
	2040	0.00	0.03	0.11	0.32	0.34	0.20	0.71	0.06	0.06	0.16	0.23	0.31	0.20	0.76
	2050	0.00	0.03	0.08	0.30	0.36	0.23	0.74	0.04	0.05	0.12	0.23	0.33	0.24	0.78
Izmir	2010	0.02	0.03	0.28	0.26	0.27	0.14	0.53	0.11	0.05	0.33	0.18	0.21	0.12	0.47
	2020	0.01	0.03	0.23	0.24	0.31	0.18	0.67	0.08	0.04	0.29	0.17	0.26	0.16	0.66
	2030	0.01	0.02	0.18	0.24	0.34	0.21	0.75	0.06	0.03	0.24	0.17	0.29	0.20	0.78
	2040	0.01	0.02	0.13	0.24	0.36	0.24	0.78	0.04	0.03	0.20	0.18	0.32	0.23	0.81
	2050	0.00	0.02	0.10	0.24	0.38	0.27	0.78	0.03	0.02	0.15	0.19	0.34	0.26	0.81

Scenario		Males							Females						
Euro	Year	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39
Province		Education category							Education category						
		E1	E2	E3	E4	E5	E6	Upper Secondary+	E1	E2	E3	E4	E5	E6	Upper Secondary+
Kayseri	2010	0.02	0.03	0.26	0.29	0.27	0.12	0.55	0.16	0.06	0.36	0.19	0.18	0.07	0.41
	2020	0.01	0.02	0.21	0.26	0.32	0.16	0.68	0.11	0.04	0.30	0.17	0.25	0.12	0.64
	2030	0.01	0.02	0.16	0.26	0.36	0.20	0.75	0.07	0.03	0.24	0.18	0.29	0.18	0.78
	2040	0.00	0.01	0.11	0.25	0.38	0.24	0.78	0.05	0.02	0.20	0.19	0.32	0.22	0.81
	2050	0.00	0.01	0.08	0.25	0.39	0.27	0.78	0.03	0.02	0.15	0.19	0.35	0.26	0.81
Van	2010	0.07	0.15	0.24	0.31	0.18	0.06	0.34	0.31	0.22	0.19	0.17	0.08	0.02	0.15
	2020	0.04	0.12	0.20	0.26	0.28	0.10	0.52	0.21	0.19	0.17	0.20	0.17	0.07	0.33
	2030	0.02	0.09	0.14	0.26	0.33	0.16	0.66	0.15	0.14	0.12	0.23	0.24	0.13	0.57
	2040	0.01	0.06	0.11	0.26	0.35	0.20	0.75	0.11	0.11	0.09	0.24	0.28	0.18	0.73
	2050	0.01	0.05	0.08	0.25	0.37	0.24	0.77	0.08	0.08	0.07	0.24	0.31	0.22	0.75

Note: Education categories: E1: No Education; E2: Incomplete Primary; E3: Completed primary; E4: Completed lower secondary; E5: Completed upper Secondary; E6: Tertiary

Table 6. Education distribution by sex among population aged 15 and above and for 20-39 years old under Euro scenario.

Scenario		Males							Females						
Medium	Year	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39
Province		Education category							Education category						
		E1	E2	E3	E4	E5	E6	Upper Secondary+	E1	E2	E3	E4	E5	E6	Upper Secondary+
	2010	0.01	0.02	0.19	0.25	0.32	0.20	0.65	0.10	0.04	0.28	0.18	0.25	0.15	0.56
	2020	0.00	0.02	0.16	0.23	0.36	0.22	0.73	0.07	0.03	0.24	0.17	0.30	0.19	0.71
Ankara	2030	0.00	0.01	0.12	0.23	0.40	0.24	0.77	0.05	0.03	0.19	0.17	0.34	0.22	0.78
	2040	0.00	0.01	0.08	0.23	0.42	0.26	0.78	0.03	0.02	0.15	0.18	0.37	0.25	0.80
	2050	0.00	0.01	0.06	0.22	0.44	0.27	0.78	0.02	0.01	0.11	0.19	0.40	0.27	0.81
	2010	0.03	0.07	0.26	0.36	0.20	0.08	0.38	0.20	0.11	0.32	0.21	0.12	0.04	0.24
	2020	0.02	0.06	0.22	0.33	0.27	0.10	0.51	0.13	0.11	0.27	0.20	0.20	0.08	0.44
Gaziantep	2030	0.01	0.04	0.15	0.34	0.33	0.13	0.62	0.08	0.09	0.20	0.23	0.27	0.12	0.61
	2040	0.00	0.03	0.11	0.33	0.36	0.16	0.69	0.05	0.07	0.15	0.24	0.32	0.16	0.72
	2050	0.00	0.02	0.07	0.32	0.39	0.19	0.72	0.03	0.06	0.12	0.24	0.36	0.20	0.77
	2010	0.02	0.03	0.28	0.26	0.27	0.14	0.53	0.11	0.05	0.33	0.18	0.21	0.12	0.47
	2020	0.01	0.03	0.23	0.24	0.32	0.17	0.67	0.08	0.04	0.29	0.17	0.27	0.15	0.65
Izmir	2030	0.01	0.02	0.17	0.24	0.36	0.20	0.74	0.06	0.04	0.24	0.18	0.31	0.19	0.76
	2040	0.00	0.02	0.13	0.25	0.39	0.21	0.77	0.04	0.03	0.19	0.19	0.34	0.22	0.80
	2050	0.00	0.01	0.08	0.24	0.42	0.23	0.78	0.03	0.02	0.14	0.19	0.38	0.25	0.81

Scenario		Males							Females						
Medium	Year	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39
Province		Education category							Education category						
		E1	E2	E3	E4	E5	E6	Upper Secondary+	E1	E2	E3	E4	E5	E6	Upper Secondary+
Kayseri	2010	0.02	0.03	0.26	0.29	0.27	0.12	0.55	0.16	0.06	0.36	0.19	0.18	0.07	0.41
	2020	0.01	0.02	0.22	0.27	0.33	0.15	0.68	0.11	0.05	0.30	0.17	0.26	0.11	0.63
	2030	0.01	0.02	0.15	0.26	0.38	0.18	0.75	0.07	0.04	0.24	0.18	0.31	0.16	0.76
	2040	0.00	0.01	0.11	0.26	0.41	0.21	0.78	0.05	0.03	0.19	0.19	0.35	0.20	0.80
	2050	0.00	0.01	0.07	0.25	0.44	0.23	0.78	0.03	0.02	0.14	0.20	0.39	0.23	0.81
Van	2010	0.07	0.15	0.24	0.31	0.18	0.06	0.34	0.31	0.22	0.19	0.17	0.08	0.02	0.15
	2020	0.04	0.12	0.20	0.27	0.29	0.09	0.51	0.21	0.23	0.17	0.18	0.15	0.06	0.30
	2030	0.02	0.09	0.14	0.27	0.34	0.14	0.65	0.15	0.19	0.12	0.22	0.22	0.10	0.47
	2040	0.01	0.06	0.11	0.27	0.38	0.17	0.74	0.10	0.15	0.09	0.24	0.28	0.14	0.65
	2050	0.01	0.05	0.07	0.26	0.41	0.19	0.76	0.07	0.12	0.07	0.25	0.32	0.18	0.73

Note: Education categories: E1: No Education; E2: Incomplete Primary; E3: Completed primary; E4: Completed lower secondary; E5: Completed upper Secondary; E6: Tertiary

Table 7. Education distribution by sex among population aged 15 and above and for 20-39 years old under Medium scenario.

Scenario		Males							Females						
3-Child	Year	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39
Province		Education category							Education category						
		E1	E2	E3	E4	E5	E6	Upper Secondary+	E1	E2	E3	E4	E5	E6	Upper Secondary+
Ankara	2010	0.01	0.02	0.19	0.25	0.32	0.20	0.65	0.10	0.04	0.28	0.18	0.25	0.15	0.56
	2020	0.00	0.02	0.16	0.23	0.37	0.22	0.73	0.07	0.03	0.23	0.17	0.30	0.19	0.70
	2030	0.00	0.02	0.11	0.23	0.40	0.24	0.75	0.05	0.03	0.18	0.18	0.35	0.22	0.78
	2040	0.00	0.02	0.07	0.23	0.43	0.25	0.77	0.03	0.02	0.13	0.19	0.39	0.25	0.80
	2050	0.00	0.01	0.05	0.23	0.45	0.26	0.78	0.02	0.02	0.09	0.19	0.42	0.27	0.81
Gaziantep	2010	0.03	0.07	0.26	0.36	0.20	0.08	0.38	0.20	0.11	0.32	0.21	0.12	0.04	0.24
	2020	0.02	0.07	0.23	0.33	0.26	0.10	0.49	0.13	0.12	0.27	0.20	0.20	0.07	0.42
	2030	0.01	0.06	0.16	0.34	0.31	0.12	0.57	0.08	0.11	0.21	0.23	0.26	0.11	0.56
	2040	0.00	0.05	0.11	0.34	0.35	0.15	0.64	0.05	0.09	0.16	0.25	0.31	0.14	0.65
	2050	0.00	0.04	0.07	0.34	0.39	0.17	0.69	0.03	0.08	0.11	0.26	0.36	0.17	0.72
Izmir	2010	0.02	0.03	0.28	0.26	0.27	0.14	0.53	0.11	0.05	0.33	0.18	0.21	0.12	0.47
	2020	0.01	0.03	0.23	0.24	0.32	0.17	0.66	0.08	0.05	0.29	0.17	0.27	0.15	0.65
	2030	0.01	0.03	0.17	0.25	0.36	0.19	0.72	0.05	0.04	0.23	0.18	0.31	0.18	0.75
	2040	0.00	0.02	0.12	0.25	0.40	0.21	0.75	0.03	0.03	0.17	0.19	0.36	0.21	0.78
	2050	0.00	0.02	0.07	0.25	0.43	0.22	0.77	0.02	0.03	0.12	0.20	0.40	0.24	0.80

Scenario		Males							Females						
3-Child	Year	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39	Population distribution aged 15+						Proportion with at least upper secondary, aged 20-39
Province		Education category							Education category						
		E1	E2	E3	E4	E5	E6	Upper Secondary+	E1	E2	E3	E4	E5	E6	Upper Secondary+
Kayseri	2010	0.02	0.03	0.26	0.29	0.27	0.12	0.55	0.16	0.06	0.36	0.19	0.18	0.07	0.41
	2020	0.01	0.03	0.22	0.27	0.33	0.15	0.67	0.11	0.05	0.30	0.17	0.26	0.11	0.62
	2030	0.01	0.02	0.15	0.27	0.38	0.17	0.72	0.07	0.04	0.24	0.19	0.32	0.15	0.74
	2040	0.00	0.02	0.10	0.27	0.42	0.19	0.76	0.04	0.03	0.17	0.20	0.37	0.18	0.78
	2050	0.00	0.01	0.06	0.26	0.45	0.21	0.77	0.02	0.02	0.11	0.20	0.42	0.21	0.80
Van	2010	0.07	0.15	0.24	0.31	0.18	0.06	0.34	0.31	0.22	0.19	0.17	0.08	0.02	0.15
	2020	0.04	0.15	0.20	0.26	0.27	0.09	0.49	0.22	0.25	0.17	0.17	0.14	0.05	0.29
	2030	0.02	0.12	0.15	0.27	0.32	0.12	0.59	0.15	0.24	0.13	0.20	0.19	0.09	0.42
	2040	0.01	0.09	0.11	0.28	0.36	0.15	0.69	0.10	0.19	0.10	0.24	0.25	0.12	0.55
	2050	0.01	0.07	0.07	0.27	0.40	0.18	0.74	0.07	0.15	0.07	0.26	0.30	0.15	0.66

Note: Education categories: E1: No Education; E2: Incomplete Primary; E3: Completed primary; E4: Completed lower secondary; E5: Completed upper Secondary; E6: Tertiary

Table 8. Education distribution by sex among population aged 15 and above and for 20-39 years old under 3-Child scenario

The education level of the demographic aged 20-39 years old is crucial for future developments in human capital since the 20-39 age-group has been shown to be an important predictor of economic growth (Lutz, Crespo Cuaresma & Sanderson, 2008). As can be seen in Figure 9, the differences in the proportions are clear among the three scenarios. It can be seen that at the beginning (in 2010), the inequality in this education level is large for both sexes in selected provinces. However, as expected, the heterogeneity between the provinces is much larger for the female population than in for the male population. Under the Euro scenario, this inequity diminishes significantly compared to other two scenarios.

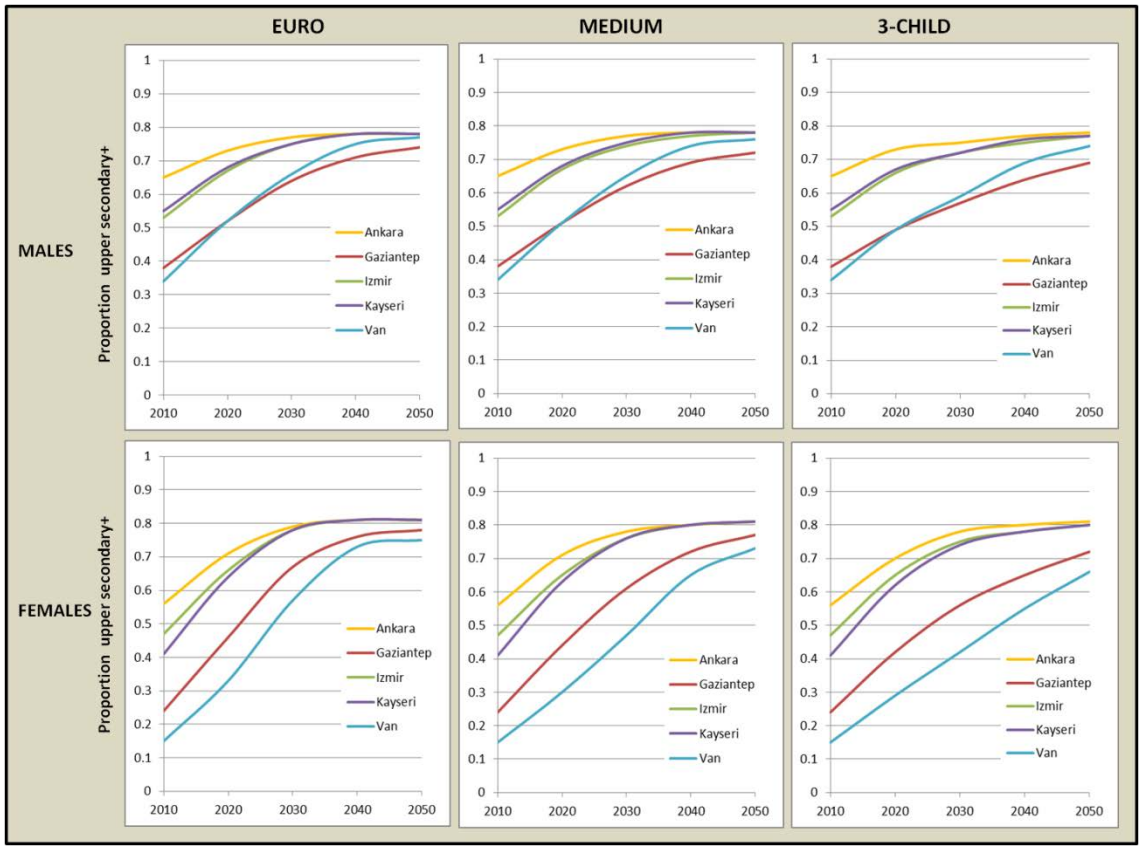

Figure 9. The proportions with at least upper secondary completed for population aged 20-39 in the five selected provinces between 2010 and 2050 by the Euro, Medium, and 3-Child scenarios.

4. Discussion

Our main objective of this study was to explore the effect of scenarios based on future changes in policies or events on the size and the structure of the population in five selected provinces that are representative of four fertility regions of Turkey. We identified three storylines for the future that are likely, namely: “Euro”, “Medium”, and “3-Child”. We operationalized these storylines in terms of future fertility, life expectancies, migration rates and education progression. While doing so, we paid attention to the fact that some policies or events might heterogeneously affect different provinces.

In this study, we took advantage of the multi-state projection model that was developed during the 1970s at the IIASA, originating from a geographic perspective in which states were defined to be regions of a country (Keyfitz, 1985; Lutz & KC, 2011; Rogers & Land, 1982); later this method was extensively improved for modelling changes in educational attainment as discussed in the methodology section. Using this model, we produced results of the projection of the population by age-sex-education for five provinces and showed how their future size and structure change differently under different scenarios and that these results can be used for policy making and planning.

Presumably, the most interesting finding of this study is the impact of different policies or conditions on future demography and human capital. One of the findings of this exercise is that fertility and internal migration are the most important factors contributing to the change in the regional population size and structure. Mortality has a moderate impact and international migration has the least effect mainly due to a very low level of initial values - derived from UN estimates (Abel, 2013). In provinces where the current rate of internal migration is already high, the impact of fertility and internal migration is significant on population size and structure. In the case of Van, very high fertility levels under the 3-Child scenario would have brought the population to increase significantly if it were not for an internal migration that flushes young people out to provinces such as Ankara and Izmir. The receiving province's population rises much faster due to this internal migration of young people, and the population will further increase by the way giving births by female migrants. Turkey is a very interesting case where regional demographic development is emblematic of larger geopolitical entities, be they at the European level or at the world level. The future outlook in terms regional population therefore mainly depends on fertility and internal migration and the implications of these changes.

With development, the rate of internal migration is more likely to grow than remain stable or decline. With a huge number of people migrating internally, the impact on demographics and on socio-economics will be important to assess. This has implications for social infrastructure such as urbanization, housing, transportation system, living arrangements, healthcare, education, left behind population, brain drain in the regions losing people among many others. Regarding the recent past experience, the high rate of internal migration in Turkey lead to an increase in the housing deficit as well as socio-economic and spatial segregation of some migrant groups in highly urbanized cities in western regions such as Istanbul, Izmir and Ankara (Güvenç, 1998; Işık, 2009; Pınarcioğlu & Işık, 2009; Yüceşahin & Tuysuz, 2011). On the other hand, research has shown that in places where people have left labour force shortage, impoverishment and unemployment rates increase as seen in underdeveloped eastern and south-eastern regions of the country (Yüceşahin & Özgür, 2008). All these are the contributing factors to continuing variability between the regions. Hence, it is a high time to conduct serious studies on these issues and to assess whether policies are needed.

In our model, international migration is a very weak demographic force which might be due to a lack of real data. International migration is a big issue in European countries. High levels of tensions exist in European countries where some political parties get their votes by selling the fear that Europe will be taken over by migrants from Turkey, particularly if Turkey joins the EU. What we see in our calculation is that given the current level of international migration, and if it doubles under Euro scenario,

such a fear seems to be simple hoax to cash on ballet. However, we note that under the Euro scenario, the rate of international migration could increase by manifold as experienced from new members of EU from eastern European countries. This is likely as a very large Turkish population is already settled in current EU countries such as Germany, Austria, and the Netherlands, and Turkey joining the EU will facilitate further migration westward.

Regarding fertility, our scenarios show different trends in fertility behaviour for the near future. Under the Euro scenario, Turkey's integration with the EU is likely to affect the fertility behaviour of the Turkish population. In general, we expect the fertility to decline very rapidly due to several reasons; firstly, integration means a flow of Turkish migrants to the other European countries (therefore, high rate of international migration) mainly for the labour reasons. More women will get into the labour force within the country and the educational attainment of the whole country will increase resulting in a massive effort to improve education levels throughout the country, especially in the regions where the current level of development is very low. All these factors will push overall fertility downwards. Therefore, we assume that fertility will further decline in all provinces and eventually converge at the level of 1.75. Under the Medium scenario, which is a bit less optimistic than the Euro scenario; the decline in fertility will be slower.

Under 3-Child scenario, Turkish society will become more traditional as a result of rising political and religious conservatism. On the one hand Turkey is in Europe with an ambition to be in the EU, and on the other hand Turkey is a neighbour to many not so stable Arab and central-Asian countries. We expect that fertility level in the regions with higher fertility will converge to a level of 2.5 (TFR) as a result of the government's push towards the target. In low fertility regions, we assume that the fertility will decline a bit to a level of 1.5 and increase to a level of 2.0. The demand for reproductive health care related services and basic education will be much higher than in Euro scenario. Hence, pressure will be higher in increasing the quantity of services than the quality. In the Euro scenario, with less demand more focus will be placed on the quality of services or on tertiary levels of services.

The projections also revealed inevitable ageing in the society in terms of the proportion of people above age 65 in the population. However, when one considers the human capital of the older population, the population is more educated which implies that they would be much healthier in physical and cognitive terms than their older cohorts. However, the increase in quantity results in an increased demand in healthcare services and governments (local and national) should start preparing plans and policies (healthcare, living arrangement). Will migrants return to their place of birth? Should we need to build more hospitals in provinces such as Van? Our results imply that the population of the country in selected provinces will increase in the near term, however, in the long run this may not hold true. The age structure of human capital is particularly important for countries in the period of socio-economic, cultural and political transitions. Research has shown that when better educated large cohorts enter the young adult ages they play a central role in the transformation of societies through the modern democracy (Lutz & KC, 2011; Lutz, Cuaresma & Abbasi-Shavazi, 2010). Due to inevitable increase in the population of Turkey in the near future, Turkey's ongoing demographic opportunity window will continue and will gain much more importance in impacting the socio-economic transformation of Turkish society.

Our model and its findings presented in this study could be conceptualized and concluded as future prospective regional convergence or divergence in the country. Development is a social, economic, and political concept expressed in the lives of people in places or regions and thus this term is usually defined as higher levels of education, income, health, political or social participation. Demographic transition theory suggests that development broadly conceived should tend to lower fertility and shift the incidence of mortality from young to the very old, as health and service access and technology rise (Morrill, 1993). Infant mortality rates should decline, the proportion of births to particularly young mothers should decrease since women and in general people receive more education. Thus, individuals postpone marriage, and participate more fully in the labour force.

Although the term 'human capital' briefly emphasizes the importance of both education and health of people, education has a privileged role in every aspect of progress in human development. Research has shown that almost in all societies better educated individuals have lower mortality rates and their children have better chances of survival and more education tends to imply a healthier and better-nourished population (Lutz & KC, 2011; Lutz, 2009). Education is also an important determinant for a wide range of demographic behaviour of individuals, as it powerfully affects fertility, mortality and migration (Bongaarts, 2010; Jejeebhoy, 1995; KC et al., 2010). This effect of education on fertility is particularly apparent in countries or regions that have clear differences among its regions (Bongaarts, 2003; Jejeebhoy, 1995; Morrill, 1993). This picture fits well in case of Turkey. These spatial patterns and relationships between the demographics and societal education level raise certain questions, as in this study, about whether or to what extent modest increases in education, especially among females, will lead to differences in demographic behaviour and particularly for the future human capital (Lutz, Goujon & Wils, 2008).

Figure 10 depicts the demographic situation with factors that might either advance or retard geographic convergence between representative provinces in Turkey. As can be understood from the Figure 10, faster and more sustainable economic and social development is undoubtedly related to a higher level of education, income and being in a healthier environment. In these circumstances, higher levels of life expectancies, income convergence, faster educational achievement and thus increased attainment to universal basic education would be achievable targets in the short run. If development tends to converge over time, then so should demographic character due to fertility decreases, technological progress in educational and health systems and increases in life expectancy. Our "Euro" and partly "Medium" scenarios identified in this study coincide with this type of transition. However, we expect faster transition under Euro than Medium.

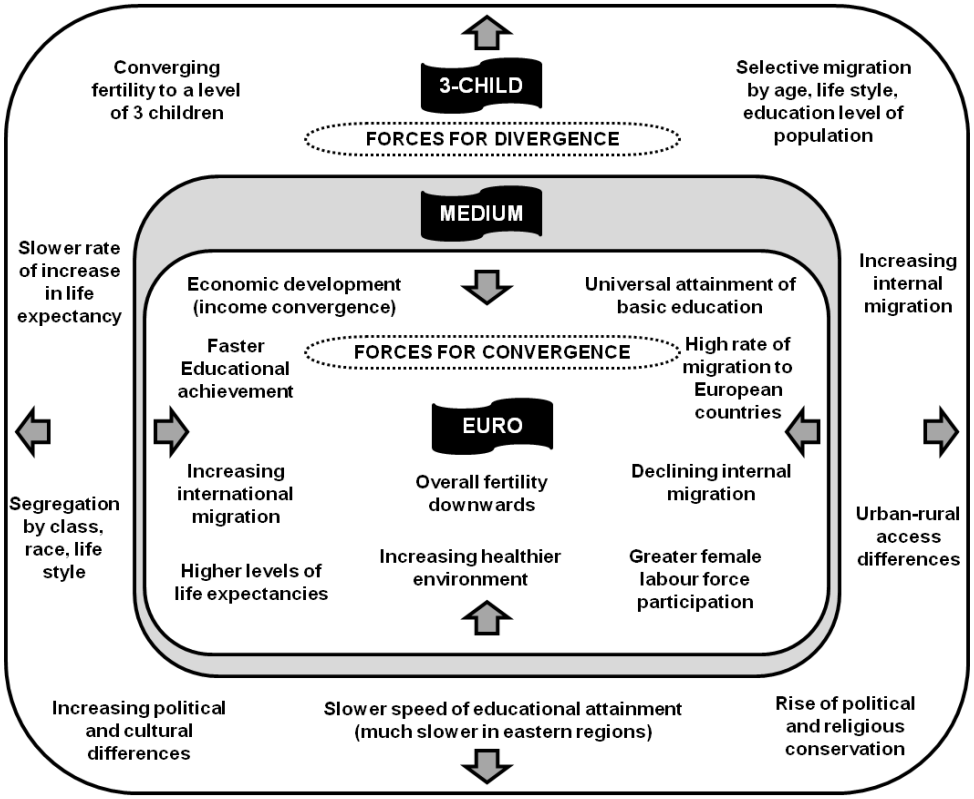

Figure 10. Forces for convergence and divergence in demographic character under the "Euro", "Medium", and "3-Child" scenarios.

Note: The figure is prepared by inspiration from Morrill (1993).

On the other hand, Morrill (1993) stated that such a transition may not occur simultaneously or in the same form across countries, regions, or nations. This is the basic origin behind imbalances, continuing variability or diverging trends among world regions. At this point our 3-Child Scenario is suitable to simulate continuing demographic variability among the representative provinces for future developments and human capital. As can be seen from the figures 7, 8, and 9, under the 3-Child scenario the gap between the provinces will persist. It would be important to pay attention to the variability of the proportions with at least higher secondary completed for the population aged 20-39 under the three scenarios in selected provinces (Figure 9). The education of this age-group has been shown to be an important predictor of economic growth particularly for the future (Lutz, Crespo Cuaresma & Sanderson, 2008).

In conclusion, this kind of scenario analysis will present policy makers a better projected picture of alternative future of Turkey and therefore will be highly useful in making policy decisions. We therefore recommend to expand the current exercise to the whole of Turkey to integrate other disciplines in a system analysis approach. The result of this exercise reveals the extent that Turkey's population could evolve in the future and provides policy makers and planners a tool to look into the future and test the implication of certain policies and expectations on the development of population.

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