CONVERGENCE PROCESSES IN DEVELOPING COUNTRIES' POPULATIONS AND THE ROLE OF FAMILY PLANNING COMMITMENTS

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1. INTRODUCTION

We live in a world that is politically and economically influenced by demographic issues. The imbalance between poor and rich world's populations, their own different structural characteristics – very young or very old – along with the considerable immigration waves from countries that are facing demographic and economic transition, for example, contribute in fueling the international political debate, with often no real perception of the demographic dimension of the themes at stake.

The recent events occurred on the Southern bank of the Mediterranean cannot be understood if, for example, we don't take into account the young structure of the Egyptian population that has a median age of 24 years. This has directly or indirectly influenced the social and economical evolution of the country, creating at the same time some strained situations within the generations overlooking adulthood and the labor market.

Such a process, not only has to do with African countries: 95% of the latest 25-year old cohorts, still lives in poor countries, a billion being between 15 and 24 and another 1.8 billion even younger.

TABLE 1

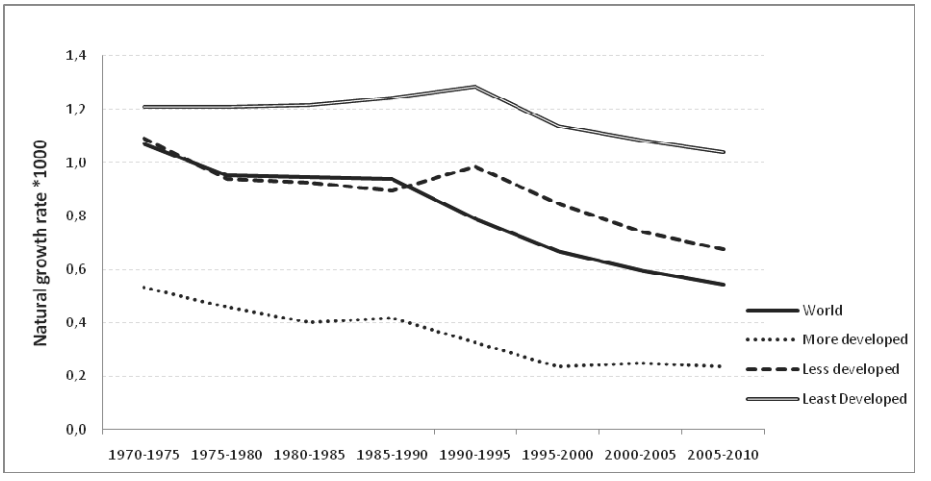
World population by economic development and major area, 1960-2050 (thousands)

	Population			Increase (%)	
	1960	2010	2050	1960-2010	2010-2050
World	3,038.4	6,895.9	9,306.1	127.0	35.0
More developed countries	913.3	1,235.9	1,311.7	35.3	6.1
Less developed countries	2,125.1	5,660.0	7,994.4	166.3	41.2
Of which, least developed	243.7	832.3	1,726.5	241.5	107.4
Africa	286.7	1,022.2	2,191.6	256.5	114.4
Asia	1,707.7	4,164.3	5,142.2	143.9	23.5
Latin America & Caribbean	220.1	590.1	751.0	168.1	27.3
North America	204.3	344.5	446.9	68.6	29.7
Oceania	15.8	36.6	55.2	131.6	50.8
Europe	603.9	738.2	719.3	22.2	-2.6
World	3,038.4	6,895.9	9,306.1	127.0	35.0
More developed countries	913.3	1,235.9	1,311.7	35.3	6.1
Less developed countries	2,125.1	5,660.0	7,994.4	166.3	41.2

Source: United Nations, Department of Economic and Social Affairs, Population Division (2011).

The world's demographic landscape has radically changed over the past decades. The world's population, that consisted of one billion of inhabitants at the beginning of 1800, is now seven times larger. It took more than a century to double that first billion, yet the following figures have come faster and faster, until the time gap only lasted twelve years, the intervening period between the fifth (reached in 1987) and the sixth billion (reached in 1999). The new millennium is still characterized by growth – never below the doorstep of 80 million people – with an increase speed equal to two people and an half per second or, in other words, doubling Argentina's population within a year or filling up twelve US basket stadiums in a single day. According to the most recent predictions of the United Nations, depending on such dynamics the Earth will host around ten billion people in 2050 with an increase – estimated as from today – equal to the population amount of the previous century.

The world's population is bound to triple by the middle of the present century[1], yet the interest in the consequences of such a growth is decidedly held down, as it shows itself in conjunction with an unquestionably positive signal: the reduction of growth speed.



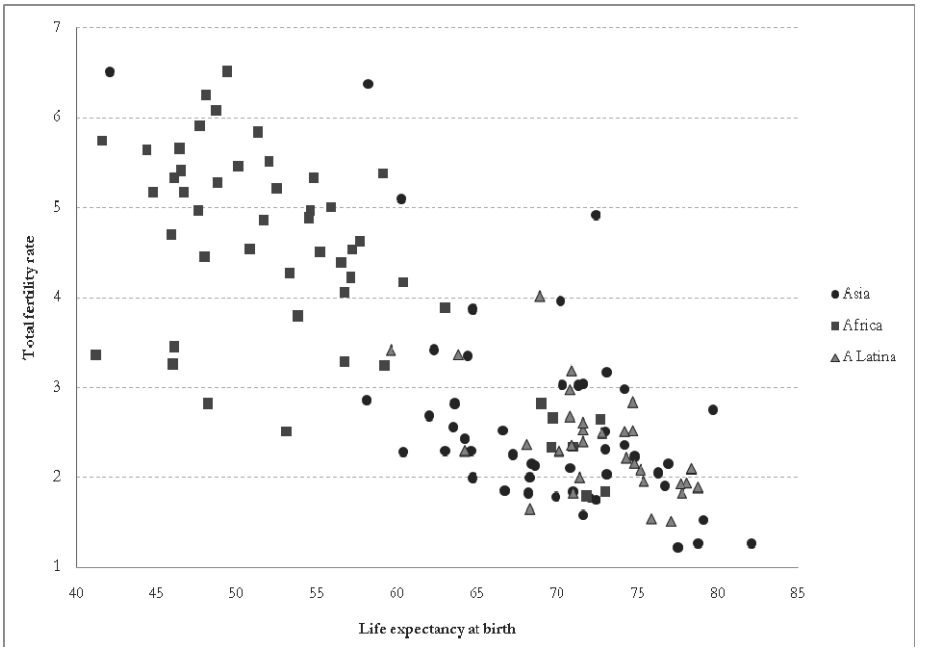
Picture 1 – Natural growth rates according economic development, 1970-2010 (medium variant).
Source: United Nations, Department of Economic and Social Affairs, Population Division (2011).

As a matter of fact, from the second half of the 1980s onward, the growth rate first reduced in high-income countries and then in the others, basically dragged down by fertility decline. The present growth rate is mainly due to the inertial effect of demographic processes, the so called population *momentum*, a circumstance caused by the still high number of fertile generations, who still give rise to numerous groups, notwithstanding their demand for children is lower than the previous cohorts.

[1] The latest UN Prospect estimates that world population will reach ten billions within 2100. See World Population Prospect - The 2010 Revision, Press Release 3/5/2011.

The generations in reproductive ages nowadays have been basically determined by the different decline speeds of fertility and mortality. The life expectancy at birth has increased by twenty-one years between 1950 and the present, with lesser rates in high-income countries (eleven years), whose conditions at the time were more favorable. Much more important is the level achieved by developing countries – six months a year for a total of twenty-four – even though the *last comers* of demographic transition had gained five years less approximately. Fertility too has decreased, thus reaching by the 1970s the replace level in high-income countries, while in the poor ones such a decrease started later and at a slower rate.

The graphic representation of the main demographic parameters gives a rather clear idea of both unevenness among countries and the processes at stake. No one of the high-survival rate countries has high fertility and there are countries with low survival rate and high fertility. These positions are understandable within the framework of demographic transition. However, it turns much more interesting to observe that for a large group of countries the relationship between the two dimensions is insubstantial, as – although their fertility level stands within the interval from two to three children – they show differences of up to twenty years in life expectancy at birth. Such heterogeneity is due to the peculiarity of the political action in each country, to which the strategies of birth control belong as well.



Picture 2 – Fertility and survival in developing countries by major area, 2010.
Source: United Nations, Department of Economic and Social Affairs, Population Division (2011).

Towards the end of the 1960s – before the adoption of the First World Population Plan of Action in 1974 – several countries have undertaken the path of birth control programs. Regarded as useless by some, essential for others, such plans turned out to be among the most important policies in the last seventy years. The starting timing and the strategies undertaken have been different, based on those ideological or cultural prejudices which are well shown in the world's conferences held every decade from 1974 onward. The suspicion aroused in poor countries that birth control would serve as a way to re-establish the prewar international order caused contrasts between the socialist anti-malthusian coalition and the capitalist one. Later on this ideological opposition gave way to the one between liberalism and dirigism approaches, with the former backing the development of economy as the most effective way to slow population growth down within the poor world. The laissez-faire policy had to be replaced ten years later in Cairo by a new approach, according to which individuals and their rights represent the hub of any political action. The rephrasing of political strategies according to such an individual-based approach had the result to marginalize demographic issues, only proposed if connected to the goal of individual rights satisfaction (Micheli, 2010).

Yet, birth control is more than ever a relevant issue due to its positive effects on poverty reduction, health improvement and preservation of ecosystems, without saying that population control could make more likely to realize the eight Millennium Development Goals.

The marginalization of demographic questions has been fueled also by academic debates. Many scholars tried to demonstrate that birth control has a marginal impact on the system since contraception doesn't increase if a demand of limit birth hasn't already played out, and the costs are too much higher than corresponding benefits and above all the majority of marginalized populations are often excluded from such policies, although they would be the ones more in need of support. Others, on the other hand, supported the idea that family planning programs played an important role on fertility decline. This should be confirmed by the fact that the decrease of attention on population control – also in donors and financing – slowed fertility decline in a number of countries, undermining population projections, as minor variations in fertility have deep effects on the future size and age structure of populations (Boongarts, 2006 and 2008).

The present contribute describes the different paths of worldwide convergence processes during the last 15 years by means of socioeconomic dimensions in about one hundred of poor countries – representing 80% of the world's population – to different degrees of development at the middle of nineties. The description of the main dimensions affecting the most important changes and how they have taken place in the last 15 years will be discussed together with the role of family planning programs commitments.

2. FAMILY PLANNING PROGRAMS COMMITMENT

Family planning programs have their crucial prerogative in satisfying the right to reproductive health. Notwithstanding that, if thought with respect to both fertility containment and control, they're defined in connection with the possibility to provide information about contraception and contraceptives' supply.

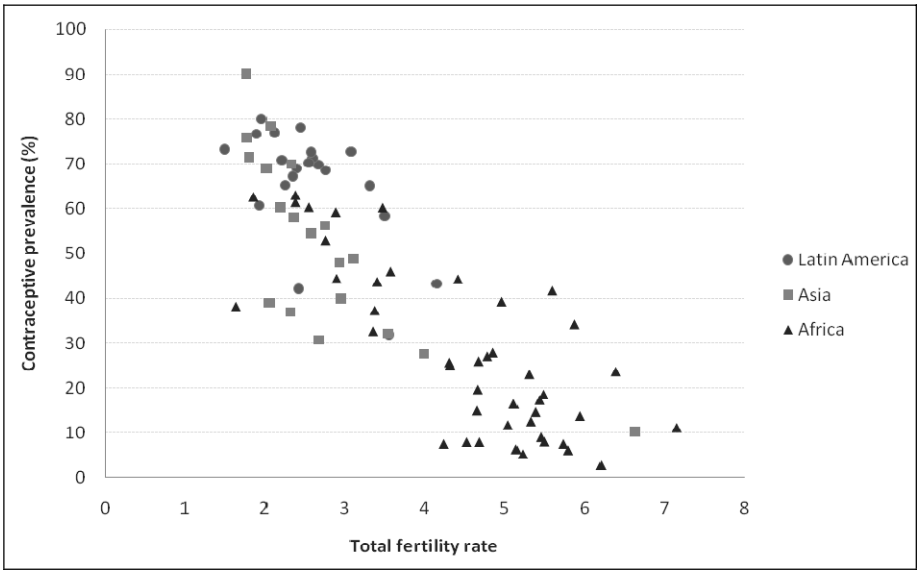
The programs carried out during the last two decades on either a voluntary or coercive basis, in institutionalized or informal ways, share some common traits: legislative and economic support, continuity of actions, the potential to hand down such actions as an improvement of health conditions or a speed-up in the development process. These traits have been summarized by the United Nations in few indicators, so as to compare different national contexts at the beginning of the new century (United Nations, 2002).

First, the government view of fertility level identifies the perception of the overall acceptability of fertility intensity: not satisfactory because too low; satisfactory; and not satisfactory because too high. The second indicator regards the Government intervention classified as action to raise, lower or maintain the fertility level. Finally four categories of governmental policy concerning individual fertility behavior were adopted to categorize countries: *(a)* Government limits access to information, guidance and materials in respect of modern methods of contraception; *(b)* It does not limit access to information, guidance and materials but provides no direct or indirect support for their dissemination; *(c)* Government provides indirect support for the dissemination of information, guidance and materials by subsidizing the operating costs of organizations supporting such activities outside the Government's own services. The indirect support may take various forms: direct grants, tax reductions etc; *(d)* It provides direct support for the dissemination of information, guidance and materials within government facilities.

The majority of governments of the examined countries (60%) regard their fertility as high, thus taking into account a proper and consistent action to control it. An even larger percentage of the involved governments directly support the dissemination of information and contraceptives.

Among the countries satisfied with their fertility level, 80% gained replacement level or are almost there. Anyway, the number of countries that still consider their fertility level as too high even if they are very closed to replacement level probably because population increase is perceived as an effect of reproductive attitude rather than the result of the inertia of demographic process.

The contraceptive prevalence and the total fertility rate are deeply connected, as are the political actions in support of contraceptive use. In detail, it can be observed that in almost every country in which the use of contraceptives is low, fertility rate is high. On the contrary, countries where the use of contraceptives is widespread have completed (or are about to complete) their demographic transition.



Picture 3 – Contraceptive prevalence and fertility in developing countries, 2005.

Yet some relevant exceptions still remain. Countries in which, notwithstanding low contraceptive prevalence, the process of demographic convergence has been started off (or it's in an advanced stage). They are Eastern European in the main and have used, more than others, abortion as a contraceptive device.

TABLE 2

Fertility levels and contraceptive prevalence by major area, 2007

	Contraceptive prevalence (%)			
	< 25	25-|50	50-|66	> 66
Fertility below 2.1		5 East Europe, 1 Asia 1 Middle East	3 East Europe, 2 Middle East, 2 Latin America	3 East Europe, 2 Africa, 4 Latin America, 3 Asia
Fertility between 2.1-3.0	1 East Europe	1 Africa, 4 Asia, 2 Middle East	4 East Europe, 2 Latin America, 4 Asia, 3 Middle East, 4 Africa	10 Latin America, 1 Asia
Fertility between 3.1-4.9	4 Africa	9 Africa, 2 Latin America, 1 Asia, 1 East Europe	1 Latin America, 1 Africa	
Fertility 5 or more	1 Asia, 15 Africa, 1 Middle East		4 Africa, 1 Latin America	

Source: Authors elaborations from UN source.

3. DATA AND METHODS

In order to explain if and how transformations have taken place between 1996 and 2010 in the developing world a set of indicators deriving from International

Agencies are used. The selection of countries with a good availability of data led to a fully satisfactory territorial representation of the developing world[2].

TABLE 3

Number of countries and population amount

Areas	Number of countries	% within number of countries	Population covered (thousands, 1996)	% within the sampled population (1996)	Population covered (thousands, 2010)	% within the sampled population (2010)
European Union	4	3.7	30,179	0.6	28,300	0.5
Central/Eastern Europe	6	5.6	279,123	5.9	277,900	4.9
Northern Africa	6	5.6	159,324	3.4	208,600	3.7
Western Africa	13	12.1	207,475	4.4	300,800	5.3
Oriental Africa	13	12.1	215,673	4.6	314,300	5.6
Central/Sothern Africa	10	9.3	130,959	2.8	116,600	2.1
Western Asia	12	11.2	162,680	3.5	218,000	3.9
Central/Southern Asia	11	10.3	1,313,312	27.9	1,678,300	29.7
Oriental Asia	10	9.3	1,721,930	36.6	1,931,200	34.2
Central Sothern America	21	19.6	480,976	10.2	573,700	10.1
Oceania	1	0.9	4,331	0.1	6,800	0.1
Total	107	100.0	4,705,961	100.0	5,654,500	100.0

Source: Authors elaborations from cited source.

The world convergence process is described thru a factor analysis. Each country has been analyzed in two different years to allow the comparison of factor scores for different countries in the same year and for a country in two different points in time[3].

As a conclusion to this analysis an ordinal regression with a logit link function has been performed to value if the pace of changes in economic development and commitment in family planning had both a significant part in the determination of the demographic transition phase.

[2] When data were not available for a specific year an estimation has been provided on the basis of data related to same period years. For the few cases where no information was available in the same five-year period of interest, an imputation was performed via an Expectation Maximization (EM) algorithm after an accurate analysis of missing values patterns.

[3] The value of Kaiser-Meyer-Olkin measure of sampling adequacy for these data is 0.940 and the Bartlett's test of sphericity is highly significant ($p<0.001$) confirms that factor analysis is appropriate for these data. The 3 factors extracted explain the 77.4% of total variance. After varimax rotation the first factor accounts for 35.7% of total variance, the second for 25.0% and the third for 16.6%.

TABLE 4

Variables used in Factor Analysis

Adolescent fertility rate (births per 1,000 women ages 15-19)
Mortality rate, under-5 (per 1,000)
Maternal mortality ratio (modeled estimate, per 100,000 live births)
Mortality rate, infant (per 1,000 live births)
Life Expectancy at Birth, Both Sexes (years)
Total Fertility Rate (TFR)
Contraceptive prevalence - any method (% of women ages 15-49)
Literacy rate, adult total (% of people ages 15 and above)
% of population with access to drinking water
Poverty headcount ratio at $1.25 a day (PPP) (% of population)
Population ages 0-14 (% of total)
Births attended by skilled health staff (% of total)
Rural population (% of total population)
Urban population (% of total)
GDP per capita (current US$)
Malnutrition prevalence, height for age (% of children under 5)
Population ages 65 and above (% of total)
Share of women employed in the nonagricultural sector (% of total nonagricultural employment)
Population growth (annual %)
Distance between actual and replacement-level fertility in 1996 and 2010 [$(TFT_{1996}$-TFT_{2010}/TFT_{1996}-2.1)]

4. POPULATION MATTERS: CHANGES IN THE DEVELOPING WORLD 1996-2010

The Factor Analysis performed on the set of data listed above gave as result the extraction of 3 dimensions. Table 5 shows the factor loadings for each variable onto each factor after rotation. The first factor was therefore labeled as "Demographic and development convergence", the second as "Macroeconomic conditions and deprivation" and the third as "Population structure". A high score on the first factor in one or both years of analysis indicates a severe underdeveloped country with low life expectancy, high mortality, fertility and illiteracy, low contraceptive prevalence. Similarly a high score on the second factor marks a context with high levels of poverty and a traditional agricultural based economy. This dimension is considered in the theory of transition directly connected to the demographic process thru a passage from an agricultural economy to an urban-industrial based structure with a raise of income and improvements in female empowerment (Angeli & Salvini, 2008). High levels on the third factor pertain to areas with fast level of population growth, sustained by a population with a traditional (pre-transitional) population pyramid.

TABLE 5

Rotated component matrix

	Component		
	1	2	3
Adolescent fertility rate (births per 1,000 women ages 15-19)	0.853		
Mortality rate, under-5 (per 1,000)	0.852	0.372	
Maternal mortality ratio (modeled estimate, per 100,000 live births)	0.833	0.369	
Mortality rate, infant (per 1,000 live births)	0.825	0.380	
Life Expectancy at Birth, Both Sexes (years)	-0.795	-0.447	
Total Fertility Rate (TFR)	0.779		0.460
Contraceptive prevalence - any method (% of women ages 15-49)	-0.764		-0.311
Literacy rate, adult total (% of people ages 15 and above)	-0.660		-0.472
% of population with access to drinking water	-0.658	-0.412	
Poverty headcount ratio at $1.25 a day (PPP) (% of population)	0.657	0.564	
Population ages 0-14 (% of total)	0.625	0.323	0.588
Births attended by skilled health staff (% of total)	-0.625	-0.530	-0.323
Rural population (% of total population)		0.902	
Urban population (% of total)		-0.901	
GDP per capita (current US$)		-0.661	
Malnutrition prevalence, height for age (% of children under 5)	0.517	0.596	0.320
Population ages 65 and above (% of total)	-0.323		-0.785
Share of women employed in the nonagricultural sector			-0.782
Population growth (annual %)	0.452		0.734

A first confirmation that a process of demographic and development convergence is actually taking place comes from the analysis of the distributions of first factor scores in the two different moments of observation. The median values of the two distributions show a decrement from a value of -0.23 in 1996 to -0.32 in 2010. Such drop becomes more evident thru indicators more sensitive to extremes value, like the simple mean (-0.28) or the 5% trimmed mean (-0.27). The latter indicator in particular supports the idea that the variation is not due only to extreme values. We detect also a reduction of dispersion, with lower values for indexes as range and interquartile range, variance and standard deviation. The change in the sign of kurtosis means that for 2010 scores more of the variance is the result of infrequent extreme deviations while in 1996 is due to frequent modestly sized deviations. The general trend towards lower scores is also confirmed by the shift of extreme values, in particular of the maximum – which has a decrease of 0.81 – while the lower value shows a variation of -0.33. Moreover the effective change in the values in the two different points in time comes also from the Wilcoxon Signed Ranks test which is significant.

TABLE 6

Distribution of scores for factor 1 – Demographic and development convergence 2010-1996

Factor 1 – Demographic transition 2010		Statistic	Std. Error	Factor 1 – Demographic transition 1996		Statistic	Std. Error
Mean		-0.143	0.087	Mean		0.143	0.104
95% Confidence	Lower Bound	-0.316		95% Confidence	Lower Bound	-0.062	
Interval for Mean	Upper Bound	0.031		Interval for Mean	Upper Bound	0.348	
5% Trimmed Mean		-0.180		5% Trimmed Mean		0.087	
Median		-0.328		Median		-0.231	
Variance		0.820		Variance		10.149	
Std. Deviation		0.905		Std. Deviation		10.072	
Minimum		-10.878		Minimum		-10.551	
Maximum		20.219		Maximum		30.033	
Range		40.097		Range		40.583	
Interquartile Range		10.195		Interquartile Range		10.518	
Skewness		0.708	0.234	Skewness		0.828	0.234
Kurtosis		0.013	0.463	Kurtosis		-0.0159	0.463

As studies on demographic transition point out, is more appropriate to recognize more than one transition path instead of a common process for all countries. If we accept this approach, then it is really important to understand where and why the convergence has been more evident.

TABLE 7

Extreme scores for factor 1 – Demographic and development convergence 2010- 1996

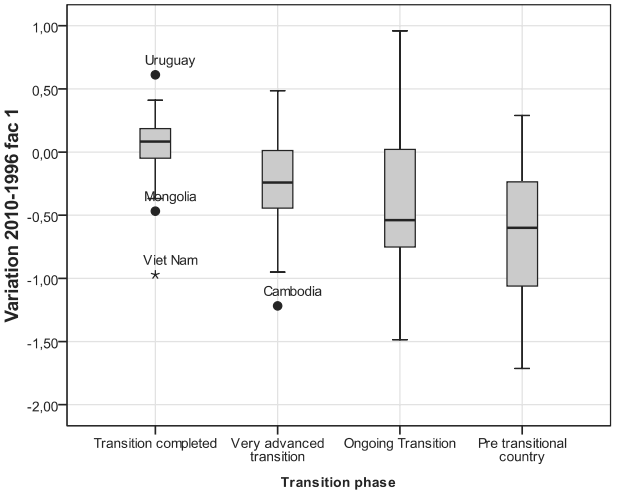
		2010			1996		
		Countries		Value	Countries		Value
Highest	1	Angola	Pre transitional country	2.219	Niger	Pre transitional country	3.033
	2	Chad	Pre transitional country	2.071	Sierra Leone	Pre transitional country	2.851
	3	Mali	Pre transitional country	1.977	Congo	Ongoing transition	2.712
	4	Sierra Leone	Pre transitional country	1.934	Angola	Pre transitional country	2.656
	5	Nigeria	Pre transitional country	1.749	Mali	Pre transitional country	2.405
Lowest	1	Sri Lanka	Very advanced transition	-1.878	Sri Lanka	Very advanced transition	-1.551
	2	Viet Nam	Transition completed	-1.831	Thailand	Transition completed	-1.446
	3	China	Transition completed	-1.541	China	Transition completed	-1.397
	4	Albania	Transition completed	-1.396	Trinidad and Tobago	Transition completed	-1.388
	5	Uzbekistan	Very advanced transition	-1.368	Bosnia Herzegovina	Transition completed	-1.361

Considering the top 5 lowest and highest scores on the first factor for each year of analysis we observe that countries with highest scores are nearly all pre-transitional countries from Sub Saharan Africa whereas lowest scores all pertain to countries where transition is already completed or is very close to be completed. Again, observing the changes in scores between the two moments in time we note that countries with the best performance on the first factor are all pre transitional countries or ongoing transitional, the farthest group to the achievement of the development goals. On the contrary, countries where no changes are recorded are nearly all in a very advanced phase of transition.

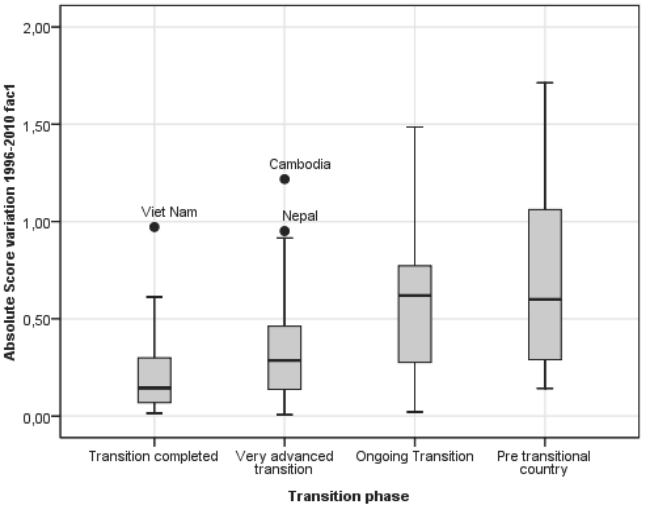
TABLE 8

Absolute difference in scores from years 1996 to 2010 for factor 1 – Demographic and development convergence

		Case Number	Transition phase	Value
Highest absolute difference in scores	1	Rwanda	Pre transitional country	(-) 1.71
	2	Ethiopia	Pre transitional country	(-) 1.63
	3	Niger	Pre transitional country	(-) 1.54
	4	Congo	Ongoing transition	(-) 1.49
	5	Eritrea	Ongoing transition	(-) 1.35
Lowest absolute difference in scores	1	Mexico	Very advanced transition	(+) 0.01
	2	Argentina	Very advanced transition	(-) 0.01
	3	Mauritius	Transition completed	(+) 0.01
	4	Kuwait	Very advanced transition	(+) 0.02
	5	Cote d'Ivoire	Ongoing transition	(+) 0.02



Picture 4 – Score variation 1996-2010 for transition phase Boxplot. Factor 1.



Picture 5 – Absolute Score variation 1996-2010 for transition phase Boxplot. Factor 1.

The phase of demographic transition is very important in order to assess direction and intensity of the variation: pre transitional countries more likely have a negative variation on the score, pointing out a faster pace in the direction of convergence, while ongoing transitional and very advanced transitional countries mark lower changes. Countries that have completed their transitional path can show positive variations probably due to the actual economical crisis that can slightly worsen indicator levels.

The difference in scores variation is definitely linked to the phase of transition. Pre transitional countries show in 2010 a mean score wich is higher than that one registered for ongoing transitional countries in 1996. While in the period of observation very advanced transitional countries reached and scored better than those where transition is completed, the other two groups remain clearly far from them and at different levels of convergence.

TABLE 9

Mean and median scores for factor 1 by transition phase

Transition phase		2010	1996
Transition completed	Mean	-0.695	-0.739
	Median	-0.574	-0.694
	N	27	27
	Std. Deviation	0.545	0.419
Very advanced transition	Mean	-0.647	-0.409
	Median	-0.620	-0.443
	N	36	36
	Std. Deviation	0.439	0.441
Ongoing Transition	Mean	0.217	0.621
	Median	0.061	0.548
	N	22	22
	Std. Deviation	0.718	0.717
Pre transitional country	Mean	0.999	1.651
	Median	0.828	1.615
	N	22	22
	Std. Deviation	0.778	0.772

If we introduce the geographical detail we observe that, within the group of countries where transition is completed, European and Latin American countries show a low raise in scores meaning that, even if fertility is below replacement level, some parameters related to development have slightly worsened. On the other hand Asian countries show a decrease. In the cluster of very advanced transition countries, Northern African countries had the highest mean reduction. In the set of pre transitional and ongoing transition states, where reductions were generally higher, Asian countries had the best performance in both groups.

TABLE 10

Mean scores and reduction for factor 1 by transition phase and area

Transition phase	Area		2010	1996	Var. 2010-1996
Transition completed	European Area	Mean	-0.541	-0.663	0.122
		N	10	10	10
		Std. Dev.	0.426	0.413	0.130
	Asia	Mean	-0.912	-0.795	-0.117
		N	9	9	9
		Std. Dev.	0.575	0.409	0.444
	Central Sothern America	Mean	-0.454	-0.641	0.187
		N	6	6	6
		Std. Dev.	0.613	0.482	0.215
Very advanced transition	Northern Africa	Mean	-1.061	-0.585	-0.475
		N	4	4	4
		Std. Dev.	0.269	0.456	0.334
	Asia	Mean	-0.799	-0.521	-0.278
		N	18	18	18
		Std. Dev.	0.389	0.485	0.360
	Central Sothern America	Mean	-0.403	-0.246	-0.157
		N	12	12	12
		Std. Dev.	0.304	0.320	0.376
Ongoing Transition	Sub-Saharan Africa	Mean	0.547	0.927	-0.379
		N	13	13	13
		Std. Dev.	0.664	0.731	0.706
	Asia	Mean	-0.613	0.021	-0.634
		N	5	5	5
		Std. Dev.	0.179	0.394	0.303
	Central Sothern America	Mean	-0.001	0.369	-0.370
		N	3	3	3
		Std. Dev.	0.265	0.511	0.293
Pre transitional country	Sub-Saharan Africa	Mean	1.053	1.681	-0.629
		N	20	20	20
		Std. Dev.	0.690	0.736	0.615
	Asia	Mean	0.459	1.350	-0.891
		N	2	2	2
		Std. Dev.	1.735	1.422	0.313

Economic development and poverty as measured by scores on the second factor point out that even if mean, trimmed mean and median show a general reduction[4] – indicating the existence of a transition towards an economies less agriculture dependent and a reduction in levels of poverty and deprivation – heterogeneity has grown, meaning higher difference between rich and poor countries.

TABLE 11

Distribution of scores for factor 2 – Demographic and development convergence 2010-1996

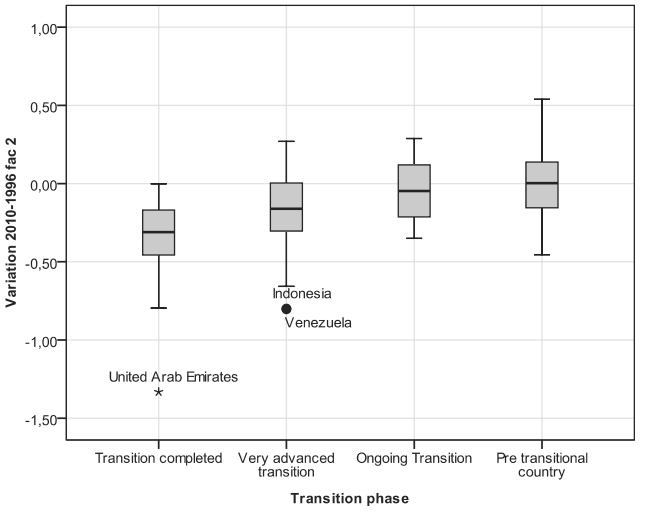
Factor 2 – Demographic transition 2010		Statistic	Std. Error	Factor 2 – Demographic transition 1996		Statistic	Std. Error
Mean		-0.079	0.101	Mean		0.079	0.092
95% Confidence	Lower Bound	-0.278		95% Confidence	Lower Bound	-0.104	
Interval for Mean	Upper Bound	0.121		Interval for Mean	Upper Bound	0.262	
5% Trimmed Mean		-0.040		5% Trimmed Mean		0.105	
Median		-0.016		Median		0.112	
Variance		1.083		Variance		0.914	
Std. Deviation		1.041		Std. Deviation		0.956	
Minimum		-4.035		Minimum		-2.703	
Maximum		2.079		Maximum		1.930	
Range		6.115		Range		4.633	
Interquartile Range		1.448		Interquartile Range		1.171	
Skewness		-0.647	0.234	Skewness		-0.407	0.234
Kurtosis		1.203	0.463	Kurtosis		0.214	0.463

[4] Wilcoxon Signed Ranks Test is also significant for this set of scores.

TABLE 12

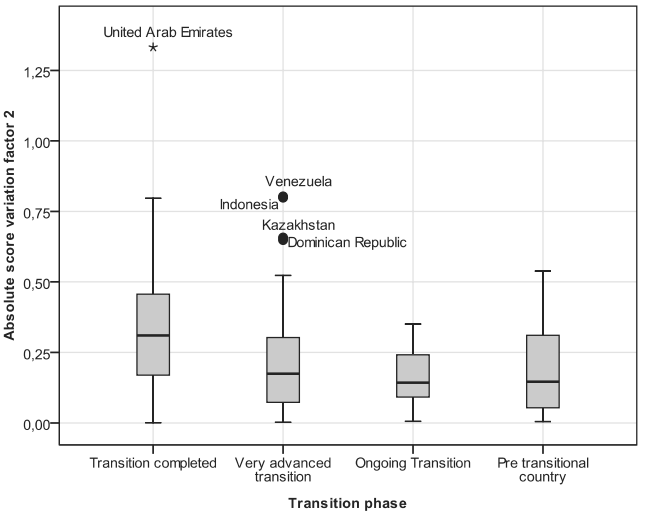
Extreme scores for factor 2 - Macroeconomic conditions and deprivation 2010- 1996

		2010			1996		
		Countries		Value	Countries		Value
Highest	1	Burundi	Ongoing transition	2.079	Burundi	Ongoing transition	1.930
	2	Nepal	Very advanced transition	1.803	Viet Nam	Transition completed	1.846
	3	Sri Lanka	Very advanced transition	1.771	Nepal	Very advanced transition	1.833
	4	Bangladesh	Very advanced transition	1.563	Sri Lanka	Very advanced transition	1.817
	5	Papua New Guinea	Ongoing transition	1.508	Bangladesh	Very advanced transition	1.650
Lowest	1	Un. Arab Emirates	Transition completed	-4.035	Un. Arab Emirates	Transition completed	-2.703
	2	Kuwait	Very advanced transition	-2.738	Kuwait	Very advanced transition	-2.589
	3	Venezuela	Very advanced transition	-2.312	Saudi Arabia	Very advanced transition	-1.844
	4	Gabon	Ongoing transition	-2.059	Gabon	Ongoing transition	-1.822
	5	Saudi Arabia	Very advanced transition	-2.039	Argentina	Very advanced transition	-1.745



Picture 6 – Score variation 1996-2010 for transition phase Boxplot. Factor 2.

The distribution of extreme values demonstrates that the economic dimension is not as closely related to the level of fertility as the development convergence. The presence of countries in transition within the group with the lowest scores proves that starting transition with a delay in economical development is possible, if proper policies are carried forward. On the other hand, advanced positions in transition are more likely where there is a good level of development.



Picture 7 – Absolute Score variation 1996-2010 for transition phase Boxplot. Factor 2.

TABLE 13

Mean and median scores for factor 2 by transition phase

Transition phase		Variation 2010-1996	2010	1996
Transition completed	Mean	-0.353	-0.520	-0.167
	Median	-0.310	-0.519	-0.314
	N	27	27	27
	Std. Deviation	0.292	1.078	1.009
Very advanced transition	Mean	-0.186	-0.272	-0.086
	Median	-0.161	-0.354	-0.175
	N	36	36	36
	Std. Deviation	0.269	1.122	1.081
Ongoing Transition	Mean	-0.044	0.296	0.340
	Median	-0.048	0.336	0.448
	N	22	22	22
	Std. Deviation	0.191	0.953	0.937
Pre transitional country	Mean	0.014	0.403	0.388
	Median	0.002	0.486	0.430
	N	22	22	22
	Std. Deviation	0.279	0.564	0.481

The relation between economic development and transition stage is indirect. If progresses recorded by the first factor about mortality, health conditions, education and contraception are directly related – and partially included – to the level of transition, the economical dimension doesn't follow the same path. While the analysis of the first factor scores shows that higher progresses in convergence have been made by countries at the beginning of their transition, trends for the second factor in the years 1996-2010 show that advanced transition countries had better performances in terms of economic convergence. This is also confirmed by the exact Wilcoxon Signed Ranks Test on the second factor that is significant for the whole distribution but, if performed in each class of demographic transition, is not significant for ongoing and pre-transitional classes. This means that coun-

tries at an initial level of demographic transition show no significant variation in the economic dimension in the period of analysis. It is therefore clear why distribution in 2010 for the second factor has a higher level of dispersion compared to 1996 and as well why variation in scores in the period 1996-2010 for factor 1 and factor 2 shows a significant (at 0.01 level) inverse nonparametric and parametric correlation[5] (-0.579 and -0.573). This means that countries that have completed transition, or are very close to end it, show higher progresses on the economical side while countries in first phases of transition, or that haven't still begin it, have better performances on the development side (as they had definitely a worst initial situation) but didn't show similar progresses on the economical level.

Again, if we analyze extreme values in variation for the span of time 1996-2010 in the second factor scores we see that the top five countries where economic condition worsen are nearly all pre-transitional, while the best performances are recorded for very advanced transition states. It's interesting to point out the differences between the two world "giants" India and China: while the latter had great improvements on the economic side, Indian economic remains still, showing no variations.

TABLE 14

Extreme scores for variation on factor 2 - Macroeconomic conditions and deprivation 2010- 1996

			Countries	Value
Worsening conditions 1996-2010	1	Pre transitional country	Yemen	0.54
	2	Pre transitional country	Guinea-Bissau	0.50
	3	Pre transitional country	Guinea	0.45
	4	Pre transitional country	Niger	0.30
	5	Ongoing Transition	Congo	0.29
Best performances 1996-2010	1	Transition completed	United Arab Emirates	-1.33
	2	Very advanced transition	Venezuela	-0.80
	3	Very advanced transition	Indonesia	-0.80
	4	Transition completed	China	-0.80
	5	Transition completed	Trinidad and Tobago	-0.73
No variation in scores	1	Transition completed	Mongolia	0.00
	2	Very advanced transition	Peru	0.00
	3	Very advanced transition	India	0.00
	4	Pre transitional country	Zambia	0.01
	5	Ongoing Transition	Central African Republic	0.01

How can we explain poorest countries progresses in terms of demographic convergence if very few improvements took place on the economical side? Government policies play an important part. Where interventions to lower fertility were carried out, the reduction of scores on factor 1 is significantly higher. This means that commitments to fertility reduction can bring general positive effects not only in fertility levels, but also in improving health and survival[6]. The last Ex-

[5] Test for normality – as the number of cases is 107 Shapiro-Wilk and Kolmogorov Smirnov exact test for normality were used – show that both distribution can't be considered normal even if the p-value are low (0.10 and 0.14 for first test for differences on factor 1 and 2, 0.39 and 0.36 for the second test).

[6] Jonckheere-Terpstra Test for ordered differences among classes (in a scale where "no intervention" is considered as a class between "to raise" and "to maintain") is significant, meaning that there is a decreasing trend in the median of difference in factor 1 as the government intervention changes from an intervention to raise fertility to an intervention to lower fertility. The same relation emerges also thru non parametric correlation which is also significant at 0.01 level.

pert Panel on Fertility, Reproductive Health and Development held in New York in December 2010 came to the same conclusion, underling for example that without the past declines in fertility – due largely to increase of contraceptive users – the numbers of maternal deaths would have been about 1.7 million higher between 1990 and 2008 (Blanc, 2010).

TABLE 15

Mean and median scores on factor 1 by transition phase and type of Government intervention on fertility level

Transition phase	Government intervention on fertility level	Mean	Median	N	Std. Deviation
Transition completed	To raise	0.176	0.132	9	0.223
	No intervention	0.099	0.103	8	0.268
	To maintain	-0.038	-0.054	3	0.115
	To lower	-0.153	-0.042	7	0.410
Very advanced transition	To raise	0.194	0.194	1	.
	No intervention	-0.258	-0.262	7	0.227
	To maintain	-0.218	-0.191	4	0.203
	To lower	-0.252	-0.241	24	0.434
Ongoing Transition	To raise	0.071	0.071	2	0.071
	No intervention	-0.594	-0.479	4	0.542
	To maintain	-0.775	-0.775	1	.
	To lower	-0.391	-0.681	15	0.639
Pre transitional country	No intervention	-0.491	-0.483	4	0.646
	To lower	-0.689	-0.782	17	0.614
Total	To raise	0.160	0.131	12	0.196
	No intervention	-0.233	-0.167	23	0.458
	To maintain	-0.220	-0.099	8	0.282
	To lower	-0.392	-0.328	63	0.560

The third factor shows population structure convergence and marks the path from a structure with a high percentage of young people and a high growth rate to a population with an older structure and a low or negative growth rate. Similarly to economical dimension, the tendency for years between 1996 to 2010 is significantly negative, meaning a general convergence to an older population structure, with a raise in variability among countries. Increasing negative skewness indicates that the tail on the left side of the probability density function is longer than the right side and the bulk of the values lie to the right of the mean, toward values that indicate a pre transitional structure of population for most of the countries and a small number of states characterized by extremely low values.

TABLE 16

Distribution of scores for factor 3 – Population structure 2010-1996

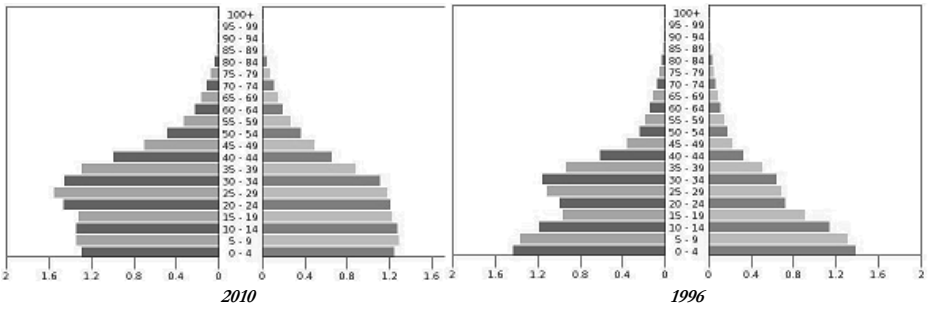
2010		Statistic	Std. Error	1996		Statistic	Std. Error
Mean		-0.204	0.098	Mean		0.204	0.092
95% Confidence	Lower Bound	-0.398		95% Confidence	Lower Bound	0.022	
Interval for Mean	Upper Bound	-0.010		Interval for Mean	Upper Bound	0.386	
5% Trimmed Mean		-0.167		5% Trimmed Mean		0.226	
Median		-0.100		Median		0.337	
Variance		1.027		Variance		0.898	
Std. Deviation		1.013		Std. Deviation		0.948	
Minimum		-3.040		Minimum		-2.196	
Maximum		1.951		Maximum		2.773	
Range		4.990		Range		4.969	
Interquartile Range		1.119		Interquartile Range		1.130	
Skewness		-0.742	0.234	Skewness		-0.433	0.234
Kurtosis		0.757	0.463	Kurtosis		0.581	0.463

Arabic countries where transition was very fast (for example Saudi Arabia had a TFR of 6 in 1996 that reached the level of 2.3 in 2010) have highest scores and now find themselves with a very young population and a high growth rate; the same is for countries with a classical pre-transitional structure like Yemen. On the other side Eastern European countries have a post transitional structure and it is clear the beginning of an ageing process.

TABLE 17

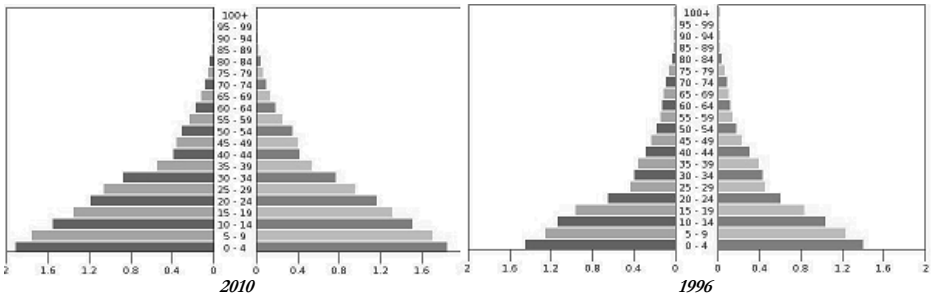
Extremes scores for factor 3 – Population structure 2010-1996

		2010			1996		
		Countries		Value	Countries		Value
Highest	1	Yemen	Pre transitional country	1.951	Un. Arab Emirates	Transition completed	2.773
	2	Un. Arab Emirates	Transition completed	1.941	Yemen	Pre transitional country	2.108
	3	Saudi Arabia	Very advanced transition	1.596	Saudi Arabia	Very advanced transition	1.926
	4	Jordan	Very advanced transition	1.388	Jordan	Very advanced transition	1.910
	5	Iraq	Ongoing Transition	1.373	Algeria	Very advanced transition	1.833
Lowest	1	Ukraine	Transition completed	-3.039	Latvia	Transition completed	-2.196
	2	Belarus	Transition completed	-2.746	Estonia	Transition completed	-2.185
	3	Latvia	Transition completed	-2.670	Ukraine	Transition completed	-2.185
	4	Uruguay	Transition completed	-2.560	Lithuania	Transition completed	-1.944
	5	Georgia	Transition completed	-2.549	Belarus	Transition completed	-1.929

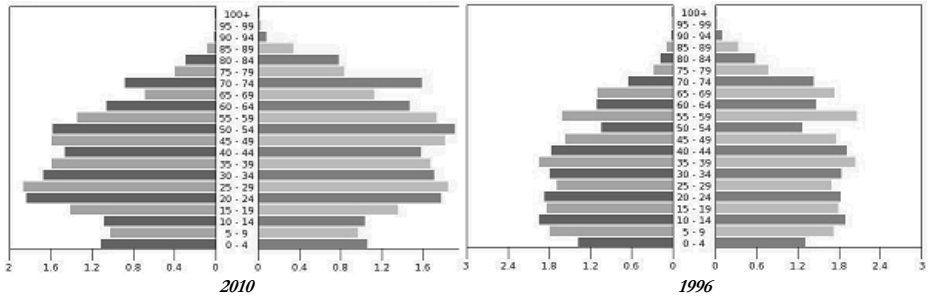


Picture 8 – Population Pyramid - Saudi Arabia.
Source: US census bureau – online resources www.census.gov.

All countries that had positive variation in scores for factor 3 during the period 1996-2010 are pre transitional or ongoing transitional. As a matter of fact the correlation between variation on first factor and third factor is significant ($p<0.01$) and strongly inverse (-0.825): nations that had the best results in lowering mortality face an initial growth and rejuvenation of population because fertility is still highly over replacement level. On the other side, countries that mark the highest lowering scores on structure indicator are nearly all advanced in the process or have completed transition: they are beginning the convergence to reduction and ageing.



Picture 9 – Population Pyramid – Yemen.
Source: US census bureau – online resources www.census.gov.



Picture 10 – Population Pyramid – Ukraine.
Source: US census bureau – online resources www.census.gov.

TABLE 18

Extreme scores for variation on factor 3 – Population Structure 2010-1996

		Countries		Value
Highest	1	Eritrea	Ongoing transition	1.30
	2	Niger	Pre transitional country	1.22
	3	Ethiopia	Pre transitional country	1.11
	4	Senegal	Pre transitional country	1.01
	5	Congo	Ongoing transition	0.87
Lowest	1	Zimbabwe	Ongoing transition	-2.25
	2	South Africa	Very advanced transition	-1.57
	3	Lebanon	Transition completed	-1.39
	4	Uruguay	Transition completed	-1.38
	5	Gabon	Ongoing transition	-1.37
No variation	1	Tajikistan	Ongoing transition	0.01
	2	Benin	Pre transitional country	0.01
	3	Iraq	Ongoing transition	0.01
	4	Burkina Faso	Pre transitional country	0.03
	5	Sierra Leone	Pre transitional country	0.04

In order to check the effects of economic improvements and policies on the probability of being at a certain phase of transition, an ordinal logistic regression has been performed.

The interpretation of the location parameters shows that both economical and policy actions do have a role in the determination of the transition phase A positive

parameter estimate means that as the values of the location variable increase, there is a greater likelihood of higher values of the threshold (dependent) variable. Here, a positive estimate for variation on factor 2 in the years 1996-2010 means that as these values rise to positive and higher values, transition takes on a higher value (here coded so higher values are related to lower progress in transition). We could also say that for a one unit of increase in variation there is a 3.274 increase in the expected log odds as one moves to the next higher-coded category of the dependent, transition phase. An interesting fact is that scores for the second factor for year 1996 and for year 2010 had previously been included in the model, but were found not significant. For the variable indicating the presence and the aims of policies – an ordered categorical factor – negative coefficients for a given level of the independent mean a likelihood of lower scores on the ordinal dependent compared to the reference level of the independent. Thus the negative parameter of -2.63 for the category "existence of policies to raise fertility" means that, compared to the category "existence of policies to lower fertility", having policies to raise fertility is associated with lower code values transition (which actually is being a country where transition is complete), for these data. But the main information that we get from this model is that the role of policies is significant in the determination of the transition phase as it is the pace of economic development. It is worth noting also that the absolute level of economic development is not significant (p=0.171). The parameter however was positive meaning, obviously, that lower factor scores are related to advanced phases of transition. This finding is not surprisingly because many country cases (like Sri Lanka and Bangladesh) showed that if there are good policies of family planning the transition can begin and would be carried on even if economic development doesn't act as the main factor.

TABLE 19

Parameter Estimates

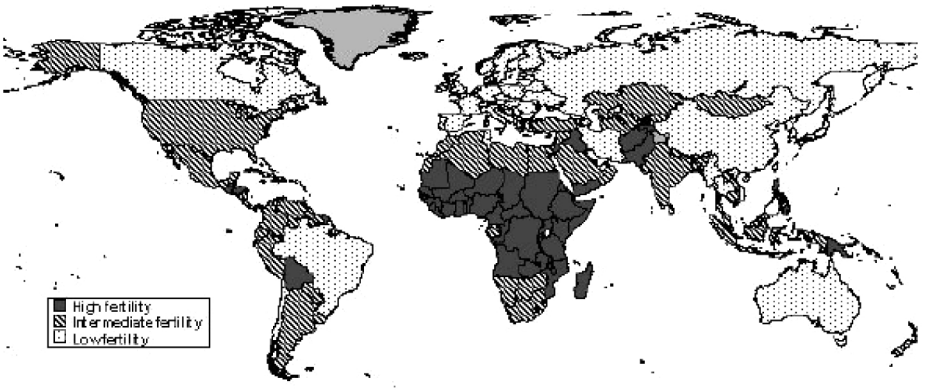
		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold*	Transition completed	-2.511	0.377	44.460	1	0.000	-3.249	-1.773
	Very advanced transition	-0.516	0.274	3.556	1	0.059	-1.052	0.020
	Ongoing transition	0.707	0.284	6.178	1	0.013	0.149	1.264
Location	Var.1996-2010 on factor 2	3.274	0.749	19.108	1	0.000	1.806	4.742
	Policy to raise fertility	-2.603	0.715	13.275	1	0.000	-4.004	-1.203
	Policy to maintain fertility	-1.478	0.739	3.995	1	0.046	-2.927	-0.029
	No policy	-0.905	0.457	3.919	1	0.048	-1.802	-0.009
	Policy to lower fertility	[a]			0			

Notes: Link function: Logit. * Reference category Pre-transitional country. a. This parameter is set to zero because it is redundant.

5. CONCLUSIONS

Developing countries are a *miscellaneous reality*, but the differences among nations have a clear geographical distribution with a concentration of high fertility

and pre transitional countries in sub Saharan Africa. This fact will play an important role in the determination of future trend for World population in the next 50-100 years. The projections just released by United Nations point out that the highest potential for future population growth is in high-fertility countries. Between 2010 and 2100, the medium variant projects estimates that high fertility countries population would more than triple while that of intermediate fertility countries would increase by just 26 per cent, from 2.8 to 3.5 billion. Whereas the populations of both the low-fertility countries and the intermediate-fertility countries are projected to peak before the end of the century, that of the high-fertility countries would continue to increase during the whole period (United Nations, 2011).



Picture 11 – Countries and area classified by fertility level.
Source: United Nations, 2011.

Our analysis has synthetically pointed out main changes for 107 developing countries on the three main dimensions of convergence (social development, economy and population structure) in the period between 1996 and 2010. For all these three dimensions the convergence is underway, but while results on development and demographic dynamics saw a general reduction of disparity between poorest and richest countries, the ones recorded on the other two dimensions mark growing differences among states. While major progresses in mortality reduction, access to health and fertility services have been made by countries that in 1996 had worst situations, on economic side main progress was recorded for the most wealthy countries increasing differences between poorest and richest. What is really happening is that countries in the European area are growing fast toward European standards and countries from the Gulf area are growing as well with particular benefits deriving also from a structure where fertility had a quick reduction and ageing is not still a reality. This third dimension had a similar trend with fast convergence of European countries to negative growth and lesser variation for other areas. Again there is an inverse relation between development and

population structure convergence, mainly due to mortality reduction not followed by a concurrent drop in fertility. As economic development slows, an increasing important part is played by family planning policies that can significantly drive demographic transition in a context where even small differences in fertility levels sustained over long periods have a major impact on the future population.

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REFERENCES

A. ANGELI, S. SALVINI (2008), *Popolazione e sviluppo nelle regioni del mondo*, Il Mulino, Bologna.

A. BLANC (2010), *The contribution of family planning to the reduction of maternal deaths United Nations Expert Panel on Fertility*, Reproductive Health and Development - Panel discussion, New York, 7/12/2010.

J. BOONGARTS, (2006), *The Causes of Stalling Fertility Transition*, in "Studies in Family Planning", vol. 37, n. 1, pp. 1-16.

J. BOONGARTS, (2008), *Fertility Transition in Developing Countries: Progress or Stagnation?,* Population Council, Poverty Gender, and Youth Working Paper, n. 7.

J.B. CASTERLINE, (2001), *The Pace of Fertility Transition: National Pattern in the Second Half of the Century*, in R.A. BULATAO, J.B. CASTERLINE (2001), Population and Development Review Vol. 27, Supplement: Global Fertility Transition, pp. 17-52.

J. CLELAND, S. BERNSTEIN, A. EZEH, A. FAUNDES, A. GLASIER. J. INNIS, (2006), *Family planning: the Unfinished Agenda*, in "The Lancet", vol. 368, pp. 1610-1627.

R. EASTWOOD, M. LIPTON, (1999), *The impact of Changes in Human Fertility on Poverty*, in "Development Studies", Vol. 36, pp. 1-30.

R. FREEDMAN, B. BERELSON, (1976), *The record of Family Planning Programs*, in "Studies in Family Planning", vol. 7, n. 1, pp. 2-40.

N.E. HIMES, (1940), *A Decade of Progress in Birth Control, Annals of the American Academy of Political and Social Science*, Sage, vol. 212, pp. 88-96.

G. MICHELI, (2011), *Demografie*, Mc Grow Hill, Milano.

W.C. ROBINSON, J.A. ROSS, (2007), *The Global Family Planning Revolution, three decades of population policies and programs*, World Bank, Washington D.C.

J.J. SPEIDEL, D.C. WEISS, S.A. ETHELSTON, S.M. GILBERT, (2009), *Population Policies, Programmes and Environment*, Philosophical Transactions of the Royal Society B, n. 1532, pp. 3049-3065.

UNITED NATIONS, (2002), *Abortion Policies: A Global review*, Population Division, New York.

UNITED NATIONS, (2011), *World Population Prospect – Medium Fertility Variant. The 2010 Revision*, Press Release 3/5/2011, New York.

DATA WAREHOUSE WEBSITES

http://www.un.org/esa/population/
http://www.census.gov/ipc/www/idb/informationGateway.php
http://www.devinfo.info/
http://www.prb.org/DataFinder.aspx
http://www.un.org/esa/population/publications/abortion/

http://www.unfpa.org/swp/
http://www.who.int/research/en/
http://www.worldbank.com/

SUMMARY

Convergence processes in developing countries' populations and the role of family planning commitments

We live in a world that is politically and economically influenced by demographic issues. Structural and economical characteristics and health issues play a significant role in the international political debate with often no real perception of their importance. The process of economical and demographical convergence in Developing World doesn't follow the same path for all countries. The analysis of indicators related to the last 15-years period shows that a widespread improvement in demographic and development indicators doesn't come along with a similar economic development. As a matter of fact on this second dimension countries that were at a more advanced economical stage in 1996 had the best improvements, while least developed remain still deepening pre-existing inequalities. Population structure follows a similar differentiation among countries that show first signs of ageing and others that remains with a pre-transitional structure. In this context family planning can significantly drive demographic transition even in absence of a substantial economic development.