A multidimensional approach in international comparative policy analysis based on demographic projections

Izhak Berkovich

School of Education, The Hebrew University of Jerusalem, Jerusalem, Israel

Abstract

The present study adopts a multidimensional approach to classifying countries in international comparative policy analyses. The article builds a data-based typology founded on future demographic projections of the United Nations. Latent class analysis (LCA) is used to identify various demographic profiles of countries based on fertility rates, net migration rates, and dependency ratios. There is great value in identifying future changes in population composition, as it enables governments to set policy agenda, prioritize needs, and prepare better for what lies ahead. The paper demonstrates the value of such typology to social services, by analyzing the demographic profiles and estimating their implications for future challenges in educational provision. The contributions of the paper to international comparative policy analysis are discussed.

Keywords: demography, educational policy, planning, multiculturalism

Published in Population Research and Policy Review, 2013, 32(6), 943 – 968.

The final publication is available at Springer via
http://dx.doi.org/10.1007/s11113-013-9281-x

1. Introduction

Comparisons between countries are the basis for analysis and recommendations in the area of provision of social services. Many policy reports include homogeneous general recommendations for all countries (e.g., World Bank 1990; 1995; 1999), but numerous others base their recommendations on a categorization of developed vs. developing countries (e.g., OECD 2000; UNESCO 2002; World Bank 2004). Such analyses, however, suffer from two shortcomings: (a) they do not base their classification on a multidimensional approach, which is better suited to describe social issues, and (b) they mostly rely on past or present data from countries. These data have limited power to describe the social complexity that social services systems in these countries will be required to address in the future.

In this regard, demographic projections may prove especially useful as a basis for classifying countries and as the starting point for policy analyses and recommendations. The benefit of speculating about what lies ahead is that it makes possible aligning present policies and resource allocation in a way that addresses the upcoming challenges and devises the necessary solutions. In the last decade, the United Nations Population Division has been publishing its demographic projections of world population growth through 2100. These projections indicate several dramatic demographic changes, which if they come about will have broad economic, social, and political repercussions for many societies and countries.

The present article aims to contribute to international comparative analyses dealing with social services in two ways: first, by suggesting a new multidimensional approach for measuring social complexity as a base for classifying countries; second, by demonstrating the central role that future demographic projections should play in such analyses. The paper focuses on the educational policy arena to demonstrate why certain indicators were chosen and what the typology implications are.

2. Multidimensional Approach to International Policy Analysis

Popular methods for classifying countries into classes for policy analysis purposes are one-dimensional, and are based mostly on fertility rate or economic status. The difference between more and less complex countries is often presented as a qualitative difference. Thus, usually one variable serves as a cut-off point in defining complexity. In the middle of the 20th century, the United Nations introduced a dichotomous grouping of world countries into "more developed regions" and "less developed

regions" based on fertility levels (United Nations 1966, 1974). This classification, which is still in use (United Nations 1988, 2011), reflects the world more or less as it was in the 1960s. Different dominant classifications have been created by the World Bank, reflecting the international economical situation as it is today. For example, one World Bank classification divides countries into low-, middle-, and high-income categories based on their gross national income per capita.[1] Another classification, based on present economic performance, categorizes countries into developed and developing. Recently this categorization has been expanded to some degree to include also transitional countries with fast growing economies[2] (World Bank 2001). Although it is impossible to assess the usefulness of these classifications, in historical or financial policy analysis they seem to make a limited contribution to policy planning because they do not reference future social needs.

I suggest that the construct explored for the purposes of policy planning in social services should be the social complexity of the governmental unit. Social complexity is defined in the current study as the scale and diversity of a given society. To date, social complexity has been measured by indicators presented side by side, often averaged, or as an array of indicators “as is.” For example, Bützer (2007) measured social class, age, and religiosity as components that are averaged into a social complexity index used to compare various municipalities. Ross (1981), who compared political differentiation between societies, measured socioeconomic structure by several undependable variables such as the importance of agriculture, animal husbandry, and hunting and gathering in the economy; degree of food storage; size of the typical community; degree of social stratification; and cultural complexity.

Ragin (1989) reflected on comparative analysis in social sciences and criticized the focus on independent effects of indicators. Other scholars also urged the research community to use alternative methods in order to gain insight into complex social phenomena (Kangas and Ritakallio 1998; Moisio 2004; Ragin 1989; Whelan and Maître 2005). Ragin (1989) strongly recommended that researchers apply mathematical methods that may capture more precisely the complexity of the explored constructs and measure the composite interactions between indicators. As an alternative solution, scholars were urged to adopt a multidimensional approach to measuring and classifying phenomena (Moisio 2004; Ragin 1989; Whelan and Maître 2005). Whelan and Maître (2005) claimed that "If we are to move beyond the accumulation of a mass of descriptive detail we need to develop a measurement

model that enables us to understand the manner in which our indicators are related to the latent concept" (p. 425).

When adopting a multidimensional approach to measuring social complexity, it is essential to determine which indicators are fit to be used as dimensions of social complexity. The selection of reliable and valid indicators must include major indicators linked to the formation of social complexity. We adopted the following steps to identify suitable indicators for multidimensional measurement: (a) presenting a theoretical justification for the selection of the indicators based on their centrality and causality with regard to latent construct (Moisio 2004); (b) selecting indicators that address various aspects of the same latent construct. Similar steps can be seen in Whelan and Maître's (2005) work, who explored vulnerability to economic exclusion and levels of economic exclusion in a comparative analysis of thirteen European countries. Additionally, Whelan and Maître (2005) suggested that rather than dealing with a wide range of indicators, scholars should focus on a smaller number of indicators that have strong theoretical grounds and are considered to be "crucial building blocks" (p. 443) of the latent phenomenon. Furthermore, it should be acknowledged that when conducting a worldwide analysis, the availability of comparative international data greatly affects the sophistication of the model constructed as far as the scope and depth of indicators used are concerned.

Although economic indicators are used routinely for policy analysis purposes in social services, I argue that they are best fit to describe economic constraints, and therefore their contribution to describing the countries' social complexity is limited. It follows that an economic-based categorization is a poor basis for policy recommendations in the area of social services provision. The literature suggests that demographic indicators may be especially promising as a basis for measuring social complexity. The significance of demography for social services provision is demonstrated below with reference to the educational policy arena.

3. Demographic Indicators and Educational Policy

For more than thirty years, demography has been a basic component in education analysis and planning (Capps et al. 2005; Châu 2003; Dworkin 1980; Hodgkinson 1985; Yates 1988). Population composition contains important information for policy makers in education (Châu 2003; Siegel 2001), including: (a) population distribution by age and gender, (b) population distribution by sectors of economic activity and

occupation, and (c) the geographic distribution of the population. Educational policy makers can use demographic data, especially the average fertility rate, to meet the needs of future students by adding new educational institutions or by eliminating unneeded ones (Siegel 2001). When the fertility rate falls, the decrease affects the number of students in primary education in the short term, the number of students in secondary education in the intermediate term, and the number of students in higher education in the long term. In addition, the fertility rate also affects the age structure of the population (Siegel 2001). A high fertility rate increases the proportion of youths in the population, whereas a low fertility rate increases the proportions of adult and elderly populations. The known size of the school-age population can be used to estimate the relative burden of expenditures on education (Siegel 2001) by calculating the ratio between the school-age population and the economically active part of the adult population. Educational success depends greatly on abundant resources and a proportionally smaller school-age population (Châu 2003). The higher the ratio of the school-age population in the country, the more difficult it is to achieve quality "education for all." For instance, the Mediterranean countries of Israel, Spain, Greece, and Italy have similar Gross National Income (GNI) per capita, but Israel shows lower scores in international tests[3] than do the other countries, where 0-14 age group ratio in their populations is nearly half that of Israel[4].

The age structure of the population can also affect the supply of teachers. Châu (2003) illustrates this point by presenting the example of France, which experienced a baby boom between World War II and the 1970s, followed be a substantial drop in the birth rate. Thus, by the year 2000 the majority of the teachers belonged to the baby boom generation, which made it easier to find teachers in France despite a decrease in the desire to work in the teaching profession.

Furthermore, demographic information about migration and its consequences for the ethnic and racial composition of the population is highly relevant for educational policy issues (Lopez 2006). Shrestha (2006) contends that the diversification of population creates several social challenges, including: (a) assimilation, as immigrants continue to speak their native language at home and maintain their ethnic culture and values in a segregated manner; and (b) high poverty rates among racial and ethnic minorities. Ethnic and racial diversification, which is often linked with low socio-economic status, is known to have a negative effect on educational enrollment, achievement, and performance (Hodgkinson 2003; Lopez

2006; Sigel 2001). Therefore, solving the challenges caused by migration is highly relevant for the ability of the education system to succeed in its mission to promote cultural integration and enable the learners' social mobility based on their skills (Harpaz 2010).

Moreover, age-structural transitions (ASTs) represent a long-term shift in the population distribution across different age groups (Bloom, Canning, and Sevilla 2003). Fertility and migration (which were mentioned earlier), and ASTs are interrelated, because fertility and migration determine ASTs, which in turn are influenced by the age compositional effects of AST itself (Pool and Wong 2006). Pool (2007) suggested that ASTs are highly related to policymaking formation because the needs of individuals the needs of individuals and their capacity to meet these needs vary throughout the life cycle. ASTs also have significant implications for policymaking because of their impact on available public resources that could be directed to providing for social needs (Pool 2007). Thus, ASTs can affect labor supply, savings, and the human capital of countries (Bloom et al. 2003).

Detailed demographic information can help policy makers better manage the physical and human resources of the education system and address the needs and demands of the population. Because demographic trends are relatively stable (Sigel 2001), they form a good basis for long-term projections (Cohen 1995).

4. Demographic Projections

Demographic models estimate future trends based on past and present patterns. In the last decades, we witnessed an increase in world population and in average life expectancy (Cohen 1995; 2001). In the coming decades, world population is projected to grow by nearly 33%, from 6.9 billion in late 2011 to 9.3 billion in 2050 (United Nations 2011). Additionally, the next decades will see a vast change in the demographic balance between the more developed regions and the less developed ones (Cohen 1995). In 1950, the number of people living in the less developed areas was double that of those living in developed areas; by 2050 this ratio is projected to increase six fold (Cohen 2001).

Fertility, mortality, and migration rates are the main elements determining the population composition of nations (Sleebos 2003). According to projections, over the next forty years half of the addition to world population will come from the following eight countries, in descending order of contribution (United Nations 2011): India,

Nigeria, Pakistan, the United Republic of Tanzania, the United States, the Democratic Republic of Congo, Ethiopia and Philippines. Moreover, in 18 countries the median age of the population is projected to be under the age of 25 in 2050 (United Nations 2011). Such countries are expected to have a large percentage of youths in their population, and face the challenges of forming a mass education system, recruiting teachers, building facilities, shaping curriculum and pedagogy, and establishing student selection and placement mechanisms.

During this period, more developed regions will show a decrease in population because of below-replacement fertility rates (Cohen 2001; United Nations 2011). Declining fertility rate is a phenomenon observed today in many developed countries, including the U.S., Canada, Germany, France, Sweden, and Great Britain (Châu 2003; Livi-Bacci 2001; United Nations 2011). Demographic projections for 2050 indicate an especially dramatic decline in fertility rates in Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Cuba, Georgia, Japan, Latvia, Lithuania, Portugal, Republic of Moldova, Romania, the Russian Federation, Serbia, Ukraine and United States Virgin Islands (United Nations 2011). Such countries are expected to experience a significant AST and to have a relatively low percentage of school-age segments in their populations, and therefore they may want to maximize the potential of youths entering and succeeding in higher education.

Another significant element that appears to have a major effect on population composition is migration (Siegel 2001; Shrestha 2006). The future of international migration depends on policy decisions by governments and on the socio-economic and political situation in various parts of the world. Of all demographic trends, migration is the most difficult to predict (Cohen 2001). Nevertheless, assuming that current migration levels remain, models predict that in some developed countries with low or below-replacement fertility rates immigration will play a central role in structuring society (Cohen 2001). Immigrants from less developed regions will compensate for the loss of projected population of some countries in more developed regions (United Nations 2011). Projections estimate that the U.S., Canada, and Spain will be the major net recipients of migrants in the following decades, with a net annual migration of 924.000, 183,000 and 163,000 (United Nations 2011), followed by Italy (144,000) and Great Britain (143,000) (United Nations 2011). Moreover, migrants have a higher fertility rate than the native populations (OECD 2002). Thus, in the U.S. and in many Western European countries immigration will gradually

change the racial and ethnic composition of the population and bring about a new national equilibrium (Frey 2009). Such countries are expected to face the poverty challenges that characterize many immigrant groups, and may wish on one hand to promote their assimilation in society and on the other to enable them to express their ethnic and cultural uniqueness.

Thus, fertility and migration trends and ASTs seem to play a growing role in shaping future population composition and size, as well as the proportion of the school-age population and its heterogeneity. Demographic projections are considered more stable than other projections and can greatly contribute to shaping government policy and setting agendas (Lopez 2006).

5. Projections, Scenarios, and Policy Planning

Projections are generally based on a method or a model and are aimed at enabling the best possible estimate of future considerations (Peterson, Cumming, and Carpenter 2003). Projections are aimed at optimizing decision making, maximizing benefits, and minimizing losses (Lindley 1985). Usually they are intended to fill gaps in information and lower levels of uncertainty about the future.

Lowering uncertainty is especially important when conceptualizing policy (Walker et al. 2003). One method that policy makers use to lower uncertainty is structuring a scenario based on projections (Ringland 2002). A scenario is a structured account of a possible future. Because the real world is complex and because there the number of possible futures is infinite, to be effective, the scenario must be focused on a specific element in the situation (Peterson et al. 2003). The selected focal issue shapes the assessment of the people and the systems (Peterson et al. 2003).

A valid scenario links past history with current events and the hypothetical future (Peterson et al. 2003; Ringland 2002). The scenario must be consistent and its dynamic plausible. After a scenario has been developed, it can be used to analyze and generate policies (Ringland 2002). Thus, a successful scenario enhances the ability of people to cope with the possible future and use it to their advantage (Peterson et al. 2003).

Scenarios are best suited for issues in which there is a great deal of uncertainty and little control (Peterson et al. 2003). They are used to envision possible futures (Kahn and Wiener 1967; May 1996) and stimulate debates among policy makers and researchers. Although lately several future scenarios of demographic issues have been

discussed (Cohen 1995; Federal Statistical Office 2006; Shrestha 2006), few attempts have been made to construct scenarios that can help international educational policy makers map future challenges and recommend courses for meeting them. These works have made the case that education, specifically the education of women, affects the human capital of both countries, as manifested in health and education, and their demographic trends (see Lutz 1991, 1996; Lutz and KC 2011; Lutz, Goujon and Doblhammer-Reiter 1998; Yousif, Goujon and Lutz 1996). These works recommended promoting the education of women as a key engine of changing the demographic characteristics of the countries and make them follow a more "modernist" pattern, increasing their human capital. By contrast, the present work suggests using future demographic projections to create a typology of the social challenges that need to be addressed by policy makers.

6. Analysis of Future Demographic Settings

In light of the literature review and the demographic projections presented in the sections above, the present paper suggests that fertility rate, net migration rate,[5] and age structure are key elements that shape demographic realities and have the power to influence future educational challenges. ASTs are affected most by changes in fertility rate, which are mediated by shifts in patterns of survival and by migration flows (Pool and Wong 2006). Migration is known to be less significant in determining age-structural changes (Pool and Wong 2006). Nevertheless, I included the net migration rate in the analysis given the claims that over time migration may compensate for population loss and affect the population diversification, especially in low-fertility countries (Frey 2009).

To describe the future demographic profiles of countries, I conducted a latent class analysis (LCA). LCA is a method of cluster analysis used to identify subgroups of related cases from multivariate data (Muthén 2002). Bollen (2002) argued that latent variables "provide a degree of abstraction that permits us to describe relations among a class of events or variables that share something in common" (p. 606). The relationships between a set of variables, theoretically linked as indicators of an unobserved typology, can help identify cases of exclusive membership in one of the latent classes (Whelan and Maître 2005). Latent variables derived from data analysis (Bollen 2002) can help uncover a better suited typology that can be used to classify

cases (Hagenaars and Halman 1989). The LCA in this study was conducted with the Bayesian module of AMOS, version 16.0.

I downloaded the data describing 2010-2030 demographic projections from the United Nations database and calculated the average fertility rate and average net migration rate for the 2010-2030 period. Six variables were specified as covariates in the LCA, including 2010 child dependency ratio (0-14 years old), 2010 elderly dependency ratio (65 years and over), 2010-2030 projected average total fertility rate, average net migration rate, and 2030 child and elderly dependency ratios. The number of clusters tested ranged from 1 to 10, based on Mardia, Kent, and Bibbly's (1979) "rule of thumb" that stipulates that the maximum number of clusters is approximately the square root of n/2. Convergence statistics results indicated that the models with one, three, and four clusters are feasible.

The fit of the three possible models was evaluated using posterior predictive *p*-value (Lee and Song 2003), Deviance Information Criteria (DIC), and the effectively estimated parameters (*pD*) (Spiegelhalter, Best, Carlin, and van der Linde 2002). DIC assists in the selection of a parsimonious model, as it represents a combination of the deviance for a model (*D* - the mean posterior deviance) with a "fine" for the complexity of the model (*pD* - the number of effectively estimated parameters). Models with smaller DIC values are considered preferable (Raach 2005). The *p* statistic represents a goodness of fit index for the models. A model is considered plausible when the posterior predictive *p*-value is near 0.5 and implausible when values are toward the extremes of 0 or 1 (Lee 2007). A *p*-value of 0.5 represents a result in which the distribution of the deviances in the observed and the replicated data overlap completely (Kelly and Smith 2011). *pD*, the effective number of parameters in the model, represents the model complexity. It is computed as the posterior mean of the deviance minus the deviance of the posterior means (Spiegelhalter et al. 2002). The fit results of the three models that emerged as feasible are presented in Table I below.

Table I: Fit measure results of future demographic settings for 2010-2030

	Posterior predictive *p*	**DIC**	***pD***
1-cluster model	.60	244.81	11.38
3-cluster model	.72	694.81	33.85
4-cluster model	.84	946.12	44.87

One cluster model was excluded because it was theoretically irrelevant. Therefore, I compared the three-cluster and the four-cluster models using the DIC and posterior predictive *p*-values. The three–cluster model seemed to be the most fitting, as it had a smaller DIC value and a posterior predictive *p*-value nearer to 0.5 than did the four-cluster model. The classification of the countries into the different clusters by the selected LCA model is shown in the Appendix. Table II displays LCA results for the most likely class membership. The results indicate the likelihood of a clustering solution over time as cases are continually classified into the same latent class (over the other classes) in the multiple analyses conducted by the software. A value of 100% for a given cluster would indicate perfect stability (all countries in the given cluster are assigned to the same cluster in the following analyses). As shown in Table II, the three clusters are quite stable. The most stable cluster is Group C, with a class membership likelihood of 99.5%, followed by Group B, with a class membership likelihood of 98.1%, and Group A, with a class membership likelihood of 96.9%.

Table II: LCA results for the most likely class membership

	Subscale			
	Group A	*Group B*	*Group C*	*Total*
Group A	96.9%	2.0%	1.1%	100%
Group B	1.8%	98.1%	0.1%	100%
Group C	0.5%	0.0%	99.5%	100%

Table III presents the descriptive statistics of the cluster-related variables, including the number of countries, as well as means and standard deviations for each cluster.

Table III: Means and standard deviations of demographic indicators for each group

Indicators	**Group A**	**Group B**	**Group C**
	N = 75	**N = 54**	**N = 66**
Child DR 2010	44.96 (10.36)	77.56 (10.19)	25.01 (4.45)
Elderly DR 2010	8.24 (2.82)	5.59 (0.99)	20.48 (5.41)
Average total fertility rate 2010-2030	2.57 (0.51)	4.91 (0.94)	1.59 (0.29)
Average net migration rate 2010-2030	-1.21 (3.39)	-0.27 (1.05)	0.92 (2.61)
Child DR 2030	40.47 (9.28)	76.36 (11.69)	23.52 (4.73)
Elderly DR 2030	14.22 (4.21)	6.32 (1.35)	34.18 (6.37)

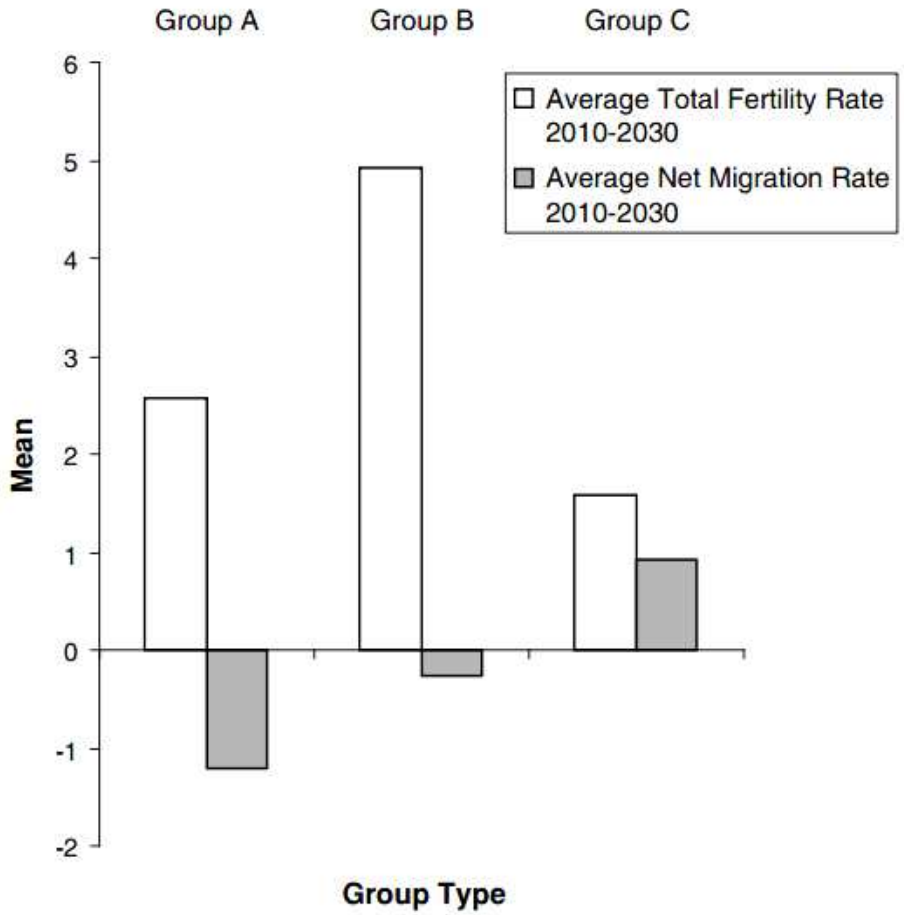
Note. DR = Dependency ratio

As shown in Table III, group A includes the countries with fertility rate approximately at the generational replacement level and a negative net migration rate. Furthermore, we find a slight decrease in the proportion of the youth population and a dramatic increase in the proportion of the elderly population in these countries. Group B contains countries with above-generational replacement fertility rates and a near-zero net migration rate. Group B countries maintain their current age structure. Group C contains countries characterized by below-generational replacement fertility rate and positive net migration rate. In this group the proportion of elderly population is projected to increase.

As Table III indicates, net migration rates in the various clusters have high standard deviations (compared with the averages), indicating that the data has been spread out over a large range of values. This variation may have been caused by the limitations of the LCA method, as LCA can detect latent classes only if they are sufficiently large (Thompson, 2007). Thus, few countries that show extreme migration rate projections were grouped with other countries that have less extreme migration rate projections, based on patterns of association emerging in the analysis of indictors. Therefore, I examined the median and interquartile range of the net migration rate for each cluster. The median net migration rate of Group A is -0.57 and group interquartile range is between -1.90 and 0.23; the median net migration rate of Group B is -0.17 and the group interquartile range is between -0.67 and 0.02; and median net migration rate of Group C is 0.45 and the group interquartile range is between -0.45 to 2.54. As medians and interquartile ranges present a much lower spread of values, closer to the means found in the LCA, I concluded that most cases in each cluster are indeed homogeneous as far as migration rate is concerned and properly represented by the means found in the LCA.

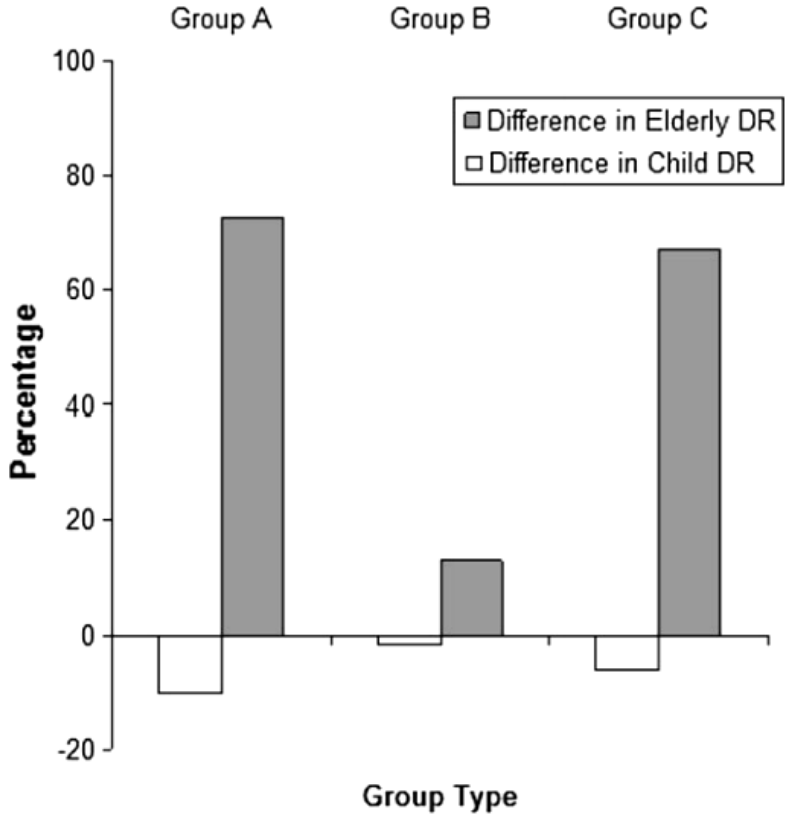
The full clustering results of countries based on the 2010-2030 demographic projection are shown in the Appendix. Figure I shows the average fertility rate for 2010-2030 and the net migration rate for 2010-2030 in the LCA model by classes of countries.

Figure I: Average total fertility rate for 2010-2030 and average net migration rate for 2010-2030 in the LCA model by country classes



To facilitate the interpretation of the changes in age structure, I calculated the difference between the 2030 and the 2010 scores, divided them by the 2010 baseline, and multiplied them by 100. Figure II presents these results expressed as a percentage of the difference in child dependency ratio and elderly dependency ratio by classes of countries.

Figure II: Percentage of difference in child DR and elderly DR (compared to the 2010 baseline) in the LCA model by country classes



Note. DR = Dependency ratio

The clusters were plotted on a world to visualize the selected LCA findings (Figure III). The countries are marked by different colors, according to the cluster to which they belong.

Figure III: World map showing the geographic location of the three classes of countries identified in the LCA model

Note. Countries or regions marked in light grey (Greenland, Benin, Western Sahara, Svalbard, and Jan Mayen) were not included in the LCA

7. Using Profiles for Identifying Future Educational Challenges and Making Recommendations

In this section I discuss the profiles that emerged from the LCA and their implications for planning educational policy. The above analysis can help assess the educational needs of different countries. Because an effective education system provides for the needs of the target group (Steyn and Wolhuter 2000), any changes in the demographic characteristics of the population, such as number, distribution, and migration, must be translated into changes in the structure and the functions of the system (Maarman, Steyn, and Wolhuter 2006). Many of the future challenges are already affecting education systems (Lopez 2006). Identifying demographic trends has implications for educational policy making in the areas of allocation of resources and recruitment of teaching personnel (Richard 1981).

Group A. This group contains countries with fertility rates that approximate the generational replacement level and with a negative migration rate, for example Turkey and Lebanon. Because such countries will face limited population growth, their policy makers will need to increase the attainment of the school-age population

and maximize its potential of continuing to higher levels of education. Policy makers should focus their efforts on low-income populations and under-represented social groups. In addition, they should seek to raise the level of vocational education and expand the higher education system.

However, in many of these countries we expect to see negative migration. Negative migration is likely to involve individuals who have the potential to be qualified teachers in the future, a situation that can create a severe shortage of teachers and result in a low educator-learner ratio. This will make it difficult for the educational systems to expand and raise the levels of secondary and higher education, and could even hurt primary education. A possible remedy is the involvement of international charitable and non-profit organizations in the provision of national education. Such involvement can stabilize the educational system and compensate for losses in teacher supply due to migration.

At the same time, in these countries we anticipate a growth in the proportion of the population aged 64 and older. This population is projected to double because of an increase in life expectancy. Thus, the needs of the aged population will become more prominent and require educational institutions that can assist in the learning and professionalization of this age group and in second career training (Carr and Komp 2011; Knapper and Cropley 2000). In the last decade, Lebanon established a large number of higher education institutions (40 in total) (Nahas 2009) and Turkey has been advised by the World Bank to increase the number of its public universities (World Bank 2007).

In light of the significant proportion of the dependent youth population, however, projected in these countries, policy makers will be limited in their ability to fund public higher educational institutions and vocational institutions. Therefore policy makers need to expand existing public institutions, which would cost less than creating new ones. Another path of action involves encouraging for-profit educational corporate institutions to operate in the local higher education market or partner with a foreign academic institution in order to reduce costs (Pyvis and Chapman 2007).

Group B. This group contains countries with above-generational replacement fertility rates and a near-zero net migration rate, for example, Guatemala and Kenya. Such countries will show rapid growth in population and have a large percentage of youths. Therefore, in the coming years they will face the challenge of creating an

inclusive mass education system, including the recruitment and training of primary and secondary school teachers, building numerous large school facilities , raising the level of the general and vocational curriculum and pedagogy, and forming student selection and placement mechanisms.

Additionally, the results indicate that the current high proportion of dependents, as manifested in child and elderly dependency ratios, will continue to characterize these countries (an average of 83% total dependency ratio in 2010 and an average of 80% total dependency ratio in 2030). A dependency ratio in this range is considered less than ideal because it places a great burden on adults in the work cycle (File and Kominski 2012; Pagoso and Dinio 2006). Because these demographic challenges are enormous and will need to be addressed in a very short time, and owing to the high dependency ratio with limited resources, shaping a pyramidal education system is more sensible. In a pyramidal system, transferring students to the next level of education is selective, therefore relatively few students proceed from the lower basic level of education to more advanced levels. In such a system, the country must emphasize primary education attainment, which is known to be the most cost-effective and produces the greatest socio-economic return (Barro and Lee 2001). Guatemala, for example, needs to reduce the pre-primary drop-out rate and increase the primary completion rate, which currently stands at 69% (Porta and Laguna 2007). Therefore, in such countries general secondary education must be selective, and students with low academic skills are best placed in vocational and apprenticeship settings.

Note that rapid development of schools is known to occur in areas where the system is already well established (Carron and Châu 1981). Thus, urban areas often become more educated than rural areas. Moreover, socio-economic motives are known to drive more and more people from rural to metropolitan areas (Cohen 1995), therefore promoting education systems in urban areas seems to be the most cost-effective strategy. Because the solutions stated above favor students with better academic and geographic starting points, one of the long-term challenges in such countries is to allocate more resources to promoting students from rural regions, disadvantaged homes, and with learning disabilities. Most important, policy makers in these countries should bear in mind that the quality of the education system is related primarily to the number and the quality of its teachers (McKinsey and Company 2007). A lack of qualified teachers has a negative effect on learning and student

achievements. This problem is central in Kenya because the country suffers from an acute shortage of teachers and the pupil-teacher ratio is 40:1 (UNESCO 2010). Scouting for high-performing education students and offering them support during teacher training, together with high-paying teaching jobs, can help raise the level of the national teaching force. Moreover, proper support for international mobility of teachers can provide an opportunity in coming years (Brown et al. 2010). International teacher mobility "creams off" the more effective, ideological, and devoted teachers (Appleton, Morgan, and Sives 2006). Experienced leading teachers from abroad can teach and can be integrated in the management of teacher training programs. International teacher mobility is currently associated with post-secondary education (Larsen and Vincent-Lancrin 2002), but may expand to other educational levels in the decades to come.

Another long-term challenge is the expansion and development of a large higher education system. The absence of quality higher education institutions can drive academically strong students to migrate abroad and "brain drain" the local store of intellect. Strong local intellectual leadership is necessary to train teachers and other professional knowledge workers.

Group C. This group contains countries with below-generational replacement fertility rate and a positive net migration rate, for example, Germany and Great Britain. According to projections, such countries will have a decrease in school-age population. As increasing the knowledge of the skilled workforce has become more important in developed economies (Anderson 2008), the decreasing school-age population (on average about 10%) may threaten the ability of these countries to expand economically (Coomans 2005). Therefore, policy makers in these countries will face the challenge of increasing the achievement of primary and secondary students, and maximizing the potential of the school-age population to enter higher education. Increasing educational achievement in countries with negative demographic growth is important and should focus especially on under-represented social groups such women and minorities (Coomans 2005). Hodgkinson (2003) showed that over 70% of the variance in national test scores can be predicted by household income. Therefore, much of government investment in education must narrow academic gaps for low-income populations. In addition, in knowledge-oriented societies there is a growing need to raise the level of vocational training (Tessaring and Wannan 2004).

Furthermore, with the increase in life expectancy and growing proportion of the elderly population (which is expected to grow by nearly 80%), lifelong learning and second career training (Carr and Komp 2011; Knapper and Cropley 2000) are becoming more and more relevant. In light of these developments, policy makers must expand the higher education system without lowering its quality.

According to projections, these countries will face small native school-age populations, but immigration can somewhat make up for it and at the same time create challenges related to student diversity. The problems associated with a diverse population of students require policy makers to address issues of poverty among the increased percentages of minorities and immigrants (Lopez 2006). As a result, massive government investment is needed to eliminate academic gaps linked to socio-economic status (Hodgkinson 2003). Currently a large percentage of students with ethnic and racial backgrounds is failing to complete high school and continue to higher education (Lopez 2006). Therefore, additional academic support is needed to close the gaps, mainly at the primary school level. Whereas academic support depends mainly on the availability of resources and on the allocation formula, at present cultural and the social challenges seem to need more public debate and additional research.

In view of statements by the German Chancellor (BBC 2010) and the British Prime Minister (BBC 2011) that multiculturalism has failed, policy makers must focus on innovative ways to assimilate new immigrants. Scholars have addressed the difficulty of maintaining multicultural identity and at the same time promoting national assimilation (Hornsey and Hogg 2000), but have not produced an alternative applicable model. In many multicultural societies in which the state attempts to promote citizenship through education, it is making the educational arena a field for power struggle (Torres 2011). Producing successful integrative multicultural models that promote social integration and at the same time allow immigrants to preserve their ethnic and cultural heritage will be one of the central social and educational challenges of such countries in the coming years.

Moreover, teacher education and development programs must prepare teachers to teach in diversified classes (College Board 2005). In particular, it is recommended to encourage qualifying more minority teachers to whom minority children can relate more easily as role models (Dworkin 1980; Yates 1988).

High educator-learner ratio, due to relatively high fertility in the past, may enable small-group and one-on-one tutoring that can boost achievement. But the projected demographic change in the ratio between children and elderly populations may lead to a shift in the balance of public support between the groups that are generally dependent on public resources (Siegel 2001; Yates 1988). For example, if the proportion of youths in the population is reduced, it is possible that budgetary investment in primary and secondary education will decrease also. As teacher salaries make up the major share of the education budget (OECD 2011), it is possible that the teaching force will be downsized, reducing the educator-learner ratio. At the same time, as life expectancy, leisure time, and civil society involvement expand, adult and elderly volunteering (Hinterlong et al. 2006) appear to be an option likely to compensate for such downsizing. Policy makers should design specific training programs aimed at those who pursue teaching as a second career (Tigchelaar, Brouwer, and Vermunt 2010).

Table IV below presents a comparison of future educational challenges and recommendations in various demographic settings.

Table IV: Comparison of various demographic settings by future educational challenges and recommendations

	Group A	**Group B**	**Group C**
Primary education	❖ Narrowing of academic gaps ❖ Emphasis on increasing attainment	❖ Compulsory mass primary education system	❖ Emphasis on one-on-one and small-group teaching ❖ Narrowing of academic gaps ❖ Allocation formula that favors low socioeconomic status groups

	Group A	Group B	Group C
Secondary education	❖ Elevating the level of vocational education ❖ Emphasis on maximizing achievement	❖ Selective general education system ❖ Large inclusive vocational education system	❖ Elevating the level of vocational education ❖ Emphasis on maximizing achievements ❖ Allocation formula that favors low socioeconomic status groups
Higher education	❖ Expanding higher education institutions and the higher education system	❖ Expanding the higher education system in the long term ❖ Developing local intellectual leadership and preventing "brain drain"	❖ Expanding higher education institutions and the higher education system ❖ Financial aid packages in higher education directed at low socioeconomic status groups
Human resources	❖ Possible loss of qualified teachers and potential teachers due to migration ❖ Involvement of international charitable and non-profit organizations can stabilize the system	❖ Scouting for high performance students for teaching positions ❖ Rapid, quality training of principals and teachers ❖ Encouraging international teacher mobility	❖ Possible downsizing of the teaching force ❖ Teacher training programs for second careers and elderly volunteers ❖ Including multicultural instruction methods in teacher training ❖ Increasing minority representation of teachers

8. Conclusion

The present paper aimed to describe and analyze demographic predictions in a multidimensional approach utilizing key elements that are known to shape educational policy challenges. The typology suggested made it possible to identify various settings and the manner in which they produce future educational policy challenges. Note that countries already face some of the challenges following from their changing demographic patterns, similarly to the way in which it was presented in this paper; but according to demographic projections, the magnitude and complexity of these challenges will increase rapidly.

The present study is innovative in several ways: (a) it suggests a multidimensional approach for measuring social complexity and classifying countries in international policy analysis; (b) it suggests a social complexity typology as the basis for recommendations in the area of social services provision, which can be significant not only for policy makers in the field of education but also in other social services; (c) it bases the typology on future demographic projections. The advantages of using future demographic scenarios in social services planning lie in their ability to contribute to the policy makers' long-term perspective. Such a perspective can enable them to set agendas and priorities that will instigate the changes required in their countries to produce a leading education system 20, 30, and 40 years from now.

Most, if not all international typologies suffer from the same limitation, as they do not take into account regional variations in the national context. The central indications in the current typology, fertility and migration rates, can change dramatically between regions because of social, economic, and geographic variables (Mosher and Bachrach, 1996; van der Gaag and van Wissen, 2001). But in contrast with other international classifications, the strength of the current typology lies in its sound theoretical grounding and in its analytical method, making it applicable to analysis of national contexts (provided that data and projections at the national level are available).

Furthermore, the policy recommendations based on this kind of international typology may be used especially in centralized governance systems. As more and more individuals are concentrated in urban areas and form large metropolitan areas,[6] the nature of decentralized governance changes and becomes less decentralized. History has taught us that when faced with important social challenges, such as economic depression, war, or immigration waves, countries (even those with a

decentralized tradition) assume authority in a centralistic manner in order to address the problems at hand.

Attempting to predict the future is problematic for many reasons. One of the major limitations of planning scenarios lies in the difficulty to formulate basic assumptions (Keepin and Wynne 1984). Critical reflection is therefore required. Most of the current demographic projections are based on several baseline assumptions (Cohen 2001; Federal Statistical Office 2006; United Nations 2011): (a) birth rates in more developed regions will remain low and in less developed regions will remain high; (2) the average life expectancy of world population will increase; (3) the rates of net migration to more developed areas will remain similar to current ones. Numerous external factors, however, can change these demographic projections, including wars, diseases, human and natural disasters (Cohen 2001), government policies (Bongaarts 1994), and others.

Note further that in addition to these factors, other changes may occur in the next decades in the nature of state government and services and of schooling itself. Such changes have the potential of rendering the challenges described in the present paper irrelevant. For example, making schooling a distance-learning and Internet-based experience will narrow the part of schooling in socialization and culturization and enable greater student access to quality teaching. Nevertheless, it is the policy makers' role now to make decisions about the future, which in many cases is uncertain. To do so, they must seek to obtain sufficient data to make informed and educated decisions. Demographic patterns and future trends are highly productive, relatively stable, and more often than not play out as projected. Using demographic projections to formulate current and future strategy can give policy makers a better perspective on what lies ahead and on issues that are important. Further public debate and academic research are required to conceptualize future challenges and to test solutions to those challenges empirically.

[1] World Bank website at http://data.worldbank.org/about/country-classifications

[2] United Nations website at http://unstats.un.org/unsd/methods/m49/m49regin.htm#ftnc

[3] PISA website at http://pisa2009.acer.edu.au/multidim.php

[4] United Nations website at http://data.un.org/

[5] Net migration rate is calculated as the difference between immigrants and emigrants of an area during one year per 1,000 inhabitants. As such, it represents the contribution of migration to the overall level of population change. A net migration rate of 1 translates approximately into an additional 2% of migrants to the native population after 20 years.

[6] For example, the Tokyo metropolitan area contains a quarter of population of Japan, the Buenos Aires metropolitan area contains more than a third of Argentina's population, and the Cairo metropolitan area contains 20% of Egypt's population (Forstall, Greene and Pick 2004).

References

Anderson, R. (2008). Implications of the information and knowledge society for education. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education*. (pp. 5-22). New York: Springer.

Appleton, S., Morgan, W.J. & Sives, A. (2006). Should teachers stay at home? The impact of international teacher mobility. *Journal of International Development*, 18, 771-786.

Barro, R.J. & Lee, J.W. (2001). International Data on Educational Attainment, Updates and Implications. *Oxford Economic Papers*, 53, 541-563.

BBC (2010, October 17). Merkel says German multicultural society has failed. *BBC*. Available at: http,//www.bbc.co.uk/news/world-europe-11559451

BBC (2011, February 5). State multiculturalism has failed, says David Cameron. *BBC*. Available at: http,//www.bbc.co.uk/news/uk-politics-12371994

Bloom, D., Canning, D. & Sevilla, J. (2003). *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*. RAND.

Bollen, K. A. (2002). Latent variables in psychology and the social sciences. *Annual Review of Psychology, 53*, 605– 634.

Bongaarts, J. (1994). Population policy options in the developing world. *Science,* 263, 771–776.

Brown, A., Dashwood, A., Lawrence, J. & Burton, L.J. (2010).'Crossing over', strategies for supporting the training and development of international teachers. *The International Journal of Learning,* 17(4), 321-334.

Bützer, M. (2007). Civic engagement and uncontrolled ballot votes: Evidence from Swiss cities. *Local Government Studies, 33*(2), 215-236.

Capps, R., Fix, M., Murray, J., Ost, J., Passel, J. & Herwantoro, S. (2005). *The new demography of America's schools, Immigration and the No Child Left Behind Act*. Washington, DC: Urban Institute.

Carr, D. & Komp, K. (2011). Gerontology in the era of the third age, New challenges and new opportunities. Introduction. In D.Carr & K. Komp (Eds.), *Gerontology in the Era of the Third Age*. New York: Springer.

Carron, G. & Châu, T.N. (1981). *Regional Disparities in Educational Development*. Paris: UNESCO, International Institute for Educational Planning.

Châu, T.N. (2003). *Demographic Aspects of Educational Planning*. Paris: UNESCO, International Institute for Educational Planning.

Clatworthy, J., Buick, D., Hankins, M., Weinman, J. & Horne, R. (2005). The use and reporting of cluster analysis in health psychology, A review. *British Journal of Health Psychology*, 10(3), 329-358.

Cohen, J. (1995). *How Many People Can the Earth Support?* New York: W. W. Norton and Company.

Cohen, J. (2001).World population in 2050, Assessing the projections. In J.S. Little & R.K. Triest (Eds.), *Seismic shifts, The economic impact of demographic change* (pp. 83-113). Boston: Federal Reserve Bank of Boston.

College Board (2005). Impact of demographic changes on higher education. Summary of conference discussions. Available at: http,//www.collegeboard.com/prod_downloads/highered/de/ed_summary.pdf

Coomans, G. (2005). *The demography/education squeeze in a knowledge based economy 2000-2050*. Available at: http,//fiste.jrc.ec.europa.eu/pages/documents/eur21573en.pdf

Dworkin, A. (1980). The changing demography of public school teachers, Some implications for faculty turnover in urban areas. *Sociology of Education,* 53(2), 65-73.

Federal Statistical Office (2006). *Germany´s population by 2050, Results of the 11th coordinated population projection*. Wiesbaden, Statistisches Bundesamt.

File, T. & Kominski, R. (2012). *Dependency Ratios in the United States: A State and Metropolitan Area Analysis*. United States Census Bureau.

Forstall, R.L., Greene, R.P., & Pick J.B. (2004). Which are the largest? Why published populations for major world urban areas vary so greatly. Paper presented in the City Futures Conference, University of Illinois at Chicago.

Frey, W.H. (2009). Immigration and the Coming "Majority Minority". Available at: http://www.brookings.edu/opinions/2009/1218_immigration_frey.aspx

Harpaz, Y. (2010). Conflicting logics in teaching critical thinking. *Inquiry*, 25(2), 5-17.

Hinterlong, J., Tang, F., McBride, A.M., & Danso, K. (2006). Issues in elder service and volunteerism worldwide, Toward a research agenda. In L.B. Wilson & S.P. Simson (Eds.), *Civic engagement and the baby boomer generation,*

Research, policy, and practice perspectives (pp. 213-246). New York: Haworth Press.

Hodgkinson, H.L. (1985). *All one system, Demographics of education, kindergarten through graduate school*. Washington, DC: Institute for Educational Leadership.

Hodgkinson, H.L. (2003). *Leaving too many children behind, A demographer's view on the neglect of America's youngest children*. Washington, DC: Institute for Educational Leadership.

Hornsey, M.J. & Hogg, M.A. (2000). Assimilation and diversity, An integrative model of subgroup relations. *Personality and Social Psychology Review,* 4, 143–156.

Kahn, H. & Wiener, A.J. (1967). *The year 2000, a framework for speculation on the next thirty-three years*. New York: Macmillan.

Kangas, O., & Ritakallio, V-M. (1998). Different methods - different results? Approaches to multidimensional poverty. In H-J Andreβ (Ed.). *Empirical poverty research in a comparative perspective* (pp. 167 - 203). Great Britain: Ashgate.

Keepin, B. & Wynne, B. (1984). Technical analysis of IIASA energy scenarios. *Nature,* 312, 691–695.

Kelly, D., & Smith, C. (2011). *Bayesian Inference for Probabilistic Risk Assessment: A Practitioner's Guidebook*. London: Springer.

Kintner, H, & Pol, L. (1996). Demography and Decision Making. *Population Research and Policy Review*, 15 (5/6), 579-584.

Knapper, C. & Cropley, A.J. (2000). *Lifelong Learning in Higher Education*. London: Kogan Page.

Larsen, K. & Vincent-Lancrin, S. (2002). International Trade in Educational Services, Good or Bad?. *Higher Education Management and Policy,* 14(3), 9-45.

Lindley, D.V. (1985). *Making Decisions, 2nd ed*. New York: Wiley.

Livi-Bacci M. (2001). *A Concise History of World Population, An Introduction to Population Processes, 3rd ed*. Oxford, UK: Blackwell.

Lopez, J.K. (2006). The Impact of Demographic Changes on United States Higher Education 2000-2050. Available at: http.//www.sheeo.org/pubs/demographics-lopez.pdf

Lutz, W. (Ed.) (1991). *Future Demographic Trends in Europe and North America: What Can We Assume Today?* London: Academic Press.

Lutz W. (Ed.) (1996). *The Future Population of the World: What Can We Assume Today?* London: Earthscan Publications Ltd, IIASA.

Lutz, W., & KC, S. (2011). Global human capital: Integrating education and population. *Science*, 333, 587-592.

Lutz, W., Goujon, A., & Doblhammer-Reiter, G. (1998). Demographic Dimensions in Forecasting: Adding Education to Age and Sex. In W. Lutz, W. Vaupel, & D. A. Ahlburg (Eds.), *Frontiers of Population Forecasting, Supplement to Population and Development Review 24* (pp. 42-58). New York: Population Council.

Maarman, R., Steyn, E. & Wolhuter, C. (2006). Optimal demographic information for policy development in the South African education system. *South African Journal of Education,* 26(2), 295–304.

Marida, K.V., Kent, J.T. & Bibby, J.M. (1979). *Multivariate analysis*. London: Academic Press.

May, G. (1996). *The future is ours, Forecasting, managing and creating the future*. Westport, Connecticut: Praeger.

McKinsey and Company (2007). How the World's Best-performing School Systems Come Out on Top. Available at: http,//www.mckinsey.com/clientservice/socialsector/resources/pdf/Worlds_School_Systems_Final.pdf

Moisio, P. (2004). A latent class application to the multidimensional measurement of poverty. *Quantity and Quality-International Journal of Methodology, 38*(6), 703-717.

Mosher, W.D., & Bachrach, C.A. (1996). Understanding U.S. fertility: continuity and change in the national survey of family growth, 1988-1995. Family Planning Perspectives, 28(1).

Muthen, B.O. (2002). Beyond SEM, General latent variable modeling. *Behaviormetrika*, 29, 81-117.

Nahas, C. (2009). Financing and Political Economy of Higher Education in Lebanon. Available at: http://charbelnahas.org/textes/Economie_et_politiques_economiques/HigherEducationFinancing-Lebanon.pdf

OECD (2000). *Positioning secondary school education in developing countries*. Paris: OECD.

OECD (2002). *Trends in international migration*. Paris: OECD.

OECD (2011). *Education at a Glance 2010, OECD Indicators*. Paris: OECD.

Pagoso, C. M. & Dinio, R. P. (2006). *Labor Economics*. Rex Book Store Inc.

Peterson, G.D., Cumming, G.S. & Carpenter, S.R. (2003). Scenario planning, a tool for conservation in an uncertain world. *Conservation Biology,* 17, 358-366.

Pool, I. (2007). Demographic Dividends: Determinants of Development or Merely Windows of Opportunity? *Ageing Horizons*, 7, 8-35.

Pool, I. & Wong, L. (2006). Age-structural Transitions and Policy: An Emerging Issue. In I. Pool, L.R. Wong, & E. Vilquin (Eds), *Age-Structural Transitions: Challenges for Development,* pp.3–19. Paris: CICRED.

Porta, E. & Laguna J.R. (2007). *Guatemala- Country case study*. Paris: UNESCO. Available at: http://unesdoc.unesco.org/images/0015/001555/155575e.pdf

Pyvis, D, & Chapman, A. (2007). Why university students choose an international education: A case study in Malaysia. *International Journal of Educational Development*, 27, 235-46.

Raach, A.W. (2005). *A Bayesian semiparametric latent variable model for binary, ordinal and continuous response*. Doctoral thesis, Ludwig-Maximilians-Universität.

Ragin, C. (1989). *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley and Los Angeles: University of California Press.

Richard, I. (1981). The impact of demographic change on education systems in the European community. *European Journal of Education,* 16, 275-285.

Ringland, G. (2002). *Scenarios in Public Policy*. West Sussex, UX: Wiley.

Ross, M. H. (1981). Socioeconomic Complexity, Socialization, and Political Differentiation: A Cross-Cultural Study. *Ethos, 9*, 217–247.

Shrestha, L.B. (2006). *The changing demographic profile of the United States*. Washington, DC: Congressional Research Service.

Siegel, J. (2001). *Applied Demography, Applications to Business, Government, Law and Public Policy*. New York: Academic Press.

Sleebos, J.E. (2003). *Low fertility rates in OECD countries, Facts and policy responses*. Paris: OECD.

Spiegelhalter, D.J., Best, N.G., Carlin, B.P., & van der Linde, A. (2002). Bayesian measures of model complexity and fit. *Journal of the Royal Statistical Society,* 64(4), 583-639.

Steyn, H.J. & Wolhuter C.C. (2000). The education system and probable societal trends of the twenty-first century. In H.J. Steyn & C.C. Wolhuter (Eds.), *Education systems of Emerging countries, challenges of the 21st century*. Noordbrug: Keurkopie.

Tessaring, M. & Wannan, J. (2004). *Vocational Education and Training, Key to the Future*. Thessaloniki: CEDEFOP.

Thompson, D.M. (2007). Latent class analysis in SAS, Promise, problems, and programming. Paper 192. Available at: http,//www2.sas.com/proceedings/forum2007/192-2007.pdf

Tigchelaar, A., Brouwer, N. & Vermunt, J. (2010). Tailor-made, Towards a pedagogy for educating second-career teachers. *Educational Research Review,* 5, 164–183.

Torres, C.A. (2011). Education, Power, and the State, Dilemmas of Citizenship in Multicultural Societies. In H.A. Alexander, H. Pinson & Y. Yonah (Eds.), *Citizenship, Education, and Social Conflict, Israeli Political Education in Global Perspective*. Jerusalem: The Van Leer Jerusalem Institute.

UNESCO (2002). *Education for All: Is the World On Track?* Paris: UNESCO.

UNESCO (2010). *World Data on Education- Kenya.* Paris: UNESCO. Available at: http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/Kenya.pdf

United Nations (1966). *World Population Prospects as Assessed in 1963*. New York: Department of Economic and Social Affairs.

United Nations (1974). *Report of the United Nations World Population Conference, Bucharest, 19-30 August 1974*. New York: United Nations Population Fund.

United Nations (1988). *World population prospects: 1988*. New York: Department of International Economic and Social Affairs.

United Nations (2011). *World Population Prospects: The 2010 Revision. Highlights and Advance Tables*. New York: United Nations Population Division. Available at: http://esa.un.org/wpp/Documentation/pdf/WPP2010_Highlights.pdf

Van der Gaag, N. & Van Wissen, L. (2001). Determinants of the subnational distribution of immigration. *Journal of Economic and Social Geography*, 92(1), 27–41.

Walker, W.E., Harremoe ¨s, P., Rotmans, J., van der Sluijs, J.P., van Asselt, M.B.A, Janssen, P. & Krayer von Krauss, M.P. (2003). Defining uncertainty, a conceptual basis for uncertainty management in model-based decision support. *Integrated Assessment,* 4, 5-18.

Whelan, C.T, & Maître, B. (2005). Vulnerability and Multiple Deprivation Perspectives on Economic Exclusion in Europe: A Latent Class Analysis. *European Societies, 7*(3), 423-450.

World Bank (1990). *Primary Education. A World Bank Policy Paper*. Washington, D.C.: World Bank.

World Bank (1995). *Priorities and Strategies for Education. A World Bank Review*. Washington, D.C.: World Bank.

World Bank (1999). *Education Sector. Strategy Paper*. Washington, D.C.: World Bank.

World Bank (2001). *Hidden Challenges to Education Systems in Transition Economies*. Washington, D.C.: World Bank.

World Bank (2004). *Determinants of Primary Education Outcomes in Developing Countries*. Washington, D.C.: World Bank.

World Bank (2007). *Turkey – Higher Education Policy Study. Volume I: Strategic Directions for Higher Education in Turkey.* Washington, D.C.: World Bank.

Yates, J.R. (1988). Demography as it affects special education. In A. Ortiz & D. Ramirez (Eds.), *Schools and the culturally diverse exceptional student, Promising practices and future directions*. Reson, Virginia: Council for Exceptional Children.

Yousif, H. M., Goujon, A., & Lutz, W. (1996). *Future Population and Education Trends in the Countries of North Africa. Research Report RR-96- 11*. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Appendix: Clustering classification

Final cluster	Country
A	Algeria
A	Argentina
A	Azerbaijan
A	Bahamas
A	Bahrain
A	Bangladesh
A	Belize
A	Bhutan
A	Bolivia
A	Botswana
A	Brazil
A	Brunei Darussalam
A	Cambodia
A	Cape Verde
A	Colombia
A	Costa Rica
A	Dem. People's Rep. of Korea
A	Dominican Republic
A	Ecuador
A	Egypt
A	El Salvador
A	Fiji
A	French Guiana
A	French Polynesia
A	Gabon
A	Grenada
A	Guam
A	Guyana
A	Haiti
A	Honduras
A	India
A	Indonesia
A	Iran (Islamic Republic of)
A	Israel
A	Jamaica
A	Jordan
A	Kazakhstan

Final cluster	Country
A	Kuwait
A	Kyrgyzstan
A	Lao People's Dem. Republic
A	Lebanon
A	Libyan Arab Jamahiriya
A	Malaysia
A	Maldives
A	Mexico
A	Micronesia (Fed. States of)
A	Mongolia
A	Morocco
A	Myanmar
A	Nepal
A	New Caledonia
A	Nicaragua
A	Oman
A	Panama
A	Paraguay
A	Peru
A	Philippines
A	Qatar
A	Saint Lucia
A	Saint Vincent and the Grenadines
A	Samoa
A	Saudi Arabia
A	South Africa
A	Sri Lanka
A	Suriname
A	Syrian Arab Republic
A	Tonga
A	Tunisia
A	Turkey
A	Turkmenistan
A	United Arab Emirates
A	Uzbekistan
A	Venezuela
A	Viet Nam

Final cluster	Country
B	Afghanistan
B	Angola
B	Benin
B	Burkina Faso
B	Burundi
B	Co´te d'Ivoire
B	Cameroon
B	Central African Republic
B	Chad
B	Comoros
B	Congo
B	Dem. Rep. of the Congo
B	Djibouti
B	Equatorial Guinea
B	Eritrea
B	Ethiopia
B	Gambia
B	Ghana
B	Guatemala
B	Guinea
B	Guinea-Bissau
B	Iraq
B	Kenya
B	Lesotho
B	Liberia
B	Madagascar
B	Malawi
B	Mali
B	Mauritania
B	Mayotte
B	Mozambique
B	Namibia
B	Niger
B	Nigeria
B	Occupied Palestinian Terr.
B	Pakistan
B	Papua New Guinea
B	Rwanda

Final cluster	Country
B	Sao Tome and Principe
B	Senegal
B	Sierra Leone
B	Solomon Islands
B	Somalia
B	Sudan
B	Swaziland
B	Tajikistan
B	Timor-Leste
B	Togo
B	Uganda
B	United Republic of Tanzania
B	Vanuatu
B	Yemen
B	Zambia
B	Zimbabwe

Final cluster	Country
C	Albania
C	Armenia
C	Aruba
C	Australia
C	Austria
C	Barbados
C	Belarus
C	Belgium
C	Bosnia and Herzegovina
C	Bulgaria
C	Canada
C	Channel Islands
C	Chile
C	China
C	China, Hong Kong SAR
C	China, Macao SAR
C	Croatia
C	Cuba
C	Cyprus

Final cluster	Country
C	Czech Republic
C	Denmark
C	Estonia
C	Finland
C	France
C	Georgia
C	Germany
C	Great Britain
C	Greece
C	Guadeloupe
C	Hungary
C	Iceland
C	Ireland
C	Italy
C	Japan
C	Latvia
C	Lithuania
C	Luxembourg
C	Malta
C	Martinique
C	Mauritius

Final cluster	Country
C	Montenegro
C	Netherlands
C	Netherlands Antilles
C	New Zealand
C	Norway
C	Poland
C	Portugal
C	Puerto Rico
C	Republic of Korea
C	Republic of Moldova
C	Romania
C	Russian Federation
C	Serbia
C	Singapore
C	Slovakia
C	Slovenia
C	Spain
C	Sweden
C	Switzerland
C	TFYR Macedonia
C	Trinidad and Tobago
C	Ukraine
C	Thailand
C	United States of America
C	United States Virgin Islands
C	Uruguay