The notion of demographic transition is well known for several centuries and it is quite often the basis for demographic and social policies in the world. Since many countries have completed the transition process from rural to industrial economies with low rate of fertility and high life expectancy it is interesting to have a closer look at the global trend of where the world is going to. This trend is estimated from the point of a choice at the national level and a choice of each person in the world. The result obtained shows no quantitative and qualitative difference between the two choices. Finally the notion of success for each country has been discussed depending on whether it is on the trend, above or below the trend.

Keywords: demographic transition theory, fertility, life expectancy, economic dividend, success.

Introduction

The demographic issues have been attracting attention of social, economic and political studies for several centuries. The reason is that they have a direct impact on the present and future global development and policies practiced by the modern governments. The research in this field influences decisions of international organizations and other political and economic institutions working on family planning programs, governments developing official policies and so on.

It became obvious by the end of the nineteenth century that fertility levels were falling in many Western countries and birth rates would stabilize at new lower levels. Thompson (1929) tried to divide this transition period into three phases and afterwards Blacker (1947) distinguished five phases. However, neither of them suggested any causes to account for this demographic change.

Later, a twofold explanation of falling fertility was offered by Notestein (1945). He stated that fertility in premodern countries had
been kept high almost artificially with the help of religious doctrines, moral codes, family organization, education, etc. and this high rate was necessary for the nation to survive because of the high mortality rates. The fundamental reason for low birth rate for Notestein was “the growth of huge and mobile population” which destroyed corporate and family-based way of life in a traditional society replacing it with individualism. He also noticed that at the root of the matter there are development of technology, as well as education, improved health and alternatives to early marriage and childbearing.

Therefore the main argument of the theory is that fertility is high in poor, traditional societies where mortality is high and where there is no opportunity for personal advancement. In these societies the individual status is equal to which a person was born with and there is little motivation for advancement. Children join the labor force quite early contributing to the economy most of their life since education period is very brief. However, all these things change with modernization and urbanization when individuals have different opportunities.

A more recent study in the field of demographics using example of Thailand is written by Lee and Mason (2006) who once again explore a notion of “demographic transition” which all industrial countries have almost completed. It can be described as a shift from a rural society with high mortality and fertility rates to an urban society with low mortality and fertility rates. As a result, the labor force grows faster than the population dependent on it. This brings about two straight dividends: 1) per capita income grows more rapidly; 2) population facing an extended period of retirement has an incentive to accumulate more assets – which gives a rise to the national income. First dividend also comes from more women available to join the labor force and fewer children to invest in families’ capital. Children become well-educated, later they grow skilled workers, forstering economic and job growth. However, the first dividend period even though taking up to five decades eventually ends (feedback loop) and low fertility rate leads to declining growth of the labor force. Simultaneously, longer life expectancy speeds the growth of the elderly population and the load on the economy. The first dividend yields a transitory bonus coming to an end at some point, whereas the second dividend overlapping with the first one transforms this bonus into sustainable development and can be indefinite.

Many developing countries still undergo this transition process. Thailand at an early stage of the transition (Fig. 1) had a high number of children when mortality fell, it was followed by an intermediate stage when fertility dropped reducing the number of children while working population grew. Finally, during the late stage of the transition low mortality and fertility led to population ageing – a well-known process. The first dividend starts at the intermediate stage with the second dividend coming at the late stage. It is worth mentioning that the dividends are not automatic but depend on the implementation of effective policies.

In each country, the time to build the dividend for the society is different depending on how much people produce and consume at each age. In Thailand, people produce more than they consume only between ages 26 and 59 (Fig. 2) whereas in the United States these ages are 26 and 57; in Taiwan – 26 and 55, which is very different from the real working-age boundaries.

Each individual in Thai has only 33 years to build the dividend for the society. The lower the level of education is in a country, the earlier children start working, and the less is the quality of work. Whereas in countries where children have longer education track they automatically spend less of their life working, but the quality
of work is higher, which leads to better dividends accumulated by the society.

**Statement of the problem**

Taking into account the theory of demographic transition every country is going through or has already completed this transformation period. One of the most important resources of a nation is its human resource. Therefore it is interesting to research and compare countries which are successful with which are not when using their resources. It is also noteworthy to take a closer look at the global trend and determine which countries are more successful than the others and what the notion of success would mean in the context of transition process.

**Methods and Data**

Central Intelligence Agency World Factbook has been used to analyze the sample of 219 countries. Three main variables are presented in the research. They are fertility, life expectancy and population in the countries as of 2012. Fertility has been treated as a dependent variable, life expectancy as an independent variable and population is used to take into account the size of each observation in the sample. Fertility represents the average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given fertility rate at each age. Life expectancy is the average number of years to be lived by a group of people born in
the same year, if mortality at each age remains constant in the future. The criteria of life quality and cultural differences in the countries are not considered. The data have been processed using StataSE 10 software program.

There are two samples processed: 1) countries are simply taken as equal, irrespective of their population or 2) each observation is weighted according to the population. In the first sample countries themselves are taken representing each observation and the trend is the average for these countries. The second sample takes into account the weights of each country so that the trend becomes the average of how each citizen in these countries lives. In the first case, the experiment is based on ethnicity, in the second case – on individual. If these two experiments do not converge there is a difference between ethnicity and overall global trend. The degree of discrepancy can be explained by the influence of different ethnical or national factors.

Results

The data used have been approximated by a simple linear function of the form:

\[ \text{Fertility} = \alpha \cdot \text{LifeExp} + \beta, \]

where \( \alpha \) and \( \beta \) are parameters of approximation.

Figure 3 shows the scatter plot of life expectancy and fertility in 219 countries described by the statistically significant linear function of:

\[ \text{Fertility} = -0.12 \cdot \text{LifeExp} + 11 \]

\( R^2 \) of the function equals 0.66 with \( \beta \) coefficient being not statistically significant at 5 % level.

When taking into account the population of the countries the function looks as follows:

\[ \text{Fertility} = -0.13 \cdot \text{LifeExp} + 12 \]

The function is statistically significant, \( R^2 \) of the function equals 0.66 with \( \beta \) coefficient being statistically significant at 5 % level.

In this case the function was taken as linear because the closest quadratic model gives very close relation but doesn’t take into account some countries down the graph. The slope is negative which in this case can be explained by the orientation of the society either to the birth rate or to the life expectancy period and these are competitive criteria. Such countries as Israel, Gaza, EU countries, Canada, New Zealand, Jordan, USA, Qatar, Chile where life expectancy
is high take extra income dividend to invest in better life quality, medicine, etc., which leads to lower fertility rate. The opposite is also true. Countries where fertility rate is high (Niger, Mali, Somal, Uganda, Afghanistan, Yemen, Iraq, Jordan, Philippines, Pakistan, Egypt) might still be at the stage of transition from rural society to urban one with high fertility and mortality.

The estimated global trend gives the opportunity to define relative types of countries. Countries being above the trend could be seen as “successful”, while those being lower the trend as “less successful”.

When taking into account the weights of the countries the trend has deeper slope making some countries down the line “successful” or “more close to being successful”, whereas some countries up the line become “less successful”. That is explained by the heavier countries like China, India and EU countries adding weight to the slope of the overall trend, so more population in reality has low fertility and long life expectancy than vice versa. The pivot point of the line is for such intensively inhabited countries like China and India.

It can be calculated from the function how more or less children will be born if life expectancy changes by one year. The function shows that if life expectancy decreases globally by one year fertility rate in the world will increase by 0.12 children per woman. In relation to weights one year decrease in life expectancy globally will increase fertility by 0.13 children. This negative linear trend might be explained by several reasons: 1) there is higher mortality rate in many countries where fertility is high because women still die during the childbirth; 2) there is a tradeoff between spending money on an extra child (or policies that government applies) or rising life quality (or medical supervision). At some point it became obvious that medical treatment is beneficial for two groups under risk – children and the elderly, and mortality dropped while life expectancy grew by 5 to 10 years. After some period of time, governments and citizens usually choose between two competing groups in order to cut the spending. That can lead to lower fertility rates.

Figure 4 gives a more precise understanding of being successful in the context of the study. It can be seen that there are three main groups of countries: those which are on the trend and represent “average countries” following the overall deterministic development; those which

![Figure 4. Fertility and life expectancy: the notion of success](image)
are above the trend and can be called “successful countries” doing better than they would have done according to the trend; those which are lower than the overall trend and can be called “unsuccessful countries” doing worse than they would have done according to the trend.

**Discussion and Conclusion**

The global trend of fertility and life expectancy has a negative slope which is explained by the tradeoff for each country and each citizen of this country on the issue of spending extra money to support childbearing or longer life expectancy. Moreover, countries which have already completed the transition process are more inclined to invest in life expectancy of the elderly rather than in social services to support fertility. However, even among these countries there are several that are more successful than others. They are able to maintain higher levels of fertility with the same level of life expectancy compared to what the average global trend determines. This can be called the rate of success and it is the distance between the trend and the confidence level, on the one hand, and the position of a particular country, on the other. Being unsuccessful means to be lower the trend and the rate of it can also be estimated as the corresponding distance.

There is no qualitative difference between the trend with population weights and without it, which is a very important result meaning that each unit – an individual – repeats the overall global trend no matter in which political or economic conditions this particular person lives. There is almost no quantitative difference between the trend with and without population weights. This result highlights that there is the overall global trend which is quite often more important than some ethnical or social factors of each particular country. To conclude, it does not matter if the country has millions or billions of residents. People in the whole world follow the same trend that determines their fertility and life expectancy.

**References**

Демографический переход
в зеркале рождаемости
и продолжительности жизни:
типология стран

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В статье развивается известная теория демографического перехода стран из «аграрных» в «индустриальные». Особое внимание уделено биологическим эффектам, сопровождающим этот переход с учетом и без учета количества жителей в странах. Ставится вопрос, есть ли качественная и количественная разница между тем, как живут этносы и как живут люди вообще в мире. В результате анализа разработан подход, позволяющий классифицировать страны по их успешности относительно глобального тренда человечества.

Ключевые слова: теория демографического перехода, фертильность, продолжительность жизни, экономический дивиденд, успех.