



International Institute for
Applied Systems Analysis
Schlossplatz 1
A-2361 Laxenburg, Austria

Tel: +43 2236 807 342
Fax: +43 2236 71313
E-mail: publications@iiasa.ac.at
Web: www.iiasa.ac.at

Interim Report

IR-11-029

Alternative Population and Education Trajectories for Pakistan

Asif Wazir (wazir@iiasa.ac.at)

Anne Goujon (goujon@iiasa.ac.at)

Wolfgang Lutz (lutz@iiasa.ac.at)

Approved by

Detlof von Winterfeldt
Director

December 16, 2011

Interim Reports on work of the International Institute for Applied Systems Analysis receive only limited review. Views or opinions expressed herein do not necessarily represent those of the Institute, its National Member Organizations, or other organizations supporting the work.

Contents

- 1. Background: The Last 30 Years..... 1
- 2. Future Challenges 5
- 3. Fertility..... 5
- 4. Conclusion 14
- 5. References..... 15

Abstract

Pakistan faces today high levels of population growth entailing a large population of schooling age, and low levels of economic development, with increasing spread of poverty and unemployment over the past few decades. While education has been emphasized by the government and international development agencies to play a central role for the successful development of Pakistan, progress realized at all levels have been meagre and this for two main reasons: The investments in education have been too low and the schooling age population has been growing too fast. With 35 per cent of its population below age 15 in 2010; Pakistan was spending less than 3 per cent of its GNP on education. Consequently still 39 per cent of 15-24 year old Pakistani women were illiterate in 2008 and 21 per cent of men (UNESCO database)

Still Pakistan is experiencing a decline in birth rates and population growth begins to level off as part of the demographic transition. The last Demographic and Health Survey of Pakistan conducted in 2006-2007 shows that highly educated women are at the forefront of the fertility decline with a total fertility rate (TFR) of 2.3 children – close to replacement -- contrasting with the TFR of 4.8 for women with no education. The paper will explore through multi-state population projections by levels of educational attainment how the potential fertility and educational developments could impact on future population growth and on the human capital of the country to 2050.

The next few decades will be crucial for Pakistan as the majority of its population will be of working age – at present the median age in Pakistan is 21.7 years. The demographic bonus could however transform into demographic distress and social unrest if decision makers fail to improve education levels and to develop the economy to provide work opportunities for the coming generation of more educated male and female Pakistani. The objective of this paper is two folds: (a) To emphasize human capital development in Pakistan and changes in levels of educational attainment, especially of women and its impact on the demographic transition, and (b) to look at how women's education can influence fertility and limit population growth.

Alternative Population and Education Trajectories for Pakistan

Asif Wazir, Anne Goujon, Wolfgang Lutz

The history of education is closely intertwined with the past and present demographic history of Pakistan. There are two explanations. First of all, levels of education are clearly influencing the demographic behaviour of the people and the most visible impact of education is on women's fertility, which is systematically lower at higher levels of educational attainment as we will see in the case of Pakistan. Repercussions of education can be seen on other demographic indicators such as mortality e.g., maternal education lowers infant and child mortality, as well as maternal mortality.

The second explanation is that education at the macro-level acts as a good proxy for development. Hence measuring a population levels of educational attainment, whether in the work force or in the overall population is a valid measure of the well-being of individuals in terms of economic well-being i.e., poverty and competitiveness of the economy or social well being e.g., autonomy of women, civil freedom. The case of Pakistan is puzzling. On one hand education has been one of the top priorities in the political discourse for many decades while at the same time, very little has been actually done in terms of investments in education and in 2000, with about one-third of the young population not enrolling in school, Pakistan was spending less than 2 per cent of its GDP on education

Investments have increased in the last ten years but the inertia of education diffusion is such that it will take many more years before Pakistan can benefit from a well-educated work force in a country where population growth remains very high – slightly below 2 per cent. As an effect of fertility reductions, the schooling age population (5-19) has started to decline since 2008 – after growing at a yearly rate above 3 per cent between 1967 and 1996. This implies a relative lessening of pressures on the Pakistani school system that will be facing the challenge of increasing the “quantity” of education offered (school facilities, teachers, etc.) while not compromising on the quality (Behrman *et al* 1997, 2006). Another challenge will be to create the economic conditions to employ those populations since the working age population is growing very fast in Pakistan, above 3 per cent per year on average. In this chapter we will review changes in the literacy and education levels of the population over the last few decades. Based on projections, we will show what could be the implications of future fertility and education developments on the size and quality of the Pakistani population until 2050 according to several scenarios.

1. Background: The Last 30 Years

Aly (2007) in his white paper for a national education policy summarizes with elegant severity educational policy developments in the past since independence of the country in 1947: “Periodically, the State of Pakistan addressed the educational needs of the people and the aspirations of the State in this regard, in 1947, 1951, 1959, 1966, 1969, 1970, 1972, 1979, 1992 and lastly in 1998. Apart from the common denominator of Islam and national cohesion, the statements of vision and purpose for the national education system in Pakistan have tended to reflect the dominant political paradigm and compulsions of the day. Impliedly, most of these noble

assertions remained rhetoric, now confined to the dustbins of history.” Whether the failure lays in the lack of investments or in the implementation, a look at Table 1 on literacy rates from 1951 to 2009 gives a good measure of the gap between discourse and action. The overall increase in literacy rates from 16 per cent in 1951 to 57 per cent in 2009 is already not impressive over that length of time, and even more so when looking at the literacy figures of women which have been stagnating for thirty years from 1951 to 1981. The differences between the different provinces and between the different federal administered areas are huge pointing at a lack of homogeneity in levels of development and consequently the spread of education between regions, particularly visible in the difference between urban and rural areas. The literacy rate was for instance four times higher in Islamabad compared to that in the tribal areas (FATA) – 87 per cent versus 22 per cent.

Table 1. Literacy rates (in per cent), males, females, both sexes, all country, provinces, and federal administered areas (FDA), from 1951 to 2009

By:		1951	1961	1972	1981	1998	2004	2009
Sex	Male	19	27	30	35	55	66	69
	Female	12	8	12	16	32	42	45
	Both sexes	16	16	22	26	44	54	57
Province	Punjab			21	27	47		59
	Sindh			30	32	45		59
	KPK			16	17	35		50
	Balochistan			10	10	27		45
FDA	Islamabad				48	73		87
	Azad Kashmir				26	55	62	
	Gilgit Baltistan				3	38		53
	Tribal areas				6	17		22

Source: Wikipedia http://en.wikipedia.org/wiki/Education_in_Pakistan#Literacy_rate (consulted on 3/10/2011)

Table 2 shows the progress and most of the time the lack of progress in levels of educational attainment as can be seen from the population across censuses with a majority of that population being uneducated until the 21st century, and it was still the case of two-third of women in 2005. For those who had access to education, the path often stopped at the level of lower secondary education (below matriculation level) and a small share of the male and female population gained an upper education i.e., upper secondary or university education.

Table 2. Educational attainment of the working age population (20-64), in percent

Census	Gender	No Education	Primary Incomplete	Primary Complete	Lower Secondary	Upper Secondary	Higher
1972	Male	68	3	10	14	3	2
	Female	92	1	3	3	1	1
1981	Male	66	na	12	16	3	3
	Female	88	na	5	5	1	1
1998	Male	48	6	12	24	5	6
	Female	74	4	7	10	3	3
2005	Male	34	5	15	29	8	9
	Female	64	3	11	13	4	5

Source: Goujon and Wazir (2011)

Enrolment ratios inform the present situation in school and represent the engine of future human capital.

Table 3 is showing the data for gross enrolment ratio for the last 10 years, and those demonstrates quite strong progress at the level of primary and lower secondary education. However net enrolment ratios¹ show that all children are far from entering primary schools at the official school age – 72 per cent for boys and 60 per cent for girls in 2009 – and even more so in secondary schools 36 per cent for boys and 29 per cent for girls in 2009.

Table 3. Gross enrolment ratios in per cent, 2000-2009

Level	Sex	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Primary	Male	82	83	84	85	91	94	89	93	93	92
	Female	56	56	57	62	66	71	69	76	77	77
Lower secondary	Male	...	...	...	38	41	43	47	51	50	49
	Female	...	...	...	26	29	32	35	38	38	38
Upper secondary	Male	...	...	...	24	27	24	24	26	28	28
	Female	...	...	...	21	23	20	19	20	21	22
Tertiary	Male	...	...	3	3	3	5	5	6	6	...

A similar story of the difference between intention and action of the successive governments of Pakistan as was reported for education can be told regarding public policy towards population growth and fertility reductions. The first anti-natalist population policy in Pakistan was written in 1965 (Sathar 2001) and was pursued under the population program with, in fact, very little success due to a lack of commitment and funding. If the government of Pakistan has recognized the need for fertility to go down, especially by reducing unwanted pregnancies and investing consequently in the provision and utilization of adequate services for reproductive

¹ Gross enrolment ratio is defined as the number of pupils (of any age) who are enrolled in a particular level as a percentage of the total children of official school age population for that level. The net enrolment ratio is defined as the number of children of official school age for a particular level that are enrolled in that level as a percentage of the total children of the official school age population. Hence the difference between gross and net enrolment ratio indicates the extent of over-aged and under-aged enrolment. Source: UNESCO Database

health and family planning, surely the lack of social and economic progress – in education, health, poverty – has been hindering the fertility decline and the efficiency of population policies. The education developments shown above point a slow increases in levels of educational attainment that would be otherwise key to impact on the fertility of women by levels of education who is very much responding to these since women in Pakistan have been experiencing lower levels of fertility for a long period of time. Already in 1993, Sathar and Oppenheim Mason were inkling at the fact that women’s education is a “potentially powerful force for fertility change in urban Pakistan” not only as a unintended consequence of women’s schooling which mechanically delays entry at marriage, but also was changing the behaviour of parents who had the need and the will to limit the number of children they would have.

Hence educated couples will be more prone to use modern birth control techniques, towards which they will have a better perception and an easier access than less educated couples (Saleem and Bobak 2005), even in “backward” regions such as Balochistan (Kakar *et al.* 2011). Thus, if the women education was improved, significant decline in fertility and consequently in population growth would achieve (see Abadian 1996, Jejeebhoy 1995, Castro Martin and Juarez 1995 on relationship between women’s education and fertility).The survey data on fertility levels by women’s educational attainment detailed in Table 4 show a consistent difference of 2-3 children between those women who did not receive any education and those who received a secondary or post-secondary education. In 2006, the latest study available on fertility differentials by education showed that those are quite significant in Pakistan, with women with no education having more than twice the fertility of those who have a university education. This negative relationship between education and fertility had been recognized in all countries at all stages of development, particularly very strong in those countries that are in the middle of the demographic transition (Cleland 2002, Martin and Jaurez 1995), as is currently Pakistan. Soomro and Mahmood (2004) argue that any family planning programme in Pakistan would be weak in reaching illiterate women and that therefore investment in female education should be prioritized.

Table 4. Total fertility rates (TFR) by levels of education attainment, 1975, 1990-1991, and 2006-2007

Level	1975 ^a	1990-91 ^b	1997 ^c	2006-07 ^b
No education	6.5	5.7	6.0	4.8
Primary	5.9	4.9	4.9	4.0
Middle	3.4	4.5	4.4	3.2
Secondary		3.6	3.1	3.1
Tertiary			3.5	2.3
Total	6.3	4.9	4.0	4.1

Note: ^(a) Pakistan fertility survey; ^(b) Pakistan Demographic and Health Surveys, ^(c) Pakistan Fertility and Family Planning Survey

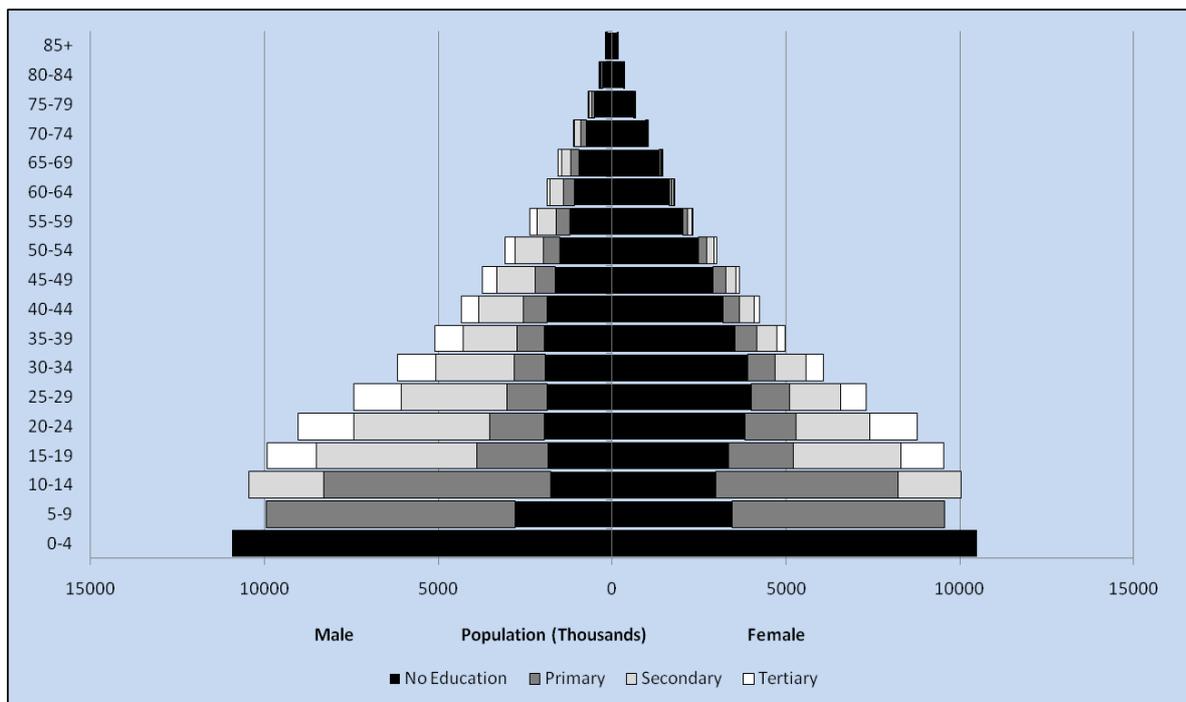
2. Future Challenges

The section above has shown that the future economic and population growth of Pakistan will be dependent on the future fertility and education paths taken by the country. We will explore in this section through several scenarios the future of human capital in Pakistan from 2010 until 2060, based on projections of population by levels.

The methodology is based on the multi-state population projection method (see Rogers 1975 and 1985 for more details), using the PDE population projection software². The population of Pakistan is subdivided into four educational categories - no education, primary education, secondary education and tertiary education.

Each subpopulation is further stratified by five years age-group and sex to which are applied education specific fertility, mortality and migration. Furthermore, transition rates between education categories allow the modelling of changes in the education sector. The Population pyramid of Pakistan in 2010 by four levels of education is shown in Figure 1.

Figure 1. Population pyramid of Pakistan in 2010, by four levels of education



Source: PDHS 2006-07, UN 2010 world population prospects

3. Fertility

The pace of fertility decline in Pakistan, which started in the early 1990s, has been very slow compared to other countries in the South Asian region. The basic premise for the scenario making about future fertility is that the fertility transition that is underway essentially continues in future. The recent evidence shows that Pakistan is in the middle of its demographic transition and forecasts further fertility decline in the

² Developed at the International Institute for Applied Systems Analysis in 1993, it can be downloaded free of charge from this link: www.iiasa.ac.at/Research/POP/pub/software/pde/pdesetup.zip

future (see Sathar and Casterline 1998, Sathar 2007, Ali and Hussain 2001 for details about fertility levels and trends in Pakistan). In longer horizon, the future level of fertility will determine by the general socio-economic and cultural changes. The prediction of these trends is not easier than that of the direction of fertility change itself. In this context, the national policies and family-planning programs will play a significant role, if these policies are well integrated into other government policies (e.g., on education and health) and particularly, if the socio-economic development of the population has reached a certain point at which large segment of the society considered the family size limitation advantageous.

We are here considering three scenarios of fertility, Table 5 namely High, Medium and National Fertility Goal (NG) to answer the following question: Based on the past experience of fertility stagnation and slower decline in Pakistan, whether fertility transition have the right pace to achieve the national population policy goals 2010 (National Goal scenario), and most importantly what will be the consequence in term of population growth if these goals are achieved or not? The TFR in the High and Medium scenarios follow the assumption of the United Nations 2010 World Population Prospects (TFR respectively 2.3 and 1.8 in 2055-60) and the NG scenario typically implements the target set by the government of Pakistan in its National Population Policy (NPP) 2010: 3 children per women by the year 2015-2020 and replacement fertility level fertility (i.e., 2.1 children per women) by 2025-30. Beyond 2025-30, the NPP does not assume any specific goal. Since the pace of decline in the NG scenario in the near future will be much faster than in the High and Medium scenarios, we assumed a continuation of the rapid pace using the low fertility scenario of the UN leading to a TFR of 1.3 in 2055-60.

Table 5. Projection of TFR by level of education in Pakistan from 2010-2060

	TFR				
	Observed 2006-2007	Base-year 2005-2010	High 2025-30	Medium 2025-30	NG 2025-30
No Education	4.8	4.2	3.4	2.8	2.4
Primary	4.0	3.6	2.8	2.4	2.1
Secondary	3.1	2.8	2.2	2.0	1.8
Tertiary	2.3	2.0	1.6	1.7	1.4
Total	4.1	3.7	2.9	2.4	2.1
Total in 2055-60			2.3	1.8	1.3

Source: PDHS 2006-07 and authors 'calculations based on UN (2010)

In the High scenario, the educational fertility differentials are obtained by keeping the relative ratio of different education specific fertility to the overall total fertility rate in 2005-10 constant over the projection period. For the Medium and the NG scenarios, we assumed convergence, meaning that fertility differentials by education tend to diminish as fertility declines. We chose the relative ratios of the different education specific fertility to the overall total fertility rate observed in the Indian state of Andhra Pradesh that had reached below replacement fertility level in 2005-06 – TFR is 1.8 according to the National Fertility and Health Survey 3 (NFHS) – as a target and assume that in 2055-60, Pakistan will have education-specific fertility rates to those of Andhra Pradesh state (India) today.

Table 6. Education-specific and total TFRs for Andhra Pradesh 2005-06

Mothers' education	Total fertility rates
No education	2.1
Primary	1.9
Secondary	1.8
Tertiary	1.6
Total	1.8

Source: Andhra Pradesh-NFHS-3 2005-06

It is important to note that Andhra Pradesh has experienced a rapid fertility decline in very short time period (TFR 4.5 in 1971-73 to 2.7 in 1992-94 and 1.79 in 2005-06) like some other southern India States e.g., Kerala and Tamil Nadu, where on an aggregate level, female education and literacy has been proven to be one of the strongest variable explaining fertility decline (Krishnan 1976, Bhat and Rajan 1990), together with improved health facilities (K.S. 1999).

The Pakistan record on the education front has not been impressive due to low levels of public expenditure on education. In a recent study, Goujon and Wazir (2011) have clearly shown that, the Pakistani educational system has thus failed to provide the basic infrastructure, eliminate gender imbalances and the quality of education, which would be required to enjoy the full collateral benefits of education such as high levels of economic growth and well-being. In this context, we have defined three scenarios of educational attainment (see Table 7) based on the assumption that education will be crucial for socio-economic development in Pakistan. The assumptions are set in terms of age and sex specific transition probabilities between levels of education to model the age specific proportion of young men and women (here between age 5 to 24 years) who make the transition from no education to primary, from primary to secondary and from secondary to tertiary education³.

The Constant scenario assumes constant transition as observed in the population aged 5-24 in 2010, to show the progress that already embedded in the present levels of educational attainment. The Trend scenario looks at the pace of change in the last two decades and prolongs it into the future. It will be compared to the Goal scenario that shows the unlikely case that Pakistan attains the national and international targets in terms of education. A comparison between the Trend and the Goal Scenarios will show to what extent, Pakistan has adopted the right pace of educational improvements to attain the targets set by national and international agencies.

The particular objectives in terms of education set on the national and international agenda are the following:

- Universal primary education: All children should be able to complete primary education by 2015-20 (MDGs and National Education Policy).
- All gender disparities will be eliminated from all levels of education by 2015-2020.

³ Although transitions can in theory happen at any age – for instance, those who become literate by the mean of adult literacy campaigns.

- Enrolment in secondary and tertiary education should increase. We translated this into specific targets: 80 per cent of 10-14 years (male and female) old would be enrolled in secondary and 50 per cent of 20-24 years (male and female) old would be enrolled in tertiary education by 2055-60.

Table 7. Proportion of respective age groups in education (in per cent)

Categories	Base year (2010)		Trend Scenario (2055-60)		Goal Scenario (2055-60)
	Male	Female	Male	Female	Both sexes
No education	17	30	12	11	0
Primary	83	70	88	89	100
Secondary	61	45	55	46	80
Tertiary	18	16	19	20	50

Source: Authors' calculations

The age and sex specific mortality and migration rates⁴ follow the latest medium variant of the United Nations world population prospects (2010). The mortality differentials are set according to findings of K.C. *et al.* (2010)⁵. Age and sex specific net international migration figures are further distributed proportionally among educational categories.

Table 8 shows the matrix of the nine scenarios derived from the different fertility (3 sets) and education (3 sets) assumptions, aiming at studying the concomitant effect of fertility and education on future population and human capital. Due to space limitation all these scenarios cannot be discussed here.

Table 8. Scenario matrix

		Education		
		Constant (Ec)	Trend (Et)	National education goals (Eng)
Fertility	High (Fh)	Fh Ec	Fh Et	Fh Eng
	Medium (Fm)	Fm Ec	Fm Et	Fm Eng
	National fertility goals (Fng)	Fng Ec	Fng Et	Fng Eng

Even if we assume that Pakistan will manage to achieve below replacement fertility in the low variant – TFR of 1.3 in 2055-60, the population would still grow significantly from 174 million in 2010 to 259 million under the national goal education scenario. A doubling (to 345 million in 2060) of population would only occur in the case of the High fertility scenario, where fertility is declining slowly to reach 2.3 in 2055-60 and enrolment stagnates (Constant education scenario). Education attainment could have a profound effect on the total population: Under the High

⁴ UN 2010 provides the total number of migrants but not the age and sex specific structure which we estimated through a residual analysis.

⁵ According to K.C. *et al.* (2010), the life expectancy at age 15 of the population in the no-education category is on average one year less than that of the population in the primary education category, three years less than that of population in the secondary education category and five years less than that of population in the tertiary education category.

fertility scenario, if Pakistan would achieve the national educational goals, then the total population would be 25 million less compared to the Constant education scenario – or 7 per cent in 2055-60. A lesser difference of 19 million in 2060 is found in the total population between the scenario where Pakistan achieves its education and fertility goals, and that more realistic where it achieves Medium fertility and follows the Trend in education development: 259 million vs. 278 million.

Table 9. Total population (in million) of Pakistan from 2010-2060

Fertility:	Education:						
	Base year	Constant		Trend		NG	
	2010	2030	2060	2030	2060	2030	2060
High	174	249	345	249	341	248	320
Medium		233	279	233	278	233	271
NG		235	267	235	266	234	259

Source: Authors' calculations

Figure 2 shows the population pyramids by age, sex and four educational level of Pakistan in 2010 and the results of three alternative scenarios for education in 2060, under the assumption of a Medium fertility scenario. In 2010, the pyramid clearly shows the improvements in school enrolments over the last three decades: The younger cohorts are better educated than the older ones, both for men and women. In 2010, 50 per cent of the working age population (WAP) – aged 20-64 which accounted for 49 percent of the total population had not received any education: one-third of the male WAP and two-thirds of the female WAP (see also Figure 3 and the Appendix Table).

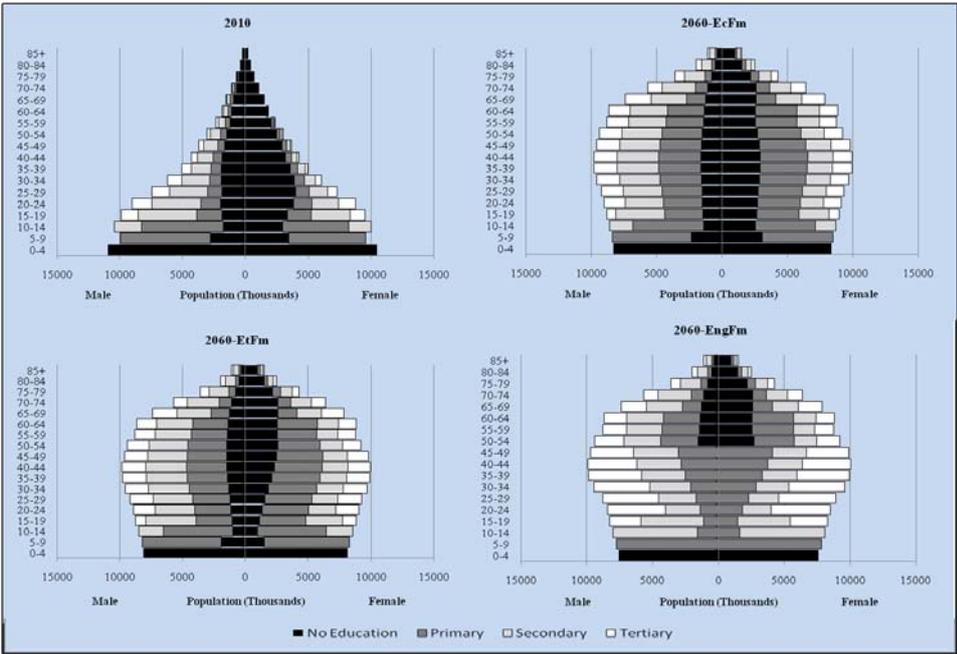
According to the Trend education scenario, Figure 2, which assumes that all future cohorts benefit from increase in enrolment ratios as observed over the recent past, the pace of change would not be enough to ensure that all children enrol into primary education as can be seen from the share with no education in age groups 5-9 and 10-14. Consequently, Pakistan would not be able to achieve the Millennium Developments Goals (MDGs) in 2015, and not even in 2060. Therefore, this calls for an intensification of investments in basic education to ensure that more children can enrol in schools, particularly in rural and remote areas, especially girls. The proportion of the WAP with no education would decline to 20 percent in 2060 – 15 per cent for males and 23 per cent for female, based on the Trend education scenario.

This is far from the 7 per cent – 5 per cent for male and 9 per cent for female – that would be achieved under the NG scenario. The momentum of education diffusion is clearly visible on the pyramid for that particular optimistic scenario, where still in 2060, the population above 50 years of age still entails a large share of uneducated people. Lack of education often results in illiteracy and the spread of adult literacy campaign would need to intensify in order to bring literacy to the population who have never or barely been enrolled, and are beyond schooling age, as was effectively implemented in India. Historically adult literacy campaigns have not been a priority of the government of Pakistan although some initiatives have been launched in the 1980s and 1990s (Goujon and Wazir 2011).

On the other hand, there will be significant increase in the share of the WAP with a primary education, from 14 per cent in 2010 to 36 per cent 2060 according to Trend scenario (see figure 4). Improvements will be significant for the share of the population with a tertiary education, which will more than triple over the projection period from 11 per cent in 2010 to 37 per cent in 2060 under NG scenario (EngFm). The projection results show the overall long time horizon needed to see the effect of the implementation of higher education in Pakistan.

For instance, the Trend scenario shows a slight increase in the proportion of highly educated – secondary and tertiary education together – in the WAP, from 36 per cent in 2010 to 46 per cent in 2060, while the corresponding proportion for NG scenario will be 67 per cent in 2060.

Figure 2. Population pyramid by age, sex and educational attainment for Pakistan in 2010 and in 2060 according to three education scenarios, Constant, Trend and NG, and Medium Fertility variant.



Source: Authors’ calculations

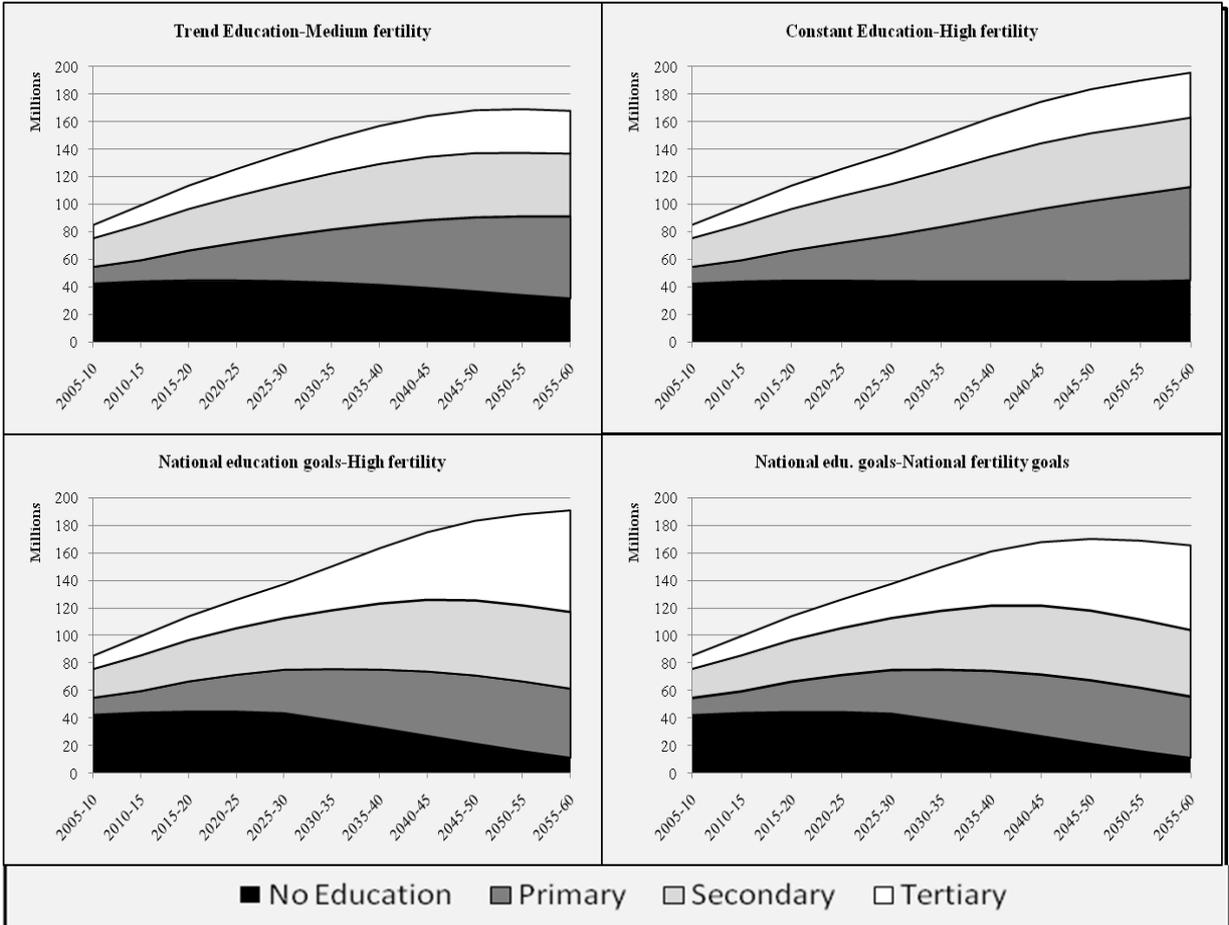
Note: Ec= Constant Education, Et=Trend education, Eng=national educational goals and Fm= Medium fertility.

Figure 2 also shows that the Trend education scenario would not be enough to remove the gender gap which persists at all levels. For example, the proportion of uneducated women aged 20-24 years in 2010 is twice then share of uneducated men. One out of four women aged 15 and over will be out of school while the proportion for men is “only” 16 per cent. Under the NG scenario, the proportion of uneducated women of aged 15 and over would be 16 per cent compared to 8 per cent for men in 2060, due to the momentum of education diffusion. The impact of educational improvement is clearly visible for secondary and tertiary education in the NG scenario, which implements rapid improvements in education (i.e., universal primary education). The gender gap that was noticeable regarding secondary education in 2010 will persist although it will be attenuated. In 2010, the population with some secondary education in female aged 20-64 years was 6 million (5 percent)

compared to 15 million (34 percent) for male. In 2060, according to the Trend education scenario, the WAP would be 18 million (21 per cent) and 28 million (34 per cent) for female and male respectively. The future educational attainment of the population under the education Trend scenario reflects the education policy orientations of the government of Pakistan in recent years. In 2010, the share of tertiary educated women of working age was only 5 per cent (3.2 million), and corresponding share for men was 14 per cent (6.4 million). The gender gap would be eliminated in 2060, based on the Trend scenario; the share of female and male in the WAP with a tertiary education would reach 18 per cent (15 million) and 20 per cent (16 million) respectively – which reflects that women have benefited from an increased access to tertiary education in the recent past.

Still the lack of investments in female education in the past will hamper the development of Pakistan far into the future as it is hindering the full participation of women in the labour force. In 2008, according to the Labour Force Survey, women accounted only for 20 per cent of the active labour force.

Figure 3. Share of working age population (20-64) by level of education in Pakistan for 2010-2060, different education and fertility scenarios



Source: Authors' calculations

Based on past experience, it does not really come as a surprise that Pakistan will not be able to achieve the educational development goals (either national or international) in the future, if the pace of change witnessed in the recent past continues.

Table 10 shows the access to education of boys and girls according to the Trend education & Medium fertility scenario, shedding some light on the feasibility to achieve the Millennium development goals of universal primary education and gender gap elimination by 2015. In view of those results, there would still be 31 per cent of the 5-9 age-group who would not go to school by 2015 far from the full intake envisioned by the MDG for education, with a large gender gap as 34 per cent of girls and 27 per cent of boys aged 5-9 would not be in school in 2015.

In fact, the MDGs would not even be achieved by 2060 as 21 per cent of the children in that age group would still not be enrolled fifty years from now, which calls for further investment in the education sector. Moreover, gender disparities will be far from eliminated at both levels of primary and secondary education in 2015 where girls would still have 12 per cent less chances than boys to reach a primary education and 16 per cent less to enrol into secondary education in 2015.

Table 10. Access to education of male and female, in per cent, Trend education scenario and Medium fertility scenario, 2015-20 and 2055-60.

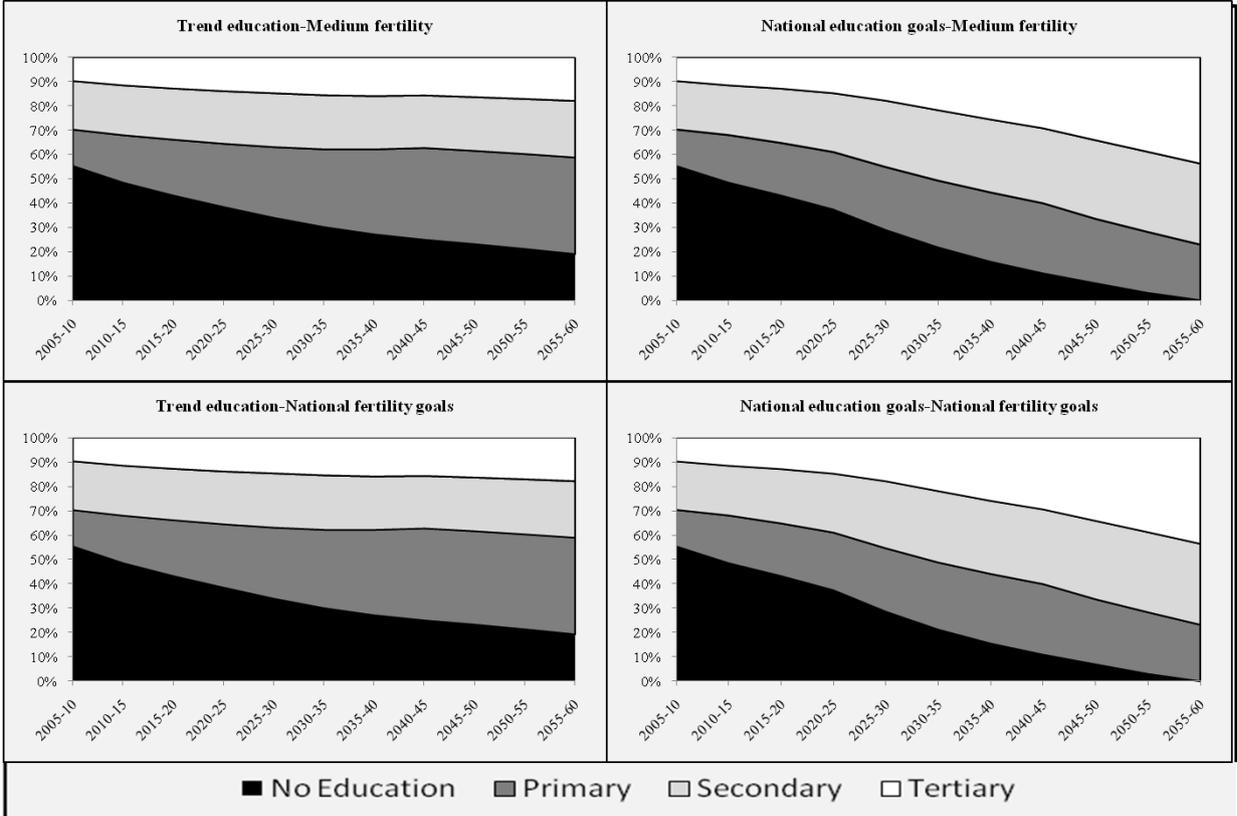
	2015-2020			2055-60		
	Boys	Girls	Total	Boys	Girls	Total
No Education	27	34	31	23	18	21
Primary	84	72	78	89	87	89
Secondary	50	34	42	55	46	50
Tertiary	19	15	16	19	21	20

Source: Authors' calculations

Although improvements would be significant by 2060, the probability of girls enrolling in primary and secondary schools would still be 2 per cent and 9 per cent respectively lower than for boys. Interestingly, and as mentioned before gender disparities would be eliminated at the level of tertiary education, where the increase in the last few years has been substantial and even more so for girls than boys. Hence, by 2015 female would still have 4 per cent less chances than male to enter a tertiary education but the relationship would be reversed by 2060 where more women than men would enrol in tertiary education. Even though, the projection also shows that the rapid increase at secondary and tertiary level foreseen by the national goals would also be quasi-impossible to be reached by 2060 according to present pace.

Figure 4 compares the output of four different scenarios in terms of the educational attainment of women of reproductive age (typically 15-49 years). In 2010, the share of illiterate fecund women exceeded 50 per cent. According to the Trend education scenarios, two significant improvements will happen in the future. The share of women with no formal education will decline from 55 per cent in 2010 to 19 per cent in 2060, while, the proportion of primary educated women will increase significantly – from 15 per cent in 2010 to 40 per cent in 2060. The share women with a tertiary level will increase from 10 per cent in 2010 to 18 per cent in 2060. Under the NG scenario, the share of women with no formal education will be eliminated in 2060. The comparison of different education scenarios shows the tremendous potential impact of educational attainment of future mothers, and may serve as an input to estimate future levels of fertility and of infant and child mortality.

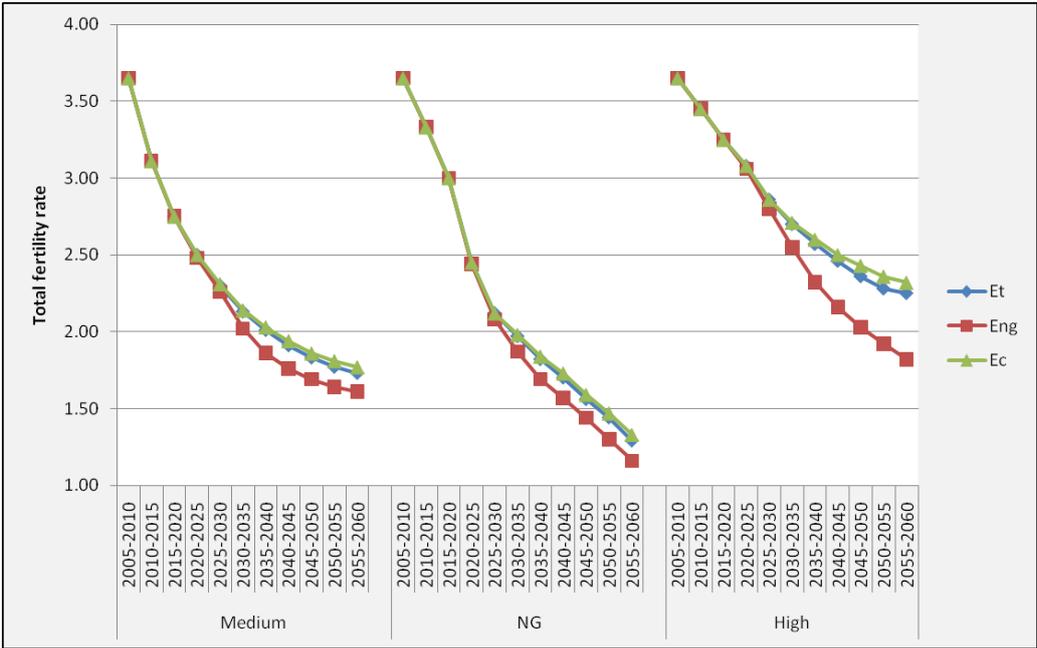
Figure 4. Share of women aged (15-49) by level of education in Pakistan, 2010-2060.



Source: Authors' calculations

Figure 5 clearly shows the significant difference in total fertility rates according to different education scenarios, and hence education composition of women in fertile ages. The Trend and Constant education scenarios are quite close, indicating that, in the past two decades the improvements were not sufficient to impact on fertility levels. If Pakistan would attain the national educational goals under the medium fertility, total fertility rate in 2060 would be 0.12 children per woman less as compared to Trend education scenario. On the other hand, according to NG fertility scenario, the difference in TFR between national education goals and Trend education will be 0.13 children per women. It is worth noting here, although it is highly hypothetical and counter intuitive, that, if national educational milestones are accomplished under a high fertility scenario, the TFR in 2060 would be 0.42 children less as compared to Trend education scenario – TFRs: 1.8 vs. 2.2.

Figure 5. Total Fertility rate in Pakistan under three fertility and three education scenarios.



Source: Authors' calculations

4. Conclusion

The future of Pakistan and its ability to develop is highly dependent on progress in the educational attainment of the population, in a context of rapid population growth. This study demonstrates the importance of investments in education in the near future so that Pakistan can harvest the fruit of long term human capital development. Lacks of investments in primary and secondary education, poor infrastructure and political instability have failed Pakistan for the achievement of satisfactory levels of education in Pakistan, especially for female. As a result, Pakistan will fail to achieve the Millennium Development Education Goals in terms of universal primary education for boys and girls. The scenarios that we looked at in this paper show that Pakistan needs to boost up the speed of change in education, especially since Pakistan will be soon experiencing a demographic bonus, a relative increase in the size of the working age population in comparison to the inactive part of the population – the young and old generations – which is most favourable for socio-economic development, that is if the country manages to increase the quality of human capital by 2060.

We show that female education is very crucial and high political commitments will be highly needed, for advancing through the demographic transition, and economic development. The past lack of investments in female education will hamper the development of Pakistan far into the future unless effective adult educational campaigns are implemented to bring at least literacy to many women who come to adulthood without being able to read and write.

5. References

- Abadian, S. 1996. Women's autonomy and its impact on fertility. *World Development* 24(2): 1793-1809.
- Aly, J.H. 2007. To debate and finalize the national education policy. A white paper of the National Education Policy Review Team. Accessible online at <http://planipolis.iiep.unesco.org/upload/Pakistan/PakistanNationalEducationPolicy>
- Behrman, J., David, R. and S. Richard. 1997. School quality and cognitive achievement production: A case study for rural Pakistan. *Economics of Education Review* 16(2):127-142.
- Bhat, M. and S. Rajan. 1990. Demographic transition in Kerala revisited. *Economic and Political Weekly* 25:1957-80.
- Castro, T. and F. Juarez. 1995. The impact of women's education on fertility in Latin America: Searching for explanations. *International Family Planning Perspectives* 21(2): 52-57.
- Cleland, J. 2000. *Education and Future Fertility Trends, with Special Reference to Mid-Transitional Countries*. United Nations Population Division (UNPD): New York, USA.
- Goujon, A. and A. Wazir. 2011. Human capital and population development: Pakistan and the "Cannon and Butter Dilemma." Pages 157-182 in L. Hummel, J. Laurel, and L. Richard. (eds.) *Understanding Pakistan Through Human and Environmental Systems*. U.S. Army War College Center for Strategic Leadership: West Point, USA.
- James, K.S. 1999. Fertility decline in Andhra Pradesh: A search for alternative hypothesis. *Economic and Political Weekly of India* 34(8):491-499.
- Jejeebhoy, S. 1995. *Women's Education: Autonomy and Reproductive Behaviour*. Oxford: Clarendon Press.
- Samir, K.C., Barakat, B., Goujon, A., Skirbekk, V., Sanderson, W. and W. Lutz. 2010. Projection of populations by level of educational attainment: Age and sex for 120 countries for 2005-2050. *Demographic Research* 22(15): 383-472.
- Rogers, A. 1975. *Introduction to Multiregional Mathematical Demography*. New York: Wiley.
- Rogers, A. 1995. *Multiregional Demography: Principles, Methods, and Extensions*: New York, Wiley.
- Saleem, S. and M. Bobak. 2005. Women's autonomy, education and contraception use in Pakistan: A national study. *Reproductive Health* 2(8):1-8.
- Sathar, Z.A. 2007. Stagnation in fertility levels in Pakistan. *Asia Pacific Population Journal Reviews* 22(2):113-131.
- Sathar, Z. A. 2001. Fertility in Pakistan: Past, present and future. Paper presented at the Workshop on Prospects for Fertility Decline in High Fertility Countries: New York, USA.
- Sathar, Z.A. and J. Casterline. 1998. The onset of fertility transition in Pakistan. *Population and Development Review* 24(4):773-796.

- Sathar, Z.A. and K. Mason. 1993. How female education affects reproductive behaviour in urban Pakistan. *Asian Pacific Population Forum* 6(4):93-103.
- Soomro, Y. and N. Mahmood. 2004. Female education and fertility: Implications for a family planning programme. Paper presented at the 20th AGM and Conference of the Pakistan Society of Development Economists, Islamabad, Pakistan.
- Syed, A. and J. Hussain. 2001. Fertility transition in Pakistan: Evidence from census. *The Pakistan Development Review* 40(4):537-550.
- United Nations. 2010. World population prospects: 2010 revision. United Nations Population Division (UNPD), New York, USA.

Appendix Table A. Population aged 15+ and WAP, in 2010 and according to nine scenarios, 2030 and 2060⁶

			Population (in million)															
			15+								WAP							
			Male				Female				Male				Female			
			e1	e2	e3	e4	e1	e2	e3	e4	e1	e2	e3	e4	e1	e2	e3	e4
Education	Fertility																	
2010 (Base-Year)			19.5	9.5	20.0	7.9	34.2	7.2	9.3	4.5	15.0	6.8	14.8	6.4	27.5	5.2	6.1	3.2
2030	Constant	High	20.6	21.3	31.0	14.6	38.7	21.2	15.5	10.4	15.4	16.6	24.4	13.0	29.0	16.5	13.1	9.2
		Medium	20.4	21.0	30.5	15.5	38.4	20.8	16.3	10.3	15.4	16.6	24.4	13.0	29.0	16.5	13.1	9.2
		NG	20.5	21.2	30.8	14.6	38.6	21.0	16.5	10.3	15.4	16.6	24.4	13.0	29.0	16.5	13.1	9.2
	Trend	High	20.4	21.3	31.1	14.7	38.2	21.3	16.7	10.6	15.4	16.6	24.4	13.0	28.8	16.5	13.1	9.3
		Medium	20.3	20.9	30.7	14.6	37.9	20.9	16.4	10.5	15.4	16.6	24.4	13.0	28.8	16.5	13.1	9.3
		NG	20.4	21.1	31.0	14.7	38.1	21.2	16.7	10.6	15.4	16.6	24.4	13.0	28.8	16.5	13.1	9.3
	NG	High	18.8	21.0	30.9	17.0	34.7	19.2	20.3	12.7	15.4	16.3	23.4	14.2	28.2	15.1	14.2	10.4
		Medium	18.7	20.7	30.4	16.8	34.7	18.9	19.7	12.4	15.4	16.3	23.4	14.2	28.2	15.1	14.2	10.4
		NG	18.7	20.9	30.7	16.9	34.7	19.1	20.1	12.6	15.4	16.3	23.4	14.2	28.2	15.1	14.2	10.4
2060	Constant	High	22.3	39.7	45.0	23.1	42.6	43.9	27.6	19.8	16.1	32.1	31.5	17.8	28.8	35.6	19.1	14.9
		Medium	19.4	33.9	38.9	20.3	37.3	37.6	23.9	17.3	13.8	27.6	27.1	15.3	24.8	30.6	16.4	12.8
		NG	19.2	33.5	38.5	20.2	36.9	37.1	23.7	17.2	13.8	27.4	27.0	15.2	24.7	30.4	16.3	12.8
	Trend	High	19.8	39.9	46.6	24.0	33.3	46.9	30.1	23.2	14.2	31.8	32.7	18.6	21.9	37.9	20.7	17.8
		Medium	17.5	33.5	40.2	21.0	30.2	39.8	25.8	20.0	12.3	27.3	28.1	15.9	19.3	32.4	17.7	15.1
		NG	17.4	33.2	39.7	20.9	30.2	39.3	25.4	19.8	12.3	27.2	27.9	15.9	19.3	32.2	17.5	15.0
	NG	High	8.5	29.8	42.4	45.1	17.0	30.1	38.2	44.3	4.4	24.9	28.7	37.0	7.1	24.9	27.3	36.6
		Medium	8.4	26.5	37.2	38.3	16.9	26.8	33.0	37.4	4.3	22.1	24.9	31.2	7.1	22.0	23.6	30.8
		NG	8.4	26.5	36.8	37.7	16.9	26.8	32.6	36.8	4.3	22.1	24.9	30.8	7.1	22.1	23.5	30.3

Source: Authors' calculations

Note: e1=No Education, e2= Primary, e3=Secondary, e4=Tertiary, WAP=working age

⁶ Detailed results of the population by age, sex, and education, from 2010 to 2060, according to the different scenarios can be made available by the authors upon request.