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DEMOGRAPHIC APPROACH IN MEASURING HUMAN CAPITAL OF KAZAKHSTAN

DEMOGRAFICKY PŘÍSTUP NA MĚŘENÍ LIDSKÉHO KAPITÁLU KAZACHSTÁNA

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Abstract

This work is intended to provide reader with information about the value of human capital stock in Kazakhstan using well-known so-called education-based and lifetime labor income-based approaches. The main goal of this study is determination of main components of human capital development in Kazakhstan, especially from demographic viewpoint through the evaluations of modern reproduction of human capital in Kazakhstan. The results of estimations indicate that the human capital stock has significantly increased in Kazakhstan during the period studied (from 2003 to 2008) and that it surpass the value of physical capital in the country. The potential of human capital augmentation has been estimated as favorable for upcoming years in Kazakhstan.

Key words: human capital, population quality, Kazakhstan, demography, working age-population, education.

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Abstrakt

Cílem práce je poskytnout čtenáři informaci o hodnotě lidského kapitálu v Kazachstánu na základě známé úrovně vzdělání a celoživotního příjmu z pracovního zařazení. Hlavním cílem této studie je určit hlavní složky rozvoje lidského kapitálu v Kazachstánu, zejména z demografického hlediska, prostřednictvím zhodnocení současné reprodukce lidského kapitálu v Kazachstánu. Výsledné odhady naznačují, že hodnota lidského kapitálu se během studovaného období (2003–2008) významně zvětšila a že překročila hodnotu fyzického kapitálu v zemi. Potenciál dalšího zvýšení lidského kapitálu v Kazachstánu v příštích letech je hodnocen jako velmi příznivý.

Klíčová slova: lidský kapitál, kvalita populace, Kazachstán, demografie, populace v pracovním věku, vzdělání

Contents

1. Introduction

In modern Kazakhstan state and public, as well as educational and other social institutions understand the importance of human capital reproduction and that the improvement of human capital quality is among the most important strategic objectives related to the competitive advantages in the world community. Today, in Kazakhstan the term human capital has become a buzzword not only in academia but also in politics, business and the media. How important is human capital to the Kazakhstani economy? What we can do in order to increase the level of human capital in the country further? How human capital stock has developed in Kazakhstan from the past? What is the level of human capital of Kazakhstan today? How the human capital in Kazakhstan will develop in future? All the views and discussions to these questions can only be resolved when there is a reliable measure of how much human capital Kazakhstan actually has and what kind of components define the level and value of human capital in Kazakhstan.

2. Aims of the study: research questions and goals

The main research questions of the dissertation work: how much human capital Kazakhstan has and what is the specific role of population size and structure in reproduction of human capital stock in Kazakhstan?

The main goal of the thesis is the determination of main components of human capital development in Kazakhstan, revealing the role of demographic components in human capital reproduction in Kazakhstan. In this work we will concentrate on:

- exploration of the origination and development of concepts about human capital;
- identification of key factors of human capital formation and reproduction;
- revealing of demographic aspects of human capital formation and reproduction
- detection of human capital structure and its main types;
- determination of socio-demographic changes held in Kazakhstan during last century;
- application of relevant methods to measuring human capital in Kazakhstan;
- measuring the stock of human capital for Kazakhstan as well as discussion of key components of human capital formation in Kazakhstan.
- description and discussion of specific trends and core determinants of human capital reproduction in Kazakhstan;
- open further discussions in related topic and prepare ground for inter-discipline researches.

3. Theoretical framework and relevant literature

By the middle of the 20th century the profound changes in technological basis of production as well as in socio-economic forms of human interaction have taken place. This had required a re-examination of all economic categories and the reproduction system in whole. New conditions of life and economic activity demanded a new detection of human's role, his/her intellectual and social abilities, the elaboration of a new theory, where center-gravity of researches had shifted from the processes of using labor force to processes of creating qualitatively new labor forces.

With increase of the role of scientific and technical progress in the economic growth, scientists had changed their attitudes towards the problems of labor-power reproduction. At the center of scientists' attention stood the questions of a qualitatively new labor force *creation*, while, previously the main issues concerned to the *use* of this existent labor force. The structural changes in the total labor force and the interest in factors of economic growth and economic dynamics had caused the origination and development of the human capital theory.

The above mentioned objective conditions contributed to the development of human capital theory and its organic integration into the general economic theory in the light of its historical development. Such theory has appeared during 1950's - 1990's and developed in the works of T. Schultz, G. Becker, J. Mincer, E. Gundlach, C. Mulligan, X. Sala-i-Martin, G. Psacharopoulos, M. Blaug, L. Woßmann, V. Nehru, W. Lutz, T. Le, J. Kendrick, D. Jorgenson, B. Fraumeni, R. Barro, J. Lee, etc.

Human capital can be described as some level of health, education, skills, abilities, motivation, energy, cultural development of both the individual and the group of individuals or moreover of whole society, formed as a result of investments and savings, which is accordingly used in any sphere of social reproduction, and contribute to economic growth and affect the wages of its possessors.

4. Materials (data) and methods

Despite of the wide use of the human capital concept, different people define human capital in different ways. In fact, discussions on human capital measurement issues are conditioned by how human capital *per se* is defined. Like physical capital stock, the human capital can be, generally, valued using three basic methods:

i. it can be observed as a distribution of the population's education, skills, and experience for a particular society, which is inferred as a certain level of readily available human resources and potential for the production.
ii. it can be estimated as the sum of investment, minus depreciation, added over time to the initial stock;
iii. it can be estimated as the present value of the income flow, which is expected to be produced over an assumed lifetime (within and outside labor market).

The issues of measuring human capital become the bedrock of human capital studies. It is obvious that one who can manage to determine the adequate and accurate methods of measuring the human capital can answer the question what is the level and character of human capital in a given society.

In order to determine the main components of human capital development in Kazakhstan, with special attention to demographic components and evaluate the modern reproduction of human capital in Kazakhstan we have chosen two approaches: education-based and life-time labor income-based

Data - Education-based approach

The data for human capital stocks evaluations, covering the period 1959–1999, was obtained from the data on educational attainment of the population and its distribution at the moment of censuses. It is known that IIASA is conducting the research for constructing a dataset on human capital (educational attainment levels by age and sex) for 120 countries in the period 1970-2000 which has been reconstructed using demographic multistate back-projection methods. The model needs population distributions by age, sex, and level of educational attainment as a baseline for the projections. Authors mention that no single source of data provides this, so an integration of a diverse range of datasets is required. The data on differences in fertility rates for countries was obtained from a wide variety of data sources, including Demographic and Health Surveys (DHS), World Fertility Surveys (WFS), Reproductive Health Surveys (RHS), World Values Surveys (WVS), national censuses, and International Public Use Micro-Sample (IPUMS) census data. Using a Brass-Gompertz Relational Model, IIASA experts estimated the relative age pattern of mortality for each educational attainment category based on the reference mortality pattern of the population as a whole.

Data - Life-time labor income-based approach

The data from sample surveys of employment became the basis for obtaining information on the labor market, which have taken place since 2001 on a quarterly basis. The surveys cover all regions of Kazakhstan. 21,000 households are quarterly surveyed. The units of observation are the households and individuals aged 15 years and older living in them. The survey uses the concepts and definitions, based on standards and methodological approaches of the ILO and EuroStat. Population is classified according to the level of economic activity as employed, unemployed and economically inactive. Data on age groups are composed by abridging in 5-year interval that generally reflects the situation on the labor market and reduces the error of extrapolation of survey data. Only since 2003 Statistical Agency of Kazakhstan has started to compile specific data which meet basic needs of our model.

Method - Education-based approach

Education-based approach assumes that education, measured by educational attainment of the adult population, contributes to the accumulation of human capital stock in the country. Educational attainment is of course a very rough indicator for human capital, especially over a long period of time and across different sectors of the education systems and different political, economic, educational reforms have been initiated throughout the history. We have decided, however, to accept this mainstream indicator of human capital, rather than introducing more or less arbitrary and sophisticated ones.

Method - Life-time labor income-based approach

The lifetime labor income approach measures the human capital embodied in individuals as the total discounted present value of expected future incomes that could be generated in the labor market over their lifetime. The method can be implemented by: modeling the time-paths of income streams; constructing data on demographic accounts and market labor activities; applying per capita measures of lifetime labor income to all working-age persons of a cohort; aggregating across all education-, age-residence-, gender-groups to derive the value of human capital stock.

According to our approach the individual's human capital $\boldsymbol{H}$, in age-group $\boldsymbol{x}$ with educational level $\boldsymbol{e_i}$, is defined as the total discounted present value of his/her expected future stream of labor incomes, and specified as:

$$\boldsymbol{H_x^{e_i} = (n \times I_x^{e_i}) \times R_x^{e_i} + H_{x+n}^{e_i} \times p_{x+n} \times \left\{\frac{(1+g)}{(1+d)}\right\}^n}$$

where:

$H_x^{e_i}$ – individual's human capital for given education-earning profile e_i in age-group x

$I_x^{e_i}$ – worker's annual labor-income of the education-earning profile e_i in age-group x;

$R_x^{e_i}$ – employment rate of given education-earning profile e_i in the age-group x;

p_{x+n} – survival probability during the period n from the age-group x till the next age-group $x+n$;

g – average annual growth rate in real income;

d – average annual interest rate;

$x, x+n$ – age-group, next age-group;

e_i – educational attainment of the level i;

n – length of the period, (which also equals the age interval width – 5 years)

Working life table in demography and its application in human capital measurement

Demography has the valuable experience and methodology in measuring different aspects of age- gender- education-specific indicators of the population. Demography as a scientific discipline has developed the methodology enabling researcher to conceive the specific regularities in the population which are not observable by any techniques known in other scientific disciplines. This specific experience of demography can be applied in interdisciplinary studies too.

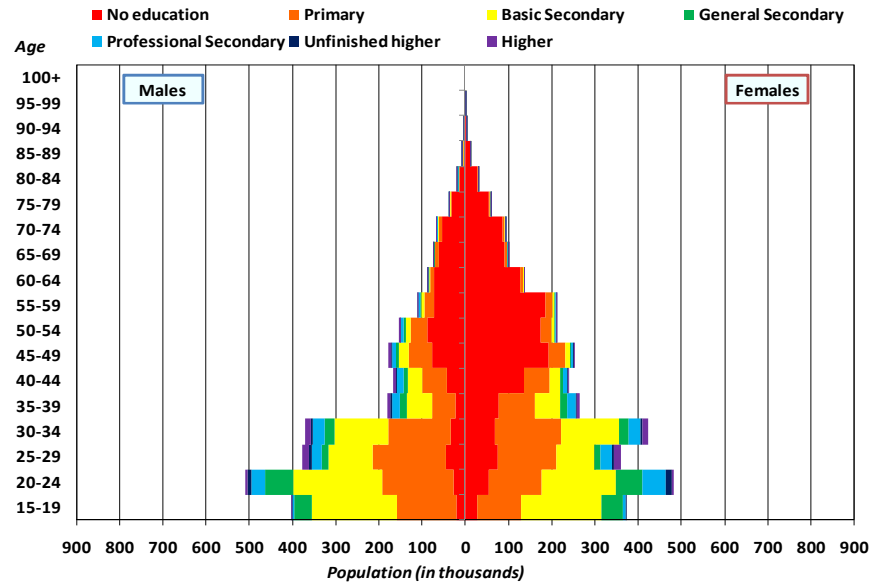
Discussing pros and cons of working life tables we have to stress that working life table (estimated working life expectancy) is the useful tool (indicator) in human capital studies along with other methods discussed in previous chapters. We would like to present working life table as an alternative method in measuring human capital. We hope the working life tables enriched by other approaches to human capital measurement or other approaches enriched by techniques of working life tables can make an important step in human capital studies and its measurement.

5. Results and discussion

Education-based approach

Figures 1 and 2 show the population pyramids for Kazakhstan in years 1959 and 1999. The absolute number of students enrolled in school increases over time, and the average level of educational attainment of the adult population rises. It obvious that the level of human capital in Kazakhstan have risen since 1959, both in terms of educational achievement and the total stock of working age population. Clearly, the current educational attainment of Kazakhstan is comparatively good enough thanks to previous Soviet educational policy in the country.

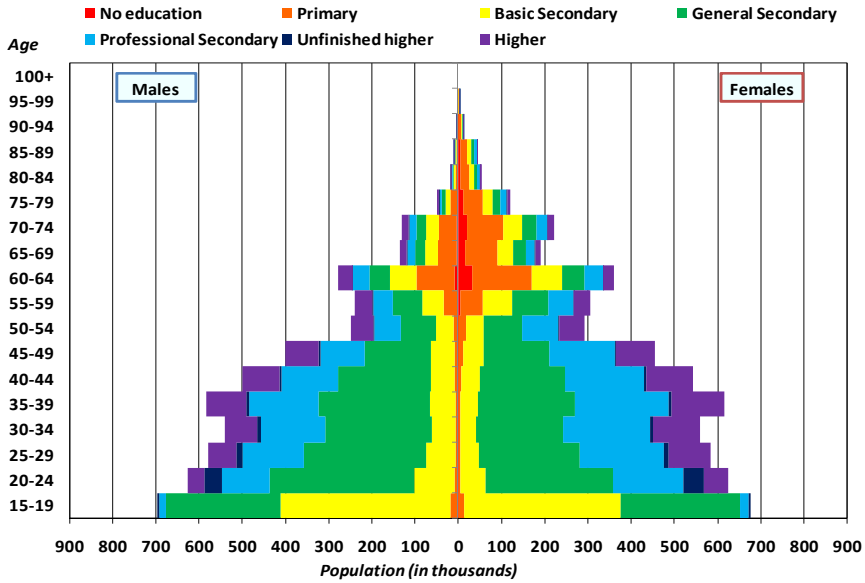
Fig. 1 - Age pyramid by level of formal education for Kazakhstan in 1959



SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010)

In Figure 3 we combined all the forms of post primary and pre-higher education to secondary education, herewith deriving from real observed data, four major educational levels introduced by IIASA: no education, primary education, secondary education and higher education attainment of the population in Kazakhstan. Thereby we tried to present the human capital development track from 1959 to 2050.

Fig. 2 - Age pyramid by level of formal education for Kazakhstan in 1999



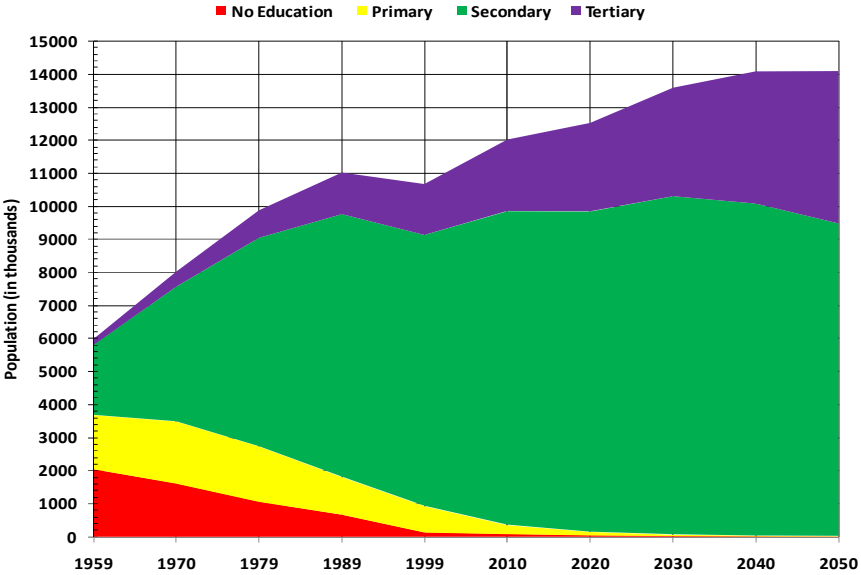
SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010)

The absolute number of people with no education will continue to decrease for the whole projection period under the all scenarios. The momentum of past education concern will continue to have an effect over the next decades. According to GET Scenario of the projection the overall educational attainment of the adult population will increase and share of total uneducated will make up only 0.1% by 2050. This progress comes from changes already embedded in the education structure of the population, from higher education flows of older generations, who gradually fill the stacked pyramid and area year by year. Another feature of the education momentum in Kazakhstan is the active participation of women in the formal education, as they account for 52.6%-54.3% of the educated working-age population during the projection period.

The share of the no education group in the population aged 15 and over has declined from 34.3% in 1959 to 1.3% in 1999, and is expected to decline to 0.1% by 2050. The share of the primary and secondary education group within total educated population has increased from 62.8% in 1959 to 84.4% in 1999. Chart shows that the shares of population with certain tertiary education has increased, from 3.0% (males' share 1.6%; females' share 1.4%) in 1959 to 14.3% (males' share 6.5%; females'

share 7.8%) in 1999, whereas by 2050 this share is expected to reach 32.7% (males' share 11.1%; females' share 21.6%).

Fig. 3 - Population aged 15 years and over by levels of education, both sexes, 1959-2050



SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010); Lutz et al. 2001. GET Scenario.

Life-time labor income-based approach

In Table 1 the stock of human capital is depicted. We have to note that the stock influenced by the size of the corresponding cohort *ipso facto* defining the final value of the stock. Interestingly, the human capital stock of the educational-earning profile with "vocational education" was the highest among urban population only in 2003, however after this year its share reduced and human capital stock of "higher education" profile since 2004 started to be the highest among urban working population. For rural population two biggest stocks of human capital were constantly belonging to educational-earning profiles of unqualified workers and those with vocational education. These two profiles made up more than a half of human capital stock in rural Kazakhstan during observation period. This fact indicates that the share of workers with these two levels of education is rather high among rural workers of Kazakhstan.

Tab. 1 - Aggregate human capital stock by worker's educational level, Kazakhstan, in $ billions (deflated for 2008)

	Urban population					
	2003	**2004**	**2005**	**2006**	**2007**	**2008**
Higher education	95.4	141.8	183.8	234.6	321.3	376.7
Unfinished higher education	12.8	16.5	23.1	28.8	32.2	36.9
Vocational education	104.9	136.2	161.4	194.0	263.4	293.7
Unqualified	29.0	37.5	43.8	55.8	57.7	64.7
Total	***242.2***	***332.1***	***412.2***	***513.2***	***674.7***	***772.0***
	Rural population					
	2003	**2004**	**2005**	**2006**	**2007**	**2008**
Higher education	17.9	24.9	31.0	40.7	69.4	84.6
Unfinished higher education	4.1	6.2	7.1	9.0	13.4	16.2
Vocational education	40.9	52.1	59.9	73.3	118.9	133.6
Unqualified	44.4	63.8	76.6	90.4	137.4	160.8
Total	***107.2***	***147.1***	***174.5***	***213.4***	***339.1***	***395.2***
	Total population					
	2003	**2004**	**2005**	**2006**	**2007**	**2008**
Higher education	113.3	166.7	214.8	275.3	390.7	461.3
Unfinished higher education	16.8	22.8	30.2	37.8	45.6	53.1
Vocational education	145.8	188.4	221.3	267.3	382.3	427.3
Unqualified	73.4	101.4	120.4	146.2	195.1	225.5
Total	***349.4***	***479.2***	***586.7***	***726.5***	***1013.7***	***1167.2***

SOURCES: Author's calculations based on Statistical Agency of Kazakhstan (2003- 2008), State Committee on Control of Education in Kazakhstan (2006, 2009), National Bank of Kazakhstan (2008), Le (2006), Gu and Wong (2008).

As in all comparison for many countries of the world the value of human capital in Kazakhstan is higher compared to physical capital (national wealth) in the country. For example, compared with physical capital, Kazakhstan's economically effective human capital stock was well over 7 times in 2004. However, this comparison is rather naive, since physical capital is measured in terms of the cost of production and is net of maintenance expenses, while human capital in this study is measured by its yield and is in gross terms (in that maintenance costs are not deducted from labor incomes). Even though the cost and the yield approaches are theoretically equivalent,

their results do not always agree in reality. There still remains the unsettled question whether or not human capital stock values should be net of maintenance expenses (See Table 2).

Tab. 2 - Human capital and physical capital, in $ billions (deflated for 2008)

	2003	2004	2005	2006	2007	2008
Total value of aggregate human capital stock	349.4	479.2	586.7	726.5	1013.7	1167.2
Total value of national wealth (physical capital)*	51.0	66.0	86.6	117.7	146.7	183.0
Ratio of human capital to physical capital	6.9	7.3	6.8	6.2	6.9	6.4

*by the end of year; without considering the values of land, mineral wealth and forests;

SOURCES: Author's calculations based on Statistical Agency of Kazakhstan (2003- 2008), State Committee on Control of Education in Kazakhstan (2006, 2009), National Bank of Kazakhstan (2008), Le (2006), Gu and Wong (2008).

To measure the net additions to human capital stock for the working-age population, the changes in the human capital stock during any accounting period are decomposed into the following elements:

- new workers joining the labor force;
- retired workers;
- depreciation;
- revaluation;
- changes in population composition (investment in education, net migration, etc.).

Although the urban population in general benefited more due to revaluation of their human capital, the changes in composition of working age population was more favorable in rural Kazakhstan. As for depreciation these aggregate value for urban and rural populations showed that the higher the level of revaluation the higher the value of depreciation. During the period 2003-2008 the urban population had also higher depreciation in human capital.

The level of retirement component which affected the changes in human capital within the period 2003-2008 is the same for urban and rural areas in Kazakhstan. The changes in human capital accumulation due to new members in labor market reflect in some extent the changes in composition of working age population. Rural population has higher percentage of change in composition of working age population. As we have mentioned that net human capital is derived from the difference between gross human capital formation and depreciation for given period, there is no wonder that net

human capital formation level is more than twice higher in rural areas compared to urban population of Kazakhstan. See Table 3.

Tab. 3 - Decomposing human capital stock change to the components, by place of residence, Kazakhstan, in $ billions (deflated for 2008)

Elements of change	2003-2008	Share
Total population		
Gross human capital formation	215.9	26.4%
Revaluation of human capital	663.3	81.1%
Depreciation in human capital	-162.3	-19.8%
Retirement component (leavers from labor market)	-1.6	-0.2%
New members (newcomers to labor market)	102.6	12.5%
Net human capital formation	53.5	6.5%
Total stock changes in human capital	***817.8***	***100.0%***
Urban population		
Gross human capital formation	134.5	25.4%
Revaluation of human capital	450.7	85.1%
Depreciation in human capital	-110.5	-20.9%
Retirement component (leavers from labor market)	-1.0	-0.2%
New members (newcomers to labor market)	56.1	10.6%
Net human capital formation	24.0	4.5%
Total stock changes in human capital	***529.9***	***100.0%***
Rural population		
Gross human capital formation	81.3	28.2%
Revaluation of human capital	212.5	73.8%
Depreciation in human capital	-51.8	-18.0%
Retirement component (leavers from labor market)	-0.5	-0.2%
New members (newcomers to labor market)	46.5	16.1%
Net human capital formation	29.5	10.2%
Total stock changes in human capital	***288.0***	***100.0%***

SOURCES: Author's calculations based on Statistical Agency of Kazakhstan (2003- 2008), State Committee on Control of Education in Kazakhstan (2006, 2009), National Bank of Kazakhstan (2008), Le (2006), Gu and Wong (2008) and Wei (2009).

6. Conclusion

Summarizing on this conclusion and the entire thesis, we would like to emphasize the practical outcomes which this thesis can provide:

I. We applied the education-based and lifetime labor income-based approaches to measuring human capital in Kazakhstan. These approaches have not been used in estimations of human capital in Kazakhstan so far, neither separately nor together in one work. This work *shows the applicability of the approaches for the case of Kazakhstan*, however the observed period are comparatively short to other studies within these two approaches. We also tried to stress on the importance of demographic components which these approaches regard at some extent. We think that these methods should be used in further researches of human capital in Kazakhstan.

II. The relevance of the study within this work is supported by growing interest in understanding the process of human capital reproduction in Kazakhstan. In this respect we are convinced that *the importance of human capital studies in Kazakhstan's science* is going to increase. We opened a question on creation of human capital account in Kazakhstan, with consideration of demographic components and the peculiarities of their development, as well as studying not only human capital stocks but also human capital flows, where demographic components have a considerable significance. Science in Kazakhstan, along with educational, public, civic and other institution on the inter-department level should concentrate on human capital issues. We hope that this work will bring *new impetus in studies of human capital in Kazakhstan*.

III. Originated from economics and particularly from labor economics the human capital theory and human capital studies for many years were concentrated on economic approaches and economic cognitions. Soon, the human capital studies showed not only scientific vitality, relevance and importance, but also became exactly that phenomenon which brought together many scientific disciplines onto common field. In these respect we think that demographics with its developed methods and principal approach in cognition can enrich the human capital studies and provide *new viewpoint on human capital reproduction*. Obviously, demographic approach in the best manner can capture issues like human potential, educational composition, age-specific human capital, compositional structure of human capital, distribution and proportion of human capital in the population,

ageing of human capital, spatial and social movement of human capital (human resources), forecasting human capital and its components and many other parameters of human capital reproduction. Therefore we would like to present demographic approach to the general human capital studies.

IV. The study of human capital and population quality is the new level of cognition also in population studies. As any scientific disciple the population studies are developing, where the issues of population quality and human capital become a new reality, new object and subject of study, *new emphasis which allow better analysis of population reproduction*. For that reason demography as scientific discipline also benefits from considering issues of human capital and population quality within its own study field.

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Monitoring of electoral activity and electoral behavior of population of South Kazakhstan (a number of social researches, quantitative, qualitative and combined methods) ***8/2005 – 12/2005***
"Meshetian Turks: integration or departure?", ECMI (European Centre for Minority Issues), Almaty, ethnographic research, participating /included supervision method ***11/2004-7/2005***
Focus group "Socio-vital attitudes of youth" ***4/2005***
Exit Poll (monitoring of election process for Association of Sociologists and Political Scientist of Kazakhstan) Supervisor ***10/2004***
Monitoring of electoral activity (for Association of Sociologists and Political Scientist of Kazakhstan) ***08/2004***
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Youth and election (supervisor) (for Youth Informational Service of Kazakhstan) ***08/2003***

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05/2009 The 10th European Week Eindhoven / Netherlands (EWE): "Faces of Europe - Looking through the eyes of others"
03/2009 PIDEC Annual Conference Achievements and Failures of Civil Society in Central Europe –Twenty Years after the Fall of Communism
08/2008 First Regional Conference (FRC) of Central Eurasian Studies Society (CESS), Kyrgyzstan, "*Labor Migration as a Factor of Demographic Reproduction in Migrant Families"*
11/2005 Workshop "NGO as the source of information for Mass Media" (Shymkent, organizer – MediaNet)
12/2004 The monitoring of President Election in Ukraine, member from delegation of IDEE, Semfirepol, Bahchisaray, Kiev (Ukraine)
11/2004 Workshop "Civic bridges. Central Asia" Hudjand (Tajikistan)
09/2004 The 2nd Regional Meeting in network "Civic Bridges" (IDEE), Issyk Kul (Kyrgyzstan)
08/2004 Workshop 'Social partnership and election" (National Public Association "League of Trainers), Shymkent
07/2004 Regional workshop "The League of young voters" (National Democracy Institute and The Republic Network of Independent Observers)

07/2004 Internship in the Department of Akim (Head of region) of South Kazakhstan

06/2004 Model United Nations 2004, Shymkent

05/2004 Course of the centre of preparation of state employees «Altyn kor» (Golden foundation)

03/2004 Workshop "Civic bridges. Civic society against corruption" Osh (Kyrgyzstan)

02/2004 Workshop "Civic bridges. Civic involving" Fergana (Uzbekistan) participant

10/2003 Workshop "Civic Lobby" Shymkent (NGO "ECHO")

11/2002 Workshop in the network of project *"Inculcation principles of ethnic tolerance in activities of journalists of South Kazakhstan"*. Shymkent. Organizer as a volunteer

Publications:

- *"Human capital as a category of economic quality of the population" International Youth Scientific Forum "Science for business" May 18-19, 2011 Almaty*
- "*Development of Population Quality and Reproduction of Human Capital in Kazakhstan*" 2nd Demographic Conference of Young Demographers, Prague, 2/2010
- "*Main trends in demographic development of Kazakhstan during the Soviet period*" Almaty, 2009. Conference proceedings.
- *"Categories of human's social world"* Collected articles of conference "Uly Jeniske tagzym" devoted to 60th anniversary of Victory in Great Patriotic War. Publishing house Kazakhparat, Almaty 04/2005
- *"The press and ethnic estrangement in Kazakhstan"* Institute of ethnology and anthropology Russian Science Academy (RAN), in the network of project of ethnologic monitoring & early prevention of conflicts (EAWARN) Moscow, № 46 November 2002, co-author Igor Savin.