

## **CONTENTS**

|   |           |
|---|-----------|
| <b>List of abbreviations</b>  | <b>11</b> |
| <b>List of tables</b>   | <b>12</b> |
| <b>List of figures</b>  | <b>13</b> |
| <b>1 Introduction</b>   | <b>14</b> |
| 1.1 Relevance of the study for the case of Kazakhstan   | 14        |
| 1.2 Outline of the study  | 17        |
| <b>2 Evolution of ideas and conceptions about population quality and human capital as scientific categories</b> | <b>20</b> |
| 2.1 Development of ideas about qualitative characteristics of population  | 20        |
| 2.2 Human capital as a category of economic quality of population   | 26        |
| 2.3 Evolution of ideas and conceptions about human capital as scientific category                               | 29        |
| 2.4 Evolution of population and human's role in socio-economic relations  | 33        |
| 2.5 Summary and discussion  | 35        |
| <b>3 Determinants and dimensions of human capital</b>   | <b>38</b> |
| 3.1 Demographic and social aspects of human capital formation   | 38        |
| 3.2 Cycles and factors of human capital formation and reproduction  | 41        |
| 3.3 Types, structure and components of human capital  | 46        |
| 3.3.1 Health Capital (Bio-Physical Capital)   | 46        |
| 3.3.2 Labor Capital   | 47        |
| 3.3.3 Intellectual capital  | 48        |
| 3.3.4 Cultural and moral capital  | 49        |
| 3.3.5 Social capital  | 50        |
| 3.3.6 Organizational capital  | 52        |

|          |   |           |
|----------|---|-----------|
| 3.3.7    | Structural and Institutional capital  | 53        |
| 3.3.8    | Human capital structure and components  | 53        |
| <b>4</b> | <b>Review of human capital measuring methods and approaches</b>                     | <b>55</b> |
| 4.1      | Introduction to human capital measurement approaches                                | 55        |
| 4.2      | Education-based approach  | 56        |
| 4.2.1    | Introduction to education-based approach  | 56        |
| 4.2.2    | Education enrolment rates   | 57        |
| 4.2.3    | Mean years of schooling   | 58        |
| 4.2.4    | Educational attainment  | 61        |
| 4.2.5    | Demographic multi-state projection method of human capital by IIASA                 | 62        |
| 4.2.6    | Literacy rates  | 63        |
| 4.2.7    | IALS (International Adult Literacy Survey) and ALL (Adult Literacy and Life skills) | 64        |
| 4.2.8    | PIAAC (Program for the International Assessment of Adult Competencies)              | 64        |
| 4.2.9    | Skill-based method  | 65        |
| 4.2.10   | Quality of schooling  | 66        |
| 4.2.11   | Summary and discussion of education-based approach                                  | 68        |
| 4.3      | The cost-based approach   | 70        |
| 4.3.1    | Conventional methods  | 70        |
| 4.3.2    | Cumulation method   | 71        |
| 4.3.3    | Human Capital Index of the Lisbon Council   | 72        |
| 4.3.4    | Perpetual Inventory Method  | 73        |
| 4.4      | The income-based approach   | 74        |
| 4.4.1    | Conventional methods  | 74        |
| 4.4.2    | The Jorgenson and Fraumeni method   | 77        |
| 4.4.3    | Le's life time labor income method  | 79        |
| 4.4.4    | The income-based index method   | 80        |
| 4.5      | Other approaches to human capital measurement                                       | 83        |
| 4.5.1    | Combined method   | 83        |
| 4.5.2    | Residual method by the World Bank   | 85        |
| 4.6      | Summary of approaches to human capital measurement and discussions                  | 86        |

|          |  |            |
|----------|--|------------|
| <b>5</b> | <b>Demographic and socio-economic background of human capital reproduction in Kazakhstan</b> | <b>90</b>  |
| 5.1      | Human capital studies during the Soviet and the Independence periods in Kazakhstan           | 90         |
| 5.2      | Statistical data on Kazakhstan: history, limitations and peculiarities of development        | 95         |
| 5.3      | Demographic development of Kazakhstan form the late 19 <sup>th</sup> century up to 1991      | 99         |
| 5.4      | Main socio-economic changes and demographic trends in Kazakhstan since 1991                  | 107        |
| 5.5      | Regional differentiation in socio-demographic development in Kazakhstan                      | 115        |
| 5.6      | Labor market development during Soviet and Independence periods in Kazakhstan                | 121        |
| 5.7      | Summary and discussions  | 123        |
| <b>6</b> | <b>Measuring human capital for Kazakhstan by education-based approach</b>                    | <b>127</b> |
| 6.1      | Introduction   | 127        |
| 6.2      | Historical development of education in Kazakhstan  | 129        |
| 6.3      | Data   | 133        |
| 6.4      | General trends in human capital (educational) composition of Kazakhstan                      | 134        |
| 6.5      | Retrospective and perspective projections of human capital by IIASA for Kazakhstan           | 139        |
| 6.6      | Summary on main findings and discussion of the method  | 145        |
| <b>7</b> | <b>Measuring human capital for Kazakhstan by lifetime labor income-based approach</b>        | <b>148</b> |
| 7.1      | Description of the measuring method  | 148        |
| 7.1.1    | Introduction   | 148        |
| 7.1.2    | Personal human capital of a worker with higher education                                     | 154        |
| 7.1.3    | Personal human capital of a worker with unfinished higher education                          | 155        |
| 7.1.4    | Personal human capital of a worker with vocational education                                 | 158        |
| 7.1.5    | Personal human capital of an unqualified worker  | 160        |
| 7.1.6    | Total human capital stock in the country   | 162        |
| 7.1.7    | Sensitivity analysis   | 164        |
| 7.2      | Data   | 165        |
| 7.2.1    | Introduction   | 165        |
| 7.2.2    | Educational attainment of employed population  | 166        |
| 7.2.3    | Employment   | 166        |
| 7.2.4    | Education enrolment rates and education transition probabilities                             | 167        |
| 7.2.5    | Income growth rate, discount rate and labor incomes  | 167        |
| 7.2.6    | Probability of surviving   | 168        |
| 7.3      | Basic results  | 168        |

---

|          |  |            |
|----------|--|------------|
| 7.4      | Decomposing changes in human capital   | 173        |
| 7.4.1    | Introduction   | 173        |
| 7.4.2    | Depreciation   | 175        |
| 7.4.3    | Revaluation  | 175        |
| 7.4.4    | Changes in population composition  | 176        |
| 7.4.5    | Results  | 177        |
| 7.5      | Summary on main findings and discussion of the method                                    | 179        |
| <b>8</b> | <b>Working life table in demography and its application in human capital measurement</b> | <b>182</b> |
| <b>9</b> | <b>Conclusion</b>  | <b>185</b> |
| 9.1      | Discussion on demographic components of human capital reproduction in Kazakhstan         | 185        |
| 9.2      | Discussion on demographic approach to human capital measurement                          | 188        |
| 9.3      | Concluding remarks   | 192        |
|          | <b>References</b>  | <b>193</b> |
|          | <b>Appendices</b>  | <b>202</b> |
|          | Appendix tables  | 202        |
|          | Appendix figures   | 230        |

## **LIST OF ABBREVIATIONS AND TERMS**

|   |   |
|---|---|
| <b>Aul</b>                              | Village (in Kazakh), Kazakh traditional village   |
| <b>CIT</b>                              | Central Institute of Labor (U.S.S.R.)   |
| <b>Cobb-Douglas production function</b> | A standard production function which is applied to describe much output two inputs into a production process make. It is used commonly in both macro and micro examples.  |
| <b>Esep qurali</b>                      | Textbook for mathematics  |
| <b>IIASA</b>                            | International Institute for Applied Systems Analysis  |
| <b>Jadidism</b>                         | from Arabic “usul-i-jaded” means “new method” of teaching in schools  |
| <b>KazGramChek</b>                      | Central Emergency Committee on Elimination of illiteracy  |
| <b>Kuzneckostoi</b>                     | The Soviet Plant  |
| <b>Magnitstroï</b>                      | The Soviet Plant  |
| <b>Mektep/Medrese</b>                   | Other transliterations include mekteb, meqteb, maqtab, also called kuttap (Arabic: “school”), is an Arabic word meaning elementary and secondary schools. Though it was primarily used for teaching children in reading, writing, grammar and Islamic subjects (such as Qur’an recitations), other practical and theoretical subjects were also often taught. |
| <b>Opportunity Cost</b>                 | The cost of an alternative that must be forgone in order to pursue a certain action. Put another way, the benefits you could have received by taking an alternative action. For example, the cost of probable earnings which could be enjoyed if student have chosen the work instead of study.   |
| <b>Oqu qurali</b>                       | Textbook for reading  |
| <b>OrgNabor</b>                         | Organizational recruitments for different industries, was widely used during Soviet Period in Kazakhstan  |
| <b>SAK</b>                              | Statistical Agency of Kazakhstan  |
| <b>Til qurali</b>                       | Textbook for grammar  |
| <b>VID</b>                              | Vienna Institute of Demography  |

## LIST OF TABLES

|                   |   |     |
|-------------------|---|-----|
| <b>Tab. 4.1</b>   | Areas assessed in Adult Skills Surveys  | 64  |
| <b>Tab. 5.1</b>   | Mid-year population in thousands, Kazakhstan. 2010  | 118 |
| <b>Tab. 5.2</b>   | Population change patterns by regions, 01.01.2010–01.07.2010, Kazakhstan  | 118 |
| <b>Tab. 7.1.1</b> | The estimations of a worker's human capital, higher education, urban population, 2003, Kazakhstan, in USD, deflated for 2008                            | 154 |
| <b>Tab. 7.1.2</b> | Description of acronym (designated parts of the formula – 7.4)  | 157 |
| <b>Tab. 7.1.3</b> | The estimations of a worker's human capital, unfinished higher education, urban population, 2003, Kazakhstan, in USD, deflated for 2008                 | 157 |
| <b>Tab. 7.1.4</b> | Description of acronym (designated parts of the formula – 7.5)  | 159 |
| <b>Tab. 7.1.5</b> | The estimations of a worker's human capital, vocational education, urban population, 2003, Kazakhstan, in USD, deflated for 2008                        | 159 |
| <b>Tab. 7.1.6</b> | Description of acronym (designated parts of the formula – 7.6)  | 161 |
| <b>Tab. 7.1.7</b> | The estimations of a unqualified worker's human capital, urban population, 2003, Kazakhstan, in USD, deflated for 2008                                  | 162 |
| <b>Tab. 7.1.8</b> | The estimations of aggregate human capital stock for unqualified workers, urban population, 2003, Kazakhstan, in USD, deflated for 2008                 | 163 |
| <b>Tab. 7.1.9</b> | Sensitivity analysis on changes in income growth and discount rate to human capital value of urban population, 2003, in USD billions, deflated for 2008 | 165 |
| <b>Tab. 7.3.1</b> | Individual lifetime labor income by educational level, Kazakhstan, in USD, deflated for 2008  | 169 |
| <b>Tab. 7.3.2</b> | Aggregate human capital stock by worker's educational level, Kazakhstan, in USD billions, deflated for 2008   | 170 |
| <b>Tab. 7.3.3</b> | Human capital and physical capital, 2003–2008, in billions USD deflated for 2008  | 171 |
| <b>Tab. 7.3.4</b> | Per capita human capital, urban and rural Kazakhstan, in USD, deflated for 2008   | 171 |
| <b>Tab. 7.3.5</b> | Return on human capital due to investment in education, in %, deflated for 2008   | 171 |
| <b>Tab. 7.3.6</b> | Differences between expected mensal labor income and average mensal salary, by worker's educational level, in %, deflated for 2008                      | 172 |
| <b>Tab. 7.4.1</b> | Decomposing human capital stock change to the components, by place of residence, 2003–2008, Kazakhstan, in billions USD                                 | 178 |

## LIST OF FIGURES

|                  |   |     |
|------------------|---|-----|
| <b>Fig. 5.1</b>  | Dynamics of population change in Kazakhstan, 1830–2010  | 102 |
| <b>Fig. 5.2</b>  | Annual average wage level per month, Kazakhstan, 1993–2009, in USD  | 108 |
| <b>Fig. 5.3</b>  | Dynamics of population change in Kazakhstan, 1990–2009  | 110 |
| <b>Fig. 5.4</b>  | Dynamics of urban–rural population change, Kazakhstan, 1990–2010  | 113 |
| <b>Fig. 5.7</b>  | The relative structure of working age population by age, Kazakhstan, 1926–2050  | 114 |
| <b>Fig. 5.8</b>  | Population of Kazakhstan by regions   | 119 |
| <b>Fig. 6.1</b>  | Age pyramid by level of formal education for Kazakhstan in 1959   | 135 |
| <b>Fig. 6.2</b>  | Age pyramid by level of formal education for Kazakhstan in 1970   | 135 |
| <b>Fig. 6.3</b>  | Age pyramid by level of formal education for Kazakhstan in 1979   | 136 |
| <b>Fig. 6.4</b>  | Age pyramid by level of formal education for Kazakhstan in 1989   | 136 |
| <b>Fig. 6.5</b>  | Age pyramid by level of formal education for Kazakhstan in 1999   | 137 |
| <b>Fig. 6.6</b>  | Population aged 15 and over by education (all), both genders, Kazakhstan, 1959–1999   | 138 |
| <b>Fig. 6.7</b>  | Population aged 15 and over by education (only educated), both genders, Kazakhstan, 1959–1999   | 138 |
| <b>Fig. 6.8</b>  | Population aged 15 years and over by levels of education, both genders, the GET scenario of the IIASA projection, Kazakhstan, 2000–2050 | 141 |
| <b>Fig. 6.9</b>  | Population aged 15 years and over by levels of education, both genders, 1959–2050   | 141 |
| <b>Fig. 6.10</b> | Population aged 15 years and over by levels of education, males, the GET scenario of the IIASA projection, Kazakhstan, 2000–2050        | 142 |
| <b>Fig. 6.11</b> | Population aged 15 years and over by levels of education, males, 1959–1999  | 142 |
| <b>Fig. 6.12</b> | Population aged 15 years and over by levels of education, females, the GET scenario of the IIASA projection, Kazakhstan, 2000–2050      | 143 |
| <b>Fig. 6.13</b> | Population aged 15 years and over by levels of education, females, 1959–1999  | 143 |

## **Chapter 1**

### **Introduction**

#### **1.1 Relevance of the study for the case of Kazakhstan**

It is evident from the history that the territory of modern Kazakhstan had never been overpopulated. All the societies lived in the territory of Kazakhstan, throughout its history always were in need of more population. High fertility intensions were culturally supported in these societies. All these societies and states, predominantly, followed the path of quantitative development of population. The size of population always mattered for Kazakh society too. The first decades after the independence (since 1991) and actually up to now, were marked not only by ideas of national, cultural, linguistic, religious and other revivals, but also by ideas of demographic revival. The dominance of extensive economic development of Kazakhstan during last decades has hypertrophied the significance of quantitative aspects of population growth and labor resources in the country to the detriment of its qualitative characteristics. Seemingly, the sole concentration on quantitative issues of the population can not solve demographic and socio-economic problems related to demographic development which are present today in Kazakhstan. Thereupon, the matter of studying the categories of population quality is rising very urgently in Kazakhstan, especially the issues of human capital.

The social science since its inception had paid the great attention to the study of human's condition in the society and human's role in social relations. However, even recognizing the importance of human development and human's capabilities in social progress, the scientists of the 18<sup>th</sup> and the 19<sup>th</sup> centuries had been given a priority to the study of physical factors of growth and development of the society. Obviously, the main reason for this approach was the level of decisive human's role, which by that time, as well as human's creative abilities, did not played a determinative role in the development of society yet, as it became later. However, the evolutionary development of society is also accompanied by the evolution of the human conception in the society and economic system and with evolution of human's role the social science begun to conduct active discussions in such conceptions as "population quality", "quality of life",



“living standards”, “human capital”, “social capital”, “human potential development”. Nevertheless, there are still rather big misunderstandings on theoretical frames concerning the issues of human capital and population quality in social science. As for the development of methodological issues in estimation of phenomena such as population quality and human capital, the situation is even vaguer. In the social science world the conceptions of human capital and population quality are still not clearly stated. Thus, the questions of the human in modern world, the role of human in development, human’s ability and future, became one of the most important issues of the modern science.

The issues of human capital have been actively discussed in Kazakhstan, recently. Today the “human capital” is widely accepted and used term in Kazakhstan. Many politicians, economists, specialist in different areas apply to this term to describe the importance of the political socio-economic, institutional developments and the role of human and population in these processes.

As far back as the first Appeal-Message to the Kazakhstan’s nation in 1997, President discussed the issues of human capital and its importance to the future development: “The quality of the population or human resources is among of our main assets. We have a highly educated population with a high level of scientific and creative potential. Many countries believe that the achievement of such quality is one of their strategic objectives. This is, actually, the main heritage of our people from previous system. We should strive to build on invaluable asset and to create more and more civilized conditions for development of this potential. The process of globalization, scientific and technological progress, especially in the development of new information and telecommunication technologies, offers unique opportunities for our huge but sparsely populated country. However, nothing guarantees that we will keep pace with these processes. Consequently, it is essential to understand these technologies, to achieve their full integration into our society, to support scientific and technical personnel. We must create a nationwide system of personnel management with a powerful and effective training at home and abroad, with a fair procedure of upward mobility, with a unified information system, with guaranteed social protection system, with respect for the fundamental resource management – human capital” (President’s Appeal to the Nation of Kazakhstan in 1997).

After this message President has repeatedly pointed out the urgency of the human capital development for the country. The following documents broadly discussed the matter of human capital developing the new contemporary ideas in this field: “The development of social and human resources is Kazakhstan's key long-term priority. The priorities of human development are extremely important” (President’s Appeal to the Nation of Kazakhstan in 2004).

“Practically all the successful modern countries actively integrated into the world economic systems have relied on a ‘smart economy.’ In order to create such economy we should primarily develop our human capital” (President’s Appeal to the Nation of Kazakhstan in 2007).

“The key element of administrative reform should be the new human resource policy in the country. Today human becomes a crucial factor of development. Quality of life should be an

effective market instrument of human capital development and social modernization of Kazakhstan, without giving rise to free-rider attitudes. The provision of social welfare must be accompanied by improved quality of life, as well as human resources. This is the primary mission of the scientific, educational and healthcare systems of the country” (President’s Appeal to the Nation of Kazakhstan in 2008).

Considering human as main asset of the country, President Nazarbayev in his Appeal (2008) has pointed out the active investment in human capital in order to get high levels of competitiveness; these targets were outlined in strategic plan till 2020 – Kazakhstani way to leadership.

Apparently, the notions about population quality, human capital, quality of life, human development and human resource management from the highest rostrums gave an impetus to wide discussion of these terms. More and more political, business and social institutions try to fully understand what the human capital is and what its role in modern socio-economic processes is. Today the idea of human capital in Kazakhstani society widely accepted however there exists a general variety of definitions in the society, which leads sometimes to different cognition of the human capital issues and defining the priorities to answer the question how to develop and foster the reproduction of human capital in Kazakhstan. In *the Strategy of Industrial-Innovation Development of Kazakhstan for 2003–2015* one can find following target views and the role of human capital for development in Kazakhstan: “An inprescriptible condition for successful implementation of industrial and innovation strategy is the availability of qualitative human capital. In modern conditions of economic growth is identified as the scientific and technological progress, and above all, as professional quality of workforce” (The Strategy of Industrial-Innovation Development of Kazakhstan for 2003–2015).

The development of labor market is also necessitating the expenditures and investments in human capital in the country. “This requires mutual participation of public and private sectors in the selection of priorities, search, selection and expertise of R&D in order to finance the development of human resources and infrastructure to attract investment, as well as the distribution and institutionalization of intellectual property rights between all parties involved in the process. In order to ensure the integration of academic and university research, mobility of human resources, the participation of research organizations, universities, planning and design organizations in such organizational structures as a research and educational consortia and science and technology holdings will be encouraged” (The concept of public policy on labor market and employment of human resources in Kazakhstan for 2010–2019).

Other state departments maintain the importance of human capital in development. Human capital development is believed to be a corner stone in the implementation of Youth Policy in Kazakhstan. “Youth policy will focus on the implementation of measures to complement and extend the possibilities of youth through programs and projects in education and health, since exactly these areas become key factors in the formation and development of human potential” (The State Program of Youth Policy of the Republic of Kazakhstan for 2010–2014).

The issues of human capital measurement is also, has been discussed, for example the Agency of Information and Communication of Kazakhstan assessed the transition capacity of country's regions to the Information Society and suggested the method for estimation of human capital characterized by the following indicators:

- educational indicator according to UNDP system;
- indicator of higher education attainment;
- indicator of population's erudition;
- indicator of students;
- ratio of students studying information and communication technologies;
- PC skills possession indicator;
- indicator of PC use of population at work;
- indicator of computer preparedness;
- indicator of PC possession at home;
- regular use of the Internet indicator;
- e-mail use indicator.

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.

## **1.2 Outline of the thesis**

Open discussion in the study of human capital and population quality, the imperfection of conceptual apparatus and methodological approach, the high practical significance of human capital and population quality regulation have **determined the theme** of this doctoral thesis, object and subject of the study, led to the study objectives.

In this dissertation we try to discuss the theoretical issues, main methods of measurement and main peculiarities of stages in demographic history and current situation of human capital reproduction in Kazakhstan. We discuss several theoretical difficulties associated with conceptualization of categories as population quality and human capital as well as we will try to measure the stock of human capital in Kazakhstan leaning on demographic approach as widely as

possible. Writing this doctoral thesis, we intended to provide reader with information about phenomena of population quality and human capital as scientific categories and main trends in reproduction of human capital in Kazakhstan.

The **object** of research is the process of human capital reproduction in Kazakhstan. The **subject** of research is the current level of human capital in Kazakhstan; its estimation based on several demography-related approaches of measurement. 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 doctoral thesis 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.

The **Chapter 2** reviews main theoretical background as well as evolution of concepts which developed in concordance with the evolution of human's role per se. The chapter is intended to answer main theoretical question within the thesis: *what* is the human capital, *what* we suppose by using the term and *what* it describes, *what* was the history of term origination and *what* is the role of human and his/her human capital in socio-economic relations and development?

After giving general necessary theoretical introduction to the topic in next **Chapter 3** we tried to explore the links between population and human capital reproduction regularities, demographic and social aspects of human capital formation. Also we tried to examine the basic structure, components and types of human capital, look for main factors and cycles of human capital formation and reproduction.

The **Chapter 4** deals with a very important issue, which still leaves many unresolved questions – measuring human capital. We try to cover and perceive in this chapter the most frequently applied methods up to date, discuss their strong and weak sides. The measurement of human capital stock is so far has based on econometric approaches: education-based approach, cost-based approach, life time income-based approach etc. In the subsequent chapters we try to account for so-called “demographic component” in the approaches of measuring human capital, since we consider them to be very decisive in formation of human capital. And demographic factors are those factors which shape and determine the core of human capital. That is why we will try to apply methods which take into proper consideration the demographic aspects of human capital.

The **Chapter 5** explores the basic stages and trends of demographic development and conditions for human capital formation in Kazakhstan from the end of the 19<sup>th</sup> and the beginning of the 21<sup>th</sup> centuries with specificities of each period in terms of political and socio-economic factors which resulted by significant changes in processes of population reproduction and accordingly human capital development. We gave brief demographic outlines of development of human capital during the transition period in Kazakhstan, specificity of human capital development in Kazakhstan and its regional differentiation. Chapter 5 intends investigation of the co-relation between demographic changes and human capital reproduction in Kazakhstan.

It is clear that the demographic behavior inherently can not have the instant point of change in the timeline. However, we examine the period from which all conditions had begun to change in history of Kazakhstan. In addition, we try to explore how different are the levels of individual and group human capital between certain social groups (according to age, gender, place of residence and educational level) within the society. In **Chapter 6** we measure human capital in Kazakhstan by education-based approach to understand the influence of societal changes since 1959 on human capital reproduction in Kazakhstan and try to look what expects Kazakhstan in terms of human capital distribution and composition up to 2050. While Chapter 6 acts as true demographic cognition of the human capital level in Kazakhstan the following **Chapter 7** discusses estimation of human capital stock in the country based on lifetime labor income-based approach. This approach has more market-oriented value and understanding of human capital and its effective use in the country. This approach lets answering 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?

In **Chapter 8** we try to measure human capital according to basic demographic methods which are widely used in modern demography. We find some of them relevant to measuring working potential, tempo and quantum parameters of working age population. **Chapter 9** concludes.

## **Chapter 2**

### **Evolution of ideas and conceptions about population quality and human capital as scientific categories**

#### **2.1 Development of ideas about qualitative characteristics of population**

Population is the main component of a country, national wealth and the main engine of the growth. In social sciences, there is an explanation of the category of “population quality” as the integral characteristics of many people, united in a community, which determine the level of efficiency of their vital activity. Population quality is the characteristic of people which expresses the level of their ability to carry out activities under different conditions for their development. The population quality becomes a resource and a guarantee of a stable development, the basis of the national, economic, social and cultural security of a state and a society.

Many scientists were interested in questions of population quality, starting from ancient times. In the 6<sup>th</sup> century B.C., Confucius connected the population quality with the preservation of family traditions, motivation and life principles of individuals (Jacka 2007). In 1897 the term “population quality” was mentioned in the Chief of Paris Statistical Bureau, Jacques Bertillon’s book “The problem of depopulation” (Le problème de la depopulation). One chapter of this work was called “The quantity and quality”. The author himself did not reveal the population quality as a scientific category, he just warned and opposed to its treatment as the supremacy of one nation over another (Schneider et al. 2002).

The initiation of population quality as a scientific category took a long time. Close attention and serious scientific research in the issues of population was received only by the 20<sup>th</sup> century. Generally, socio-biological and socio-economic approaches can be taken into account. The concepts, explaining the idea of population quality, based on biological approach begun to develop at the turn of the 19<sup>th</sup> and 20<sup>th</sup> centuries, during the period of rapid development of evolutionary theory and genetics. Supporters of this approach considered the human and the

population just as part of nature, and conception of "population quality" considered as a purely biological category. However, some authors insisted that the formation of biological features and qualities of human, are regulated also in the social conditions, while others believed that it is the biological characteristics of the population which define the social life. There has been a considerable output of generalizations and of programs for the improvement of the quality of succeeding generations of human beings. These so-called eugenic programs have been widely propagandized and have in some cases received the official backing of governments, but the scientific ground-work on which they are supposed to rest is still in many respects incomplete and shaky.

McKenzie (1981, in Wikipedia 2011) wrote: "the founder of eugenics, Sir Francis Galton systematized these ideas and practices according to new knowledge about the evolution of man and animals provided by the theory of his cousin Charles Darwin during the 1860s and 1870s. After reading Darwin's *Origin of Species*, Galton built upon Darwin's ideas whereby the mechanisms of natural selection were potentially thwarted by human civilization. He reasoned that, since many human societies sought to protect the underprivileged and weak, those societies were at odds with the natural selection responsible for extinction of the weakest; and only by changing these social policies could society be saved from a 'reversion towards mediocrity,' a phrase he first coined in statistics and which later changed to the now common 'regression towards the mean'".

"The eugenists (Pearl, Thompson, Jennings, and Haldane) start out by viewing human as an organic type whose hereditary characteristics are the result of the same processes as those producing the characteristics of other animals. These processes are essentially summed up in the two terms mutation and natural selection although other factors such as isolation, population size and (possibly) emergence or an 'elan vital' play some part" (Woodward 2008:469).

The population quality had been measured in terms of fitness to survive and breed descendants, consequently the differential rates of increase or decrease as between two type-forms are the only naturalistic indices of their relative quality. According to eugenists in cultural society there are two types of selection operating simultaneously. The first of these is natural selection which is adaptive to the environmental conditions over which human still exercises little or no control, the second is cultural selection which is adaptive to human-controlled environmental conditions, both in the biological (fauna and flora) and the physiographic (climate and topography) portions of the environment and especially in culture itself.

"Cultural selection does not necessarily support natural selection to maintain or improve a quality defined in the naturalistic sense. It may do so but on the other hand culture may set up its own implicit or explicit standards of quality that may be inimical to the long-time naturalistic standards. Furthermore, as has been often pointed out, cultural selection may be extremely rigorous and modify biological type with relative rapidity; it may therefore overturn within a relatively short period the work of a natural selection operating over many generations" (Woodward 2008:470).

Another unique conception, the A. H. Halsey's conception, took a special place among the socio-biological concepts considering genetically caused population quality as a determinant of

social processes. Halsey believed that the genotypes are determining the possibility of development, and the environment, in the other hand, is determining what are the opportunities and to what extent they will be realized in the individuals' lives. Halsey, in his works, recognized the strengthening of social factors role and reduction of genetic factors role in shaping the population quality (Schneider et al., 2002).

The interesting analysis of social and biological factors in shaping population quality was displayed in the P. R. Cox's approach. Without denying the importance of biological factors, he acknowledged that the current quality of the population is more dependent on social conditions, rather than eugenic means. "The absolutization of such approach, i.e. the consideration of human only as an animal can lead to unreasonable and inappropriate practical recommendations. It is indisputable that the human experiences the impact of nature, but these characteristics are not exhaustive. As society changes, the biological evolution is less defined in human nature (although, scarcely, the effect of biological factors will reach the zero level). Only in the society human can develop his/her personal qualities, so his/her equalization to animal is improper".

In this regard, another group of researchers based, in their researches, on socio-economic approach. Here, human is viewed solely as a social phenomenon, all the parties of his/her development are, *prima facie*, defined by labor. The concept is based on two starting points:

1) Biological features in human are not essential for his/her historical development. They are completely dissolved being internally connected with the social features, as a result human ceases to be a biological substance. The features of population determined only by social environment.

2) Labor is recognized as a foundation of human society and the driving force of human development. The labor had created the human and therefore the quality of laborer is the starting point in the forming of population quality.

The first large-scale elaboration of the phenomenon "population quality" was made by Lambert-Adolph-Jacques Quetelet (1835). At the core of his philosophy underlies his thesis: "the laws managing development of people and altering their behavior, in general, are a consequence of the way of organization, education, economic well-being, institutions, local influences and many other reasons, of people themselves..." Thus, Quetelet considered population as a growing phenomenon and attributed this development to the specific abilities of human, i.e., to his/her qualitative determinacy (the term "quality" Quetelet used later). Quetelet pointed out the relationship of population features with productive forces. Although Quetelet did not offer his own definition of population quality, but owing to him for the first time the phenomenon was seen with other positions. Quetelet's work based on the principle of "average citizen", according to what, with an increase in the number of observed individuals "their individual, physical, intellectual and moral characteristics disappear, and the main societal facts on which society exists and persists is put forward ". Modern methods of assessing the population have opened new possibilities for the usage of the "average citizen" for developing the concept of population quality, because the average human of each era is a type of human development in this era, which displays at local and temporary conditions human's improvement abilities (Eknayan, 2008).



Karl Heinrich Marx (1990), also, dealt with the problems of population quality, using this term to describe one of the material conditions of production. In one of his early written works Marx wrote that the essence of "special human is not a beard, not his blood, not his abstract physical nature, but his social quality".

Since the 1970's in the social sciences, the issues of population quality had been given an increased attention. Population quality was mainly interpreted based on the theory of human capital, emerging through investments in health, education, skills, etc. Obviously, at that period the socio-economic approach to research dominated, which was due to need to explore additional reserves and resources of economic growth. In conditions of low population growth rates and low labor force growth rates the quality of the workforce started to be considered as a decisive factor in economic growth and progress of a society. For example, T. Patten Jr. pointed out that the real wealth should be measured through the quality of population, living in the country and working in the different organizations. He determined the quality of the workforce as the unity of education and work experience, and he equated labor forces to human capital (Ramsden, 2002).

One of the most significant contributions to the development of the general idea of population quality was made by Theodore William Schultz. He (1994) pointed out: "the economic role of natural resources and intermediate products is small with comparison to the role of human services in production and consumption". Applying to the analysis of population quality formation patterns, Schultz (1994) opposes quantitative and qualitative theories of the population, considering its size and stressing that development of "qualitative theory" is complicated by "the difficulty of defining and measuring the phenomenon of quality".

The preponderance of socio-economic approach in the studies was the result of scientists' awareness with the place and role of human in the development of society and the consequence of a comprehensive study of socio-demographic processes (which was a big step forward, actually). A new impetus to the study of the population quality was given by works of Aurelio Peccei, in his book "The human quality", (founder and president of the Club), indicated that the main problem of humanity is that its nowadays cultural development lags behind the realities of modern times which were developed by humanity itself. Only by improving quality of humanity, people can use for their benefit the enormous potential of material world (Masini, 2004).

The qualitative characteristics of population and demographic processes are situated in two relative ideological areas which are determined in the scientific concepts of "population quality" and "quality of life" (QOL). Quality of life is a set of social values, characterizing the types of activities, the structure of needs and the conditions of human existence, people's satisfaction with life, social relationships and environment. This set of individual's properties should determine an optimal functioning of human in terms of biological, material, spiritual and other developments.

The term "*quality of life*" accumulates the basic *conditions* of human existence and development, while the idea of "*population quality*" is the *level* and the result of population development, which determine the further development of society. Population quality is what inside of people, and the quality of life is what outside. The qualitative characteristics of a population are

reflecting the effects of prevailing conditions of life accrued during the previous periods. The positive changes in social characteristics of the population (life expectancy, health status, the propensity to reproduce, educational level, etc.) directly depend on the intensity of positive changes in quality of life. At the same time, qualitative characteristics of population reflect what have been accumulated during the period preceding the effects of the current living conditions, i.e. QOL. Practically, all the characteristics of people's life are interrelated by direct and reverse linkages and that is why their combination is a complex system that organically links population quality and quality of life. As a result, through the scope of needs, the population quality stipulates the basis of the QOL.

Quality of life is not limited to the standard of living, which indeed serves as one of many criteria of QOL. The standard of living refers to the quality and quantity of goods and services available to people, and the way how these goods and services are distributed among a population. It is generally measured by standards such as income inequality, poverty rate, real (i.e. inflation adjusted) income per person. The other measures such as access and quality of health care, educational standards and social rights are often used as well. Examples are access to certain goods (such as number of refrigerators per 1000 people), or measures of health such as life desires. It is the ease by which people living in a time or place are able to satisfy their wants.

The idea of a '*standards of living*' may be contrasted with the quality of life, which takes into account not only the material standard of living, but also other more intangible aspects that make up to human life (leisure, safety, cultural resources, social life, mental health, environmental quality issues etc). There are many factors being considered before measuring standard of living, like GDP, the per capita income, population, infrastructural development, political and social stability etc. Interestingly, two nations or societies that have similar material standards of living, can significantly differ in terms of life quality. However, there can be problems even with just using numerical averages to compare material standards of living, as opposed to, for instance, a Pareto index (a measure of the breadth of income or wealth distribution). Standards of living are perhaps inherently subjective. As an example, countries with a very small, very rich upper class and a very large, very poor lower class may have a high mean level of income, even though the majority of people have a low "standard of living". This mirrors the problem of poverty measurement, which also tends towards the relativity. This illustrates how distribution of income can disguise the actual standard of living (Wikipedia).

Although, the category of population quality was used in the scientific literature previously, still, its full content hardly has been detected, and thus a theoretical and methodological base of this issue has not been developed. It should be noted that currently some researchers are actively using and treating the category of "population quality" as a synonym for "*human potential*". Of course, these concepts are very closely linked. However, in our view, to wide extent the term human potential can be considered as a set of abilities and rights of a human at birth, which develops at the process of further socialization, in various ways, depending on many factors. The concept of human potential is intended to disclose with the maximum fullness the idea of human's self-value.

Regarding the notion of “population quality” it should be understood as a category which characterizes the population as a subject of social life, social production and social relations, i.e. the ability of population to react to emerged environmental, technical, economic, social and cultural conditions and adjust them for changing needs of population. If you consider population quality and human potential in this context, it is clear that, despite the clear and interdependent relationship of these concepts, they are, actually, not identical in content.

For a long time, the development models of the society which focus on economic growth and ways to accelerate this growth have been being prevailed. It was believed, that the economic growth automatically will lead to progress in human development and in whole society. However, despite strong economic growth in the 20<sup>th</sup> century, most of developing countries did not solve the problems of poverty, low employment, quality of life and standards of living improvement. Further, the formula "economic growth" = "human development" has not been justified and has resulted in intensification in socio-political instability and poverty. Therefore, at the end of the 20<sup>th</sup> century, the concept of *human development* had become the most attractive issue, the primary purpose of which is the realization of the needs and aspirations of the human.

As early as the 1970's the theorists of the Rome Club, analyzing the structural relationship and the conflict between nature and society, concluded that “the development and deployment of human potential is what, ultimately, determines the success or the failure of economic, social and any type of development”. The club recognizes that investment in people, today, is considered as the most effective investment. This situation had urged scientists to realize that in the developing world the needs for food, shelter, education and healthcare directly contribute to higher productivity and overall socio-economic growth. Thus and so, the questions of the human in modern world, his/her future, role in development and qualitative characteristics (such education, health, values, abilities, skills and so on) became one of the most important issues of the modern population studies.

In the last decade of the 20<sup>th</sup> century, experts from international organizations, like UNDP, had developed the modern concept of human development, which puts human in the center of the social progress and considers economic growth as means, rather than, as the ultimate goal of human development. This concept leads to the conclusion that not only GDP should be considered as the main indicators describing the development of a society, but also the parameters that characterize the health, education and access to information. The emphasis is made on the so-called human development or human potential development, the achievement of this level of development is evaluated not only on indicators of income, but also on such factors as life expectancy, the proportion of adult literacy and accessibility to education. In wide extent, the concept of "human development" includes all aspects of development of the human personality beginning from the state of his/her health and ending with the state of his economic and political freedom. So the human potential development represents the greatest possible realization of human capabilities.

Taking into account aforesaid, the author renders the following definition of population quality, it is the functional characteristics (abilities) of population, which allow population to meet new

challenges and use the socio-objective reality, not only to live in these various new situations, challenges and changes (structural, ideological, economic, social, political), but also use them for development of population itself. This is a level of population abilities to live in different environments and to amend them for itself. Population quality is expressing, also active set of abilities that people have, because of the experience of historical development on particular territory.

## **2.2 Human capital as a category of economic quality of the population**

We have seen that population has not only quantitative parameters and determinants, but also it has very important qualitative characteristics. The qualitative characteristics of population can be expressed by different measures, approaches, understandings, assumptions and cognitions. In sense of basic population studies, the population quality is the unifying global category and aspect. The population quality occurs as integrative characteristic in population studies, not only in terms of describing particular properties of the population, but also it is integral to all categories which express different characteristics of the population. Its concept stands far above all modern and fashion theories about population. The understanding of population quality is crucial, today, for creating the effective strategies for social development. Perhaps, the category of population quality is the most extensive and the broadest category-concept in terms of describing the properties of the population. It has a different dimensions and features. The concept of population quality is very large idea, which develops today in many different areas of social and fundamental sciences. As you have noticed many different authors understand and research the population quality differently. And this is somehow justified, since the quality of population can not be impressed only by one concrete dimension, just because population has different meanings and approaches for research. Moreover, the population, by itself, is developing very rapidly through all human history. On the other hand the idea of quality is also developing and has different meanings and approaches, as well. So in the situation when ideas of both the population and the quality have different approaches and meaning, along with development paces, for scientist, their unification and making joint category as "population quality" doubtlessly create very multi-dimensional and multi-approached understandings of given phenomenon. All this approaches and understandings are "correct" and "true" in each case and context. As the most appropriate category which successfully describes the economic component of quality, characteristics and properties of the population we consider the category of "human capital".

Human capital as a scientific category is the most economic among the socio-demographic, and the most hominal among the economic categories. Human capital is the economic quality of the population, economic potential and quality of individuals, groups and the whole society. One of the founders of human capital theory, Becker (1993) defines human capital as the sum of knowledge, skills and other abilities of human, formed, accumulated and improved as a result of investment during life activity, required for a specific purposeful activity and promoting the growth of

productive force of labor. Human capital refers to the stock of skills and knowledge embodied in the ability to perform labor so as produce economic value, formed as a result of investment and accumulated human's health, knowledge, skills, abilities, motivations which are expediently used during the process of labor, contributing to human's productivity and wage increase. Many early economic theories refer to human capital simply as "labor", as one of three factors of production, and consider it to be a fungible resource, homogeneous and easily interchangeable.

Since we are interested in mainly economic constituents of population quality, we will deeply discuss the idea of human capital in this thesis. We think that the socio-economic side of population quality can be expressed and described, in simple and the best way by concept of human capital. Some can say that the human capital is also very large concept and approach, not narrower than population quality per se. However, we think that human capital has very strict borders of conceptualization anyway, mainly economic interests and determinants. Choosing the concept of human capital we would like to deeply discuss further this concept, concentrating on socio-economic side of population quality.

Actually, the idea of "capital", per se, in some extent already expresses the quality of the object. "Capital is the inherited and acquired by human abilities and qualities" (Walch 1935). So we can set an objective of this work as provision of expanded notion of the ideas of "capital" and "human capital" as the qualitative characteristics of the population and human. In economics, the term capital or capital goods or real capital refers to items of extensive value. The term "capital" can also be applied to the amount of wealth controlled by an economic agent (human, company, society). The capital is the aggregate relations and commodities expressed as a value that can bring whether surplus value or loss. The capital is not the thing, not the property, but historically defined economic relations regarding things, the attitudes about the changes in their value, i.e. their capitalization.

Human capital theory studies the process of qualitative improvement of human resources, forming one of the central divisions of modern labor supply analysis. The development of innovative economics is not impossible without increasing of employment and labor productivity. Here, not so much the quantity as the quality of labor force plays the decisive role. According to the theory of human capital, the quality of the workforce is one of the main factors of economic growth. In turn, the quality of the labor force depends on the level of human capital, which includes the ability, knowledge, skills and competence intrinsic to the individual. Here, the most important forms and conditions are represented by formal education, trainings and labor migration. Any imbalances in these areas lead to a decrease in the quality of the workforce, and therefore productivity, which adversely affects the trajectory of economic development.

During the origination stage of capitalism the basic condition for development of production or manufacture was the idea of "labor force", or ability to work, "aggregate physical and moral abilities" of a human, alive human personality and forces which were put in motion, every time when s/he produced any use-values. The human was considered as means of labor, as productive forces and his/her abilities were evaluated only during the process of economic goods production.

Physical and moral abilities had qualitative dimensions, but were not presented structurally and were evaluated simplistically in quantitative measurement. The evolutionary development of the society has been led by the evolution of human's status in social relations, including economic relations. Since the labor expresses a conscious, teleological and resultant activity and the most significant part of human's life, the concepts in this area (scientific areas studying labor) transformed most actively.

By the middle of the 20<sup>th</sup> 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. At that time methods of economic analysis were being improved, the subject and the object of research were being specified, new divisions of economic theory were being elaborated and developed and the differentiation of economic sciences was being expedited. New conditions of life and economic activity demanded a new detection of human's role, human's 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. Theodore William Schultz and Gary Becker became pioneers in defining human capital as a holistic concept, focusing on investment in human capital and evaluation of its effectiveness. Investments in enhancing human capabilities lead to increased productivity, to increase of profit, including increase in employee wages. Which means that, the reproduction and accumulation of income is taking place by means of human capabilities, which make them a special form of capital. Russian economist Kritsky (1995) defines human capital as a universally specific form of human's vital activity, assimilating consumption and productive pre-forms of the society life, which corresponds to the ages where products were appropriated and produced, and implemented as a result of the historic movement of human society to its current state. Acknowledgement of the universality, historicity and precision of human capital in Kritsky's definition can restrict the time frame and socio-economic conditions of existence of human capital phenomenon. This means that human capital, by itself, can be developed through time and generations, as well as, through different socio-economic conditions.

In the most complete manner 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.

### **2.3 Evolution of ideas and concepts about human capital as a scientific category**

The economy exists for human and at same time it is reproduced by human. The economic activity of human, simultaneously, is appearing as a consequence of the prevailing system of social relations, and as a source of improvement of productive forces and economic relations in the society. The development of a coherent theory of human capital and its organic embedding into the structure of social and economic science has historically carried out consistently as the enrichment of science itself. Throughout the human history there were changes of trends in development of material production, in its increasing complexity, in the modes of production and in the tremendous development of the means of production, which had entailed the transformation in the productive forces as well as in industrial relations. During all this time the public opinion was actively seeking for shapes of an appropriate paradigm for the development of the society.

There was the great attention in the history of social science to the issues of studying the place and the role of human, to his/her abilities and needs, to his/her economic position and productive capacity. Almost in all schools of socio-economic thought an important place was occupied by problems assessing the role of the economic agent (player, actor) in economy and economic relations. “Homo-economicus”, as an initial economic figure always attracted the attention of scientists. The most consistent and adequate socio-economic role of the human was revealed in the theory of human capital. Initial conditions to assess the human’s abilities as a special kind of capital had already been in the works of the classics of economics such as William Petty, Adam Smith, David Ricardo and Karl Heinrich Marx.

The 16<sup>th</sup>–18<sup>th</sup> century became the era of rapid development of capitalistic relations. The bourgeoisie as a new progressive class of the time tended to capitalize any kind of values. This interest was aspired to be reflected by economic science as well. Thus, in the works of W. Petty, we find an attempt to assess “value of... people, artisans, sailors, soldiers” as “live effective forces”. “The value of people, like land, is equal to twenty times of the annual revenue which they bring” (Hay 1998). Thus, the quantitative measure was suggested for the owner of capital in order to comparatively assess the capital value of prospective employees.

A. Smith directly included skills, knowledge and abilities in the “basic capital which realized in human”. The productive capacity of worker is also involved in the production of income as well as machine building and land, although it does not enter into circulation and is inseparable from the worker. Formation of the labor force as an element of basic capital, i.e. improvement of worker’s deftness and skills requires additional labor costs, time and other expenses. The costs of employer to train employees, in this respect, are similar to other capital costs and thus become a structural part of the capital (Sher 2004).

D. Ricardo developed the Smith’s idea about the role and the place of human capacities in productive forces of society. He laid out the specifics of the costs structure for the labor force reproduction. He wrote that the use of machines in production requires the education and mastering

of natural and technological knowledge of workers. Surplus capital would be equally valid in the production of future wealth, no matter if it is obtained through workers' qualification or machine improvement. Educational level of workers affects the level of development in a country. The backwardness and underdevelopment of the country are explained by the lack of education in all strata of population (Gootzeit 1976).

The role of labor and human capacities in the production are thoroughly disclosed by Karl Heinrich Marx. He considered the labor and ability to work as leading factors in economic development, and the workers as the main productive force of society. Already in the manufacture, the division of labor considerably increases the productivity of labor. At factories based on the use of machines, a clear distinction between simple and complex labor is observed, the role of mental abilities and the need for professional training have been increased. Human and his/her abilities are active aspects of production, which impel and regulate the operation of machines and technologies. Marx was the first who interpreted the transformation of human abilities into specific form of capital. He stressed that human development can be regarded as the production of basic capital. However, in the case of capitalism the labor force in the hands of the worker is a commodity, but not necessarily capital as capital it operates after the selling, in the hands of capitalists during the manufacturing process. According to Marx (1990) the restoration of workers' ownership for the means of production and physical capital legally would mean the overcoming of ownership expropriation of workers' human capital.

In order to analyze the conditions of human abilities transformation into specific form of capital the Marx's methodological approach becomes very useful for the ascertainment of the capitalization conditions of money, results of production, means of production, land, intangible benefits and all other goods. According to Marx, money is converted into capital under the following conditions:

- 1) when the money stock turn into money drive and used for value increase, i.e. realize a profit;
- 2) when labor becomes a source of surplus value, since the cost of labor force reproduction is less than the new value created by labor in the production process;
- 3) land, labor and services can turn into capital through the capitalization of their return interest, for example, capitalization of different rents;
- 4) under the domination of private ownership of capital, there appears an exploitation of human by human, when the effect of human capital is appropriated by owners of physical capital.

Alfred Marshall also compared, and even equated the processes of material resources capitalization and capitalization of employees' personal skills. Marshall considered the incentives of people to accumulate human capital by contributing to education are similar to incentives which determine the accumulation of physical capital (Wood 1996). Expenditures on education and skills of workers in enterprises are funded from circulating capital. Since, the work of educated human is more productive, the educational costs can be equated to the investments which increase the income and national wealth. Therefore the investments in accumulation of human abilities can be admitted as a special form of capital, which value is increasing with the complexification of production technology, informatization and intellectualization of labor.



The technological revolution has given a powerful impetus to rethink the role of human, his/her abilities and opportunities in the economy and society. The science and knowledge become a direct productive force. The institution of intellectual property appeared and rapidly grew as a special investment in capital of enterprises. In the structure of business sectors appeared innovative enterprises, while intellectual products and exclusive rights formed a huge and rapidly growing sector of the economy. Intellectual capital as the main asset of competitiveness was recognized in the science and practice of business. The automation of the production and management, network forms of industrial engineering supersede the human from direct production and raise his/her creative, social and organizational skills as the most attractive side of the human personality and at the same time as a basis for separation of human capital.

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 Theodore William Schultz, Gary S. Becker, Jacob Mincer, Erich Gundlach, Casey B. Mulligan, Xavier Sala-i-Martin, George Psacharopoulos, Mark Blaug, Yoram Ben-Porath, Burton A. Weisbrod, Finis R. Welch, L. Hansen, S. Bowles, Richard Layard, John F. Ermisch, Barry R. Chiswick, etc. The theory developed in the framework of neoclassical economics and was used in analyses of education, health, family and other areas non-market activities.

T. Schultz is reasonably recognized as a founder of the human capital theory. In the articles “Capital Formation by Education” (1960) and “Investment in human capital” (1961) he described as a rigorous concept his vision of a new economic role of the human and his abilities in the modern economy. In discussions about the sources of economic growth T. Schultz put in the forefront the role of education. He considered the changes in structure and the qualitative improvement of the aggregate labor force as the result of investments in education system. Education expenditures are equal to investment in technological progress, since in both cases, productivity and profitability of production increases. Schultz compared the roles of physical and human capital and researched their forms and structures, as well as their interaction and influence on productive efficiency. The fundamental conclusion was done about the leading role of human capital in modern industry, especially in science- and knowledge-intensive sectors of economic activity.

In three-republished monograph by G. Becker “Human capital: a theoretical and empirical analysis” the human capital theory has received a systematic form. Becker (1993) wrote that the main incentive factor was the realization that in most countries, growth in physical capital account for the relatively small portion of income. Searches for satisfactory explanations had caused an interest to the less tangible entities, such as technological progress and human capital. In Becker's works, there are widely used quantitative methods and models for studies of investment relationships in human capital and their returns. He had greatly expanded the understanding of investment in human capital. According to Becker (1993) most of the household decisions about marriage, children, education, changing jobs, and costs of medicine, take the form of investments. Not only the cost of education, but also the cost of raising children, health, search for information

on professional development and other costs are regarded as investment if they lead to the growth of the productive capacities of human, therefore his/her income.

The age after Becker is characterized by great interest to the scientific concept of human capital and its wide acceptance. In the work of C. R. McConnell and S. L. Brue, "Economics", investments in human capital are treated as any action that increases the skills and abilities or labor productivity of workers. Authors regard the cost of engineering tools and equipment, the costs that improve anyone's performance as an investment, because current expenses or costs are being incurred with the expectation that these costs will be offset by increased multiple revenue stream in the future (Wood 1996).

Proponents of human capital theory developed many types of quantitative methods for analyses of the effectiveness of investments in education, health care, training in production, migration, birth and child care and their returns for individuals, family and society. The main focus of these analyses is human's productive ability and wage (income) differentiations caused by the different levels of investment. Opponents of this idea, try to ascribe a leading role of the abilities differentiation in the hereditary and biological factors. They believe that the simple explanation of individuals' income differences with different levels of education, leads to overestimation of the training and education effects. Both of these explanations of causes of differentiation in ability to work and, consequently, in wages (incomes) have been criticized by other scientists. In their view, education acts as a mediator which transforms inequality in social lineage in income inequality. The transmission from generation to generation of economic inequality in society arises from transmissions of links in the world of socio-economic relations and through the adoption of value attitudes, motivations and behavioral stereotypes. Therefore, if at different levels of the production hierarchy the workers with different behavioral characteristics are required, and if the development of these characteristics is carried out mainly in the family, then the social lineage may cause the reproduction of economic inequality. C. Jenks showed on extensive selective material that the correlation between education and earnings is found only in aggregate group values, whereas in the analysis of individual data the connection is virtually disappears. Hence the conclusion is that the differentiation of income is probabilistic in nature and caused predominantly by random factors and variables (Farmer and Terrell 1996).

Human capital is a complex, diverse and changing phenomenon. Researchers of human capital focus on different aspects which makes differences of approaches and assumptions in determining its nature and content. Thus, despite the considerable efforts made to develop the labor force theory and sophisticated techniques of statistical analysis of income differentials and the factors causing them all this were unable to complete the creation of a harmonious, well-composed and proved by facts theory.

## **2.4 Evolution of the population and human's role in socio-economic relations**

With the growth of technical equipment of work, the structure and content of functions performed by a human in production process had undergone significant changes. Historically, the first stage of the technological development had been hand-tools, by means of them human was operating on the subject of labor. The labor functions of the worker had a relatively stable nature, organically ensuing from the natural human capabilities. The leading role in the work was played by skills acquired through many years of productive experience and retained throughout whole life. Therefore, the creation of “ability to work” did not require stupendous time costs. With the transition to mechanized production had arisen a need to separate the functions of creation and implementation of means of labor. Machine creation had become a more complex process, and the implementation of this process could not be based just on practical experience of producer. This had been requiring some theoretical knowledge. The contradiction between intellectual activity and labor was resolved by a separation of creation and use of means of labor, i.e. the separation of applied science from production. With the accomplishment of such division the work started to be carried out only as a direct labor, and the worker became an adjunct of the machine. With the growth of technical equipment of work and complexity of machines the structure and content of functions performed by human had changed substantially.

At the upper stage of comprehensive mechanization all the functions of physical labor are performed by machines, the human has only the functions of machine management. This process requires a qualitatively new abilities as well as polytechnic and complex knowledge. The system of education and its separation from immediate labor helps to resolve the contradiction between immediate and intellectual labor. With the development of automation not only the functions of physical labor were devolved on machines but also the functions of management of these machines. Human became freed up from participation in the production process, and became a regulator of this process. In this case, the decisive role is played by the level of general, polytechnic and special knowledge. Such changes in work functions show an increasing share of intellectual labor work costs, saturation of immediate labor with intellectual activity and with functions of creative character. Doubtlessly, such labor requires the huge accumulation of knowledge and information, tremendous long-term input to work. The aim of this new kind of labor, which considerably excels from physical labor, becomes an innovation. The priority in such innovation based economy is set to the accumulation of intangible and intellectual properties, where the intellectual properties are considered as the major factor in the establishment and development of high technology.

All the new means of life activity are based on science, education and production, so they become possible on the basis of two related forms of accumulation: non-material (knowledge, skills, experience, and culture) and material. Currently, the non-material accumulation (human capital) affects all aspects of life activity through the influx of new scientific and technical knowledge, innovations, know-how and professional development of employees, along with

development of general culture. The wider the spread of new scientific knowledge, the more it is embodied in the professional qualifying potential of employees, the higher the proportion of high technological products, the better the return on investment in human capital. The non-material (intangible) accumulations generate significant multiple effects.

Since the second half of the 20<sup>th</sup> century the rate and efficiency of economic growth started to be determined ever more by the level of worker's self-development and accumulated human capital. Several scientists, mostly in economic sciences, had noted that since the early 1960's the process of gradual transformation of industrial labor force into postindustrial (innovation) labor force had began, which has highly developed informational needs and capabilities realized in the form of innovative human resources.

With transition to innovative economy a new form of wealth came into existence, transforming its entire structure. The quality of human capital and the degree of its involvement in social production have a direct impact on the level of national wealth. The volume and structure of national wealth is one of the main characteristics of society, which determines the economic power of a country. The innovative economy is understood as the economy, where fundamentally different way of managing is dominating i.e. innovative, relating to the development of all sectors and spheres. The essence of this principle consists in radical change in considering science and education as main sources of various innovations. In an innovative society, the creative structure of productive forces of society and human are actualized increasingly in the form of human resources. In an innovative society, the individual is not simply "economic human", who refers to a set of economic functions and roles that define a rational human behavior in the economy of industrial type, but s/he becomes multifaceted human personality as a decisive factor and the main resource of innovation-based society.

At the stage of innovative economy development, the knowledge forms the majority of value in products and services created by society. In innovative economy the activities associated with production, storage, transmission, and using of knowledge acquires considerable importance. A special role in these activities belongs to the education, the character and significance of which are changing at the greatest degree. In innovative economy of postindustrial society the investments in human capital become a leading factor of economic growth and competitiveness of national economy, company and individual. Innovative economy pushes aside the issue of property ownership in its traditional sense and puts a premium on intellectual property.

When traditional resources and sources are about to exhaust the economic growth is ever more provided by the use of innovative resources, the main carrier of them along with material factors becomes a human with high level of education, scientific and special knowledge. The wealth of the country is created by productive labor of its citizens. Economically developed countries are characterized by high and sustained rates of economic development, what have ensured comparatively high employment rates, rising incomes and consumption per worker. The latest trends of socio-economic development show that there is a need to identify new priorities and criteria in interpretation of a new concept of capital, which would summarize the main features of

highly developed modern society. Human capital theory studies the process of qualitative improvement of human resources, forming one of the central sections of the modern analysis of labor supply. Real revolution in labor economics was originated with promotion of this theory.

Human capital theory has suggested a unified analytical framework for explanation of such, seemingly, various ordered phenomena as the contribution of education to economic growth, the demand for health and education services, the age dynamics of wages, wage differentials of male and female workers, the transfer of economic inequality from generation to generation, fertility patterns resulting on family and etc.

In modern conditions the complex of productive capacities and needs of human is established in the form of human capital, which is transformed into a set of creative innovative capabilities and needs which are specific to the innovative stage of social development and functioning in the form of innovative resources. Innovative human resources are an adequate form of expression of the essential human's creative powers to innovative stage of social development. This form is included in the system of the innovation-based economy as the main factor in ensuring the high quality and dynamism of social and economic progress of a society. Today, human capital has become the central idea of the many humanitarian and social sciences, including demography. The role of human, population and humanity is growing in various branches in the processes which take place around the human.

## **2.5 Summary and discussions**

At the turn of the 20<sup>th</sup> century the humanity entered a new round of its development. Today the world moves from an industrial to a postindustrial society, where the innovative economy takes a leading role. The transition of society to postindustrial stage of development and innovative economy are accompanied by dramatic changes in the interaction of production and consumption; in priorities of values definition; in the formation of a new form of human activity (intellectual activity); in production process (innovative activity); in structure of accumulation (intangible capital); in structure of preparation and employment of human resources; in financing structure of tangible and intangible productions; in property relations, especially, the emergence and rapid development of intellectual property and in changing forms and patterns of social wealth.

Such transformation of society leads to the fact that labor begins to act as a form of human capital. The human capital, per se, becomes the main factor of economic growth and socio-economic development. The fundamental changes have been undergoing in lifestyle of humanity. The new society is now based on development of science and efficient technologies; on new quality of human capital, on changes in social structure; on higher levels of management; on more rational use of resources; on new opportunities in production associated with these factors; on consumption and cutting of the costs per unit of resources for the production of goods and services.

In aggregate these circumstances constitute a new synergistic effect which calls forth the formation of a new society. The achievements of human intelligence, intellectualization of

production led to a new round of development of human society. The industrial society was characterized by the prevalence of physical labor in it, while in the innovative economy the role of intellectual capital has increased. The intelligence, information and knowledge become major assets of economy in new informational and innovative society. Restrictions caused by demographic, labor, spatial and temporal, environmental, raw materials and other factors can be surmounted or mitigated with help of these new assets. Prevalence of intellectual labor in conditions of new society requires the disclosure of human's intellectual abilities and characteristics.

The changes in types of skilled workers reproduction were established due to demands of scientific and technological progress and rapid development of science. Such significant changes in characteristics of humanity development demanded a clarification of information about reproduction of the aggregate worker and his/her participation in economic processes.

Human capital studies allows us to understand the role of social institutions, identify social parameters in production process and conduct the economic analysis of social factors influence on market and innovative economy. From this point of view, human capital can be regarded as a form of expression of human's productive forces at the post-industrial stage of social development with socially oriented economy of innovative type. The main contribution of human capital theory to the science does not lie only in a reformulation of economic theory and previous studies, but in pushing back the boundaries of economics beyond the sphere of market transactions.

Apart from the economic effects of investments in human capital, human's education and high culture bring additional social benefits as the growth of life quality and levels of social optimism. The theory of human capital had contributed to change of attitudes and directions of governments in formulation of social policy with understanding of productive potential of social expenditures. Expenditures on education, health, culture, social care and welfare started to be treated by public officials and society as high-performance investments, not as non-repayable budget losses.

As it was mentioned earlier, the development of human capital theory proceeded in concordance with the neoclassical school. In recent decades, the neoclassicists' initial principle of "optimizing behavior" of individuals began to spread to various spheres of human's non-market activity. Different concepts and methods of economic analysis have been used to study such phenomena and social institutions as education, health, migration, family, crime, racial discrimination, etc.

Although the human capital theory was coined in economic sciences, the further development of the concept provoked increasing interest of other scientific fields and tremendous development of this theory in various scientific disciplines. One of them is population studies or demography which is, now, becoming the area studying the reproduction processes of main component of human capital – the human and population. If you follow the latest researches and works in the field of human capital, one can easily notice the prevalent interest of studying human capital within the ambit of population studies. This case is understandable and pleasing, since by studying population one can grasp the main ideas of human capital formation, accumulation, reproduction and development.

It is also important to remember that for a population the quality and the quantity are not mutually exclusive, they are mutually, complementary and closely linked concepts. Evidently, the features of the population quality are defined by the socio-economic, technological, cultural, environmental and many other conditions. These conditions, however, do not have a direct and unambiguous impact, but they form the human behavior (including its demographic aspect), which, in turn, underlies the basis of relations and changes in population (since the category of quality is changing or by other words the idea what is the quality concerning population is constantly changing). This means that quality specifications are a subject to change as a result of changes in human behavior, i.e. during the transformation of attitudes towards meeting various needs of the population. At the same time, qualitative characteristics (whatever is the standard for quality) have a significant impact on demographic behavior, at both, the individual and the collective levels. In this context, the exploration of mutual influence of changes in population quality and in the social and demographic processes, in depth, will allow to disclose important determinants of the social and demographic behavior changes and development in society. In other words population quality as a concept enables to observe the interaction process of mutual influence of the social and demographic aspects, as well as, influence of intra-demographic aspects to each other.

## **Chapter 3**

### **Determinants and dimensions of human capital**

#### **3.1 Demographic and social aspects in human capital formation**

It had been believed, since wide acceptance of Malthus's theory, that rapid population growth has a negative effect on the economic growth and welfare per capita, despite the fact that the opinion has long been contradicted by empirical evidence and the counterarguments were abound.

Further studies found little cross-country evidence of link between population growth and economic growth rates. These new studies of population responded to the failure of the Malthusian theory by substantially ignoring any relation between population and the economic growth. Considerations in this approach take place not in the population growth intensity, but in the rate of investment in physical capital and other forms of tangible capital. This approach had emerged the new stream of researchers who were called as the population neutralist, who support the idea that population growth neither systematically impedes nor promotes economic growth. It is still questionable whether results by population neutralists, who found no significant correlation between population growth and economic growth, have reflected the true unimportance of population growth or it was model specification errors, poor data and reverse causality. Nonetheless, this view has been the dominant scientific belief considerable period of time (Bloom et. al. 2010).

Both Malthusian theory and population neutralists had left out the issues of human capital and population quality. These theories actually omit any economic motivation and present a strictly biological view of mortality as a mechanism which adjusts numbers of people to available resources and potential. The early population studies generally focused on population numbers and missed to a large extent the issue of age structure changes and any structural changes and distributions. Population growth caused by rising fertility and population growth caused by falling mortality are likely to have quite different socio-economic consequences because they have different age structure effects and the proportion of economically active and inactive population. In the past few years the new evidence and thinking appeared which relates to the importance of population age



distribution in the determination of macroeconomic performance. Contrary to the neutralist view, the emerging studies and evidences indicate that population does matter to economic growth, with age structure playing a crucial role. The following structure of the population has the most significant impact on the economy: distribution by gender and age, by education, by professional qualifications, by type of residence (territorial distribution), by types of families, by health and etc.

The economic needs and contributions of people vary over the life cycle. For example, young people tend to be net consumers, while working age people tend to be net producers and savers, with the elderly falling somewhere in between. Large youth and elderly cohorts might slow the pace of economic growth, while large working age cohorts might speed it up. Falling economic dependency ratios create favorable opportunities for economic growth, forming what is now referred to as a “demographic dividend” or “demographic window” which has recently gained prominence in the economic literature. As birth rates fall and the aged population remains small, the total dependency ratio declines, this offers the opportunity for rapid economic growth and further investments in education and infrastructure. It is also seen as a unique opportunity for countries to invest in their future human capital by increasing education. This means that the age structure of a population may also be very consequential for its economic performance (measured by income per capita). For example, according to Bloom et al. (2010), East Asia’s macroeconomic performance is tracked very closely by its demographic transition and resulting changes in age structure. Bloom et al. (2010) estimates indicate that almost one-third of its “economic miracle” is accounted for the “demographic window”. By contrast, the stagnation in demographic change or the development of burden age structure also accounts for a large portion of Africa’s economic debacle.

However, the potential of this “demographic window” is not necessarily to be enjoyed in all developing countries. The economic growth is not an automatically reflected by changes in the population age structure (Bloom et al. 2010). Changes in age distribution simply create the potential and opportunity (window) for economic growth. Whether or not this potential is realized depends on the policy environment, the quality of governmental institutions, labor legislation, macroeconomic management, openness to trade, education policy and etc. Historical examples show that Latin America missed to fully capture the demographic window. During 1965 to 1990, its demographic situation favored the conditions for economic growth and was similar to the demographic conditions and trends in East Asia, but its economic performance lagged well behind. High inflation, political instability, adversarial labor relations, and an inward orientation with respect to trade through much of the period appear to have prevented many Latin American countries from exploiting its demographic window of opportunity, at least in its early phases. While, much of East Asia’s policy environment enabled to take advantage of the demographic window.

Bloom et al. (2010) found that open economies, with good institutions and fairly homogeneous populations (i.e. low ethno-linguistic fractionalization), have higher rates of economic growth. According to their analysis, neither being landlocked nor being located in the tropics is statistically significant. The mean years of schooling of the workforce is not so significant, though better health

in the form of higher life expectancy does have a significant positive effect on growth. They also found a large positive coefficient on this interaction, indicating that a completely open economy will enjoy nearly twice the growth impact of demographic change as an average country, whereas a country with a closed economy will have almost no gain from demographic change. This indicates that the impact of demographic change may increase labor supply, but how well this extra supply of workers is put to productive employment depends on the economic system and policies being used. A large working age population requires a matching large demand for labor if demographic window expected to be enjoyed by a country. Without appropriate policies the extra labor supply can result in unemployment or underemployment, with political instability, elevated rates of crime, the deterioration of social capital and possible further adverse consequences. Well-chosen and effectively implemented policies in these areas: engagement with the global economy, labor practices, and capital markets and education can be potential factors of realization of the demographic window for further intensive development.

The population can not exist outside the economic relations, while the economy can not exist without a population. Demographic processes affect the economy primarily through a change in the size and age-gender structure of working age population. The “qualitative” composition of population, as a whole, and especially of its working-age becomes an important factor of development. First and foremost this “quality” related to the educational level and professional skill, the qualities that make it possible to quickly learn the benefits of scientific and technological progress and effectively use them to produce at a lower cost of labor a significantly greater volume of production, as well as to the ability to quickly learn new technologies. The quality of the population is also closely connected to socio-economic mobility and agility. Social and economic mobility is the ability of workers to switch from one activity to another and to change the scope and type of labor application and can be expressed in the following forms: natural (age), social, skill and mechanical (migration).

The demographic and socio-economic processes, i.e. the favorable development of demographic and socio-economic components also influence the components of human capital reproduction (education, health etc.). Many scientists (Bloom, Canning, Boucekkine, De La Croix and Peeters) engaged in study of relevant links of educational and demographic processes stress on several economic and demographic factors, which can trigger the high level of educational achievement:

1. An improvement in longevity is a solid explanation for the rise in educational achievement. Increased longevity is potentially an important determinant of literacy: longer lives increase the period for returns to be enjoyed and to investment in education, inducing longer schooling. The rise in life expectancy may be one of the reasons for an increased incentive to invest in education. A longer life increases the length of period during which education investments can be recouped. Kalemlı-Ozcan et al. (2000) point out that the effect of improvement in health and longevity on educational investments has played a large role in economic growth over the last 150 years. However, the effect is clearly linked to the prospective working life rather than total lifespan, suggesting that education levels may be linked to planned retirement ages and

social security incentives. Even though theoretically the longer life span should be associated with the longer working life, however in practice this may not be the case.

2. A rising density of population may have played a role in fostering the rise in literacy and education. Higher density of population can lower the cost of education through facilitating the creation of schools in communities. A representative empirical study by Ladd (1992) shows that a small increase in density lowers the costs of providing services, at least at very low levels of population density. Externalities can also be generated by denser population. For Kremer (1993), high population density spurs technological change. Boucekkine et al. (2008) highlight that industrial revolutions rely on innovation and the adoption of new technologies which requires a certain density of educated people, population density and literacy are likely to be key variables in the development process. Galor and Weil (2000) and Lagerloef (2003) argue for “population-induced” technological progress. Population number and density need to reach a threshold for productivity to accelerate. Unified growth theory, a recent stream of economic growth literature, surveyed by Galor (2005), emphasizes the role of demographic change in the transition to the modern economic growth regime.
3. A technological progress increased labor productivity and wage rates in the modern sector and thereby increased the return to investment in education. Facing better income prospects in this sector, households would invest in education to benefit from the higher returns. This view is supported by Hansen and Prescott (2002) and Doepke (2004).

We want to call on consideration of several demographic and economic processes which can define the observed educational achievements which should be considered during the studies of human capital reproduction in a particular country.

### **3.2 Cycles and factors of human capital formation and reproduction**

The issue of human capital is widely discussed in the scientific, applied and academic literature. Human capital as a scientific category has become one of the core concepts in general thoughts about human and society, allowing the description and explanation of many social processes in the light of human interests and actions. The composition of the productive forces and capital, education and income distribution, economic growth and national wealth are adequately reflected in social science with the use of category “human capital”.

The discoverers of human capital as a holistic concept: T. Schultz and G. Becker focused on investments in human capital and assessment of their effectiveness. This is understandable, since exactly the investment funds transform resources into capital, making from a simple welfare a capital-welfare. Investments in human capabilities lead to increased productivity, increased income, including the increase in earnings of employee. So, there is a reproduction and the cumulative accumulation of income through human capabilities which make a special form of capital from these human capabilities. The use of human capital increases not only the earnings of employee, but also the profits of enterprises and the country.

Numerous statements of the founders of human capital theory come to the fact that people increase their capacity as producers and as consumers by investing in themselves, while significant increase of investments in the human, changes the structure of his/her income. Therefore, human capital represents not innate, but accumulated properties of human. Human can not be born with a ready capital. It is necessary to create it in the life process of every individual. The innate properties can act only as factors which contribute to the productive human capital formation.

In classical economic theory the reproduction was understood as consecutive changes of movement phases and cost forms of the product. Production-exchange-distribution-consumption as transformation phases of material form of the product of labor is characterizing the life-cycle of material production. During the production from raw materials the useful product is created. During the exchange, in the presence of labor division, the product is exchanged for other useful products. Proceeds from sale of goods (income) are distributed pro rata the needs of indemnification of capital, payment of staff salaries, payment of taxes, savings and payment of revenue to owners of capital. Actually, this is the main stages of any reproduction process.

In essence, the human capital can be ascribed to more qualitative type of capital. It is characterized by the universality of coverage, embodied scientific information in it, in contrast to the physical capital. The knowledge of many human generations, embodied in human capital, gives it a universal character. Its properties are constantly accumulating, updated and enriched. The quality of human capital can be conceptualized as a stable set of properties of its components, which form professional, qualifying, intellectual and cultural abilities, constantly enriched during the accumulation of knowledge, cultural skills and other abilities and which provide the growth of labor quality.

Human capital reproduction is closely related to human population reproduction *per se*. Individual human capital formation is carried out in the fields of education and upbringing of the younger generations. Reproduction and accumulation of human capital is provided in the period of active employment. The formation and reproduction of specific types of individual human capital is accomplished through some forms of human activity with the help of sectors and institutions of social and informational services. The formation, reproduction and accumulation of human capital are directly related to functioning of social sphere of the economy. Therefore it is important to take into account the particular traits of society transition into the innovative track of development with priority development of social sphere.

The formation of human capital begins with the birth of human and continues throughout the life. Health, knowledge, abilities, experience, culture are accumulated and act as a certain stock or capacity, which demands the preservation and reproduction. Human capital is formed by individual and is inseparable from a human personality. Only the products of intellectual and physical labor can be isolated and alienated, while the intellectual and physical abilities and needs of the individual hardly can. Hence, the reproduction of human capital is inextricably linked with human activity *per se*, and with the phases of human's life.

The first life cycle of the individual human capital formation takes up the first six or seven years of life. In this period, parents are fully responsible for upbringing of children and their “normal” (within norms) development. The government assists in education of children through the municipal network of nurseries and kindergartens. In this period the formation of the musculoskeletal system, the biochemical mechanisms and all subsystems of the organism as the foundation of health and strength are elapsing. At this age, the human masters the basis of culture and communication norms: language, speech, basic life principles of behavior and communication. In the same period the perceptual and sensory world, psychomotor reaction and the nervous system stability are formed.

From age of 7 to 17–18 years, the children study in school. The purpose of general education in terms of human capital is to build the foundations of cultural and moral capital, to identify and capture individual abilities and orientations of children. General secondary education provides basic level of knowledge in the fundamental, social and humanitarian sciences. Without this basic knowledge it is practically impossible or difficult to obtain further professional knowledge, especially in professions of highly skilled workers, specialists and managers. During the same time the socialization of the individual, the recognition of civic rights and responsibilities and the desire to live according to norms of social morality and rules of the community, are completed.

The acquisition of vocational education through apprenticeships and industrial training, vocational and graduate schools becomes one of the major life cycles. Education and practice form a qualification, labor capital, professional abilities to perform specific work at specific jobs where professional knowledge and skills are brought up to higher levels.

The main forms of human capabilities development are education, health, social mobility. Investments are the main source of the formation and accumulation of human capital. Subjective and objective factors determine the terms of use, economic and social effects of human capital overturn. It is necessary also to take into account the special features in formation, accumulation and reproduction of individual, company and aggregate (national) human capital, as well as the specific conditions of their use and non-use (the degradation and depreciation of human capital is possible, for example, in periods of unemployment and social disorder).

Production of human capital, its distribution and exchange for revenue and consumption, as well as return rates provide some new information on human capital movement, but unfortunately they do not directly and unambiguously explain the nature, the purpose and the motivation of human’s decision on self-development. The same limited “mechanistic” analogies become apparent, like during the most frequent comparisons of physical and human capital contents. However, we think that the specificity of the nature and the role of human capital are more significant, diverse and complex. It is necessary to look for new methodological approaches and principles describing the reproduction of human capital in the modern economy, which may help in further detailed and objective typology of human capital.

G. Becker (1993) indicates the existence of heterogeneity of human capital. He thinks that one individual can possess many human capitals at once. He wrote: “a major assumption has been that all human capital is homogeneous, an assumption that conflicts with obvious qualitative differences

in types of education, on-the-job training, informal learning, etc. in the same way that the frequently used assumptions of homogeneous physical capital conflicts with myriad observed differences in plant, equipment, etc. The advantage of 'heterogeneous' assumptions is that by sweeping away qualitative detail – detail that, incidentally, has received excessive attention in the literature on human capital – one can concentrate on more fundamental relationships in human capital. For those unable to accept, even tentatively, an assumption of homogeneous human capital let me hasten to stress that different kinds can rather easily be incorporated into the analysis. The only significant new parameters introduced are those giving the correlations between the different supply and also between the different demand curves for the different kinds of capital. It should be intuitively clear that positive correlations tend to make both earnings and investments more unequally distributed and skewed, for then persons who invest much (or little) in and earn much (or little) from one kind of capital also tend to invest and earn much (or little) from the other" (Becker 1993:122).

The recognition of heterogeneity of human capital was an important step in the development of human capital theory, which led to understanding of differences in the rates of return. Also, recognition of the role of the so-called "non-productive labor" (work in the social sphere, as well as the production of services) in the process of human capital formation and in reproduction the foundations of national wealth in the country, also became important transitions in understanding of human capital phenomenon. For centuries, the labor devoted to child-rearing, health and education were considered as "non-productive" jobs and were not given an "honor" to be an object of economic analysis. Still, there is prevailing view that the schools, kindergartens, hospitals, sport-clubs, rest-homes and sanatoria, museums and libraries, theaters and houses of culture, other social enterprises are "non-profit" and "non-productive" organizations with excessive burden on the budget at any level. Meanwhile, the social services reproduce the main wealth of the society and every single individual, they create the human capital. The work in social sphere of economy is productive in its nature. Its main objective is the formation, accumulation and reproduction of human capital, which are currently the main productive force of any society and the most important factor of economic growth. Three hundred years, economists have studied mainly the reproduction of material wealth, and services began to be studied only in recent decades. It is necessary to recognize the role and importance of services in the life sustenance. It is important to understand the characteristics of services as a special product with special technology in organizations of social enterprise, since the area of services is the right field where intangible types of the capital are created.

The human capital reproduction issues substantially depend on how we define human capital. When human capital defined as purely by indicators of educational achievement, then the human capital reproduction mainly related to favorable educational conditions and processes related to education. Whenever, human capital defined as some sort of accumulated value due to investments in human, then expenditures can be considered as an important source and condition of human capital reproduction. In case, when earning capacity is regarded as human capital, then the market and labor conditions as well as labor productivity issues are put forward in matter of human capital

reproduction. However, whatever the principal approach in defining reproduction factors of human capital, no one can deny the importance of demographic characteristics in human capital reproduction.

One might argue that possible factors that affect human capital extend well beyond the classical variables usually defined based on ethnicity, gender, education and age. Using micro data to explore other determinants and unlike the existing literature which uses observable indicators as proxies for the unobservable human capital, Le (2006) characterizes human capital as a multidimensional latent variable that is influenced by and reflected in many variables. He assumes that human capital is neither years of schooling, literacy scores, nor lifetime earnings. Rather, it is a latent variable that is reflected in such labor-market outcomes as earnings and how much time the person spends on working. This latent human capital is shaped by parental education, educational achievement, demographic background and literacy skills.

Le (2006) found that parental education influences literacy skills both directly and indirectly through own education, i.e. if education signals the innate abilities and if intergenerational correlation in innate abilities is strong, children born to educated parents should be more able, thus having higher literacy skills. Also, educated people earn more and generally appreciate more the value of education. Hence, they would invest more in children's schooling, thereby raising children's educational achievement. Education, in turn, enhances literacy skills.

According to Le (2006), literacy abilities constitute human capital by definition. Other possible determinants of human capital include parental education, own education and demographic background. These latent variables are meant to capture possible effects on human capital (of parental wealth, innate abilities, environment, contacts and opportunities) that do not show up through literacy skills. Demographic variables include age and four dummies for male, migrant, native speaker and rural resident. Age also enters as a quadratic term to allow for possible non-linearity between age and human capital.

Le (2006) wrote that educational achievement is always the single most influential determinant of literacy skills, while gender, age and education are the key predictors of human capital. His findings states that human capital exhibits concavity in age and varies enormously across ethnicity, gender and education. Although Le (2006) warns that he might not incorporate all possible determinants in his model. Nevertheless, he has used all relevant variables that are available from a typical socio-economic survey. It is true that determinants of human capital are not just age, gender and education; yet these variables prove to account for most of the explained variation in human capital within the model.

Human capital is obviously not just education or literacy abilities. Education only represents a potential, and how much of that potential is turned into productive capital depends on several factors. Age is important, as it proxies for work experience, a key determinant of productivity. Gender is associated with availability for work, participation in the labor force and work hours. Human capital defined differently may be influenced by different factors.

### **3.3 Types, components and structure of human capital**

The classification of human capital is possible on various grounds and for different purposes. Usually, types of human capital are distinguished by the sorts of investments. T. Schultz indicates that the human abilities “...develop through certain activities, which have attributes of investments”. “Schooling, on-the-job training, health promotion, growing stocks of information on economy” are considered as such types of investment activities (Schultz 1994). All these activities are aimed at formation of specific and concrete groups of human abilities, which receive capital assessment and are used as human capital.

Another classical typology proposed by G. Becker (1994) which includes a division between "general professional skills (general skills) applicable outside the company (firm), and special skills in firm (specific skills) suitable only for certain classes of jobs in given company (firm). The latter type provides the employee with better prospects in this organization, but it also binds employee to this organization, restricting his/her working mobility”. Following Becker, the human capital literature often distinguishes between "specific" and "general" human capital. Specific human capital refers to skills or knowledge that is useful only to a single employer or industry, whereas general human capital (such as literacy) is useful to all employers. Economists view firm specific human capital as risky; since firm closure or industry decline may lead to skills that cannot be transferred.

Kritsky (1995) identifies three main types of human capital: “productive, consumer and intellectual capitals”. The reproductive approach to the classification of human capital is important in order to assess the magnitude and intensity of human capital in specific sectors of human activity.

More recently, the classification of human capital based on the speed of return rates is often mentioned. Within this classification, migration and search for information are factors with a short-term return, whereas education, training, health care and birth of children are investments with long-term returns.

#### **3.3.1 Health Capital (Bio-Physical Capital)**

Manual power, physical endurance, stamina, workability, immunity to diseases etc. increase the active work period required for each human in any field of professional activity. Health of human and nation have huge capital importance and the losses of health and increased mortality directly leads to decrease in productivity. Decrease (reduction) in health capital affects the demographic situation. Demographic indicators for the future allow the evaluation of possible quantitative and structural changes in the capacity of health.

Diseases, injuries and disabilities, untimely mortality all reduce the average duration of life expectancy. That means the employee is not creating a product and not involved in providing profits. Moreover, s/he must be paid some sick-leave expenses, borne the cost of his/her replacement in the workplace. To stimulate the health capital accretion many companies use bonuses for staff to vacation pays (medical-vacation pay), who has not been sick during the year.



The system of voluntary health insurance through the employer has the stimulative importance, taking into account the real savings in working time. To prevent morbidity during the working period, it is important to reduce the share of employment in hazardous and dangerous conditions, strictly abide the safety measures. In many enterprises “economy” on safety costs of working conditions led to a doubling of occupational traumatism and occupational morbidity.

Health capital is an integral part of human capital, as investments which are expressed in preservation of workability and working efficiency due to reduction of morbidity and increasing of productive period of life. Health levels substantially depend on the quality of health services, which accompanies the human from birth until his/her retirement. Investments in health provide a normal turnover of workforce in production. The reduced health, morbidity, disability are expressed in the incapacity to work. Of course, the fewer diseases, the higher the level of health of the country and the return on investment in health. Even though it is difficult for a country to regularly invest in health, in case of deep socio-economic crisis, we must understand that health is that vital part of human capital, which “does not understand” the pressure for money, “does not tolerate” disregard and always “revenge” on society for its irresponsible treatment. It is known that current generations bear in themselves the burden of previously accumulated pathologies. The current diseases, due to their inertial effects, will reverberate severe consequences in the future.

It is obvious that good health of population is the result of deliberate and long-term health national development programs. Good health is a guarantee of longer life expectancy, higher productivity; and therefore, the expenditures on health are profitable investments with long-term and ever-increasing returns.

### **3.3.2 Labor Capital**

The more complex is labor, the higher are requirements for qualifications, knowledge, experience and responsibility of the employee. As Peter Ferdinand Drucker had noted, that business is an organization where the knowledge and qualification of its staff becomes a factor which totally determines its existence or destruction. However, the knowledge is a specific resource of human and knowledge can not be found in books. Only information can be found there, while knowledge and qualification are the abilities to apply information in a specific field of activity (Zachariev 2002). Strumilin had derived that skilled labor 2–3 times more productive than simple labor and accordingly, should be paid by tariff-scale 2–3 times higher. Investments in maintenance and upgrading the qualifications provide direct return both for workers and enterprises (History of the U.S.S.R., 1967).

Although, there is a problem in differentiation of labor force and human capital, in our view, accretion of skills and additional productive forces of skilled labor can be converted into labor capital as a special kind of human capital. The labor capital in enterprises is embodied in skilled workers and their professional knowledge. The share of qualified workers depends on the technology used, the greater is proportion of technology the higher is demand on qualified labor of well educated and experienced employees, i.e. higher demand on labor capital. Technology

improvement and transition to new technologies require investments in skill-upgrading and re-qualification.

Labor capital is formed through whole life of individuals as they gain experience, hone labor skills, possess valuable abilities and the most importantly acquire the education. Education is the main mode in the reproduction of skilled workers. Today, people with higher levels of education get more advantageous and more remunerative jobs. This trend of correlation between education and income of people is about the same in all countries of the world. This suggests that at the present time the providing, getting and investing in education are very lucrative, because education directly affects labor productivity and its efficiency. In every modern society the special attention is paid to education. The qualification is an integral part of labor capital per se, which represents the degree and type of worker's professional competence. During the investing in education of the labor force, we must remember that these investments are manifold effective than investments in any other factor of production.

### **3.3.3 Intellectual capital**

The intellectual and creative activities are the most unique attributes of human intellect. The product of intellectual activity is copyrighted as an exclusive property of the author, who owns the rights to determine the directions and forms of its economic use. Objects of intellectual property are involved in the economic turnover as intangible assets of enterprises and increase the incomes of company and owners of these assets. The increase in proportion of high-qualified specialists in the industries and enterprises indicates the growing role of creative basis in the production process.

Most of the scientists recognize the crucial role of human's intellectual activity. Indeed, the intellectual products may be formalized as an intellectual property and included in economic and business transactions in the form of intangible assets, investments in basic capital and license buying and selling. Achieving the technological and organizational advantages over possible competitors is one of the main functions of intellectual capital. The definition of intellectual capital has a quite general nature and usually means the sum of the knowledge of all employees of the company or country that provides its competitiveness.

The intellectual capital as a form of human capital has acquired its relevance rather recently. Intellectual capital becomes apparent especially during the activation of innovative processes at enterprises. As we noted earlier, in modern world people with more knowledge and information, take a more favorable places in life. The material production concedes to an expanding service sector. Investments in intellectual capital are becoming more common due to its high efficiency. Highly talented researchers and scientists earn high income from intellectual property. This sphere of economics is currently developing very rapidly and is very promising and highly profitable branch of economic activity. On current stage of technological development, the intellectual capital appears with an intensity that allows us to talk about the fundamental difference between the new economics from the industrial economics, based on natural resources and on the labor of the so-called "industrial personnel".

Intellectual capital represents one of the core components of the general human capital value. Intellectual capital is one of the main constituents of human capital, whenever we want to estimate the human capital. The main value of human capital based on intellectual aspect of the population. The concept of intellectual capital and the related concept of intellectual property are inseparable from the new economics. These are the most essential components, which identify the new economics.

### **3.3.4 Cultural and moral capital**

Another valuable asset which compounds an important part of human capital, and acts as premise for successful human capital acquisition is the cultural capital. The cultural capital is the linguistic and cultural competence of human, the wealth in the form of knowledge or ideas that legitimize the formed social statuses and official power, maintain the established social order and existing hierarchy in a society. Cultural capital of an individual is characterized by following parameters: intellectual culture (intellectual capital), educational culture (educational capital), moral and ethical culture (moral capital), symbolic culture (symbolic capital), social culture (social capital).

The cultural characteristics of the individual have a value assessment: qualitative and quantitative characteristics of knowledge, skills, moral and ethical qualities, abilities, life style, social relations of the individual and a set of costs relating to the development of the cultural characteristics of an individual. High culture and morality of human are also needed in the production process as well as skills and intelligence. Medical ethics, educational and business ethics, code of honor of the businessmen, labor and consumer morale create a healthy moral-psychological climate in and between staffs in the companies and entire country, increase labor productivity and incomes. The reputation of employee as well as image of company is equally important to attract customers and investments, alongside with the purely businesslike characteristics of entrepreneurship. The business honor, the conscience, the honesty and the responsibility are highly valued in political, economic and business relations. That is why the cultural and moral capital must be considered as a special kind of human capital in all sectors of human's activity.

However, the cultural values embodied in people as well as the culture (as a set of stable forms of social interaction) per se, do not directly represent the human capital. They represent only a potential manifestation of human capital. The active use of human's cultural potential in the process of social action (i.e., in the action which, by supposed purport of an actor or group of actors, is correlated with the actions of other actors and relies on them") is not necessarily actualized as a human capital. This important transformation can be achieved only through continuous and special social action, which allows an individual to become the subject of labor and take appropriate place in professional field which corresponds to his/her cultural level which by-turn allows to obtain not only a social and professional status, but also access to additional income which excess the costs connected to the simple reproduction of the employee and his/her family. Only under certain

circumstances, during the active use, the cultural values embodied in human are transformed into cultural capital changing his/her professional status.

The category of cultural capital in social sciences designates the set of intellectual abilities, education, skills, integrity and qualification of an individual and individuals, which are used in the process of social activity and in the legitimization of social status and social power possession. The assessment of individual's maturity degree and the level of cultural capital can be implemented through different ways. Mostly the methods of cultural capital assessment are developed in social psychology and theories of labor motivation. In the human resource theories, there is an approach based on qualitative characteristics of employee's behavior and reputation with fixation of facts of his/her deviant behavior, such as violations of labor and technological discipline, unmotivated conflicts detrimental to the production process and other negative misconduct. All these types of human capital, mentioned above, have one thing in common. They are inalienable from the human. However, components of human capital are heterogeneous, and lately there had been a number of works that brought out new forms in the structures of human capital which may be alienated from the human personality. These new forms include social capital, structural capital, institutional capital, etc.

### **3.3.5 Social capital**

Social capital as scientific category is now increasingly recognized in the scientific literature. Kritsky (1995) defines social capital as a set of social relations, which minimizes the transaction costs of information within the entire socio-economic relations, throughout the networks, society and economy. Social capital is linked to the fact that each social agent in some extent is included and integrated into a system of social relations. This is a capital of communication, collaboration, cooperation, mutual trust and mutual support, which is formed in the area of interpersonal relations.

Social capital is defined as "the characteristic features of social life (cooperation, norms and trust) which enable participants to operate effectively together to achieve common goals". The World Bank (2009) gives the following definition: "Social capital refers to social institutions, relationships and norms that shape the quality and quantity of interactions between people in society..." "Social capital is not simply the sum of the institutions which underpin society; it is the glue that holds them together. The World Bank (2009) also notes that social capital can be represented as a set of horizontal links between people. They include social contacts, and related rules that affect society, productivity and welfare.

All the factors that create the possibility of the origination and development of social relations and ensure their preservation have direct relationship to social capital. Practically, the major portion of our intellectual potential is composed of the knowledge which is transmitted by society and acquired in the process of socialization and integration into the system of social relations. This knowledge characterizes the social qualifications and the learning process and self-development through the establishment of new social ties, creating new structures within the society. This process provides the integration of individual experiences of humans into universal social

experience. Thus, social capital can be characterized as the knowledge which is transmitted and developed through the relationships between employees, partners, suppliers and customers. For possession of social capital, human must be connected with others and these others are the actual source of his/her advantages. Natural resources and technology used in countries can be unchanged, while their social capital can grow with the development of external relations and image of the country.

Social capital has specific features: (1) it is always the product of organized interaction, so it has a social rather than individual nature. Portes (1998) contrasts financial capital and human capital, where the first resides in people's bank accounts and the latter is embodied in individuals' investment in education and job training, social capital inheres in the structure and quality of social relationships between individuals; (2) social capital as product of organized social system operation occurs as a public property. However, despite this fact every individual can benefit from the effect and degree of social capital, and this collectively owned social capital somehow becomes a part of human's individual assets.

Social capital is created through the exchange of knowledge, and this requires the existence of a common organizational environment, where such exchange could be freely and continuously carried out. Social capital is indeed a form of capital. As a form of capital it can create some inertia in an economic or social system. Accumulated social capital can help form costly links; it can also become an incentive for players to stay in costly relationships. When social capital is taken into consideration, links that seem irrational when examined in one period may be perfectly rational when the history of the link is taken into consideration. Social capital is more simply defined as the value of social obligations or contacts formed through a social network.

Schmid (2002, in Claridge 2004:4) identified that capital is not immediately used up in production but rather its services extend over time. The capital stock is subject to investment for future production and depreciation and decay from both use and non-use. The main difference is that more than one person benefits from social capital.

“Many authors have questioned and even attacked the appropriateness of the term capital in social capital. Smith and Kulynych (2002) believed that the word capital has a too broad, pervasive and honorific meaning and that the term blurs many distinctions which adversely affects the scholarly inquiry, whatever its implicit or explicit normative concerns.

Inkeles (2000) suggested that the term capital is too limiting and would rather use the term social or communal resources. The author argued: capital being an element of production, in particular the production of goods, but also services. We want not only goods and serves but also social support, physical and social security, freedom of expression, opportunities to develop ourselves and a host of these outcomes not captured by the idea of goods and services” (Claridge 2004:6).

In conclusion we would like to cite the Claridge's words concerning what social capital can be: “it is interesting that the term capital should be used with social, considering capital is already a social relation. In the original sense of the word capital, an object is only capital under particular

social conditions. In the same way the sources of social capital are only capital under particular social conditions. Some scientists think that the idea of social capital is still in its early stages of conceptualization and there are still many problems with the current conceptualization. Social capital theory suffers from much criticism for being poorly defined and conceptualized. This problem largely stems from the fact that social capital is multidimensional with each dimension contributing to the meaning of social capital although each alone is not able to capture fully the concept in its entirety (Hean et al. 2003)” (Claridge 2004:9).

### **3.3.6 Organizational capital**

“Organizational capital, which can be considered as a type of social capital, is a concept that has been used primarily by economists to denote the productive capacity that derives from the qualities of an organization's ‘people relationships.’ Social capital, on the other hand, has been used, typically by economic sociologists, not simply to refer to productive capacity but more generally to denote a social resource that enables actors to attain their ends. The concept of organizational capital was developed by John Tomer in his 1973 Ph.D. thesis and later as an article and book (1981, 1987). Working separately, Edward Prescott and Michael Vissher (1980) also wrote about “organization capital.” (Tomer 2007:web page content).

“Investment in organizational capital uses up resources in order to bring about lasting improvement in productivity, worker well-being, or social performance through changes in the functioning of the organization (Tomer 1987: 24). It involves (a) changing the formal and informal social relationships and patterns of activity within the enterprise, or (b) changing the individual attributes important to organizational functioning, or (c) accumulating information useful in matching workers with organizational situations.

Organizational capital is embodied either in organizational relationships, particular members of organizations, the organization's repositories of information, or some combination of the above. Pure organizational capital provides the best contrast with human capital because it is vested entirely in the relationships among workers, not in the workers themselves. It is these relationships, for example, particular organizational structures, that enable desired worker behavior to be evoked or fostered. The organizational capital concept has great value in that it links organizational behavior insights regarding the contribution of organizational structure, culture, climate, patterns of interaction, socialization, etc. to the economic concepts of capital and productivity. Organizational capital has important implications for industrial policy, that is, for understanding when government ought to act to foster industry investment in critical types of organizations. Investment in organizational capital can also contribute to increasing an organization's socially responsible behavior, the rationality of its decision-making, and the citizenship behavior of its members” (Tomer 2007:web page content).

### **3.3.7 Structural and Institutional capital**

We decided to put these two types of human capital in one paragraph, since they represent relatively similar area of human capital operation and functioning on almost the same scientific

commonplace. The competitive environment in modern economy is continuously changing under the impact of innovation. High speed of such changes complicates conditions under which country can succeed. One of such condition is the presence of significant *structural capital* in country. Structural capital is the ability of country to manage its organizational and governmental structures, conforming to the changing socio-economic and political environment and at the same time changing it in a favorable direction for the country. This capital is greater, the greater the freedom of citizens of the country (the carriers of human capital).

Institutional capital represents institutions that promote the efficient creation, storage, reproduction and use of all types of human capital in social environment. Institutional capital is a systematic competence of the country or the systems reinforcing creative performance and institutional capabilities for creation products and values. Institutional capital is the knowledge of institutions in the country. This is not the knowledge of individual employees. Institutional capital can be described as embedded knowledge or institutionalized knowledge which can be stored with the help of information technologies in accessible and easily expandable databases (Schneider and Means 2000).

Well-developed structure, not only helps society in better implementation of set goals, but also becomes a very important intangible asset necessary for success in development of the society. While the well-developed system of institutions in the structure as well as the level of interaction, integration, transparency and availability of various institutions are another advantageous conditions for effective development too.

### **3.3.8 Human capital structure and components**

We can see a classification of human capital formed by levels and types of property of human capital and on the basis of combining different approaches. This classification of human capital allows us to consider and assess the human capital at: micro level: individual human capital; meso level: human capital of the organization; macro level: national human capital. In the structure of individual human capital we can single out health capital, cultural and moral capital, labor capital and intellectual capital. In the structure of company human capital the avowed assets of the individual human capital (patents, copyright, know-how, etc.) play a special role, intangible assets of company (trademarks, brand marks, copyrights, commercial experiences, etc.), organizational capital, structural capital and institutional capital. National human capital includes the political capital, national intelligence priorities, national competitive advantages and human potential of the country, the level of social cohesion etc.

So, based on different typologies and classifications we can distinguish following components in basic elements of human capital structure of each individual:

- a) *knowledge*: the appropriate form of information used in social activities, which enhance effectiveness;
- b) *ability*: the art to carry out any activity successfully;
- c) *experience* or *skills*: workmanship to perform specific labor operations for a long time;

- d) *culture*: principles and patterns of behavior within the existing knowledge, rules, traditions and moral in society;
- e) *motivation*: activity orientation, intensity, satisfaction with process and results.

The idea of human capital is not just a simple description of population abilities to reproduce needed labor qualities for development. The idea of human capital represents the form of complex human interaction of every member of society with social environment. Human capital is a dynamic relationship between its components that evolves constantly on spatial and temporal scales. Every socio-economic interaction in population has wide ranging and unpredictable outcomes to the structure and consequences of the human capital at various levels. Similar structures of human capital can have very different externalities and ends, and the role of time, space, feedback loops and chance further illustrate the complexity of the dynamic relationships involved. Human capital is an important determinant in some socio-economic situations because it is an asset, albeit a difficult to measure and sometimes non-convertible one.



## **Chapter 4**

### **Review of human capital measuring methods and approaches**

#### **4.1 Introduction to human capital measurement approaches**

The issues of measuring human capital are increasingly coming to the fore of understanding of features and mechanisms of human capital. However, the common principles in estimations of this complex indicator have not been elaborated yet. 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. Human capital is a complex and multi-dimensional phenomenon, which can be acquired in various ways (at home, at school, at work, and so on).

Compared to other forms of capital (financial, physical), human capital is less tangible, and hence more difficult to measure. The approaches to human capital measurement mainly include the education-based approach, cost-based approach and the income-based approach. Like physical capital stock, the human capital can be valued using three general 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).

Mainly, human capital measurement approaches are constructed indirectly and based on various proxies of human capital. Measures of human capital are inputs in some areas and outputs in others and different measures suit different research questions. The value of rearing and education of new employees, along with advanced training, the lengthening of employment period, the loss due to morbidity, mortality and other factors, etc. have been recognized as essential elements, during the process of human capital measurement.

## **4.2 Education-based approach**

### **4.2.1 Introduction to education-based approach**

Human capital is broadly defined as the productive capacity embodied in people. Depending on the data at hand and assumptions in mind human capital can be defined and measured in various ways. Not so rarely, the human capital is associated with the productive capacity of a human, which is believed to be related to a various factors, such as knowledge and skills, physical and mental abilities, health and attitude. OECD (2001) defines “knowledge and skills” as the most important component of the productive capacity of a human, so human capital can be also defined as the knowledge and skills embodied in people. Several researchers extend the concept of human capital by considering the importance of health and other factors in formation and reproduction of human capital. In the best way, all major factors that determine the creation and augmentation of human’s productive abilities should be considered in measurement of human capital. However, the knowledge and skills, from a practical point of view, are relatively easier to measure. Various indicators of educational achievement are comparatively accessible variables which can serve as proxies of knowledge and skills.

In turn, the knowledge and skills focuses attention on the contribution of education and training to human capital formation. This approach coincides with the original comprehension of the human capital theory, formulated by Schultz (1961) and Becker (1964) in the early 1960’s. Knowledge and skills is usually accumulated in forms of formal and informal education, working experience, innate ability, etc. Even the category of education alone includes formal schooling activities such as compulsory primary and secondary education, post-school education (universities and vocational training institutions) and informal education in the form of learning within family, self studies and etc. It is a very difficult task to include all these parameters in the education-based measurement of human capital in one go. To make the research more manageable, many scientists focus attention on indicators of formal schooling and sometimes include post-school education and working experience, two major contributors in human capital formation. The full scheme of learning activities according to “Learning Activities by German Time Use Survey” is presented in Appendix Figure A1.

It is believed that the education is an essential part of the human’s condition and life. The original meaning of the word refers to people who orient in an informed stage in which they can exert independent judgment based on the combination of different skills and pieces of information. This is an important pre-condition for coping with all kinds of challenges of everyday life and for improving the human condition both of the individual and social level. For the society, education plays a central role in economic, institutional, social and technological development. Education plays an important role in market activities as well as in non-market activities. In fact, education can enhance well-being of human’s not only by opening up broader economic opportunities but also through non-market benefits such as improvements in health, nutrition, fertility, upbringing of children, opportunity for self-fulfillment, enjoyment and development of individual capabilities.

These non-economic returns to education are no less important as the impact on market labor activities and the economic success of both individuals and nations. Since the majority of research works focuses on the role of human capital in enhancing the economic performance, the market dimension of human capital is adopted in most of the measurement approaches. In measuring human capital researchers more frequently have to exclude the parameters of non-market dimensions, because human capital is harder to measure through non-market activities, and is the subject to many controversies. So, within the education-based measure scientists mainly interested in formal schooling related to market activities.

Education-based approach measures human capital by educational output indicators as literacy rates, education enrolment rates, dropout rates, repetition rates, years of schooling, educational attainment, test scores and etc. This approach bases on two main assumptions first, that these educational indicators are closely related to investment in education and second, that education is a key element in human capital formation, accumulation and reproduction, which determine the earning profile of the human. Therefore the educational indicators are believed to be the adequate proxies for human capital.

#### **4.2.2 Education enrolment rates**

OECD (2001) gives the following definition of the term: “education enrolment rates are expressed as net enrolment rates, which are calculated by dividing the number of students of a particular age group enrolled in all levels of education by the number of people in the population in that age group.”

Studies using education enrolment rates as proxies for human capital heavily rely on the notion that the enrolled population represents the flow and current investment in human capital which will be reflected in the stock of human capital sometime in the future. However, education represented by current education enrolment intensities may not be fully added to the productive human capital stock due to students’ not participating in the labor force and investment waste through repetition and dropouts. Education enrolment rate serve as a poor proxy for the present stock of human capital since the current education enrolment rates are indicators of the schooling level of the future, rather than current, labor force.

Unfortunately, school enrolment rates do not even accurately reflect future flows of the human capital stock, because the change in the stock of human capital is the difference between the human capital of those who enter and those who exit the labor force, but school enrolment rates do not take into account the latter. Also, being measures of flows, education enrolment rates only capture part of the continuous accumulation of the stock of human capital. In addition, in developing countries the school enrolment intensities often lack reliability.

According to Barro and Lee (2001), UNESCO enrolment data primarily come from annual surveys of educational institutions in each country and reporters often overstate enrolment figures for the sake of their institutions. And finally, the school enrolment rates can be the best satisfactory proxies for human capital in some countries but not in others.

### 4.2.3 Mean years of schooling

Mean years of schooling has several advantages over school enrolment rates and ratios. It is a valid stock measure and it quantifies the accumulated educational investment in the current labor force. Wachtel (1997) indicated according to several assumptions the number of mean years of schooling is equal to cost-based measure of human capital. There are three groups of studies based on the method they employ developing data series on years of schooling: the survey-based estimation method, the projection method, and the perpetual inventory method.

Psacharopoulos and Arriagada (1992) introduced the survey-based estimation method, which became the first approach attempting to compile data on average years of schooling  $\bar{S}$  by applying following formula:

$$\bar{S} = \sum L_i D_i$$

where  $L_i$  is the share of participants in labor-force who has  $i$  level of schooling and  $D_i$  is the duration (years) of the  $i$  level of schooling. Data on  $L_i$  were available directly from national censuses and surveys, corresponding statistics by deriving based on the educational composition of the population classified by gender and age.  $\bar{S}$  describes the total sum of schooling durations weighted by corresponding population size in labor market of that schooling level. In their results an average years of schooling indicated by  $\bar{S}$  ranged from a low of 0.5 for Mali (1976) to a high of 12.6 for the US (1981).

Since it was not known how many years had been finished by those who did not complete certain schooling level. Thus it was assumed that these individuals had attended half of the duration of the corresponding level. Such assumption creates confusion rather than resolves a puzzle and becomes a potential source of measurement error, since repetition and dropout rates considerably vary across countries. Another drawback is related to the variations of observation years from country to country (from 1960 to 1983) as well as different definitions of labor force across countries are hampering the cross-country comparisons (in Le et al. 2005b:20).

Further, Kyriacou (1991, in Le et al. 2005b:21) tried to overcome limitations in Psacharopoulos and Arriagada's (1986) study by regressing the average years of schooling obtained from Psacharopoulos and Arriagada (1992) calculations, on lagged gross enrolment ratios<sup>1</sup> obtained from UNESCO. His model assumed that the relationship between lagged education enrolment ratios and total years of schooling of a given population was stable across time and countries when in practice it never was. The length of each schooling level, dropout rates and repetition rates were implied to be similar. These assumptions explain why the estimates correlate well with the original (Psacharopoulos and Arriagada's) data for the mid-1970's, but differ substantially for other periods.

---

<sup>1</sup> The gross enrolment ratio (GER) or gross enrolment index (GEI) is a statistical measure used in the education sector and by the UN in its Education Index. The GER gives a rough indication of the level of education from kindergarten to postgraduate education (primary, secondary, and tertiary) amongst residents in a given jurisdiction. The GER is calculated by expressing the number of students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels.

It seems that more generally the Kyriacou's method acts as a regression model which can be used to predict one variable from one or more other variables

Lau et al. (1991) estimated the mean years of schooling  $S$  at year  $T$  by summing the education enrolments rates  $E$  at all grade levels  $g$  for all ages  $a$ :

$$S_T = \sum_{T-a_{max}+6}^{T-a_{min}+6} \sum_{g_1}^{g_{max}} E_{g,t} \theta_{g,t}$$

where  $\theta_{g,t}$  is the probability of surviving to the year  $T$  by an enrollee in grade  $g$  at time  $t$ , (where  $t$  is any particular year which lays between the range  $T - a_{max} + 6$  and  $T - a_{min} + 6$  prior to the observation year  $T$ ),  $a_{min}=15$  and  $a_{max}=64$  are respectively the youngest and oldest working ages. Taking 6 years as the age of school entry, we have  $T - 64 + 6$  as the year when the oldest enrollees enter school, whereas the youngest students start school in year  $T - 15 + 6$ .

However, this model requires considerable amount of data. For example, for the population aged 15–64 during 1965–1985, the method needs data on the total years of schooling on school enrolment and survival probabilities that go as far back as 1907. That became a pre-condition for a substantial measurement error, because pre-1950 and post-1980 data on education enrolment were not available and thus needed to be extrapolated, and data gaps needed to be filled by interpolation. It is not clear how and where the exact age-specific information is captured. The “Fulfillment” by extrapolated statistical data and collation with observed census data is probably the major reason why Lau et al.'s results were poorly correlated with Psacharopoulos and Arriagada (1986) results. Method ignored dropouts, grade repetition and migration which probably could lead to even more biases (in Le et al. 2005b:21).

Nehru et al. (1995) modified Lau et al.'s method to correct for dropouts and repetition:

$$S_T = \sum_{T-a_{max}+6}^{T-a_{min}+6} \sum_{g_1}^{g_{max}} E_{g,t} (1 - r_{g,t} - d_{g,t}) \theta_{g,t}$$

where  $r_{g,t}$  is repetition rates and  $d_{g,t}$  represent the dropout rates. Due to several data constraints these intensities are assumed to be constant over time and across grade levels. The reduction of errors caused by backwards extrapolation became a contribution of Nehru research by collecting education enrolment data since 1930. Nehru et al. results show that workers in sub-Saharan Africa had the least average schooling years (2.5 years) by 1987. However, along with East Asia, sub-Saharan Africa experienced the fastest growth in value of mean schooling years (in average 4.2% per annum) during 1960–1987, whereas the growth in value of mean schooling years for industrial countries was only 0.3% per annum, i.e. the intensity of raise in average years of schooling was higher in developing countries. This was because workers in these countries had already received up to 10 years of schooling per person. However, their results has been criticized by De la Fuente and Domenech (2000), as Nehru et al. (1995) argued that census-based estimates are not necessarily excellent data source if one uses perpetual inventory method to estimates years of schooling. As a result, Nehru et al. (1995) decided to ignore census data on attainment levels because most

countries in their sample have more than one census observation and which complicated the setting the benchmarking data (in Le et al. 2005b:22).

Barro and Lee (2001) studies have observed a high correlation between adult illiteracy rates and the share of uneducated people and used this observation to fill missing data on no schooling. Net enrolment ratios were used to avoid overstating education enrolments. They adjusted the gross enrolment ratios for repetition as well as the allowance for variations in the duration of schooling levels over time was made. Many authors point out that Barro and Lee results have comparatively greater internal consistency over time. However some authors indicate (De la Fuente and Domenech) that Barro and Lee data contain a lot of noise, which lead to unjustifiable inconsistencies in country rankings across data sets as well as implausible jumps and breaks in the time-series patterns (in Le et al. 2005b:23).

Cohen and Soto (2001) tried to minimize potential error in imputations by obtaining as much observable data as possible. The imputations of missing data were done by assuming the school attainment of the population aged  $x$  in one census to be equal to the school attainment of the population aged  $x - n$  in the census conducted  $n$  years earlier, in case of absence such information the attainment of the population aged  $x + m$  in the census conducted  $m$  years later. Only when relevant census information was not available Cohen and Soto fall upon education enrolment data and the perpetual inventory method (in Le et al. 2005b:24).

The “years of schooling” became a frequently used indicator of the human capital stock, which can also be measured for separate age groups. The length of education widely had been used as the universal measure, because years spent in formal education were comparatively easy to obtain and readily available in most of the countries and conditions. A single number that can be easily compared and tugged in different equations became the main advantage of years of schooling as an indicator of human capital stock. Censuses and surveys are traditional and the most typical sources of the data on “years of schooling”, however, since many of them do not directly ask for the real number of years a human has attended the school, but rather ask for the highest education has been completed, this information often needs to be converted into years of schooling by assuming average study duration (years) for certain educational attainments.

Although “years of schooling” widely used in previous studies this indicator fails to account for the fact that costs and returns of education vary hugely from level to level of education, incorrectly assuming that one year of schooling always raises human capital by an equal amount. For instance, an employee with 5 years of schooling is assumed to possess 5 times more human capital than an employee with 1 year of schooling. Psacharopoulos and Arriagada (1992) observed diminishing returns to education, concluding that education return to primary education is higher than the return to secondary education, which is higher than the return to tertiary. The direct measurement and interpretation of “years of schooling” is complicated also due to the existence of repetitions, which tend to be very high in several developing countries. Its main disadvantage is that as a single average number it hides the underlying distribution (age, gender, place of residence), which in the case of education and human capital may be very important.

#### **4.2.4 Educational attainment**

There is another measure in education-based approach, which refers to international standards of primary, secondary, and tertiary education, and accounts for the highest level of education that has been completed by individuals. This way of quantitative description of the extent of education is called the highest completed education or simply educational attainment. In earlier studies the indicators of educational attainment at the macro level were often very crude which led researchers not to use this indicator widely. However, later more and more scientists refer to it in their researches, because it allows for better study of educational distribution across the population, rather than just studying one average number (as for mean years of schooling) for the entire population. Using full distribution of educational attainment by age and gender has an advantage of being closer to the original picture and data, avoiding the problem of grade repetition since it is measured irrespective of the number of years it took to complete certain level of education.

International Institute for Applied Systems Analysis (IIASA) and the Vienna Institute of Demography (VID) experts (2010) point out that many analyses of the implications of changing levels of education prefer to use just one average indicator of human capital rather than the full distribution across educational attainment categories. Seemingly the authors of these analyses prefer this less informative indicator first of all because it is simpler to use a single number as a human capital indicator in the various regression models. However, this single number simply hides the interesting distribution by educational attainment. In addition, this number becomes a more problematic indicator in contrast to the information on distribution, because it has to be derived from the attainment distribution by applying even more problematic assumptions than in the case for reconstructing the distributions by educational attainment and hardly ever measured directly by itself.

Also, it is clear that both educational attainment and mean years of schooling represent the stock numbers, which coincide with the idea of human capital; nevertheless, at the same time they are different types of stock. As Lutz et al. (2005) have pointed out that “two countries that have the same number of mean years of schooling of its adult population may have very different educational attainment distributions – one with small, highly educated elites amidst an uneducated majority, and another where broad segments of the population have intermediate education levels. The consequences of these two different education regimes on poverty and economic growth as well as on health and mortality may be very significant” (Lutz et al. 2005:6)

Relating educational attainment distribution to human capital stock Lutz et al. (2005) emphasize the importance of the information on educational structure of the population. “Using only the average years of schooling as a human capital stock is highly unsatisfactory, if one makes the plausible assumption that, for instance, the educational composition of people aged 25–35 is more relevant for economic growth than that of people aged 65–75. An empirical analysis of the relative importance of education in different age groups can only be made if age-specific education information for the past decades becomes available in time-series form” (Lutz et al. 2005:3). Crespo Cuaresma and Lutz (2007) emphasized the importance of the demographic dimension of human

capital for explaining differences in income and income growth across countries. They found that the education levels of younger workers are more relevant for education-driven technology absorption. The important conclusion was in finding the strong correlation between differences in the education level of the younger age groups the differences in GDP per capita across countries. This finding appears to explain the differences significantly better than aggregate measures of human capital which account for the full adult population.

Ahuja and Filmer (1995) became one of the first who present new method of educational composition estimations. Using United Nations population projections they derived an educational distribution for two large age groups: 6–24 and 25+ from given sets of education enrolment ratios and education enrolment projections by UNESCO. They sum up the total school enrolment over long time series by perpetual inventory method and then convert these estimates of educational attainment of the adult population. Ahuja and Filmer (1995) overcome the lack of information on long time series by using the existing Barro and Lee (2001) estimates for educational attainment 25+ for the base year. Thereby, Ahuja and Filmer (1995) projected the educational composition (for four educational groups) for many developing countries. Ahuja and Filmer (1995) result, however, too crude and lack more specific information by age for the older age-groups, their projections have static nature not allowing the educational composition of the population to influence fertility, mortality and migration despite the obvious strong educational fertility, mortality and migration differentials according to educational attainment. These kinds of shortcomings are taken into account in the next method.

Moreover, Black's study on US (Black et al. 2003) suggests that there is serious measurement errors associated with educational attainment. According to the research based on the US Census and population surveys, people tend to over-report their education levels. This kind of measurement errors can have significant implications for estimating returns to education.

#### **4.2.5 Demographic multi-state projection method of human capital by IIASA**

Lutz (2005) became the first who applied the demographic multi-state method to estimate human capital. Actually, this method combines several simple but important ideas of population's educational level development, which are closely related to each other. First of all results are presented in form of educational attainment distribution of the population. By other words, this is a demographic age-pyramid, but enhanced with more deliberate distribution of the population by gender, age and educational attainment. Method relies on two main assumptions that education influences the fertility, mortality and migration of the population, which is turn influences to further composition of the age-pyramid, as well as people jump in subsequent educational category they will have education specific mortality, fertility and migration rates. This transitions accounts by demographic multi-state method, where each educational level refers to a specific state with a specific demographic behavior. It should be noted that this is the most demographic approach we have met during the reading related literature. However, many other methods have sound demographic assumptions in their model, too.



The model needs population distributions by age, gender, 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. Concerning migration, in the absence of detailed information on the migration flows between individual sending and receiving countries, the age-gender-education distribution of the population of sending countries was pooled for each period.

Lutz et al. (2005) introduce a unique education-based method in understanding and measuring human capital. The authors point out: “education is the process (flow) through which people gain skills and knowledge. The stock of educated people with such skills and knowledge is referred to as human capital. Under this definition, education as measured by enrolment or completion rates contributes to the accumulation of human capital stock, which is measured by the educational attainment of the adult population.”

Lutz et al. (2005) emphasize on the huge momentum which has the education, since today’s human capital stock is a result of education over the past decades. The educational attainment distribution of a population by age and gender for several points in time allows conducting projections of complete age pyramids by level of education into the future which can be used for the analysis of consequences of the changes in the educational composition.

#### **4.2.6 Literacy rates**

The literacy rate is defined as the proportion of individuals in population over age 15 who can read and write (UNESCO 1993:24), adult literacy rates impart meaningful information about a country’s general educational status. The literacy rate has been used in early empirical studies that control for human capital in growth equations. However, being an important component of human capital, the adult literacy rate does not account for the level of literacy, the type of literacy, and the contribution of additional skills in numeracy, analytics, technical knowledge etc. Moreover, literacy is not consistently defined across countries and thus creates biases in international comparisons and in fact not always corresponds to educational levels and is not synonymous with education or training. Using adult literacy as a proxy for human capital also ignores the contribution of more advanced skills and knowledge to productivity.

The later efforts in this area to seek for more deliberate tools of measurement led to elaboration of several series of surveys. Mainly they were initiated by OECD. There is a set of well known adult literacy surveys conducted by OECD.

#### 4.2.7 IALS (International Adult Literacy Survey) and ALL (Adult Literacy and Life skills)

Between 1994 and 1998 three waves of the IALS assessed the prose, document and quantitative literacy of adults in a total of 22 countries, and between 2002 and 2006, the ALL assessed prose and document literacy, numeracy and problem solving in 11 countries and one U.S. state. All these conducted surveys demonstrated the viability to measure how well adults perform literacy, numeracy and problem-solving tasks in real-life situations on international level.

*Tab 4.1 – Areas assessed in Adult Skills Surveys*

| IALS (1994–1998)      | → | ALL (2002–2006)   | → | PIAAC (2011)  |
|-----------------------|---|-------------------|---|---|
| Prose literacy        | → | Prose literacy    | → | Reading literacy                                      |
| Document literacy     | → | Document literacy | → | Reading literacy                                      |
| Quantitative literacy | → | Numeracy          | → | Numeracy  |
|                       | → | Problem Solving   | → | Problem solving in<br>technology-rich<br>environments |

SOURCE: OECD (2010) <http://www.oecd.org/dataoecd/13/45/41690983.pdf>

#### 4.2.8 PIAAC (Program for the International Assessment of Adult Competencies)

The OECD new survey is going to be conducted in 2011–2012. PIAAC is built on previous surveys and extends the ambitions of international adult assessment beyond the more traditional measures of literacy and numeracy. PIAAC's measurement of competencies in problem solving and of skills used in the workplace moves the survey well beyond conventional measurements of literacy. These two features will help to assess the extent to which adults have acquired a generic set of skills and competencies. At the same time, PIAAC looks more closely than previous surveys at whether people with low literacy levels have the basic building blocks that they need to read effectively.

PIAAC provides a more comprehensive international picture of human capital and other aspects of adult competency. The program includes 26 countries in survey: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Korea, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, United Kingdom, United States, Estonia and Russian Federation.

It is designed as a survey that will be repeated over time to allow policy-makers to monitor the development of human capital in their countries. The survey is also ambitious in its analytical objectives. PIAAC measures not only the level of skills, but also attempts to assess how skills are associated with the success of humans and countries. The survey also looks at how well education and training systems succeed in generating these competencies, and at how public policy might improve their effectiveness. A sample of 5000 adults will be identified in each country, which will be able to choose to use larger samples to obtain more detailed information, for example at the regional level or for particular groups of interest such as youth in transition from education to work or adults over the age of 65 years. Because this project is only going to be implemented next year

the first results will be available not earlier than 2013. The full content of methodology and assumptions we believe is still going to be updated. So, we hope that this measure will make difference and open new dimensions in measuring human capital.

#### 4.2.9 Skill-based method

In order to develop measurement method by skill-based approach we have to clarify what the skills exactly are and how to measure them. There is little agreement among scientists on what constitutes “skill”. Most commonly the years of schooling is used to measure skill, in majority of theoretical models measuring skill is limited to dividing employees into low-skilled and high-skilled categories. Duration of education or educational attainment is very simplified measures for skill because each of them does not take the quality and type of the education into account. Another drawback of using a skill measure like years of education or educational level is that they do not consider the skills attained through on-the-job training. Theoretically many works divide skills to be firm-, industry- or occupation-specific. However, in reality it is likely that in some portions skills are specific and in some portions general.

Lazear (2003) introduced skill-weights approach of human capital measurement, assuming that all skills are general (non-specific) that affect the productivity differently on different jobs. The difference is that firms vary in their weighting of the different skills; by other words the skill-weights in different firms can be different. According to the skill-weights approach, it is assumed that the workers’ wage depends on the value of the weights that the firm poses on the employee’s skills. At the same time it is quite obvious that when skills are defined and the total number of skills in economy is high, then only a part of them can affect directly the employees’ productivity and wage on one particular job.

So it can be assumed that for each firm there is a set of skills which affect the employee’s productivity significantly and these skills can be called “critical skills”. It is assumed that firm poses a zero-weight to all other skills which do not affect the productivity significantly. As it is not easy to estimate the skill-weights by empirical way, then it is assumed here that firms pose equal weights to all critical skills. If the number of critical skills in firm  $i$  is  $m_i$ , then each of these skills is valued by the weight  $1/m_i$ . The potential wage  $y_i$  of a worker in the firm  $i$  will be then:

$$y_i = \sum_{j=1}^{m_i} \frac{1}{m_i} A_j$$

if worker has a level  $A_j$  of a skill  $j$  then s/he can get a return  $1/m_i$  in firm  $i$  from it if this skill is critical to this firm, and s/he will get a return 0 from it if this skill is not critical in that firm.

Authors of the model believe that employers are only interested in the critical skills development of employees, as investing in other skills will be clearly waste of resources as these skills do not affect the productivity of workers. Leping (2006) successfully explains, using the approach of the model and results on Estonia, how changing a job can lead to losses in skills and wages. “Highly idiosyncratic skill-weights of the firm cause large wage losses when worker switches firms. The wage loss of a worker when changing jobs depends on the labor market

thickness. Thick markets in this context are the markets where there are lots of job offers or where firms have quite similar skill-weights. When the labor market is relatively thin, then it is not possible to find a new job that is similar to the previous one and the worker cannot make a good use of his skills in other firms and this is true even if each of those skills are general in the sense that there are other employers who make use of the same skill” (Leping 2006:25).

This idea coincides with that which emphasizes on diminishing effect of considerable switches from industry to industry. Becker (1993), also, widely discussed skills and incentives to invest in the skills in his classical works: “the time spent in any one activity is determined not only by age, mortality, and morbidity but also by the amount of switching between activities. Women spend less time in the labor force than men and, therefore, have less incentives to invest in market skills; tourists spend little time in any one area and have less incentive than residents of the area to invest in knowledge of specific consumption opportunities; temporary migrants to urban areas have less incentives to invest in urban skills than permanent residents; and as a final example, draftees have less incentive than professional soldiers to invest in purely military skills” (Becker 1993:74). Although Becker did not directly touch the issues of human capital measurement, he actively discussed the mechanisms of incentives of investment in human capital, as well as conditions and regularities of returns from investments in particular skills. Skill-based method acts as the most market oriented method measuring human capital within education-based approach.

#### **4.2.10 Quality of schooling**

It was mistakenly believed that indicators of quantity of schooling is much more important and make significant contributions to overall education process. This exceeding ardor to parameters of quantity in education led to unjustifiable disregard of education quality. Following input indicators are considered quality dimension of education: public educational spending per student, pupil-teacher ratios, salaries of teachers and length of the school year, and such outcome indicators as repetition and dropout rates.

Barro and Lee (2001) suggested test scores as a quality measure. Theoretically, test scores are good human capital indicators because they measure educational outcome, cognitive skills, and can ensure international comparability. However, test scores do not directly reflect schooling quality, for example, the share and input of innate abilities remains unobserved in test score results. In fact, innate abilities also affects how people score, and to a lesser extent so do social and cultural background. Besides, a measure of schooling quality is not necessarily a good measure of labor-force quality, as past and current students may be quite different from current workers (in Le et al. 2005b:26).

International Adult Literacy Test (IALS) introduced by OECD also intended to measure the qualitative outcomes of the education; however unlike tests for students it directly measures the human capital of labor-force participants and unlike other schooling indicators, this test captures the knowledge that is gained outside formal education. IALS have attracted considerable interest, as well as criticism, in human capital measurement. There is a huge variation in literacy scores across

countries observed, despite the same amount of average years of schooling of the labor forces; also, there is a large discrepancy in achievement between students and adults.

The majority of “education quality” measures are unfortunately poorly correlated with each other and with quantity measures of schooling hence would probably create more bias than accuracy in human capital measurement. Widely used education-based measures of human capital produce results that are often appearing not to correspond with each other.

Woßmann (2003) introduced a unique indicator by incorporating quality measure into stock measures. This integrated measure is good to use as a quality weight for the “year of schooling” in a country, where according to the model the US values acts as a benchmark weight. Woßmann present in his formula average rates of return to education integrated to a quality-adjusted ( $Q$ ) measure of human capital stock  $h$  in the country  $i$ :

$$h_i^Q = e^{a \sum r_a Q_i s_{ai}}$$

where  $Q_i$  denotes educational quality index for country  $i$  relative to the US value,  $r_a$  refers to the world average rate of return to education at level  $a$ , and  $s_{ai}$  denotes average years of schooling at level  $a$  in country  $i$ . Author used data from Barro and Lee (2001) for average years of schooling, from Psacharopoulos and Arriagada (1992) for average rates of return to education, and from Hanushek and Kimko (2000) for a of schooling quality. Woßmann (2003) concludes that observed differences in country specific returns to education cannot be solely or even largely attributed to differences in educational quality. Particularly, these differences are likely to appear due to immobility of labor and imperfect labor markets (in Le et al. 2005b:27).

The value of human capital in Woßmann’s method may rise continually, just like physical capital, and it is not bound by a limit which is inherent in other quantity measures of human capital. Most notably, his measure captures quantity along with some aspects of schooling quality in one single number. Since this single number is derived from a huge amount of data this method is very data demanding, data dependent from other sources and biased, to the extent that the results of Barro and Lee (2001), Psacharopoulos, and Hanushek and Kimko (2000) are biased by mismeasurement.

Finally, we would like to emphasize, that whenever we try to describe the quality or qualitative characteristics we are still appealing to quantitative indicators and measures, perceiving quantitative paradigm. Inherently the idea of measure is already the entity of quantitative approach. By our opinion, this quantitative paradigm is comparatively easy for comprehension, while the quality represents unlimited set of measures all at same time and same object. Although, we all well know that, according to dialectics the ideas of quantity and quality are not mutually exclusive, they co-exist abreast, here, we would like to stress how important is the perception of qualitative approach but not the contradistinction of quality and quantity. We just assume that phenomenon of quality per se exists in its specific entity, where quantitative cognition approach can show only a separate part of it. However, what is the measurement of quality anyway? The human mind will never know rest until it finds the way to measure what is the quality and what is not, what is “more” and what is “less” quality.

#### **4.2.11 Summary and discussion of education-based approach**

The unambiguous conceptual framework and feasibly accessible data made the indicator of education a commonly used proxy for human capital. Education-based measures of human capital, including school enrolment rates, average years of schooling, composition by educational attainment and literacy rates are easy to quantify and have comparatively good international data coverage. The historical emphasis on education in early studies has led to a research agenda where human capital was proxied by school experience. The education-based approach became popular mainly because it uses measures that are relatively easy to quantify and have several consistencies in collection procedures. Even though educational attainment is becoming a popular proxy for human capital used in the literature, unfortunately, it neglects how human capital is valued by the market.

In fact, human capital is often estimated in terms of “years of schooling” or formal educational attainment levels, regardless of actual productive capacity using average years of education, expected years of tertiary education, and participation rates in adult education and training. This indicator can act as a proxy of the educated people share in a society, however, it does not necessarily represent the actual level of human capital. These measures give a rough idea of how much human capital a country has. Despite supplementing some additional information about gross differences in economic growth between societies, these crude proxies for knowledge and skills are unable to satisfactorily explain the performance and development of more sophisticated and economically advanced economies.

Recent studies on human capital show that education-based measures are not able to serve to fully grasp the main idea of the phenomenon of human capital. It has been criticized for not adequately reflecting key aspects of human capital and for emphasizing quantity over quality. According to Le et al. (2005b) considerable guesswork and lack of scientific underpinning involved in education-based approach lend support to the argument that poor data quality is a principal cause behind the “growth puzzle” the lack of relationship between economic growth and human capital formation in the recent literature. Such indicators just suggest basically an upper bound, a possible maximum value of human capital stock. This disappointing outcome caused by many inherent imperfections of the educational indicators:

1) The educational indicators frequently miss the fact that quality of education differ across time and space creating severe biases.

2) The educational indicators can not account for all human capital elements other than formal schooling, by excluding health, on-the-job training, informal schooling and work experience. There is no consensus on the question whether or not to consider the uneducated people as having no human capital at all, because practically these people can be economically valuable as long as they work.

3) The educational indicators simply assume that workers of different education categories can perfectly substitute each other, as long as their years of schooling or attainments are equal. According to Judson (2002) “the using years of schooling as a human capital stock measure is

analogous to estimating physical stocks by counting the number of buildings, rather than valuing different kinds of buildings differently” (Le et al. 2005b:25).

4) Good data coverage mentioned above, nevertheless, is not free of deficiencies in that data which is not allowing the implementation of some measurement methods within the education-based approach. Many authors claim that it is the lack of good data, rather than the characteristics of the educational indicators themselves, which makes them poor proxies for human capital.

5) Educational indicators neither capture the specificity and richness of knowledge embodied in humans, nor quantify the flow of future benefits of the knowledge accrued. In fact, they were found to be perfectly relevant to one group of countries but not to another group that is at a different stage of development.

6) Traditionally, scientists have estimated human capital on the basis of educational indicator, regardless of actual productive capacity. While, there is no necessarily strong relationship between the level of education in a society and growing productivity in that society.

7) There is nothing automatic between educational achievement and human capital accumulation, formation, reproduction, utilization and maintenance;

8) There is still no generally accepted view on the relation between education, human capital, and economic growth. Studies with an emphasis on the long-term relation between education and economic growth are of a different character of the relation between human capital and economic growth and do not primarily attempt to estimate the effect of human capital on economic growth.

Moreover, as the real value of human capital measured by education based indicators depends ultimately on the efficiency of social institutions it is strongly related to efficient allocation of human capital and employment in the economy. Inefficiencies and structural differences strongly affect how human capital is valued by the market, and directly influence the final real level of the productivity. Education-based measures became poor proxies for the true stock of human capital not because what they measure, but how they are measured. Several studies of education quality could not solve the problem of the approach anyway. Since quality is multidimensional, many indicators of quality have to be considered, yet estimates across indicators are very poorly correlated.

Nonetheless, we have to acknowledge a huge body of scientific works where education is generally regarded as an important component for economic growth and the general conclusion is that there do exists a correlation between education, human capital accumulation and economic growth and the stock of human capital plays an extremely important role in promoting economic growth and prosperity. We think, despite all those difficulties in full reliability of education-based approach, they became one of the principal measures of human capital not without logic. In general, we would say that all education-based approach methods give good and simply comprehensible information about the trends in educational development assuming that education is a key component in rising productivity and efficiency of labor. The results of education-based measure intuitively assert that they can be a proxy for human capital. Educational trends or trends in development of education should always been taken into account in development studies.

The idea and dimension of the term “capital” which is inherent in the concept of human capital acts as a specific type of resource, describing a certain type of human resources, but not monetary or investment values directly. Human *per se* became a resource, and what distinguishes an individual is the “educational personality”. We found it generally a reasonable approach in understanding the phenomenon of human capital. Whereas some other approaches seek for economic explanation of the human capital by attempts of direct and indirect measurement of accumulations of investments and costs, the educational approach measures treats human capital first of all as a human potential, human resource or human specificities where the education acts as a measure and indicator of different levels of capabilities across spaces and times. It is obvious that researcher who is keen to education-based approach first of all interested in humane values of the populations, social conditions, social history and maybe only then in economic benefit and monetary dimensions of human. The monetary values and cost values are a bit less interesting to the researcher who chooses education-based approach in measuring human capital. We understand that education-based approaches may not directly answer many econometrical questions of the human capital measurement, but nevertheless namely education based measures are able to catch the history, present and future trends of educational base of human capital development altogether and at the same time. These measures allow prediction of future, explanation of past, description of distribution and search for non-economic aspects of human capital reproduction.

In view of the pros and cons, we think at least respect the education-based approach deserves an attention to consider. Even though there is wide spread attempts to measure educational potential by income outputs, the discussion whether education is an effect rather than a cause of income is still not totally resolved. We think there could be a reverse causality between education and earnings, high earnings may result from higher education, rather than vice versa. However, some critics question the illation that education increases productivity from the observation that it increases wages, where others claim that schools do not affect skills but serve merely as a filter sorting differences in abilities that exist independently of schooling. Anyway, this does not necessarily mean that the screening or sorting function of education is unimportant or unproductive. As Mincer stressed: “the search for talent by the school is an activity no less productive than the search for any other scarce natural resource. Human capital is augmented both by learning and by selection, i.e. the more able student learns more at the same cost” (Mincer 1993:294). In next section we are going to discuss the role of costs and expenditures in human capital accumulation and reproduction, as well as the human capital measurement methods based on the cost of its creation.

### **4.3 The cost-based approach**

#### **4.3.1 Conventional methods**

The estimates of costs in a country, families, enterprises and various funds allow the determination of current annual total costs of the society on human capital reproduction as well as the investment in people. Engel (1883) originated the method of production cost as a measurement of human



capital. Engel had estimated individual's human capital according to rearing costs. He considered a person to be fully produced by the age of 26, this means that the cost of rearing a person is equal to all costs needed to bring up an individual from conception to the age of 25. Nonetheless, Dagum and Slottje (2000) had indicated that the model should not be taken as a measurement of human capital, since it just sum up historical costs and ignores the time value of money as well as the social costs that are invested in people (in Le et al. 2005b:4). Later, the Engel's approach has been updated through taking into consideration the depreciated value of money spent on investment in human capital which is equal to the stock value of human capital. As for methodologies of assessing "net value" of human capital, they still need additional studies and researches, because now there are no satisfactory evaluation methods of depreciation or obsolescence of human knowledge, production skills, etc. So, what part of the cost for reproduction of human capital is used in "real accumulation"?

#### **4.3.2 Cumulation method**

The U.S. Bureau of Economic Analysis (BEA) under the direction of Carol S. Carson, together with experts from the OECD for a long time were developing a system of scientific and technological advance indicators, including the costs of "research and development" (R&D). The concept and methodology for estimating the volume of total expenditure on R&D was presented in the "Frascati Manual", which became an international standard, which is used for comparative analysis of the scientific research results in many countries. The BEA experts have also developed a methodology for estimating the current R&D expenditures and their accumulation as intangible capital and as an important factor of economic growth. BEA methodology is based on information which is available for the U.S. concerning detailed information on expenditures on science since 1920 (Carson 1996).

The proposed methods, surely, contain a lot of conditional assumptions in the rearrangements of statistical values, especially during calculations with constant prices for such a long period, where conditionality can be found:

- in the magnitude of the lag between the period of implementation of R&D and the period of their realization in the accumulated human capital as an increment in stock of knowledge and skills;
- in determination of mean lifetime of this type of capital (approximately 18 years) and the average age of this capital. The values of such capital in R&D, estimated by other researchers are close to estimates of the BEA.

Researchers adhered to the OECD standards made similar estimations by following scheme:

1. Total current expenditure including fundamental and applied researches and designs;
2. Accumulation per period;
3. Changes in stock;
4. Consumption for current period;
5. Gross accumulation;
6. Net accumulation.

It is clear that the use of such estimation methodologies of human capital accumulation is possible only with detailed statistical data, which many countries still do not have. However, the experience in methodological development by scientists' estimation of R&D definitely assists in solving the complex problems associated with the assessment of human capital of population in many countries.

### **4.3.3 Human capital index of the Lisbon Council**

Human Capital Index of the Lisbon Council deployed the model which measures human capital also in terms of the cost of its creation. It is a cost of creation approach to measuring human capital. Measurement method applies index approach which was constructed for the 13 European Union (EU) states and 12 Central and Eastern European states. Specifically, the index defines four types of human capital and analyses the way those types of human capital collectively contribute to the national wealth:

“1) *Human capital endowment* – measures the cost of all types of education and training per person active in the labor force. The human capital endowment referred to the total sum of investment in five types of human capital development: a) Informal parental education: general skills and cultural adaptation taught by parents; b) Formal school education: general skills which children learn mostly up to secondary school; c) Formal university and higher education: specific skills that students learn in university and upper vocational training institutions; d) Formal and informal adult education: skills which adults acquire outside of their daily work environment, which are nevertheless either directly or indirectly job-related such as management training; e) Informal learning on the job: skills acquired incidentally as part of the daily job activity and continuous. Each component is measured either in terms of direct expenditures or in terms of opportunity cost.

2) *Human capital utilization* – looks at how much of a country’s human capital stock is actually deployed.

3) *Human capital productivity* – measures the productivity of human capital by dividing a country’s overall consumption by all of the human capital employed in that country.

4) *Human capital demography and employment* – looks at existing economic, demographic and migratory trends to estimate the number of people who will be employed” (Ederer et al. 2007:5).

In this method the formal education is measured directly in terms of the expenditures spent, while the informal education can only be indirectly inferred, in terms of the opportunity cost to the parent or the adult who is engaging in informal education. This is done by assuming an opportunity cost for the time spent corresponding to the average net salary per hour received in that country in that time. As it has cost components and index components, it is viewed as a blend of the cost and the cumulation methods. Unfortunately, the technique details for this approach have not been fully released.

#### 4.3.4 Perpetual Inventory Method

American economist John W. Kendrick suggested using the “perpetual inventory method” in determining the accumulative value of the investment in human. His methodology was expounded on the basis of detailed statistical information concerning the United States. This method is acceptable for statistical estimates for the countries with long-term dynamic series of the accumulation and consumption structures. Kendrick’s assessment technique determines family and society costs on maintenance of children until they reach the working age and get a particular profession, retraining, professional development, labor migration, health, etc. Along with these costs the investments in housing, in household durable goods, in stocks of family goods, as well as the costs of research and development are taken into consideration. These specified aggregate costs of families and society are summed for a mid-period of labor-force preparation. Using deflator index the exponents of values are converted from the current year in comparable prices, on date when human capital is assessed (Kendrick 1996).

Perpetual Inventory Method is generally used in case of missing direct information for calculations of the fixed assets stock. Kendrick (1996) estimated both tangible and intangible human capital. Tangible human capital includes child rearing costs. Intangible human capital consist of education, training, medical, health and safety expenditures, and mobility costs. The calculation of fixed capital consumption can be based on these asset stocks. The sum of gross fixed capital formation in previous years is calculated as gross capital stock. In the simplest case it is assumed that the total investment of a particular asset does not deteriorate during the expected service life of that asset and is discarded as a whole after that period of time. Generally, the Perpetual Inventory Method formula is presented in the following way:

$$A_{t,t} = \sum_{i=0}^{d-1} I_t P_{t-i,t}$$

where:

- $A_{t,t}$  – stock of fixed assets (gross) in year  $t$  in prices of year  $t$ ;
- $I_t$  – gross fixed capital formation in year  $t$  in current prices;
- $P_{t-i,t}$  – price index of year  $t$  with base year  $t-i$ ;
- $d$  – expected duration of total service of human capital;

This method estimates the resources invested in the education and other human capital related sectors, which can be useful for cost-benefit analyses. Also it is comparatively easy to apply, due to the availability of data on public and private expenditures. According to Perpetual Inventory Method calculations, the share of human capital in accumulated national wealth of the U.S. (excluding government investment) in 1970 was more than a half. Thus, Kendrick derived the estimates of human capital accumulation in its full "replacement cost" (The World Bank 2009).

The Perpetual Inventory Method covers detailed aspects of human capital accumulation from the cost side and provides a very comprehensive explanation for sum up all related cost to estimate the value of human capital. A certain level of data availability on both public and private

expenditures on formal education as human capital investments made the cost-based approach to be a relatively easy to apply. However, Le et al. (2005b) have criticized the cost-based approach pointing out that the value of human capital is basically determined by the demand for it, not by the cost of production. Moreover, it is very difficult, if not impossible, to distinguish expenditures between investment and consumption. As it is well known with physical capital, there is no necessary relationship between investments and the quality of output. This problem is more serious with human capital and therefore we think that cross-sectional and temporal comparisons not reliable all the time. As Le et al. (2005b) have pointed out, “for example, an innately less able and less healthy child is more expensive to raise, so the cost-based approach will overestimate the human capital of those people while underestimating well endowed children who, all else equal, should incur less rearing and educational expenses” (Le et al. 2005b:5).

Yet, the data requirement is enormous, for example, we may need to get data ninety years back for implementing all calculations. Additionally, the method does not provide the full guideline for many technique treatments, such as for the split of health expenses between investment and “preventative costs”. It is very difficult to distinguish between investment expenditures and consumption expenditures within the method. It is not easily observable, how changes in each type of spending contribute to the changes in the human capital stock value. It is obvious that most of expenditures on human have both consumption effect (satisfying consumer preferences) and investment effect (enhancing productivity), therefore the cost-based measures are sensitive to assumptions about the type of spending and the share of various household and public expenditures that should be regarded as human capital investment. The ambiguity in distinguishing of consumption effect and investment effect of expenditures on human creates controversies in what should be considered the human capital investments.

In cost-based methods applied for physical capital, usually the investments are valued at their purchase price, but this is not generally available for measuring human capital. During measuring human capital by perpetual inventory method, only the costs or expenditures are included in investment. The main drawback of cost-based approach is that it ignores a fundamental feature of the process of education, the lengthy gestation period between the current outlays of educational inputs and the emergence of human capital embodied in their graduates. Furthermore, some of the nonmarket benefits of human capital investments remain unrecorded. Some researchers maintain the idea that consumption is an end, rather than a means, of investment and production, so gross earnings are more relevant to human capital derivation.

## **4.4 The income-based approach**

### **4.4.1 Conventional methods**

In comparison with the cost-based approach which measures human capital from the input side, the income-based approach measures human capital from the output side. Actually, the estimations by income-based approach to human capital measurement were elaborated earlier than the

cost-of-production method. As we wrote in Chapter 2, Petty (1690) became the first scientist who applied this framework. He calculated the human capital stock of England by differentiating between the estimated national income and property income. Results amounted up to £520 million. However, Petty's method was too simplistic, because it did not take into account the heterogeneity of the population size, structure and composition. Nonetheless, his estimations had raised the issue of measuring a country's laborer's monetary value (in Le et al. 2005b:6).

According to many scientists the first scientific model of measuring the income value of a human, was introduced by Farr (1853), who calculated the earning capacity of a laborer as the present value of an individual's future earnings net of living expenses, adjusted for survival probability and using a discount rate of 5%. Farr's method had opened extensive interest for further development of income-based approach to human capital measurement. The core principle of the method is to value the human capital of a population as the total income that could be generated over lifetime of workers. (in Le et al. 2005b:6–7).

Dublin and Lotka (1930) followed Farr and contrived a formula for estimating the value of a human at a given age  $a$ ,  $V_a$ , as:

$$V_a = \sum_{x=a}^{\infty} \frac{S_{a,x}(W_x Y_x - C_x)}{(1+i)^{x-a}}$$

where  $i$  is the interest rate,  $S_{a,x}$  is the survival probability to age  $x$ ,  $W_x$  is the employment rate at age  $x$ ,  $Y_x$  is the individual's annual earnings from age  $x$  to  $x+I$ , and  $C_x$  is the annual cost of living. This formula is, actually, a formal statement of Farr's method, except that Dublin and Lotka made allowance for unemployment (in Le et al. 2005b:7).

Income-based approach measures human capital and human's earning power at market prices, because the labor market more or less accounts for many factors, including ability, effort, productivity and education, as well as the institutional and technological structures of the economy. Through market activities people produce goods and services, foster innovation and growth through managerial and creative activities, and generate income that allows for the acquisition of market goods and services. Also, one does not need to assume an arbitrary rate of depreciation, as depreciation is already implicitly captured in the model. The choice of a discount rate involves some subjective judgment, but this should not be a big problem. Income-based approach provides the most meaningful results if the required data are available. Moreover, as Le et al. (2005b) indicate, since the approach based on income is forward-looking, everyone who interested in evaluation of future productive capacities of the population would prefer this approach than the historical cost-based approach.

However, the estimates by income-based approach are very sensitive to the value of chosen discount rate and the age of retirement. There is another major shortcoming of the income-based approach. According to the approach the differences in labor productivity are assumed to be reflected mainly by differences in wages (income). In practice, wages may vary for many other reasons. Thus, the results of human capital stock measurement by this method may be biased.

The income-based method is criticized for not deducting maintenance costs from gross earnings. There is a big controversy whether or not the maintenance costs should be deducted during the estimation. One can argue, since the physical capital estimates are net of maintenance costs, thus human capital should also be net. According to Le et al. (2005b) Weisbrod (1961) attempted to account for maintenance, but he encountered many difficulties. In addition, what kinds of expenditures should be classified as maintenance, and how to account for public goods when estimating per capita consumption for different members in the same household is the problem that is not easily resolved. It is also argued that net productivity is a more adequate measure of a person's value to others; whereas gross productivity is a superior estimate of total output to the society (Graham and Webb 1979). Another disadvantage of this approach is the data constraints on earnings, especially if one seeks for age, gender, place of residence and education specific data in estimations. The situation becomes more difficult for the case of developing countries, where wage rates are often not observable. In the early conventional methods reviewed above, the main drawback is associated with the lack of reliable data on earnings and unwarranted assumptions about future earnings (in Le et al. 2005b:9).

Facing these kinds of difficulties in full application of the method early researchers had rejected the usage of the method for while. However Weisbrod (1961) following the assumptions of income-based approach as the most successful, kept developing the approach. And, finally became one of the first who used cross-sectional micro data. He adopted Dublin and Lotka's (1930) formula:

$$V_a = \sum_{x=a}^{74} \frac{S_{a,x} W_x Y_x}{(1+i)^{x-a}}$$

where  $V_a$  denotes the present value of expected future income of an individual at age  $a$ . The retirement age is 75, at which earnings are nil. Assuming that in  $n$  years, those currently aged  $x$  would earn an income equal to what people aged  $x+n$  now earn. Weisbrod (1961) applied the same slant to the employment intensities and survival probabilities (in Le et al. 2005b:10).

He estimated human capital for US males aged 0–74 in 1950, according to his results even the lowest estimate of human capital stock surpasses the stock of non-human capital, confirming the fact that labor income exceeded property income. Weisbrod heeded that the society was paying too much attention to physical capital, while it was human capital that deserved greater investment. Weisbrod warned that excessive use of cross-sectional data can fail to notice the changes in age-specific values over time, and the human capital measures under static age-specific indicators are probable to be biased. Using median earnings instead of mean earnings, which were not available at the time, this method underestimated the real value of human capital. Weisbrod method did not account for the conditions of growing economy (in Le et al. 2005b:10).

Later, Miller (1996) demonstrated that by accounting for economic growth, estimates of lifetime income-based on cohort analyses well exceeded those based on cross-sectional patterns. Graham and Webb (1979) enhanced the Weisbrod model by incorporating the economic growth in:

$$V_a^i = \sum_{x=a}^{75} \frac{S_{a,x}^i W_x^i Y_x^i (1 + g_k^i)^{x-a}}{(1 + i_k^i)^{x-a}}$$

where the  $i$  denotes some characteristics of a specific population and  $i_k^i$  and  $g_k^i$  are respectively the interest rate and growth rate in earnings that apply to type  $i$  individuals at the  $k$ -th year of life. The core assumption here is that a person aged  $x$  with characteristics  $i$  will base his/her expectation of earnings  $n$  years from now on what is earned by those who are currently  $x+n$  years old and who possess the same basic characteristics (in Le et al. 2005b:11).

Graham and Webb (1979) departing from earlier studies by controlling for education had discovered that lifetime income rises with education at all ages. Throughout the life cycle, human wealth initially rises, then approaches zero at retirement. The stock of human capital in the US in 1969 ranged from 2,910 billion USD at a 20% discount rate to 14,395 billion USD at a 2.5%. Although, this model was more developed than earlier ones, but it still was not free from some methodological limitations and covered barely half of the US population (in Le et al. 2005b:11).

#### 4.4.2 Jorgenson and Fraumeni method

Jorgenson and Fraumeni (1989, 1992) introduced the model in measuring human capital based on income-based approach. Apparently, this method is the most frequently and widely used method today. This method has been applied for many countries creating a certain degree of consistency in human capital accounts and estimations conducted for: Japan, Korea, the United Kingdom, Norway, Denmark, Netherlands, France, Italy, Spain, Australia, New Zealand, Mexico, the United States, Canada, Russia, Poland, Romania and besides, the core idea of the method widely applied in the measurements of such international organizations as EuroStat, ILO and OECD.

The most significant contribution of the method to the development of overall income-based approach was in simplifying the procedure for discounting future income streams to the present value. Specifically, model assumes that the present value of lifetime labor income for a person of a given age is just his/her current annual labor income plus the present value of his lifetime income in the next period weighted by survival probabilities. It is assumed that all individuals leave the labor market at age 75 and have no labor income and therefore zero human capital. For instance, a human's lifetime labor income at age 74 is his/her current annual labor income only because he will retire next period. For a person at age 73 his/her lifetime labor income is his/her current annual labor income plus the lifetime labor income of the preceding 74 year old person, adjusted by income growth and survival factors, and so forth. By working backward recursion in this way for all possible combinations of gender and education level, all individuals' lifetime labor incomes at each age can be derived. The lifetime income  $V$  of an individual with gender  $s$ , age  $a$ , education  $e$  can be estimated by following formula:

$$V_{s,a,e} = Y_{s,a,e} + S_{s,a+1,e} \times V_{s,a+1,e} \times \frac{(1 + g)}{(1 + i)}$$

where  $Y$  is annual earnings and  $S_{s,a+1}$  is the probability that the person will survive another year,  $g$  is the income growth rate,  $i$  is discount rate. Jorgenson and Fraumeni (1992) estimated the human capital for the US population “classified by two genders, 61 age groups, and 18 education groups (0–17+ years of schooling) for a total of 2,196 cohorts. There are five stages of the life cycle within the model: no school and no work (ages 0–4), school but no work (5–13), school and work (14–34), work but no school (35–74), and no school or work (75 and older)” (in Le et al. 2005b:12).

An important advantage associated with the Jorgenson-Fraumeni method is its ability to evaluate the reproduction of human capital augmented by current educational activities, i.e., measuring additional human capital embodied in the people who are currently attended in formal education and who anticipate to improve their employment and income prospects as a result. For these people, lifetime income is:

$$V_{s,a,e} = Y_{s,a,e} + \{E_{s,a,e} \times S_{s,a+1,e} + V_{s,a+1,e+1} + (1 - E_{s,a,e}) \times S_{s,a+1} + V_{s,a+1,e}\} \times \frac{(1 + g)}{(1 + i)}$$

where  $E$  denotes the school enrolment rate. Working backwards from the lifetime incomes of the most educated people, we can obtain lifetime income for individuals who are still at school.

According to the model human capital is not restricted to market activities and can be generated from both market and non-market activities. “Jorgenson and Fraumeni had imputed the value of labor compensation for nonmarket activities: household production, e.g., cooking, cleaning, and care-giving (excluding schooling). They defined full labor income as the sum of market and non-market labor compensation. In fact the division to market and non-market incomes depends on how much time is allocated to maintenance. For example, 10 hours maintenance a day, so if a person works 40 hours a week, he would have  $40 \times 52 = 2080$  hours for market activities and  $(14 \times 7 - 40) \times 52 = 3016$  hours a year for non-market activities. Annual earnings, market and non-market, are derived from after-tax hourly labor compensation for each gender-education-age cohort” (Le et al. 2005b:13).

“Jorgenson and Fraumeni (1989) estimated that in 1982 prices the US stock of human capital increased from 92 trillion USD (1949) to 171 trillion USD (1984). As per capita human capital grow only up to 15%, authors conclude that population growth accounted for most of the increase in human capital stock. Women accounted for about 40% of the stock of human capital and this proportion remained fairly stable throughout the period. The share of human capital due to market activities was around 30%” (Le et al. 2005b:13). However, critics argue that the model is overestimating the human capital through treatment of non-market activities. This is the most controversial part of Jorgenson and Fraumeni’s model, as well as the assumption that human capital equally raises the productivity of time spent at leisure and at work. How to evaluate for non-market labor activities is a contentious issue. for example, is the value of PhD holder’s work in the garden higher than that for someone who only completed secondary education? As Conrad (1992) pointed out, there would be almost no change in the human capital stock if the population is fully employed or only half employed, since non-work time will be fully imputed anyway. In addition, the retirement age is set too high, this overvalues the productivity results of older people and overstates



the lifetime incomes for all other ages. Aulin-Ahmavaara (2002) casts doubt to the full imputation of non-work time, pointing out that at least some leisure time is necessary to prepare for work. Dagum and Slottje (2000) argue that Jorgenson and Fraumeni's model is not able to account for variations in endowment among individuals of the same gender and education which can create the ability bias in the observation.

Despite the fact that Jorgenson and Fraumeni method is widely has been applied for many countries more and more researchers refused today to account for non-market activities since they find the non-market production activities very difficult to quantify and value, and which requires time-use estimates.

#### 4.4.3 Le's lifetime labor income method

Whereas Jorgenson and Fraumeni method accounts also for human capital of non-workers, Le (2006) assumes that the value of non-participants' human capital is effectively zero. Le finds Jorgenson and Fraumeni's recursive method no longer applicable, since growth rates in earnings are not constant across ages and periods.

Le has found out that growth in employment and income tends to be greater in young ages, and therefore using a common growth rate understates the inequality in human capital across ages. By author's opinion Jorgenson and Fraumeni's model is also unable to allow for the fact that mortality rates change over time. Even though education tends to reduce mortality rates, the Le has broken down his data only to gender and age, assuming that the probabilities of surviving do not vary with education. Author warns that this assumption would understate differences in lifetime income between education levels; however, author believes that the resulting bias is trivial.

According to Le, the Jorgenson and Fraumeni's method move in sympathy with the employment rate and average annual income for employed individuals, whereas the Le's measures are additionally influenced by labor-force participation probabilities which differ tremendously from one group to another. His estimates are based on a finer breakdown of the population which allow for heterogeneity in growth rates in income, employment and survival probabilities. Le also made an attempt to account for ethnicity, while Averbach et al. (2009) accounted for migrants in estimation of human capital for Israel. However, due to data constraints, survival probabilities were not broken down by ethnicity in Le's model for New Zealand. According to author this would understate lifetime income estimates for Europeans and overstate for others. However, the difference should be negligible. Here is the principal equation by Le:

$$H_{e,a}^y = W_{e,a}^y Y_{e,a}^y \sum_{t=1}^{A-a} \frac{S_{a,a+1} W_{a,a+1}^{y+1} Y_{a,a+1}^{y+1}}{(1+i)^t}$$

where:

- $H$  – human capital
- $W$  – probability of engaging in paid work;
- $Y$  – annual earnings;

|             |   |  |
|-------------|---|--|
| $y$         | – | current year;  |
| $y+t$       | – | $t$ years from current year;                           |
| $e_i$       | – | educational attainment of $i$ level;                   |
| $A$         | – | highest age in the labor force;                        |
| $S_{a,a+t}$ | – | probability of surviving $t$ more years from age $a$ . |

Compared with the estimates of average lifetime income by Jorgenson-Fraumeni estimates for New Zealand, Le's results are around 30% lower, because author ignores non-market human capital. Moreover, Le's model does not assume constant, overstated growth rates in annual income, employment and labor-force participation. Le believes that the rates of labor force participation and employment are important indicators of economic performance. According to the author, the considering an assumption of equal economic value between a full-time worker and a non-participant as not justifiable, therefore Le excluded the human capital of those people who are out of employment as well as the contribution which employed individuals make outside paid work. Le considers this approach as arguably a better measure of the country's productive capacity since the working capital of employed individuals directly add value to economic production (Le et al. 2005a).

Le (2006) also tried to strictly confine measures of human capital to economic production and maintains the idea that the human capital which is not used in economic activities is useless. Le's results show that the population size does not matter much to the total stock of human capital, it was found that labor force participation rates to be more important. "Accordingly, getting more migrants will not lift the stock of human capital if these migrants remain to be unemployed. The stock of human capital can be augmented based on the same population stock by increasing the participation rate, other things being equal. According to Le the educated people is not sufficient to boost the country's human capital, which is more important that those people be employed so that the knowledge and skills they have gained become the productive capital rather than being squandered on unemployment and non-participation" (Le 2006:103).

Nevertheless, Le's estimates are still subject to a well known problem concerning a general lifetime income-based approach, namely omitted variables bias. Even it is important to consider ethnicity, gender, education and age in order to get more arguable results for human capital estimation, however, these variables are not sufficient to explain the variations in earnings. Several important factors have been left out of the model including ability, family background, quality of schooling and work experience (Le 2006). We agree with Le who (2006) indicated that this bias matters more to estimates for individuals than to population aggregate results. However, any aggregate measure has several shortcomings according assumptions of human capital theory; we discussed these difficulties in discussion concluding section of this chapter.

#### 4.4.4 Income-based index method

Also applying income-based framework in their measurement, some authors derived an index value instead of a monetary measure in their estimations. Mulligan and Sala-i-Martin (2000) measured

human capital as the total labor income per capita divided by the wage of the uneducated. The underlying principle for this method is that labor income incorporates not only the workers' human capital but also the physical capital available to them, i.e. having the same level of human capital workers in regions with higher physical capital will tend to earn higher wages. Piachaud (2002) rightfully noticed that high-qualified surgeon with high level of human capital can do nothing without provided physical capital (i.e. well equipped hospitals) and better team of colleagues. The impact of physical capital to reproduction of human capital is very significant. Hendricks (2002) shows that differences in human capital do not explain cross-country income differentials. He used data on immigrant workers from different countries, working in the same labor market (the USA). The database is a 5% census sample of 2.2 million natives and 178,000 immigrants (who arrived at age 20 or higher) with data on annual earnings, years of schooling (six categories), five-year age groups, gender and country of birth. Country data on educational attainment comes from the OECD. The result for immigrants to the United States from high-income economies is that they earn significantly above the US mean income. For example, New Zealanders working in the US earn incomes at 117.8% of the US average, but New Zealand's GDP per capita is only 69.1% of that in the US. This finding is certainly plausible if one considers the reverse situation. If a highly qualified physicist migrated from the US to Guyana it is highly unlikely that he would earn the same level of income. Obviously, more human capital is not sufficient on its own to raise GDP (Stroombergen et al. 2002).

Therefore, to get a wholesome measure of human capital, the effect of physical capital should be netted out. Mulligan and Sala-i-Martin's (2000) measure nets out the effect of physical capital on labor income, this measure captures the variation in quality and relevance of education across time and space, according to their formula the average human capital  $h$  of state  $i$  at time  $t$  is:

$$h_i(t) = \left\{ \int_0^{\infty} w_i(t, s) \eta_i(t, s) ds \right\} / w_i(t, 0)$$

where  $w_i(t, s)$  denotes the wage rate of an individual with  $s$  years of schooling,  $w_i(t, 0)$  is the wage rate of a zero-schooling worker, and  $\eta_i(t, s)$  the fraction of people with  $s$  years of schooling (in Le et al. 2005b:15). Wage rate represent the rate of pay based on per unit of production or per period of worktime on the job. The measure of human capital based on wage rates and labor productivity is the index method which calculation automatically eliminate the influence of physical capital. Also, this method does not demand much data and unrealistically impose the equal amounts of skills on workers with equal amounts of schooling. According to this method uneducated workers always have comparatively the same level of human capital, although they do not necessarily have the same earnings. Mulligan and Sala-i-Martin (2000) wrote: if schooling has quality and relevance that vary across time and space, any amount of schooling will introduce inter-temporal and interregional differences in an individual's level of skills. That is why the only sensible numeraire for estimation of basic human capital indicator is the parameters of uneducated worker.

Mulligan and Sala-i-Martin (2000) had proposed the methodology of measurement of total stock of human capital through a system of indices. Their estimation is based on average timing of

education and training of workers in the U.S. according to censuses. They also have noted the differences in the productivity of workers, depending on the quantity, quality and duration of labor. They concluded that the level of employee's income is directly related to the amount of accumulated value of human capital and knowledge. (in Le et al. 2005b:15).

Researchers came to conclusion that employees with higher levels of education and training require less cost per unit for sustaining their families than others, because their work more efficient. A higher level of human capital accumulation is observed among workers with higher education and qualification which enables them to have a high level of income and more often be involved in different training programs, etc.

However, this model assumes that uneducated workers are identical and that these workers are perfectly substitutable for the rest of the labor force which is questionable matter, actually. Moreover, Mulligan and Sala-i-Martin's method do not account for the inputs to human capital by other factors than formal schooling, such as informal schooling, on-the-job training and health.

Jeong (1998) borrowed Mulligan and Sala-i-Martin method and he has used as the numeraire the parameters of industrial laborer, as classified by the International Labor Office. According to Jeong, industrial laborer rather than the worker with no schooling supplies the same human capital input across countries hence is more comparable across countries than any other types of workers, since they primarily supply their physical effort with little skill. Reasonably we can assume that industrial laborers are physically fit to work in the industrial sector. They also are more comparable in terms of their health and physical conditions. Industrial laborer is a good comparable indicator also, because the minimum wage law seems unlikely to be binding for the industrial laborer since his wage rate is not low relative to the other occupations. The industrial laborer's wage rate is neither high nor low compared to the other occupations. Therefore the human capital inputs of industrial laborers across countries is not extreme and seems to be equal, while equating the human capital inputs of workers with no schooling would be extreme. Jeong's method avoids the problems inherited in education-based measures of human capital by not using schooling as a basis for comparing workers, which failure to account for schooling quality, for skills that are acquired outside formal schooling, and for variable rates of return to schooling across levels.

Koman and Marin (1999) elaborated the method of human capital measurement, which weights workers of different schooling levels by their wage income. The method has several stages of calculation. First, based on a perpetual inventory method, the number of individuals aged  $i$  whose highest level of schooling at time  $t$  is  $j$  is computed as:

$$H_{ij,t} = H_{i-1,j,t-1}(1 - \delta_{i,t}) + H^+_{ij,t} - H^-_{ij,t}$$

where  $H^+_{ij,t}$  is the number of people aged  $i$  who completed education level  $j$  at time  $t$ ,  $H^-_{ij,t}$  is the number of individuals aged  $i$  whose highest level of education was  $j$  in time  $t-1$  and who completed a higher schooling level in time  $t$ , and  $\delta_{i,t}$  is the probability that those aged  $i-1$  in time  $t-1$  died before reaching age  $i$ . At the next stage authors use a Cobb-Douglas aggregator, after transforming particular schooling level  $j$  into years of schooling, and then relate workers with different educational attainment to human capital  $h$ :

$$h = \sum_s \omega_s \ln(p(s))$$

where

$p(s) = \frac{L(s)}{L}$  the share of working-age individuals i.e. workers ( $L$ ) with  $s$  years of schooling;

$\omega_s = \frac{e^{\gamma s} L(s)}{\sum_s e^{\gamma s} L(s)}$  the share of the wage income of workers with  $s$  years of schooling in the total wage bill of the economy;  $\gamma$  is the slope coefficients that capture the effect of schooling on earnings, which are obtained from a Mincer's equation<sup>2</sup>.

Koman and Marin's method measures workers' productivity by their wage income. Koman and Marin's efficiency parameter  $\omega_s$  nets out the effect of physical capital on wages (and hence on human capital) similar to Mulligan and Sala-i-Martin's approach. (in Le et al. 2005b:16).

In order to implement this method, one needs to construct a population data set by age, gender and educational attainment for each year of study. The measurement is actually a Cobb-Douglas formula. Since the shares of different education groups by construction are not perfect substitutes to each other, when the proportion of one education group increases, it could cause the total measurement to decline. For example, if one increases the proportion of population with higher education, the measurement should increase as the overall education get higher, but it could decline due to the Cobb-Douglas formulation. This happened in the calculations of human capital for China by Li et al. (2009). Though, generally the human capital measurement should be a monotonically increasing function of the overall education. Another limitation remains, however, as the model assumes that one year of schooling yields the same amount of skills over time.

## 4.5 Other approaches to human capital measurement

### 4.5.1 Combined method

Some researchers are inclined to think that no single approach to human capital measurement is perfect and they combine different methods in order to use their advantages and overcome their shortcomings. The cost-based approach is useful for cost-benefit analysis of human capital expenditures. The cost-based approach provides a measure of flow of investments in human capital. When combined with the income-based measure of human capital, the cost-based measure provides a measure of a rate of return to investment in human capital.

<sup>2</sup> Mincer's equation models the wages as a function of human capital in statistical estimation which has been the workhorse widely adopted in empirical research on earnings determination. It has been estimated on a large number of data sets for numerous countries and time periods. The equation written in following way:

$$\ln(inc) = \alpha + \beta \times e + \gamma \times exp + \delta \times exp^2 + u$$

where  $\ln(inc)$  is the logarithm of earnings,  $e$  is years of schooling,  $exp$  and  $exp^2$  are, respectively, years of work experience and experience squared, and  $u$  is a random error. The coefficient  $\alpha$  is an estimate of the average log earnings of individuals with zero years of schooling and work experience,  $\beta$  is an estimate of the return to an extra year of schooling, and  $\gamma$  and  $\delta$  measure the return to investment in on-the-job training.

As early as the end of the 19<sup>th</sup> century, Wittstein (1867) combined Engel's cost-of-production approach with Farr's prospective method to measure human capital of an individual at different ages. However, he assumed the lifetime earnings and lifetime maintenance costs of an individual to be equal and was criticized for this assumption. (in Le et al. 2005b:8).

Tao and Stinson (1997) combined the cost and income methods. They indicate investments in human capital as determinants of human capital stock, which can be measured by the cost-based approach, while human capital, *per se*, in turn, determines earnings through the income-based approach:

$$Y_{s,a,e} = w_t h_{s,a,e}$$

where

- $h$  – human capital;
- $Y$  – earnings;
- $s$  – gender;
- $a$  – age;
- $e$  – education level of a human;
- $w_t$  – human capital rental rate in year  $t$ .

The human capital stock is estimated as the accumulated real expenditures on general education. The rental rate is assumed to be constant across cohorts. Using the cost method to estimate human capital, Tao and Stinson avoid the problem of what comprises an investment in human capital in the population. Also, this method needs no assumptions about depreciation in human capital. However, the open question: how good are educational expenses at measuring the human capital, which remains the general problem of the cost method unresolved. Authors take test (SAT) scores as a good indicator of ability, however whether or not human's ability can be measured by the test score is contentious issue (in Le et al. 2005b:28).

Dagum and Slottje (2000, in Le et al. 2005b:29) have introduced a unique method for measurement with unique assumption. They also combined various methods and approaches and defined human capital as a dimensionless latent variable:

$$z = L(x_1, x_2, x_3, \dots, x_p)$$

where  $z$  denotes a latent variable of human capital (unit variance), and  $x_1, x_2, x_3, \dots, x_p$  are indicators of human capital. Obtaining the value of  $z$  one can account for the value of human capital for the  $i^{th}$  economic unit:

$$h_i = e^{z_i}$$

Further they decided to apply Jorgenson and Fraumeni's (1989) method for obtaining the value of human capital ( $H_x$ ) of the average economic unit aged  $x$ . Then the pecuniary value of human capital of the  $i^{th}$  sample observation is measured by following formula:

$$H_i = h_i \frac{\bar{H}}{\bar{h}}$$

where  $\bar{h}$  and  $\bar{H}$  are accordingly the average values of  $h_i$  and  $H_x$ . This means that the monetary value of a person's human capital is equal to the average lifetime earnings of the population, weighted by the level of human capital that an individual has relative to the average human capital of the population. (in Le et al. 2005b:29).

Dagum and Slottje (2000) managed to estimate the human capital of individuals while previous studies only estimated average human capital of cohorts. They assumed a standardized normal distribution of human capital across population, however, whether or not human capital is normally distributed is controversial. The results obtained from this integrated framework are very sensitive to assumptions generally inherited in the income-based method, regarding the retirement age, discount rate and real income growth rate. The latent variable approach can, theoretically, remove the omitted variable bias of the income-based method. However, this innovation is hampered by the lack of data on intelligence, ability, or hard work. (in Le et al. 2005b:30).

#### **4.5.2 Residual method**

The World Bank (2006) implemented the program of estimating the total wealth of nations across 120 countries of the world. The total wealth was measured as the net present value of an assumed future consumption stream. It contained:

- Produced capital stock – the value of produced capital stocks was estimated with the perpetual inventory method and included both structures and equipment.
- Natural capital – value of natural capital was estimated by taking the present value of resource rents and included nonrenewable resources, cropland, pastureland, forested areas, and protected areas.
- Intangible capital – total wealth minus produced and natural capital and represented an aggregate value which includes human capital, the infrastructure of the country, social capital, and the returns from net foreign financial assets. Net foreign financial assets and debt interest obligations assumed to affect the level of consumption in the country.

This method of measuring the value of intangible capital by subtracting tangible capital from total capital called a residual approach to measuring the level of human capital. According The World Bank (2006) the intangible capital represents greater than 50% of wealth for almost 85% of the countries studied. The organization uses a net present value to estimate total wealth requiring certain assumptions about the time horizon and the discount rate. 25 years were set as the time horizon since it roughly corresponds to one generation. The World Bank (2006) chose a social discount rate rather than a private rate, because it was assumed that governments would use a social discount rate to allocate resources across generations. So, the social discount rate was set at 4%, which was at the upper range of estimates it reviewed for industrialized countries. The same rate was used for all countries in order to get consistency and to ease comparisons across countries.

In order to estimate the marginal returns and contribution of three types of intangible capital in the model the organization used a Cobb-Douglas specification. Independent variables include per capita years of schooling of the working population, human capital abroad (remittances by workers

outside the country) and social capital (a rule of law index). Interestingly, the marginal return to human capital in the aggregate was the highest of the three included intangible capital components; also the contribution decomposition demonstrates that the relative contributions can differ significantly across countries (World Bank 2006: Chapter 7).

The residual, or the unexplained part of net national income, is attributed to the stream of income from the human capital component. However, the residual approach can not explain why and how the human capital evolves, thus offering less valuable information. In addition, these indirect measures of the human capital are affected by measurement errors in all the terms entering the accounting identities, resulting inevitably substantial bias in the human capital measurement. However, the World Bank (2006) suggested the major unified principles of national wealth concept, which created preconditions for improvement of estimation methodology of human capital indicators. Thereby several methods for estimating the value of accumulated and used human capital and its intellectual component were developed:

- Method of “reproduction estimates” assumes the estimation of cost on formation and use of human capital adjusted with the norms of its accumulation and real reproduction overturn.
- Method of “innovation estimates” considers innovation upgrade cycles of vocational and qualification parameters of human capital, which are adequate to cycles of scientific-and-technological advance and to renewal cycles of physical capital.
- Method of “return estimates”, since human capital is one of the forms of capital (it is a source of future income and can be accumulated), rates of return are applied in analysis of its effectiveness, which are calculated by appropriation of the human capital income to its cost.
- "Genuine Savings" indicators, the net saving rate encompassing resource depletion and environmental degradation, is extended to include technological change, human resources, exhaustible resource exports, resource discoveries and critical natural capital.

We would like to conclude on this section with words of Graham and Webb (1979): “the value of any capital asset can be successfully determined by summing the costs of production and by discounting the future returns. These methods are equivalent in a world of competitive equilibrium, complete certainty, perfect capital markets and no externalities. In fact, estimates from different approaches can differ markedly since these perfect market and social conditions hardly ever prevail in reality” (Le et al. 2005b:13).

#### **4.6 Summary of approaches to human capital measurement and discussions**

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 human capital can answer the question what is the level and character of human capital in a given society. However, realizing the urgent importance of measurement method elaboration, do not hasten to search for ideal methods of measuring human capital, because the exaggerated desire to find an



ultimate measurement method of human capital can easily lead to unnecessary departing from core research questions. Our inexperienced maximalism put us forward to grasp as much widely known (and sometimes unknown) methods of research as possible. However, this strategy could eventually lead to failure, since as we understood later that the speculations in the field of proper methods of research without introducing simple data (in our case statistical data) would be endless. So this conclusive approach helped us to concentrate on more practical issues of human capital measurement.

In this paper we reviewed some well-known human capital measurement methods, and compared their advantages and disadvantages. We find that different measurement approaches can lead to very different results. All the reported measures tell us something important about the level of human capital, but each requires a different interpretation. Reviewed in this chapter the education-based, cost-based, income-based and other approaches may seem to have very different assumptions and understanding of human capital, however they are not unrelated. In fact they all implement the measurement around the common entity and try to describe the common phenomenon. Since inputs in the human capital production process, such as costs of rearing and educating people, make the basis for the cost method. The income method builds on earnings of individuals and society, whereas such indicators as literacy rates, school enrolment rates, educational attainment and average years of schooling is used to describe educational dimension of human capital.

One of the principal tasks in this chapter was to identify proper methods to estimate the level and stock of human capital in a particular society. The question of proper and relevant measurement methods remains open. Today, the majority of authors who describe and research human capital in a given society or dealing with interstate comparisons of human capital level, are appealing to proxy measures and relying, basically, on statistics on education and healthcare. Even the whole organizations engaged in human capital studies (such as OECD, NBER, the World Bank, BEA, ECOSOC etc.) incline to these proxy measures.

“In such absence of well-defined measures of human capital scientists have had to appeal to proxy measures. In case of measuring national human capital and its influence on economic growth one should be very careful with proxy measures applying to human capital, since it is clear that a wide definition of human capital is required here, as economic growth captures not only the direct benefits to the individual of investment in human capital, but also the positive externalities that a skilled population encompasses. In practice, proxies for human capital have been introduced on the hoof and there is a lot of variability in underlying definitions. This points to a fairly eclectic program of gathering together series and measures that relate to, but do not necessarily closely define human capital, but nevertheless could still be found useful by researchers investigating one or other aspect of human capital theory. This has led to an extensive literature on relationships between educational inputs and attainments, on the one hand, and outcomes such as earnings and the rate of economic growth, on the other. In such cases the researcher’s interest may lie in the connection between human capital and some particular outcome, such as income. Proxy measures

for human capital need to be selected carefully, both on the input side and the output side. The main problem in the literature is that poor proxies are used for human capital” (Stroombergen et al. 2002:10). Thus it would be difficult to imagine that conclusions drawn from these models are independent of these differentiated proxies and that policy measures based on these conclusions are not biased. The interpretation of the quality of resulting output will also depend on the uses to which a particular measure is to be put.

This situation requires complex analysis of human capital. In many developing countries (as well as in Kazakhstan) this work has been hampered by lack of an appropriate range of statistical data on a consistent and continuing basis. Thus, the issue of appropriate general statistics arises very urgent. Nevertheless, the statistical data can represent only small part of the real process, while human capital per se concerns to different spheres of socio-economic life (it is not solely economic or solely demographic issue). In fact, the human capital is somehow a proxy measure by itself, in terms of describing a specific phenomenon of human and society. This phenomenon can be: a measure indicating the human’s ability; a feature of human’s abilities; a level of human’s ability; an asset containing the human’s ability; a value representing the human’s ability; a stock of human abilities; a resource of human abilities; a condition where human uses his/her abilities; a potential of human abilities etc.

A series of different measures exist and are likely to continue to do so both for practical and theoretical reasons. The multi-dimensional character of human capital requires sets of models to be effectively measured. The measurement issues of human capital are multifaceted and lie on different spaces and approaches. None of the above mentioned approaches is free from shortcomings and there is still the lack of empirical consensus among them. Each approach is more or less subject to two main types of measurement error: the measure does not always fully and adequately reflect key elements of human capital, and poor quality of data exists. Therefore, issue of proper human capital measurement remains a big challenge for all scientists engages in this research area.

Almost all methods in general omit the importance of collective knowledge or skill residing in organizations and other collective entities. Even though the human capital is defined as a characteristic of an individual, the aggregation and summation of different individual human capital lead to organization- and national-level competence which influences those individual parts. Aggregate measures of human capital are also likely to omit the impact of interactions and spillovers arising from enhanced human capital in some members. Spillovers happen when increased skills of some contribute to higher productivity not only for those with skills but others as well who benefit from the higher productivity of the highly-skilled. According to OECD experts the highly specific, culturally bound, non-communicative, tacit and heterogeneous dimensions of human capital are not easy to encapsulate in such measures of human capital (OECD 2001).

“The foregoing discussions in human capital studies necessitate the development of a wide range of human capital measures: encompassing input-investment measures, output-stock measures and outcome measures. Different research topics and goals require different human capital

measures. No single measure of human capital is likely to be suited to all research questions. At this stage there is no definitive measure of human capital. Moreover, we do not see the absence of an all-encompassing widely accepted definition of human capital as an obstacle” (Stroombergen et al. 2002:40).

The attempts to measure only the consequences of human capital are only capturing a snapshot of a moving target. From the initiation of human capital measurement studies there has been a principal change in the motivation behind human capital evaluation. For example, early studies were more concerned with demonstrating the power of a nation, with estimating the money values of human loss from wars and plagues, and with developing accurate measures of human wealth in national accounts. Later, the focus has switched to using human capital as a tool to explain economic growth across countries. Human capital is believed to play a decisive role in the growth process, as well as producing positive non-market external effects such as enhanced self-fulfillment, enjoyment and development of individual capabilities, reduction in poverty and delinquency, and active participation in social and political affairs of a community.

However, the impact of human capital on economic growth has not been empirically supported. The practice that greater investment in humans does not result in faster economic growth along with the concern of measurement error has brought up a longstanding challenge for scientists – how to measure human capital adequately? The discussion on influence of human capital on economic growth is very sensitive to the human capital measures. It is necessary to develop an accurate and consistent measure that will facilitate cross-sectional and temporal comparisons. Only when human capital is adequately and consistently measured, we can understand how it affects the growth process and how governments can influence its quantity or quality.

In this Chapter we briefly mentioned about studies of returns on human capital. Some authors believe that the matter of returns from investment is also pertinent to the issues of human capital measurement. We think that returns issues should be described in the greater extent and the question should be addressed in separate chapter. Nonetheless, we fully realize the importance of the issue of returns, because they reflect and affect further human capital accumulation, future incentives to invest in human capital, as well as, determine the accuracy of the calculations, by all methods altogether. Issues of return on investment in human capital are included in all approaches discussed above and can not be specified and singled out in this particular case of human capital measurement classifications.

We are approaching the principal goal of our study, 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. However, before this we would like to introduce you the demographic heritage and historical background of Kazakhstan.

## **Chapter 5**

### **Demographic and socio-economic background of human capital reproduction in Kazakhstan**

#### **5.1 Human capital studies during the Soviet and the Independence periods in Kazakhstan**

In the Soviet economic science the human capital theory was critically interpreted for a long time. The human capital was defined as property and asset of natural and physical capital owners. All the surplus value and additional income from human capital considered to be appropriated by capitalists, but not by workers. The ideological and political aspects of human capital theory were emphasized. Soviet economic science attempted to prove that instead of “human capital” category there exists a category of “labor human” and instead of “intellectual capital” there is “intellectual labor” in economic relations. All theories were based on the classical political economy work of Karl Marx “Capital”, where definition of “capital” and its relevance to content of “human capital” is compared. Kritsky (1995) writes that the Soviet economists argued that the human labor embodied and accumulated in some product and used in new labor is not necessarily a capital, because the capital is social, industrial relations, where a surplus value, created by labor, is appropriated and used by capital for its own self-expansion. Therefore, in their view, it is not possible to adjust the definition of capital to the human activity.

The great contribution to the development of socio-economic problems of qualified personnel reproduction in the USSR and Soviet Kazakhstan was made by Strumilin. He can be called as the founder of a new branch of economics, the “education economics” and of special section in science as “economics of vocational education”. In his paper, “The qualification of labor and training of workers” – “Kvalifikacia truda i vyuchka rabochikh” (The report on the 2nd All-Russia Congress of Statistics in April 1919), he determined a link between qualifications (skills) and education of workers on the basis of surveys and groupings. He showed that, one year of schooling provides approximately 2.6 times greater increment in qualifications than one year of factory experience. As

well the returns from increased productivity of labor exceed the state expenditures on school education in 27.6 times. A worker also benefits from high returns whose earnings rise with growth of labor productivity (Strumilin 1982).

An important theoretical, methodological and practical work on the training of qualified personnel was done by scientists at Central Institute of Labor (Centralnyi Institut Truda – CIT), which was established in 1920. The CIT was carrying out different trainings for workers during one year by accelerated program. Thus, in 1931 the CIT had trained more than 8 000 workers for Magnitostroi and Kuzneckostroi, and contributed to the timely putting into operation of these large companies. The CIT developed courses and trainings on setting bases, docking locations and alignment references; team learning; professional development and advanced trainings; retraining for unemployed, etc (Strumilin 1982). Since 1920's in the Soviet Union the public education system had launched, including all levels of educational training and children rearing, professional training of workers and specialists, a system of continuous training and re-training. Even in conditions of military economy (during the II World War), the reproduction of the labor force as the most difficult challenge of national economy restructuring, had been successfully solved in the shortest possible time.

The issues of labor and education economics were discussed extensively in the Soviet economic science also in post-war years. In the late 80's and early 90's many political and ideological fetters had been removed in development of economic science in the USSR. Ideas of many schools and theories developed in the “non-communist” economies were re-thought, and the attention of soviet scientists spread to the problem of human capital (Kritsky 1995).

After independence, there were several works associated with Kazakhstan concerning human capital but never directly associated with its measurement issues. Several works explain generally conditions of human capital accumulation, reproduction, returns to education, demographic parameters influencing human capital formation, as well as, study the role of political, socio-economic changes and reforms as conditions for human capital development in Kazakhstan, from scope of its present, history and future, as well as, its peculiarities related to communistic legacy. These works were written both separately for the case of Kazakhstan and considering it within Central Asian, post-Soviet and post-communistic regions. We suppose the lack of works concerning human capital measurement in Kazakhstan, largely reflects the paucity of official statistics on this topic.

One of the earliest works devoted to human capital issues in independent Kazakhstan was written by Becker and Urzhumova (1998). Using a pooled regional time series data set from pre- and post-Soviet eras they examined determinants of pension populations and the labor force participation rate. Becker and Urzhumova found that Kazakhstan in the post-Soviet era responds to price incentives both with respect to real pensions and real wage rates in stark contrast to dramatically backward – bending labor supply curves of the Soviet era.

According to Becker and Urzhumova (1998) the deterioration of Kazakhstan's economy accelerated with the USSR's collapse. Historically, Kazakhstan had a very high labor force

participation rate: nearly 80% of the population aged 16–60 years was in the labor force in 1985, and unemployment was negligible. This high rate shrank toward the end of the Soviet era, at an annual rate of about one percentage point. Part of this decline was natural, since the population was ageing, and people aged 40–60 years have lower labor force participation rates than those aged 20–40 years. Unfortunately, age-specific labor force participation rate data are unavailable for this time. The decline during the 1980's however almost certainly greatly exceeded that due to compositional shifts, and must have largely reflected deteriorating job prospects. The labor force participation rates decline accelerated during 1990–95, falling by nearly 25 percentage points. It appears that labor force participation rate in Kazakhstan has declined from the top of the range for lower-middle income countries (Thailand: 86%; Poland and Romania, 80%) to the bottom (Colombia, South Africa, Argentina and Iran all range from 55 to 57%) during the 1991–1997.

Authors doubt that wages adjust to clear markets in Kazakhstan's formal employment sector during study period. Among the demographic effects, Becker and Urzhumova anticipated that urbanization would have a negative effect on labor force participation rate, since it restricts employment opportunities for women who must care for young children. A high crude birth rate should lower labor force participation rate, as pregnancy and care of young children obviously deter female labor force participation. This strongly and consistently was found, especially during the Soviet era. During 1985–95, the crude birth rate fell 35% in Kazakhstan, which has caused a rise in labor force participation rate of 15–17%. The collapse in labor force participation was actually strongly mitigated by the decline in birth rates.

Generally, Becker and Urzhumova (1998) make following conclusions:

- controlling for fertility, urbanization and industrialization ethnicity does not appear to play a role in labor force participation;
- labor turnover rates are not significantly related to labor force participation rate;
- real wages were associated with strong declines in labor force participation rate during the Soviet era;
- study at the university reduce the labor force participation rate delaying labor force entry;
- the collapse in capital investment appears to explain roughly one-third of the decline this decade in labor force participation rate.
- the transition from a Soviet to post-Soviet economy also has wrought changes which are generally understandable. Kazakhstan's workers are drifting away from the formal labor force in the absence of attractive jobs. Without economic recovery, this drift may well continue, yet the drift itself puts pressure on the government, and adds to economic difficulties.
- many of those who leave the labor market are clearly unemployed, and prolonged unemployment spells imply further difficulties reentering the labor market. Kazakhstan had a low and deteriorating formal sector labor force participation rate. Population of Kazakhstan was increasingly disengaged from the formal economy.

As authors point out themselves from a modeling standpoint, their empirical work is encouraging. Since very little formal statistical work has been done with Soviet or post-Soviet data from Central

Asia and the consistent series constructed has been arduous, and has often necessitated strong assumptions, the estimates which emerge are plausible and generally quite robust.

Filer et al. (2001) investigated the linkages between policy-induced improvements in static and dynamic efficiency in factor markets and medium-to-long-term economic growth in transition economies. Although they focused on post-communist or transition economies, much of the analysis is can be generalized and applied to various industrial and developing countries around the world. Although the work generally focuses on all post-communistic countries there is sound discussion on human capital development peculiarities in transition economies, and important regularities where examples on Kazakhstan are also present.

Pomfret (2003) wrote a paper about new experiences of Central Asian states after independence. Author analyses the economic experience of the five Central Asian countries which became independent following the dissolution of the Soviet Union. His work gives comparative analysis of Central Asian states the period of transformations. In the considerable chapter devoted to Kazakhstan in this work author wrote about human capital loss due to outmigration of more educated citizen during the transformation period.

Grimes and Millea (2003) present an analysis of a program designed to enhance economic literacy through teacher training in Kazakhstan. High school students taught by teachers trained through the National Council on Economic Education's (NCEE) International Economic Education Exchange Program (IEEEP) were examined and compared to students in courses taught by a sample of teachers who had not received training according to the cognitive and affective outcomes. Thus, two equation models were estimated in order to allow for the interdependency of economic understanding and attitudes. The results, after controlling for differences in student attributes, teacher attributes and course characteristics, indicate that students taught by trained teachers achieved higher post-course scores on standardized testing instruments. All the results and findings suggest that IEEEP training and the distribution of curriculum materials developed by NCEE in Kazakhstan was successful.

Cockerham et al. (2004) point out that there is a growing body of evidence suggesting that negative health lifestyles are the principal social determinants of the mortality crisis in the former socialist states. However, the health lifestyles in Central Asia are little known, where the downturn in life expectancy was also experienced. Authors examine health lifestyles in Kazakhstan and Kyrgyzstan. The data showed, consistent with the improved longevity of the Kyrgyz population, that such lifestyles are more positive in Kyrgyzstan despite the somewhat better economic situation in Kazakhstan, where the mortality crisis continued.

Tatibekov (2004) in his research strongly relates the demographic trends and patterns of labor market development. According to him many demographic factors are important in determining labor market in Kazakhstan. Such as change in number of population, gender aspects in functioning of labor market and employment and age aspects on the labor market.

Becker et al. (2005) study the determinants of migration between Kazakhstan and Russia for different age groups and by urban-rural residence, using monthly data for the period 1995 to 1999.

The monthly data allow assessment of different groups' responses to differential economic events by adjusted migration data and a comparable macroeconomic data set for the two countries. Authors found a virtually immediate response to the 1998 Russian financial crisis and to relative exchange rate movements. As for the response to construction activity and to wage differentials the longer lags apply and changes in real pensions do not bring important responses.

Shagdar (2006) provides a brief analysis of current trends and challenges facing education systems of five Central Asian Republics based on the qualitative data generated during field research conducted by the author, between April 2004 and September 2005. He explores issues faced in the provision of education in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, key challenges of education provision as seen by school teachers, parents and government officials and their expectations in terms of the role of education in economic development of the countries in Central Asia and the region as a whole.

Shagdar (2006) claims that countries in the region are experiencing very similar challenges in their education systems, including the lack of funding, poor management at the sector level, poor quality of education, lack of pre-school provision, inadequate training of teachers, increased urban-rural gaps and corruption in education. According to author Central Asian Republics seem to be uncoordinated and piecemeal, and are not aimed at addressing the fundamental issues which impede the education sector and cause its current deficiencies. These issues include structural imbalances in the educational sector, outmoded curricula and teaching methods, inadequate links with the labor market, lack of incentives at all levels and ineffective and corrupt government systems, reflecting both the legacy of the Soviet system and the unmet challenges of post-Soviet transition.

Shokamanov (2006) has conducted series of works related to the human development indices in Kazakhstan. These works give idea about general trends in development of human in Kazakhstan.

Arabsheibani and Mussurov (2006) wrote a conceptual work on human capital reproduction and estimation issues in Kazakhstan. They calculated the rates of return to schooling in Kazakhstan using OLS and instrumental variable (IV) methodologies. Author also used spouse's education and smoking as instruments and found that spouse's education is a valid instrument and that conventional OLS estimates that assume the exogenous nature of schooling, and hence do not control for the bias related to endogenous nature, may underestimate the true rates of return. According to the results the returns to schooling in Kazakhstan have increased with transition, which may reflect the relative scarcities of highly educated people in Kazakhstan with human capital that employers require and, following the market reforms, reward accordingly.

There are two international works assessing efficiency of reforms in post-communist Kazakhstan. Interestingly they both examine two large countries in Central Asian region: Kazakhstan and Uzbekistan. If in the first work by Perlman and Gleason (2005) authors make no specific aim to compare two states and describe in general the phases which had been passed in reforming these two countries, while the second work by Alam and Banerji (2000) compares two states and conclude that Uzbekistan adopted a cautious, gradual approach to market reform, while Kazakhstan followed a more aggressive strategy. According to Alam and Banerji (2000) even



though Kazakhstan have achieved better policy environment, its economic performance has not been better than Uzbekistan's. Authors research the interplay between policies, institutions, and initial conditions to examine several competing and complementary hypotheses about why the paths the two Central Asian countries took may have led to different economic outcomes. Authors surmise that the missing pieces in reform, especially addressed to deficiencies in the competitive environment, combined with a rapidly decreasing role of the state may have limited the gains from the policy reforms in Kazakhstan.

Despite the fact, that the paper by Osipian (2007) mainly analyses the impact of human capital on per capita economic growth in transition economies in the Russian Federation and Ukraine. This study also examines the role of education in economic development in the republics of the former Socialist Bloc along with Kazakhstan. In order to measure this impact authors have analyzed the factors that are associated with the human capital in terms of education levels. The main approach of the work is to estimate the significance of educational levels for initiating substantial economic growth. Authors estimate a system of linear and log-linear equations accounting for different time lags in the possible impact of human capital on economic growth.

As we wrote in introduction of the paper the issues of human capital is becoming very important topic in Kazakhstan, we are convinced that the works devoted to this question will increase soon. In this respect we hope that our modest estimations of human capital in Kazakhstan, which are going to be presented in next chapters, will be beneficial to further development of human capital in Kazakhstan. Although, we present and concentrate on mainly demographic understanding of human capital per se, and its measurement, we hope that our work will be interesting to the wide range of scientific disciplines and researchers dealing with general human capital measurement and peculiarities in Kazakhstan, as well as studies on Kazakhstan.

## **5.2 Statistical data on Kazakhstan: history, limitations and peculiarities of development**

The elaboration of statistical basis of Kazakhstan's demographic history began in the second half of the 19<sup>th</sup> century. The completion of Kazakhstan's accession into the Russian Empire and administrative reorganizations by reforms of 1868 had set a goal to study more intensively the region and primarily, to research the population size and composition of this region.

The first attempts of "scientifically based" enumeration of Kazakhstan's population were the local censuses, military overviews and statistics of resettlement management organizations in Kazakhstani areas. The experience gained during these first steps had formed the basis for the First General Census in Kazakhstan which took place on 9 February (by New Style 28 January) 1897. In order to judge the reliability of the data from this census, it is necessary to know the methodology and especially its implementation process in regions of Kazakhstan. The complication of materials in this census was accompanied with combining some regions into regions which are not representing the subsequent and current administrative districts in Kazakhstan. For example, from

Aqmola region one must exclude Omsk region (Russia), the materials on Oral region include also materials on Bokey Orda, Semey region includes Kereku region, from Sir-Dariya region the Pishpek and Przewalski regions (Kyrgyzstan) should be excluded, Mangistaw region was included in Trans-Caspian region, and materials on Torgay region is containing Qostanay and Aqtobe regions. The census 1897 is not an ethnic but a linguistic census, which was built on the identification by language. Most probably some Ukrainians, Belarusians, Jews, Mordovians considered Russian language as native, possibly part of Kyrgyz, Tatars, Uzbeks identified Kazakh language as native. Moreover, in Kazakhstan rumors were disseminating that the census is conducted in order to convert the nomads into settled, with further conscription, while the rich feared of higher taxes, concealing the real size of their farms. It should be noted that results of census 1897 had the common shortcomings which were inherent in entire Russian Empire, but for some items they were even more aggravated by peculiarities of the region. The data on employment and amateurish performance have been unsatisfactorily developed. On materials of the Census 1897, it is very difficult and sometimes almost impossible to assess and establish a social and professional composition of population.

The First General Soviet Census was conducted at 28.08.1920. Since, the civil war had not yet been completed the whole territory of Kazakhstan was not covered by this census. Along with general population census, an agricultural census was also carried out simultaneously. In addition to all that a brief stocktaking of industrial enterprises was provided. Besides the general demographic indicators census 1920 includes items like: education, occupation (main and secondary); situation in trade, place of work, professions, livelihood, physical disabilities and mental health. In Kazakhstan due to inconvenient routes two cities (Aqtaw and Torgay) were not covered by this census (Kuzembayuli and Amanzholuli 1999).

The most complete census was General Census of 1926. The methodology and organization of this census had covered both academic and industrial achievements in population estimation techniques of the world. An important aspect of preparatory period of Census 1926 was the preparation of maps and toolsets. The first priority was the collection and compilation of geographic, schematic and other maps and printing the settlements on them. A serious problem arose during the clarification of administrative characteristics of settlements. There is no generally accepted critical analysis of the Census 1926 results. Most of the data are used without any amendment. Nevertheless, there is a debate on the question of authenticity of the Census 1926 materials, among demographers. The authors of materials on the Census 1926 indicated that the Asian part of the country is characterized by an underestimation of women in younger ages. This was the result of traditional reluctance to allow strangers to contact young women in family. Also, during this time there was a state campaign against polygamy. As a result, the young married women were either concealed or their ages were distorted (Alekseenko 1999).

Census 1937 was held in January, which was quite successful. However, it was a "shot census". The real size and structure of population, which was estimated relatively accurately (and which is now proved by many scientists and demographers), was much smaller and different than previously

exaggerated estimates. These estimates had refuted the thesis of rapid growth of population during socialism. This census, its program, and most importantly, its disappointing results are not suited Stalin and his entourage. Despite the considerable organizational work and the enormous costs, the results of Census 1937 had been found defective, and the most of the organizers of the census in center and on peripheries were repressed. It was announced that the Census 1937 carried out with flagrant errors and a huge undercount. The materials from this census were not processed for publication and subsided in archives and have been blacked out. Therefore, in conditions of increased repressive state pressure, the work on a new census had been launched, which was to demonstrate the success of the first two Five Year Plans, serving as Communists' powerful propaganda tool (Alekseenko 1999).

In 17.01.1939 another census of the USSR was carried out. Despite all efforts, the Census 1939 had not provided the desired results, its results were "proofread" and adjusted, including overstated number of residents. The task of the Census 1939 was to count what the party and government have ordered. And no one doubted that the statistics would cope with this. For example, in order to confirm the thesis of rapid growth of urban population, the status of many settlements had been changed: hundreds of villages were named as cities. The result is a figure, which showed a more than doubling in number of residents compared with 1926 (Alekseenko 1999).

A separate issue was the rewriting of prisoners. It was impossible to conceive the region where the population density was always less than one person per square kilometer, have suddenly become densely populated. Therefore, the census papers of prisoners (in 1939 they were about 3 million) were evenly distributed by small portions throughout the whole country.

However, despite all efforts, the Census in 1939 did not refute the results obtained in 1937. The organizers of the census 1939, feeling that they have been facing the sad fate of predecessors, started the urgent search for unrecorded citizens. From the perspective of the authorities, the results were not so brilliant, but it was impossible to declare as defective another census. As a result, the organizers were awarded, and the results were published in ultra-short form. The major findings of Census 1939, including the seven-volume edition prepared for publication, were also blacked out due to fear that by aggregating the data by regions, it will be easily possible to detect a postscript (Kuzembayuli and Amanzholuli 1999).

The results of the Census 1939 were not fully published. The Census 1939 is the most "mysterious" census in the history of the USSR and Kazakhstan. The politicization and ideologizing of census program had sharply lowered its methodological level. The absence of professional statisticians, who were subjected to repression in 1937–1939, had a big impact too.

15.01.1959 was held the first postwar census. The organization and methods of Census 1959 was close to the Census 1939, but it had its own traits. Particular attention was paid to the level of education in the country. The long legacy of the Stalinism ideology had affected on materials of this census. However, the materials of period 1939–1959 were published and become available for researchers. During this period, a new generation of demographers entered the scientific world. The

population study, for the first time after the 1920's, admitted into social sciences again (Kuzembayuli and Amanzholuli 1999; Abdakaimov 1994).

15–22 January 1970 All-Soviet Population Census was held, which is exceeded all previous census on the organizational, methodical and publishing parameters, and is comparable only with the results of the Census 1926. Some materials of Census 1970 was obtained from results of the sample survey (25% of residents), these materials had high representativeness according to that time. A particular attention was paid to the employment and occupational structure of the country. In addition, for citizens of working age, employed at home or private farms, a separate questionnaire was filled in order to identify opportunities and conditions for their involvement in social production.

The next census took place on January 17, 1979, which is also studied the possible involvement, in the national economy, of additional manpower by drafting a separate questionnaire, which included 9 questions to citizens of working age, working at home or private farms (Kuzembayuli and Amanzholuli 1999; Abdakaimov 1994).

The next Census 1989 focuses on the workforce potential as well. Also in this census, there is a big concern about housing conditions in the country. The census 1989 had included wide range of characteristics for observation: population size and structure, education, livelihood, the distribution of employed population by nationality, by branches of economy, etc. Due to some hardly understandable reasons, unfortunately the results of the Census 1989 are hard to get, in Kazakhstan.

The first census in the history of independent Kazakhstan had become the Census 1999 (February). The census 1999 has included the whole experience and range of observations and characteristics developed by previous censuses. The second census was conducted in 25.02–6.03 2009. This census has included many innovations both in estimation parameters and in process of conducting, calculation and analyzing the census materials; one of them is the integration of GIS into data processing.

Considering the invaluable significance of population census, it is better to comprehend, at the same time, that each of them represents the data only on a specific date. Here, the vital statistics becomes very important tool in order to analyze changes of population in the intercensal periods.

According to Abdakaimov (1994) the development of statistical and population science in Soviet Kazakhstan has passed several stages. In 1920's Soviet statistics was characterized by an abundance of data. There is a "statistical boom" in the 1920's in history of Soviet statistics. A lot of works were written in this period, amassing a great experience. However, the reliability degree of statistics on population in the 1920's was not highly valued, even by its contemporaries. In the late 1920's the interest in problems of population had declined. By 1925, the territory of Kazakhstan had been mainly formed. *Eo ipso*, removing the practical need for further detailed study of population in defined regions.

In the 1930's the statistical works, researches and data on the population had dramatically declined. The sources published at that time mostly describes the state of economy, the achievement of healthcare, the literacy levels, etc. During the World War II and the postwar years, the

publication of statistical agencies, with rare exceptions, had been ceased. From mid 1950's the statistical publications were renewed and rapidly developing. In general, the data in statistical yearbooks include more items than the material of censuses. For a variety of issues data in periodic reporting, published in the yearbooks, are more representative than materials of population censuses. Solely details regarding migration were scanty. To monitor the dynamics of the human resources quality of the country in Soviet period the following yearbooks give useful information: "The economy of the USSR" (sections: Land and People, Science and Technological Progress, Human Resources in Agriculture, Labor, Education and Culture, Healthcare).

Data of subsequent statistical materials about Kazakhstan (1960's – 1990's) were published in a common methods and program which allows us to compare the data in yearbooks, not only for Soviet period, but also for the first years of independent Kazakhstan. This tradition was continued by the statistics of independent Kazakhstan, and in 1997, the Committee on Statistics of Kazakhstan, began to publish "The Regional Statistical Yearbook of Kazakhstan." These yearbooks have kept the general methodology, structure and parameters of previous account, but the regions and processes in Kazakhstan, in them, started to be researched more in detail.

### **5.3 Demographic development of Kazakhstan from the late 19<sup>th</sup> century up to 1991**

The properties of human capital are constantly accumulating, updated and enriched from generation to generation through transmissions of social links and adoption of value attitudes, motivations and behavioral stereotypes. The socio-economic and political experiences are compressed by history of many preceding generations and current generations bear in themselves the imprint of previously accumulated levels of population quality. All that means that human capital develops through time and generations, as well as, through different socio-economic conditions. In this chapter we try to find a causal link between human capital formation and population under influence of the political and socio-economic processes and changes in what the population of Kazakhstan were involved. Perhaps, these processes were the most significant events, which generated a lot of political, socio-economic, ideological, psychological, cultural and organizational changes in the society.

It is obvious that current characteristics of national human capital existing in modern Kazakhstan were formed beginning from early history of statehood on territory of Kazakhstan. Different populations with different types of economy were living here. The population of Kazakhstan had started its experience in human capital accumulation with the beginning of its history (no matter what is the criterion for "beginning of history"). However two conditions had been defined for choosing the time-frames for more deliberate research of human capital formation history of Kazakhstan: (1) We mostly were interested in populations which faced the most tremendous changes in socio-economic and political life on territory of modern Kazakhstan and had considerably affected current level of human capital in the country. (2) We, especially, were

concerned with the data availability on processes of socio-economic, political and demographic processes.

The earliest date, which allows us to meet both conditions in isochronic way, is 1897, when the first Census was conducted and which included the population who lived at that time in modern territory of Kazakhstan. The aim of this chapter not only to illustrate the level of human capital beginning from the end of the 19<sup>th</sup> century but also to apply more deliberate method which can comparatively surely answer the question by the use of more precise data to the question what is the level of human capital stock in Kazakhstan.

Kuzembayuli and Amanzholuli (1999) as well as Abdakaimov (1994) point that the development of industry in Kazakhstan in the late XIX century, especially development of small-scale industries and railway network had accelerated the growth of towns. The towns were growing, which were founded as outposts in the colonization of Kazakhstan. Populations of regional and county-level towns were rapidly growing, which became not only the administrative and trade-economic, but also the industrial and cultural centers. One of the commercial and industrial centers in Eastern Kazakhstan was Semipalatinsk with population of 31 000 people in 1900. In the Northern Kazakhstan, in Qiziljar, there were 21 750 inhabitants as well as 66 different enterprises for processing agricultural goods with a general capital of more than 1 000 000 rubles. These enterprises employed 1 375 workers. Population of Qostanay, which was founded in 1879, just in 18 years had increased 2.5 times and reached 14 300 people. Approximately, the population of Aqmola also had increased in the same way, which became the center of trade. In the Western Kazakhstan, Oral became a trade and industrial town, in 1900 there lived 39 000 people. The Oral–Pokrovsk railroad (1895–1896) had greatly contributed to the growth of the town. The towns such as Kerek, Atirau, Oskemen, Qarqarali, Kokshetau, Qapal, Aqtobe and Zaisan were also rapidly growing. Populations of Shimkent and Awlie-Ata had significantly increased. Verny (now Almaty), the administrative center of Jetisu region (South-East), had 37 000 inhabitants in the beginning of the 20<sup>th</sup> century.

The history of Kazakhstani population development in the 20<sup>th</sup> century can be divided into 3 main periods: (1) mid-1920's – early 1960's; (2) mid 1960's – late 1980's; and (3) 1990's. During the first period, the population was formed largely due to a mechanical increase (migratory processes), in the second period the natural increase dominated, while net migration gradually become negative, in the third period a decline in the total population observed.

As we mentioned earlier, by 1925 the borders and territory of Kazakhstan had mainly been formed, but there was still a series of administrative and territorial changes, however they had intra-country matter. Nevertheless, not only administrative reorganizations affected the change in size and structure of population. In the early 1920's Kazakhstan suffered from a terrible disaster – famine (1921–1922). The famine, in different extent, had concerned to everyone all over the country. The inevitable concomitants of famine were different epidemics. The total number of registered epidemic diseases had reached 208 000 people, almost every tenth resident of country was terribly ill. Cause of disease was famine, the ceaseless movement of starving people from the

Volga region to Turkistan through the entire territory of Kazakhstan as well as the movement from rural to urban areas. During the famine years the population of Kazakhstan had decreased by 19.2% (rural population by 21.5%). However, the most severely had starved, the Western Kazakhstan (Oral, Orinbor, Aqtobe, Bokey and Qostanay region). According to various sources the number of starving people by 1922 in this region had reached 2 286 200 people (i.e. 93%). According to M. Sdykov the 1921–1922 famine had caused more damage of population than civil war (1918–1921). There was a high mortality rates among population. Population decline (mainly due to outflows from the region) continued also after the famine, the causes were often psychological, due to several consequent years of “crop-failure”, some people had established the opinion that the low-yielding harvests have become chronic. The demographic consequences of the famine 1921–1922 can be traced in the age structure of subsequent censuses. So in the 1926–1979 censuses there is a visible gap in the (age groups) generation of 1917–1924 (Alekseenko and Alekseenko 2007).

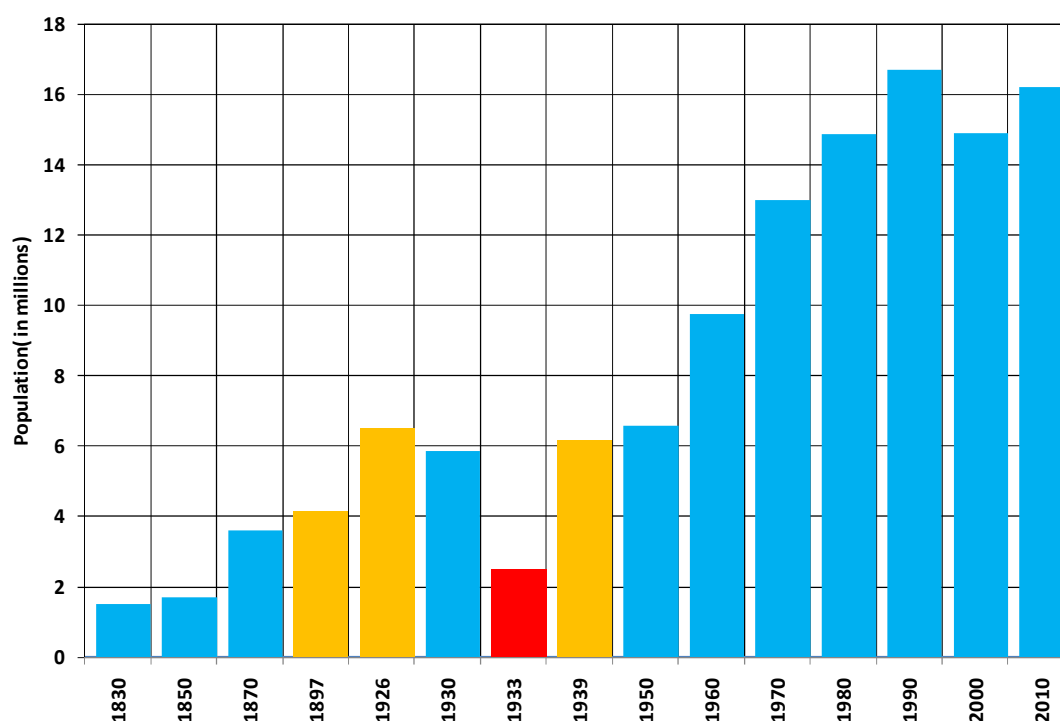
After these tragic events so-called "regeneration period" begun. This period (1924–1930) was mainly characterized by a predominance of rural population in Kazakhstan. However, during 1926–1939 the population of Kazakhstan increased up to 2.6%, while the urban population up to 268%. If in 1926 the rural population exceeded the urban population by 10.8 times, in 1939 that was only by 2.3 times. Over these years, the rural population decreased by 21.9%. Both by sizes and by paces, Kazakhstan had outstripped the All-Soviet rate of urban population growth (112.5%). To some degree, the drop in fertility, and therefore the number of population was affected by the fact that since the mid 1930's a generation, who was born during the World War I and the Civil War when fertility was low, had entered its active fertile period. These and other objective factors significantly contributed to decrease in rural population.

In December 25, 1931 a decree of the Regional Committee and the SNK of Kazakhstan was issued, which targeted on the full completion of nomads settling. By June 1932, 73.1% of farms were collectivized. By paces of socialization and collectivization of sown and cultivation areas of peasant sectors in country, Kazakhstan took up the first place in the USSR. Most of rural population was dissatisfied with progress of collectivization, which had forced them to leave their homeland. The livestock was socialized by administrative method. There was a massive loss of cattle during this campaign, as it was not possible to provide, collected in one place animals, with forages and premises. Thus, in just a bit more than two years the country had lost about 90% of its livestock. A horrendous famine started in history of Kazakhstan, surpassing by scale all previously known. Already by spring of 1931 Almaty (which became by this time a new capital of country) began to receive information about the famine from different regions of Kazakhstan, but the authorities in center ignored that and only toughened the administrative pressure. As a result, within 1931–1933 about 2 000 000 Kazakhs and 250 000 Kazakhstani population of other nationalities died. Several hundred thousand Kazakhs migrated to China, Mongolia, Iraq and Afghanistan. The number of Kazakhs halved. There is no common opinion and assessment, among Kazakh historians and demographers, concerning the number of Kazakhs who became victims of famine (from 1 750 000 to 2 020 000 persons), presumably there will be other estimations. Anyway, whatever is the final

figure, there is an obvious and terrible tragedy of Kazakh people in history, the consequences of which affect the population of Kazakhstan up to today (Alekseenko and Alekseenko 1999).

In the Figure 5.1 the size of population in Kazakhstan presented, beginning from 1830 to 2010, where we distinguished the population size according to vital statistics (*blue columns*), according to censuses (*yellow columns*) and the 1933<sup>rd</sup> year population size – the most dramatic year of the famine (*red column*). We think that it would be a very difficult task for a population to rise almost 2.47 times in 6 years (officially from 2 493 500 to 6 151 102 during 1933–1939). One can easily notice this unfeasibility and doubt either vital statistics or census results. In previous section we wrote about “political aspects” of the Census-1939 and we doubt first of all its results in this respect.

**Fig. 5.1 – Dynamics of population change in Kazakhstan, 1830–2010**



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

Another major public event which influenced the structure and size of population was boosted and drastic industrialization. Since 1926, the USSR had taken a course of accelerated industrialization. Kazakhstan, by the designs of the Moscow authorities, had to become one of the major areas of rapid industrialization. F. Goloshchekin, who actively pursued the policy of center, had advocated the establishment of the mining industry and railway transport in Kazakhstan in order to export raw materials. At the same time the reconstruction of existing and construction of new enterprises were being implemented. Ridder and Qarsaqpay mining-complexes and Qaragandi coal mines had been rehabilitated. The construction of the Shimkent Lead Plant, Balqash and Jezqazgan cooper-smelting works, Oskemen Lead-Zinc Plant had started. Industrialization was



carried out in an atmosphere of pace pressurization and unduly set plans. As a result, there arose difficulties with provision of facilities under construction with labor force, raw materials and equipment. Acceleration of industrial building construction led to a shortage in labor force. To ensure construction projects with “working hands” and at the same time in order to save on training of local Kazakh workers the authorities practiced a so-called “organizational recruitments” (OrgNabor) in covered by unemployment Western regions of the USSR, By “OrgNabors” 559 000 people had been brought in 1931–1940. A significant number of workers, especially low-skilled, were made up from former peasants from villages devastated by the collectivization. As a result, the labor productivity fell very sharply and staff turnover increased. One of the sources of labor force replenishment was dispossessed and exiled kulaks (peasants) and other former political dissidents from the central regions of USSR and Siberia. In 1931 in Qaragandi about 70 000 people were resettled in 25 villages. The “special settlers” were not allowed to leave the villages and mainly worked in mines, as well as on constructions of barracks and railways. These workers were given out 600 grams of bread per day and for their dependents only 300 grams. Hunger and disease were rife and rampant and most of the “Special settlers” died, but in their places the new ones were brought. Just in 1931 about 150 000 “special settlers” were exiled to Kazakhstan. The total number of “special settlers” had reached 360 000 people by 1937 (Alekseenko and Alekseenko 2007).

Another ugly appearance of "Soviet industrialization" was the system of camps of the OGPU-NKVD in order to provide a cheap labor force for large enterprises. In 1931 the Qaragandi camp (Karltag) was created, which contained repressed people from all regions of the USSR. During the 1930's and 1940's a number of such camps arose in Kazakhstan and the country become a huge place of exile (Kuzembayuli and Amanzholuli 1999; Abdakaimov 1994).

Alekseenko and Alekseenko (2007) point that in general, the results of industrialization are estimated ambiguously. The industrialization was carried out by tremendous lowering of population's standard of living, especially of peasantry. In five years (1929–1934) there was significant inflation rate, money supply increased up to 180%, retail prices of manufactured goods rose up to 250% –300%. Many items of the “five-year plan”, especially concerning the light industry, had not been fulfilled. Nevertheless, there was a substantial increase in overall industrial production as well as in share of industrial production in economy of Kazakhstan.

During the World War II the importance of Siberia and Kazakhstan in the economy of USSR had considerably increased. Kazakhstan became a deep southeastern rear and in accordance with decisions of the government had to reorient its economy to the needs of the battle front: to master and expand the production of defense products and strategic materials, to widen industrial building construction, to take over a number of enterprises and specialists transferred from the front line and thereby accelerate their entry into production processes at new places. In fact, there began the great restructuring of the Kazakhstan's economy, which was accompanied by a redistribution of material and human resources, providing industry with qualified personnel to replace the workers who went to the battle front.

In connection with the expansion of production capacities and facilities of old plants and factories, with construction of new objects, as well as with deployment of evacuated enterprises, the number of workers during the war significantly increased. In the first months of the war the authorities managed to organize the evacuation of industrial enterprises. In a short time 142 enterprises of the western regions of the USSR had been transported and placed in Kazakhstan, 532 506 people (with different age and professions) were evacuated to the territory of Kazakhstan. The arrival of so many people offset the shortage of manpower for the economy in Kazakhstan. If during the wartime the number of workers and employees in the USSR, as a whole, fell by 38%, in Kazakhstan it increased by 7% (1940–1943). The retirees, women and youth were also actively involved in production process, which became the main labor force in the rear. If in 1940 158 000 people were employed in the industry, the amount of these people reached 255 000 by 1945 (Kuzembayuli and Amanzholuli 1999; Abdakaimov 1994).

Kuzembayuli and Amanzholuli (1999) wrote that the construction of new industrial projects was continued and even accelerated. In Kazakhstan, by the end of 1942, there came into operation 25 different mines, 11 concentrating mills for nonferrous and ferrous metallurgy, 19 coal mines, 3 opencast mine, 4 oilfield and Oil Refinery Plant in Atiraw. The construction of railways was continued in 1942–1943 the construction of lines Maqat–Orsk and Aqmola–Magnitogorsk was completed. During the years of war Kazakhstan had 30% of the all-Soviet copper smelting, 50% of copper ore extraction and 60% of manganese ore extraction, 65% of the metal bismuth extraction, 70% of complex ore extraction and production of 85% of lead.

The working conditions in agriculture had also dramatically changed. Approximately two-thirds of the total population of Kazakhstan, who went to the battle front, was from villages and rural communities. Women became the main source for replacement of mobilized men in agricultural production. By the end of the war in many “collective farms”, women were amounted up to 70–80% of all workers. The number of women, who reached by the end of a year more than 400 work days (i.e. three times of required minimum of work), had increased from 20 607 in 1940 to 94 202 in 1945. During the war, the agriculture of Kazakhstan gave the country 504 519 tons of grain, 235 879 tons of potatoes and vegetables, 258 811 tons of meat, 319 400 tons of milk, 17 600 tons of wool which was more than five years before the war (Alekseenko and Alekseenko 2007).

According to Alekseenko and Alekseenko (2007) these undeniable successes of the Kazakhstan’s economy were given by huge labor. Most of the able-bodied men were called up to the war. The share of women in the general industry accounted for more than 50%, and in the light and food industries up to 80–90%, the share of youth and adolescents in the industry accounted by 35–40% of all workers in Kazakhstan. The work discipline was toughened, the working hours were extended, the staff turnover was limited, the compulsory overtimes were introduced (up to 11 hours at 6 work-days per week) and all vacations and leaves were canceled. The breach of discipline and work-leaves were punished by imprisonment for a term from 5 to 8 years.

The management of the economy was militarized; the forced distribution of products in the form of rationing was introduced. Like in previous years there were many “special settlers” among

the overall workforce in Kazakhstan. At the beginning of the war the Labor Army was formed from “special settlers”, their total number in Kazakhstan was more than 700 000 people (200 000 of whom were Kazakhs). By the fall 1941, by absurd accusation in aiding and abetting the Nazis, 361 000 Volga Germans had been deported to Kazakhstan. In 1943–1944 the forced relocation of 507 000 Balkar, Karachai, Ingush and Chechens, 110 000 Meskhetian Turks, 180 000 Crimean Tatars was carried out to Kazakhstan. Many tens of thousands of them died, from hunger and disease, in the first months after their deportation, the survivors became new members of the Labor Army. They were forbidden to leave the new place of residence; any violation of these regulations was punished by drudgery up to 20 years. At the cost of enormous tension and hardship the economy of Kazakhstan and its all population made its invaluable contribution to the victory of the USSR during the World War II (Alekseenko and Alekseenko 2007).

In 1954 the Central Committee decided to expand the acreages in the USSR at the expense of virgin and long-fallow lands development in the Northern and Central Kazakhstan, Siberia, the Oral and North Caucasus. To ensure the new land with labor force a mobilization of volunteers from the Western regions of the USSR was carried out, who were given significant facilities and benefits: free transportation with all property, cash allowances up to 1 000 rubles, the credit for construction up to 20 000 rubles for 10 years, up to 2 000 rubles for the purchase of livestock, the exemption from agricultural tax from 2 to 5 years. In total, for the development of virgin and long-fallow lands, in 1954–1959 more than 20 billion rubles were granted. Council of Ministers of the USSR and the Central Committee of CPSU had elaborated the project for 50 000 families resettlement in Kazakhstan, but these plans were over fulfilled in short term. Only from Moscow and Moscow region 54 000 people arrived in Kazakhstan, from Ukraine 93 000, from Belarus more than 100 000 people. In 1954–1962, from the Western Soviet Republics more than 119 500 families came to Kazakhstan. Most of immigrants arrived in the Northern region of Kazakhstan, where a mechanical increase of population reached 83% in 1939–1959. The population of Aqmola region in 1953–1955 increased 96 times, the population of Qostanay increased 26 times. In all, during the period 1954–1962 about 2 000 000 people arrived in Kazakhstan, in order to develop virgin and long-fallow lands. At the same time, the “OrgNabor” of labor force continued for the industrial enterprises of Kazakhstan. During 1954–1960 from outside of Kazakhstan, more than 300 000 people arrived in the industry of the country, and in 1961–1965 the “OrgNabor” had grown up to 500 000 people, most of whom were the immigrants from Ukraine, Belarus and Lithuania. In 1965–1975 115 000 people arrived to industrial sites of Kazakhstan (Kuzembayuli and Amanzholuli 1999; Abdakaimov 1994).

The urban population increased significantly both in the whole country and in each region. The growth in number and proportion of urban population is the result of industrial development in Kazakhstan. 730 new industrial enterprises were built and put into operation during 1954–1958. In general, during 1939–1959 the population in Kazakhstan had increased by 45.5%. By rates of population growth, Kazakhstan ranked the first place in the Soviet Union, owing, basically, to large migration inflows (Alekseenko and Alekseenko 2007).

Also during 1959–1963 about 200 000 people from China returned to Kazakhstan. These were the people who fled their homeland during the civil war and collectivization. Most of them were Kazakhs, Uyghurs, and Dungans, although among immigrants were Russians, Tatars, Uzbeks and Kyrgyz's. However, a complication of relations between China and USSR, in early 1960's had canceled this process and more than 1 000 000 Kazakhs had to live in the territory of a neighboring state (Kuzembayuli and Amanzholuli 1999; Abdakaimov 1994).

Alekseenko and Alekseenko (2007) observed that since the mid 1960's there were no great migrations on the territory of Kazakhstan, the population was formed mainly due to natural increase. The basic demographic trends were comparatively stable during long period (1959–1989) with almost no oscillations, which allows us to trace by analysis this one big period of demographic situation in Kazakhstan.

The regional analysis shows that from 1920's till 1980's there was the growth in number of both urban and rural populations. The growth rates of rural residents were constantly decreasing from decade to decade. The main characteristic is that the main concentration of the rural population is in two districts (North and South). The high concentration of rural population in the Northern area is the result of the development of virgin and long-fallow lands. In 1989, there was concentrated 72.4% of the total rural population of Kazakhstan (Alekseenko and Alekseenko 2007).

Since 1975, in whole Soviet Union the proportion of working-age population started to decrease, which not allowed the increase in industrial production and initiation of new large-scale projects, at the expense of mass attraction of new labor force. So from the mid-1970's the population influx in Kazakhstan begun to weaken. This was due to general demographic situation in the USSR, where not only the proportion of economically active population started to fall sharply, but also the fertility had considerably decreased and the mortality had increased. These negative demographic processes primarily were observed in the Western and Central regions of the USSR. By the end of the 1980's the number of outmigration from Kazakhstan began to exceed the number of inflows of population. Thus, in 1989 the negative net migration for Kazakhstan had amounted 46 800 people. The stable trend of emigration outnumbering over immigration began in 1968 in Kazakhstan and especially increased with the beginning of "Perestroika" (1985) and the subsequent collapse of the Soviet Union (Alekseenko and Alekseenko 2007).

According to Alekseenko and Alekseenko (2007) since 1991, the decrease of Kazakhstan's population was mainly associated with high rates of emigration. Falling fertility rates and rising death rates. So, if in 1992, Kazakhstan had 16 985 000 inhabitants, in 1993 it has already 16 942 000, and in 1995 only 16 590 000 people. Since 1992, for the first time in 50 years postwar history population of Kazakhstan began to decrease. The urban population decreased by 5.3%, rural population increased by 0.5%. Population of Kazakhstan has faced tremendous changes, during 1990's, which influenced its human capital.

## **5.4 Main socio-economic changes and demographic trends in Kazakhstan after 1991**

In the first years of independence, Kazakhstan had experienced a series of problems relating to economic and social matter: an intricate economic situation during transition into market economy, decline in standards of living among the majority of population, a sharp decline in providing of social care by the government and so on. The collapse of the Soviet Union and the unified economic system led to a severe economic crisis in the very earliest years of independence, when the suspension of production, rising inflation and unemployment led to a decline in living standards and to destruction of social sphere.

The substantial changes in economic and social sphere of early 1990's had a direct impact on the demographic situation in Kazakhstan. Bloom et al. (2010) indicate that demographic realities are substantially determined by economic and social circumstances and institutions. However, they also influence those circumstances and institutions through variety of channels. Moreover, Mincer (1993) thinks that the long term growth of human capital is intimately connected with the demographic transition both as a factor in it as well as an outcome of it. Human capital is a link which enters both the causes and effects of economic-demographic changes.

Perhaps, the 1990's were the most active years of these mutual influences of demographic changes and human capital reproduction in Kazakhstan. Because, the process of social transformation in Kazakhstan was accompanied by a giant immediate devaluation of human capital, which had been accumulated and generated in previous socialistic era. This massive depreciation considerably affected the level of productivity in different areas of social life and social relations. The post-Soviet society found itself in a very difficult situation. All previous knowledge, skills and capital turned into almost nothing. Society started the process of gaining new knowledge. The old part of human capital came under reevaluation and reconsideration. Since human capital is considered as the main source of development, no wonder that, the value of human capital, by new measures, had declined and caused one of the main reasons of break in development of Kazakhstan in early 90's. In addition, the degradation and depreciation of individual's creative potential and human capital took place due to long-lasting unemployment.

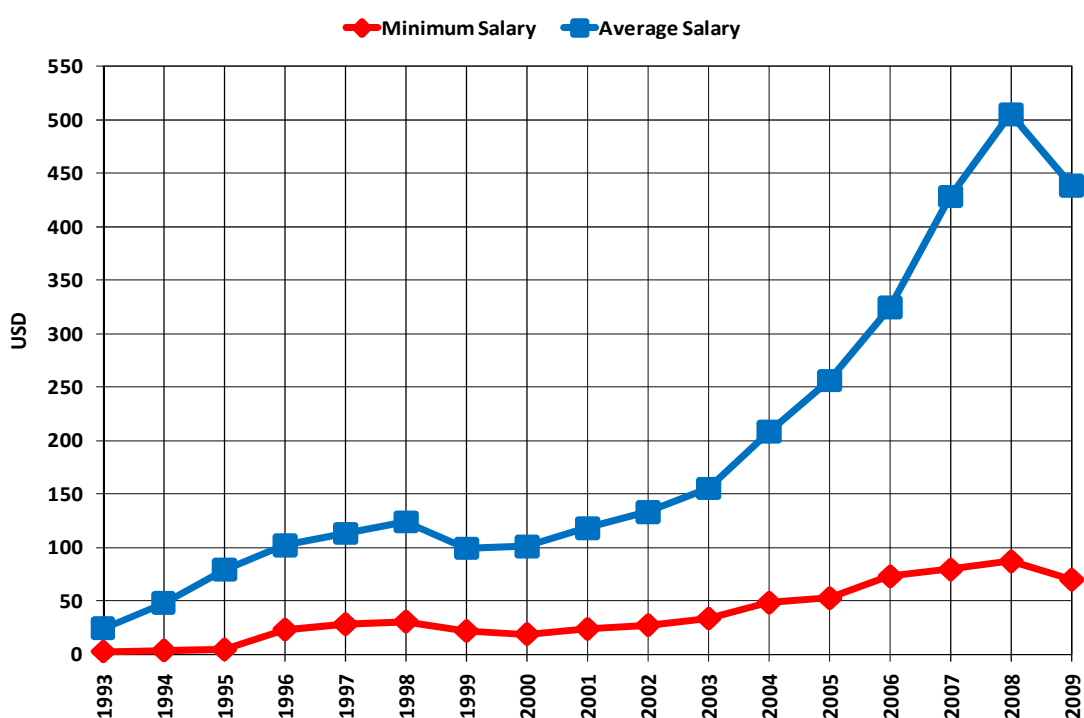
Since the fall of the Soviet Union, and declaring independence, development indicators have experienced a rapid decline. Policies to placate the situation included macroeconomic stabilization policies, promotion of sound economic management, small businesses sector development and a program of public works and job creation. However, the areas which needed to be addressed by governments came into the forefront in the mid-1990s. These included poverty alleviation, corporate governance, and regulation of both the private and the public sector. The moves to price liberalization that started in the early 1990s were rapid, but at the cost of high inflation at a time when monetary and fiscal policy were unable to bring about macroeconomic stability and a large percentage of the population of Kazakhstan was impoverished.

The economic crisis was accompanied by rising unemployment. Thus, in 1995 the unemployment rate was 10% of economically active population, and in regions with suspending industries and companies the rate had reached 16–18% (Jumasultanov 2005).

In consequence of socio-economic crisis, the numbers of people whose average income was below the subsistence level started to grow. According to the Ministry of Labor Republic of Kazakhstan, in November 1992 the share of this population was 11.9% and in 1995 it reached 37%. According to State Committee on Statistics of Kazakhstan, this share estimated as 44%, while by unofficial estimates of poverty level in 1995 was estimating around 70–80%.

According to the World Bank's index of real wages, Kazakhstan, in 1994, had the lowest wages in the CIS. Thus, the average wage per month was only 24 USD. Subsequently the average wage increased, but a large gap between wages in different sectors and industries as well as among regions still remained (Jumasultanov 2005). Figure 5.2 presents the development of salaries in Kazakhstan

Fig. 5.2 – Annual average wage level per month, Kazakhstan, 1993–2009, in USD



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

In general, in the 1990's the rates of income growth considerably were lagged behind the growth of consumer prices. According to the State Committee on Statistics of Kazakhstan, at the beginning of 1995, the level of real incomes of population in Kazakhstan was amounted approximately by 26% of the 1989 level. The sharp decline in the solvency of population had negatively affected the consumption, when the share of expenditure on food in gross family

expenditures had increased from 39% in 1989 to 45–70% in 1995. The cost of provisions was rising continuously throughout the 1990's (Jumasultanov 2005).

“The main social safety net, the system of benefits, broke down because of the large increase in poverty due to loss of jobs in an environment of rising prices. The challenge for Kazakhstan has been to promote employment, whilst maintaining a social safety net that it targeted to those in need. For most of the 1990's the social safety net system was under-funded, but the economic growth the late 1990's and early 2000's has created an environment where the government can, and is developing a targeted social development safety net. However, the problems that are facing the republic are no less severe because the distribution of income is now far more diverse than it was before the market reforms” (Charman 2007:14).

Another significant factor of demographic situation complications in the early 1990's was a crisis in social sphere: education, health, social welfare. After the collapse of the Soviet Union 80% of preschool and child care organizations were closed, the payment of allowances for large families had been ceased. In the health sector, the availability of medical care had been sharply limited. Low standards of living had adversely affected the upbringing and education of children. Many families had faced the challenges such as lack of clothing and school supplies, lack of funds to organize adequate recreation and treatment.

The economic situation in Kazakhstan had gradually begun to stabilize too. Owing to the reforms in establishment of market economy and favorable market conditions, in 1999–2000, in Kazakhstan, there were processes of economic stabilization and growth of key indicators in production. This trend affected the process of implementation of socio-demographic programs, in some extent, and influenced the general demographic behavior of population both inside and outside (encouraging them to immigrate in) Kazakhstan. “However, by 1999 the average level of growth rate was 10% per annum. The IMF commended the Kazakhstan that for continued prudent macroeconomic policies, which, supported by high oil prices and increasing foreign investment, have led to strong economic performance, broad based economic growth and the rapid accumulation of international reserves and assets in the National Fund. Macroeconomic policy has been applauded. The major international credit rating agency rate Kazakhstan an ‘investment grade’ credit rating and the country became the first former Soviet Union country to do so in 2002” (Charman 2007:8–9).

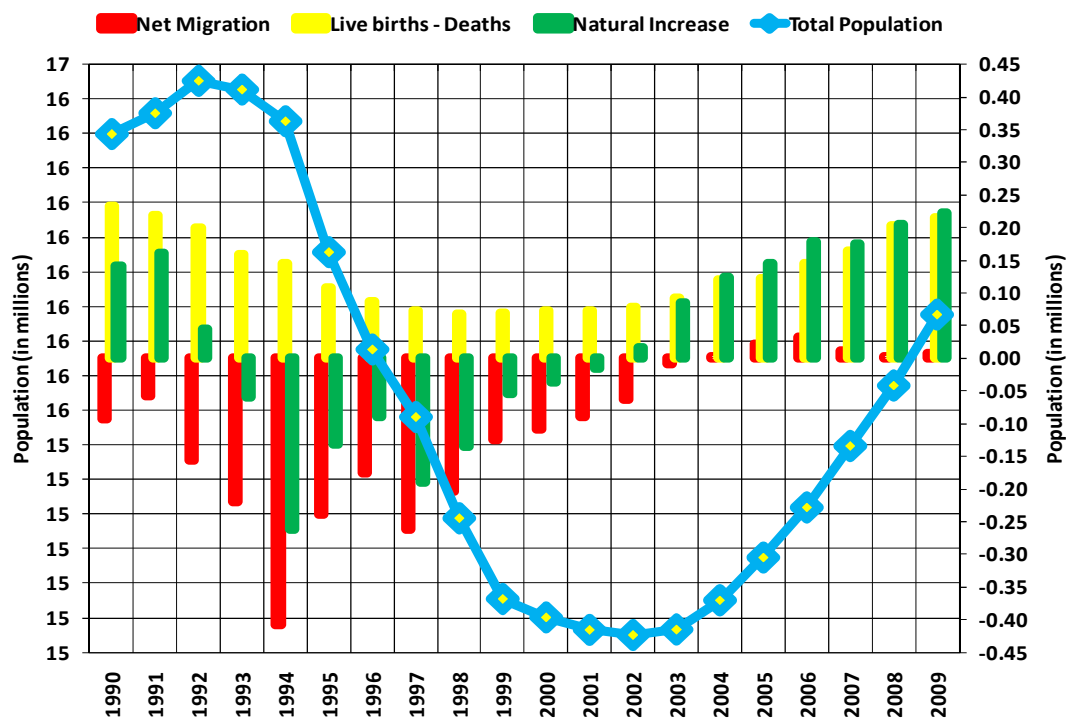
The active socio-economic and political process in the beginning of 1990's influenced the demographic situation in Kazakhstan. The new demographic situation resulted in structural changes of population, in the level of urbanization, in ethnic composition, in gender ratio etc. These changes were stipulated by several factors: the migratory processes, lower fertility, high adult and child mortality, life expectancy decline, lower marriage rates and higher divorces and dissolution rates as well as many other factors. In early independence years, Kazakhstan unfortunately was also characterized by a high level of morbidity and chronic diseases caused mainly by adverse working conditions, low standards of living and environmental conditions which led to inability to meet important needs related to health. However, the most major factors which had contributed to a

considerable change in demographic picture of Kazakhstan after independence were the active migratory processes (mostly with a negative net migration value) and low rates of natural increase.

Economic, social and political factors became the main reasons of migration in the beginning of 1990's. These factors interact and cooperate with each other and still have an influence on current migratory processes in Kazakhstan. In the period of 1992–2003, 2 863 616 people emigrated from Kazakhstan (approximately 184.5‰). During the same period 812 777 people immigrated from abroad (approximately 51.6‰). Thus, there is an overall negative net migration value of 2 050 839 people in this period (approximately 132.9‰). It should be noted that the intensity of migration was not the same all the time after independence (Statistical Agency of Kazakhstan 2009).

In 1993 and 1994 the loss associated with migration had not only absorbed the natural increase value, but also exceeded it in 1.4 and 2.8 times correspondingly. The increased outflows of migration had been noted in 1990, 1992, 1994, 1997 and 1998. The high intensity of emigration was observed during 1992–1998 (81.4% of the total negative net migration), then this process started to slow down, and with each subsequent year the slowdown became more pronounced. The peak of emigration was observed in 1994, when the number of emigrants amounted 481 000 people (24.5‰ outmigration rate) (Jumasultanov 2005).

Fig. 5.3 – Dynamics of population change in Kazakhstan, 1990–2009



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

The Census-1999 had recorded the decline in population size during the first years of independence. The sharp decline of fertility rates and raise of mortality rates, the huge migration outflow led to a decrease in total number of population (by 7.7%). Nevertheless, the trend of



migration had stabilized by the end of the 1990's when the size of negative net migration gradually started to lessen. Thus, the number of emigrants in 2000 decreased by 3 times compared to 1994, while negative net migration decreased in 3.3 times (Jumasultanov 2005). Since the second half of 2000's the intensity of migratory processes and the value of migratory losses had gained a consecutive declining trend. Finally, in 2004 the number of immigrants exceeded the number of emigrants. Since 2002, the natural increase exceeded the negative input of net migration, and from 2004 the population of Kazakhstan started to grow due to positive effect of both of these components. Gradually, the migration outflows had decreased, while the natural increase rates amplified (See Figure 5.3).

The main migration flows were being directed both to countries of far and near abroad. Among the neighboring and near abroad countries Russia, Ukraine and Central Asian republics became the main countries of migratory exchange. During 1992 – 1994 the 73% of the total number of emigrants from Kazakhstan settled in the CIS countries. In the “peak” 1994 this number had reached 78%, where Russia accounted 72% of these emigrants, Ukraine 2%, Uzbekistan 1.7%, Belarus and Kyrgyzstan by 1%. This trend continued throughout the 1990's. Thus, in 1999–2000 the main migration outflows were still directed to the CIS countries. However, if the emigration to Russia, Belarus and Ukraine exceeded immigration from these countries, with the countries of Central Asian republics, Kazakhstan had a positive net migration “exchange”. The overall negative net migration mainly was formed from the migratory relations with Russia and Germany, partially compensated by immigrations, mainly from Uzbekistan. Since 2002, there is a quite clear tendency of decline in the intensity of migratory processes with Russia and Germany, and increase with Uzbekistan (Jumasultanov 2005).

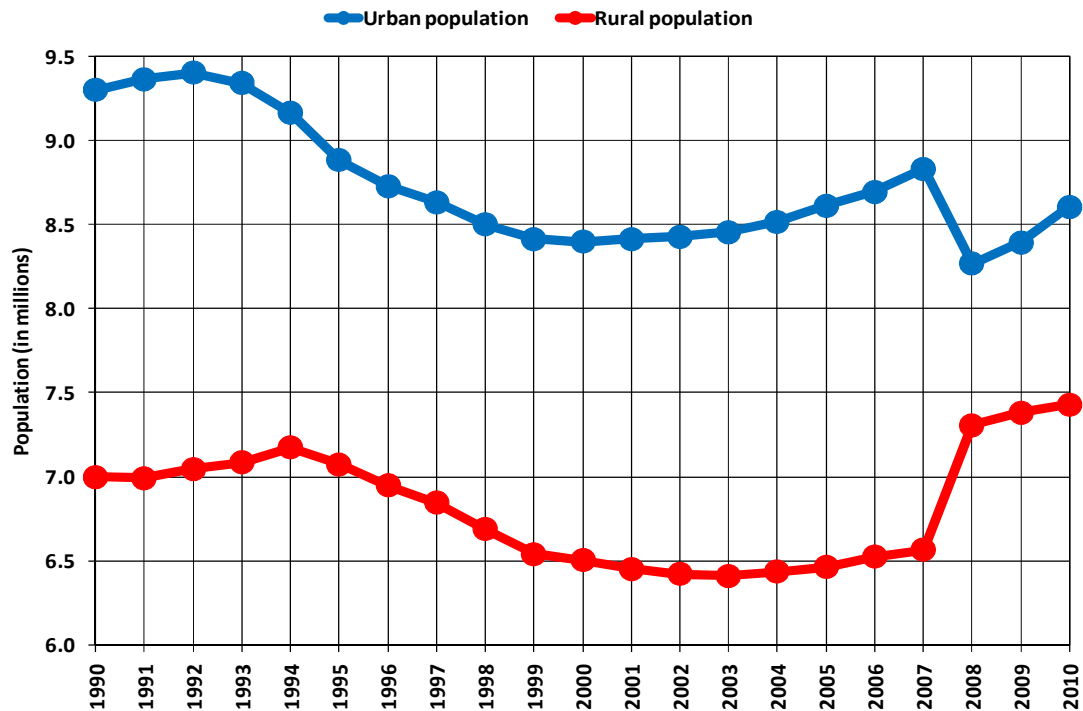
The majority of migrants (emigrants and immigrants) are people in active working age, specialists with higher education, qualified and skilled labor force. For example, only in 1998, 27 300 people with higher or unfinished higher education, 57 300 people with vocational training and 106 700 people with secondary education had left Kazakhstan. We agree that there are many evidences how people with high qualifications managed to find new opportunities for themselves in new places where they have migrated. However, when some scientists in Kazakhstan and especially from abroad try to relate high outflows from Kazakhstan with depreciation in human capital or even population quality, that makes us a bit curious and disagreed. Since we believe that, along with probable better opportunities outside the country of origin which led some people to emigrate, there are other people who decided to leave their homeland due to inability to compete at domestic labor market. Both incentives to move are evident from history. Besides, the people with the similar behavior but with different motivations and skills immigrated to Kazakhstan from abroad. There are probably some “genius” and “outcasts” as well, among these immigrants. And these people hoped to find new opportunities what emigrants could not. Well, there is another issue more. Any human has his/her labor capital as well as his/her *solidarity potential*. Let us introduce the value which we call *solidarity potential* or *cohesion capital*. The idea a bit similar to social capital, but has several fundamental traits. Social capital is the capital of social relations which provide human (the actor of

these relations) with definite benefits according to his/her position in social ties. The cohesion capital is the level of actor's loyalty and willingness to contribute to the particular social relations or networks, in order to fix his/her future individual benefits. Any human by deciding where s/he is going to have better conditions for life, starts to endow his/her loyalty to this concrete society. The incentive to reside at certain society per se indicates the propensity of a human to be needed and helpful for this society. Emigrants suppose to endow their emotions to their new homes, co-feel and co-worry for the future of this society, as well as immigrants do. And this is another important condition and value (capital) for any kinds of societies to develop, since without support feelings and cohesion hardly any society can get better prosperity for itself and for people in it. People trust more and have more hopes with defined place of final residence. This can mean that people who came have the highest loyalty to this particular society (otherwise they have probably not decided to come). So this society is the best among all known for them. The loyalty capital means that people will contribute to development of this society, while people who is deciding to move out will keep being distant from processes in that society anyway even they are physically present in this particular society, they are in process of decision of eventual move, which makes them to have low cohesion and loyalty capital as well as low intensions to develop this particular society. However, we are really distant to say that all immigrants have adequate level of cohesion capital wherever they moved. Everything depends on measuring the real level of such kind of capital. Moreover, people can move (migrate) due to plenty of reasons (marital, employment, political and many other) not only economic. All in all, we think all attempts to correlate outflows and inflows with probable quality loss or gain look a little intolerant and nationalistic, since the migratory processes in Kazakhstan did have an ethnical drive to migrate. Such thoughts are really dangerous and narrow-minded, which doubts the ability of these scientists to think scientifically whenever they say that people who moved out or in have distinctive features related to their intellect and culture. In the end we just want to say, that one has to be very careful and accurate in analyzing and especially estimating of impacts of migrations in Kazakhstan.

The current migratory processes in Kazakhstan are also characterized by high intensities in the internal migration. One reason for these active movements within the country is the mass removals of large numbers of rural residents to cities seeking for jobs. The increased migration flows in direction "village-city" are due to high rural unemployment. A transfer of the capital from Almaty to Astana also played an important role in the growth of internal migration rates, which pulled the displacement of large numbers of young people in the Northern and Central regions of the country. 2 633 000 people in the country changed their permanent residence during 1990–1999 according to official data. Thus, with the change of population in the country, the ratio of urban and rural populations had also changed. Despite the intensive movement from rural to urban areas the size and share of urban population declined during this period. According to the Statistical Agency of Kazakhstan, for ten year period (1989–1999) the urban population decreased by 805 300 persons (8.8%). Its share in total population had decreased by 0.7 percentage points and made up 56%

(Jumasultanov 2005). We suppose it was mainly caused due to international out-migration from urban areas of Kazakhstan (See Figure 5.4).

*Fig. 5.4 – Dynamics of urban–rural population change, Kazakhstan, 1990–2010*



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

Certain changes had affected the gender ratio in the country. There is a trend in prevalence of female population over males. Thus, the number of males, in comparison to 1989, had decreased by 8.2% and amounted 7 201 800 people, while female population also declined, but by 7.2% and amounted 7 751 300 people. For example, if in 1989 males accounted 48.4%; in 1999 they made up only 48.2% (Jumasultanov 2005).

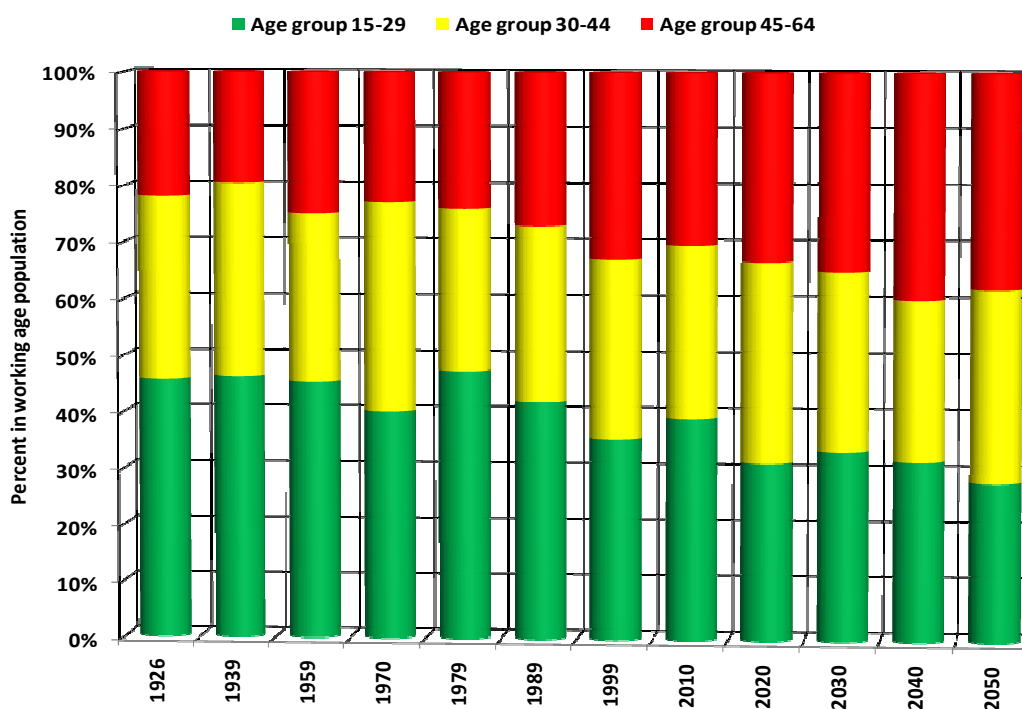
The changes were noticeable also in age structure of the country. Over the period 1990–2003 the number of working-age population had decreased by 83 000 people (0.9%), the absolute number of children and adolescents decreased by 608 000 people (11%). The share of persons of retirement age had increased by 1% (Jumasultanov 2005). If this trend continues Kazakhstan may face the problem of the gradual ageing of the population, which adversely will affect not only demographic, but also the socio-economic situation.

The dynamics of economic burden on working-age population will probably have wave-like shape. The increased burden due to ageing will be offset by reducing number of children, which indicates a significant ageing of the population and the emergence of additional socio-economic problems in the future related to population ageing. Appendix Figures A2 and A3 show the dependency ratios over time for Kazakhstan in the Goal Scenario Projections by specialist of Statistical Agency of Kazakhstan Shokamanov (2006) and Global Education Trend (GET) Scenario

by International Institute for Applied Systems Analysis (IIASA) and the Vienna Institute of Demography (VID). Both projections follow the same logic and trajectory in the period 2005–2030. By SAK projection, after 2009, Kazakhstan will enter a period of rising dependency ratios that will last at least until 2023 after which there expected a slight decline in dependency ratios by the end of period, in turn according to IIASA projection which has longer period of projection it is expected that dependency ration will rise again after 2035 and reach the maximum value by the end of projection period.

Another important trend describing changes in age structure is associated with the deceleration of young work-force entrance to the labor-market of the country, who actually acts as the main bearer of new ideas, new knowledge and general innovative impulse, without young work-force it is hardly possible any serious renovations. In 1979, 47.5% of working-age population was composed by young people (15–29 years), whereas working-age population of older ages (45–64 years) made up only 23.8%. Today the share of the “older group” overcomes the value of 30%, and it is expected that this share will reach 37.8% by 2050, which will be the largest share by that time. As for the share of “younger group”, its value has already reduced by 39.2% in 2010, and more probably will decline down to 28.1% by 2050, making the smallest share in all working-age population (Statistical Agency of Kazakhstan 2010; IIASA 2008). See Figure 5.5.

*Fig. 5.5 – The relative structure of working age population by age, Kazakhstan, 1926–2050*



Source: Created by author based on data from Statistical Agency of Kazakhstan (2010) and IIASA (2008)

## **5.5 Regional differentiation in socio-economic development of Kazakhstan**

In previous part we wrote about the importance of structural capital for the company and the country. In conditions of country structure, its optimal set and organizations is also very important condition for advantageous development. The optimal distribution of population and settlement system across the country stipulates better implantation of national economic strategies, in turn each region within optimal regional structure benefits from wise regional policies in as at national level so at successive development of neighboring regions. Thus, the optimal regional population distribution is another type of intangible capital for country and for every citizen.

Unlike countries with optimal regional settings, which ease the creation of developed local economy and local self-government institutions, the regions of Kazakhstan are characterized by vast areas, low population density, highly dispersed productive potential and low capacity of domestic market. During the transformation of economic and social systems in Kazakhstan the regulatory role of the state in the spatial development had been significantly weakened, which reflected, primarily, in the reduction of public investments in regional development. This has negatively affected the economy of certain regions; the differences between regions have increased according to standards of living, to access to social services, to development of productive and transportation infrastructures. Previously developed regions of the country with highly skilled personnel and high-density of population have witnessed a deep recession and demographic crisis. Problems related to the depressed rural areas and small towns had appeared. The transition process lengthened due to heterogeneity of economic space of Kazakhstan and significant differences in adaptation capacities of regions to new market conditions.

Following processes had significantly influenced the growth and variety of regional problems in Kazakhstan:

- formation of a new geopolitical and economic area;
- transition from the administrative-planned economy to the market economy with an unstable government regulation;
- economic and systemic crisis;
- emergence of new cross-border regions with specific infrastructural, industrial and humanitarian problems (Muhamedkarimova 2002).

Tazhin and Tazhimbetov (1993) point out that the spatial differences according to resource supply; to levels of economic development and quality of life; infrastructure development; ecological condition of environment and severity of social conflicts, are inherent, practically, in all countries of the world. Even in G8 countries the regional per capita income considerably varies by states, provinces etc. up to 30–50%. These contrasts are permanently and everywhere produced due to different economic and social, strategic and tactical goals of the development.

The modern Kazakhstan has a lot of common regional issues with the countries that retain the dynamics of socio-economic transformation in the regional context. However, the vastness of the

territory sometimes creates the illusion of less urgency, in Kazakhstan, of active and smart policy in economics, in comparison with small countries. Meanwhile, in Kazakhstan, with its vast spaces, the implementation of far-seeing, proactive, science-based settlement policy is topical and may help to save significant funds.

Since independence of Kazakhstan the state policy for management of regional development has always been aimed at achieving the proclaimed national goals: full employment, improving quality of life, equitable distribution of income, stable economic growth, etc. Kazakhstan has no exceptions in an effort to improve living standards in lagging regions, to eliminate regional disparities of socio-economic development.

The modern regional policy in Kazakhstan is based on the theory of regional growth, the theory of unbalanced regional development. It is aimed at active support of problematic regions and establishment of local and municipal government, the state regulations of regional disparities, stimulation of investments and private capital inflows to underdeveloped regions. From market-based instruments of regional policy different subsidies, credit and fiscal leverages are used (Muhamedkarimova 2002).

The regional contrasts in Kazakhstan, in the levels of production development and social standards of living, are rather notable. Especially, the imbalances between “capital region”, rapidly developing Western regions and Southern and Northern agricultural regions are pronounced as well as between urban and rural areas. These circumstances compel the government of Kazakhstan to focus on “spatial reconstruction” of the country in order to achieve a balance in the distribution of economy and population. The allocation of productive forces in the country is very uneven and has its own characteristics in different economic zones and natural areas with different physical-geographical, historical and demographic conditions of infrastructure development. The scientific literature usually distinguishes five economic regions (natural economic zones) in Kazakhstan: Northern, Central, Eastern, Western and Southern. The reason for interregional disparities in living standards is the strengthening of sectoral, professional, demographic and social differentiations (Muhamedkarimova 2002).

The general national plan includes the development priorities of regions corresponding to the strategy of systemic development. By resolution of the government of Kazakhstan dated May 11, 1999 (#561) “About providing assistance to areas with depressed economies” 27 rural districts, where 15.6% of the population is concentrated, were classified as areas with depressed economies. These districts had been detected and located in all regions of the country, containing 5 districts in the West, 3 districts in the East, 9 districts in the North, 8 districts in the South and 2 districts in the Center. The main problems in these districts were unsatisfactory state of transportation infrastructure; low provision of qualitative drinking water; adverse and sometimes extreme environmental situation; the unemployment and low level of living standards; the remoteness of product markets and outlets; lack or underdevelopment of infrastructures for processing and marketing of agricultural products. For some areas, the border problems were also very urgent, such as sharing of water resources, plots of arable land, contested parts of the territory, outflows and

inflows of population. In accordance with the mentioned resolution a list of investment projects was defined to support the infrastructure of the districts through the national budget. After implementation of a number of measures to render public assistance in 13 districts the economic activity had been resuscitated (The Resolution #561 1999).

In the classification of Kazakhstan's regions the following terminology was admitted:

- *depressed regions*, regions which demonstrated relatively high rate of development in the past;
- *stagnating regions*, characterized by extremely low or "zero" trends and potential to develop;
- *pioneer regions*, or regions of new reclamation and development;
- *micro-region* or *primary economic regions*, by further fragmentation of which their signs are lost;
- *economic regions of the first order* (or *general*), i.e. the regions of higher order which form a regional scheme of macro-division of the country;
- *program (planned) regions*, regions which are subject to targeted development programs and their contours do not always coincide with same regions on administrative territory. For example, a zone of ecological disaster of the Aral region covers the territory of 17 districts of four regions of Kazakhstan: Aqtobe, Qizil Orda, Qaragandi, South Kazakhstan and Turkistan town and actually has effects for all the Central Asian republics;
- *unique (project) regions*, are associated with the implementation of new-built quarter or other national projects (for example, the construction of Astana, the new capital of Kazakhstan; and technological and financial areas near by Almaty.)

In the analysis of territorial disparities, the researchers *prima facie*, appeal to social and economic conditions of settlement systems. In Kazakhstan there are urbanized regions with large cities, the industrial urban centers (Qaragandi, Kereku, East Kazakhstan, Aqtobe region) and regions with a significant predominance of the rural population (North-Kazakhstan, Almaty, Qizil Orda and Aqmola regions). Heterogeneous system of rural settlement, is connected with the specifics of transhumance and grain farming, there are significant differences in the socio-economic development of the population in these regions.

The sharpest contrasts according to population density are existed between the Western and Southern Kazakhstan. In the Southern part of the country which occupies 26% of the territory 42.7% of the total population resides, while the Western part, which occupies the same territory 27% has only 13.9% of inhabitants of the country and its density is 2.8 times less. There are significant differences between the Southern and Northern regions, latter with less than the quarter of total population, and the difference in the population density is 1.5 times. Central Kazakhstan (Qaragandi region) occupies the largest territory in the country, but it is characterized by low density and uneven distribution of the population which is connected with peculiarities of natural environment and the modern development of economy. The regional settlement system, existing here, is different from other regions with appreciable predominance of urban population (72%) (Muhamedkarimova 2002).

The population development in the regions and major cities of the country is presented in Tables 5.1 and 5.2.

Tab 5.1 – Mid-year population in thousands, Kazakhstan, 2010

|                   | Total           | Urban          | Rural          |
|-------------------|-----------------|----------------|----------------|
| <b>Kazakhstan</b> | <b>16,131.2</b> | <b>8,672.7</b> | <b>7,458.5</b> |
| Aqmola            | 737.6           | 334.0          | 403.6          |
| Aqtobe            | 722.3           | 394.0          | 328.3          |
| Almaty            | 1,704.8         | 407.4          | 1,297.4        |
| Atiraw            | 517.9           | 254.8          | 263.2          |
| West Kazakhstan   | 626.4           | 285.5          | 340.9          |
| Jambil            | 1,049.0         | 439.2          | 609.8          |
| Qaragandi         | 1,354.4         | 1,063.5        | 290.8          |
| Qostanay          | 885.8           | 437.2          | 448.6          |
| Qizil Orda        | 695.2           | 273.2          | 422.0          |
| Mangistaw         | 454.5           | 238.6          | 215.9          |
| South Kazakhstan  | 2,451.6         | 920.2          | 1,531.4        |
| Kereku (Pavlodar) | 751.6           | 502.1          | 249.5          |
| North Kazakhstan  | 642.0           | 230.3          | 411.6          |
| East Kazakhstan   | 1,419.6         | 774.2          | 645.4          |
| Astana city       | 701.4           | 701.4          | 0.0            |
| Almaty city       | 1,417.2         | 1,417.2        | 0.0            |

SOURCE: Statistical Agency of Kazakhstan <http://www.eng.stat.kz/digital/Population/Pages/default.aspx>

Tab 5.2 – Population change patterns by regions, 01.01.2010–01.07.2010, Kazakhstan

|                   | Total change  |               |               | Natural change |               | Net Migration |                |
|-------------------|---------------|---------------|---------------|----------------|---------------|---------------|----------------|
|                   | Total         | Urban         | Rural         | Urban          | Rural         | Urban         | Rural          |
| <b>Kazakhstan</b> | <b>95,094</b> | <b>65,238</b> | <b>29,856</b> | <b>48,392</b>  | <b>40,569</b> | <b>16,846</b> | <b>-10,713</b> |
| Aqmola            | -389          | 551           | -940          | 977            | 377           | -426          | -1,317         |
| Aqtobe            | 3,404         | 2,627         | 777           | 2,833          | 1,736         | -206          | -959           |
| Almaty            | 11,869        | 2,779         | 9,090         | 2,298          | 6,545         | 481           | 2,545          |
| Atiraw            | 4,559         | 2,872         | 1,687         | 2,365          | 1,939         | 507           | -252           |
| West Kazakhstan   | 2,106         | 2,553         | -447          | 1,370          | 895           | 1,183         | -1,342         |
| Jambil            | 5,123         | 1,750         | 3,373         | 2,736          | 4,940         | -986          | -1,567         |
| Qaragandi         | 2,323         | 3,200         | -877          | 2,246          | 925           | 954           | -1,802         |
| Qostanay          | -505          | 472           | -977          | 344            | 517           | 128           | -1,494         |
| Qizil Orda        | 5,406         | 2,739         | 2,667         | 2,849          | 3,117         | -110          | -450           |
| Mangistaw         | 8,248         | 2,861         | 5,387         | 2,353          | 2,418         | 508           | 2,969          |
| South Kazakhstan  | 22,459        | 8,353         | 14,106        | 9,389          | 15,717        | -1,036        | -1,611         |
| Kereku (Pavlodar) | 778           | 1,851         | -1,073        | 1,067          | 477           | 784           | -1,550         |
| North Kazakhstan  | -1,327        | 145           | -1,472        | 11             | 21            | 134           | -1,493         |
| East Kazakhstan   | 845           | 2,290         | -1,445        | 1,413          | 945           | 877           | -2,390         |
| Astana city       | 17,360        | 17,360        | 0             | 5,526          | 0             | 11,834        | 0              |
| Almaty city       | 12,835        | 12,835        | 0             | 10,615         | 0             | 2,220         | 0              |

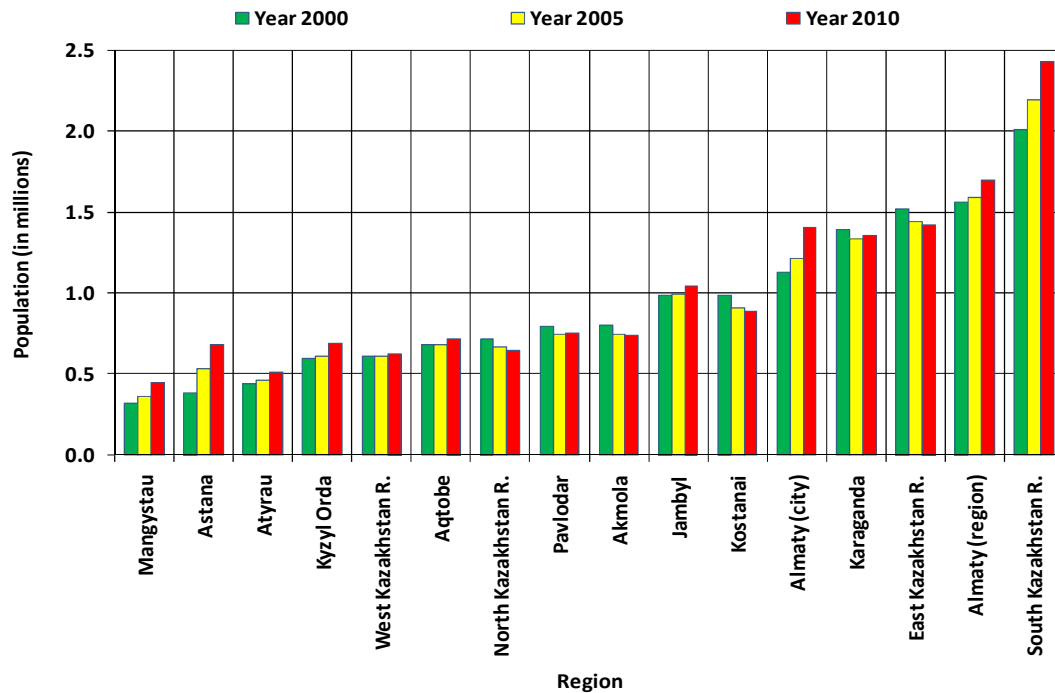
SOURCE: Statistical Agency of Kazakhstan <http://www.eng.stat.kz/digital/Population/Pages/default.aspx>

The regions of Kazakhstan are characterized not only by significant differentiations in actual structure of population, but also by unique characteristics and specific trends in demographic



development (See Figure 5.8). Some regions of the country is characterized by high fertility (Atiraw, Mangistaw, Qizil Orda and South Kazakhstan regions), but the infant mortality rate is 2–3 times higher in these regions than the all republican level. In other regions, there are the signs of depopulation in rural areas (East Kazakhstan, Kereku, Qaragandi and North-Kazakhstan regions). There are considerable differences in migration trends among the regions, as well. From 2000 to 2007, the growth of resident population was observed in 9 regions: South-Kazakhstan, Qizil Orda, Atiraw, Mangistaw, Astana city etc.. While the population in the northern and central regions: Aqmola, Qostanay, North Kazakhstan, Kereku, Qaragandi has noticeably decreased. The main reason was a mechanical loss (outmigration of people from the country), in addition, the lowest rates of natural increase, associated with high mortality and low fertility were observed over the years in these regions (Statistics Agency of Kazakhstan 2008).

Fig. 5.8 – Population of Kazakhstan by regions



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

As for the intra-regional (within a region) movements of population, the “socially forced” migrations from rural to urban areas dominated which had exacerbated the tensions in labor markets of cities. The migrants, just formally, acquire a status of urban residents and almost do not become involved in social, industrial and cultural life. Despite unemployment, homelessness, low competitiveness on the labor market, increasing role of environmental issues, the city continues to attract the rural population of the country. This is due to the fact that cities offer more diverse opportunities for professional, social and cultural development. The provision of many services such as higher education, specialized medical care, different forms of cultural activity, is possible

only in big cities. The real level of access of rural population to various social goods and services is conditioned by traits of the settlement system.

The sharpest imbalance in regional development occurs between urban and rural areas, the economic activity of latter is represented mainly by agrarian sector. The main problems of rural areas are high unemployment rates, low standards of living, high rates of employment in agriculture, poor infrastructure, large territory, weak link of settlements with markets, peripheral location of many rural areas and villages (aul) and their considerable distance from centers, harsh natural and climatic conditions, acute shortage of water resources, environmental problems of the Aral Sea, Balqash, the Semey proving area and intensive extraction of oil and gas fields.

The territorial division of labor and economic structure of regions can be characterized by *Gross Regional Product (GRP) and regional production per capita*. The distribution of country regions by volume of GRP is uneven. The phenomenon of high GRP in almost all areas of the Western region is explained by high concentration of oil and gas sector enterprises. However, the region is unfavorable in terms of broad socio-economic aspect. The region has severe climatic conditions, high costs of life, in recent years the unemployment and an intensive population outflow have risen dramatically from rural areas to regional centers, small towns and the capital, as well as outside the country (See Appendix Figure A4).

In terms of family income, the difference is up to 3.5 times between regions. The maximum income was being received, in 2008, by inhabitants of Atiraw region, the minimum in South Kazakhstan region (See Appendix Figure A5). There remains a significant income differentiation not only between regions but also within regions. In the Western region the gap between the maximum and minimum levels of income amounted up to 3.4 times, in the North up to 2.1, in the East up to 1.4. There are also great differentiations in average wages among regions. The highest level of wages was formed in cities Almaty and Astana, as well in Mangistaw region (2007). The wages in South Kazakhstan, Jambil, Almaty, Aqmola, North Kazakhstan and Qizil Orda regions are below the national average wage level. The gap between the highest (Mangistaw region) and the lowest (Jambil region) levels of wages, in 2007, was amounted as more than 2 times. While the difference between wages in the extractive and mining industry areas and rural areas of Atiraw and Mangistaw regions is up to 6–9 times (See Appendix Figures A6 and A7).

The ratio of pecuniary gains (earnings) and actual costs of life (subsistence level) can be regarded as main statistical indicator for comparison of regional levels of life. For example, the share of population with incomes below the subsistence level (below the poverty line) was 28.4% in 2001. The smallest proportion of population living below the poverty line in 2008 was in Astana (3.2%), Kereku (8.3%), Almaty city (8.5%) and Qaragandi (8.5%) regions. The biggest shares of population who live below subsistence level are in following regions: Mangistaw 26.9%, Qizil Orda 24.6%, Atiraw 18.1%, and Aqmola 16.6%. It is interesting that these regions have the highest salaries in republic, but still actual cost of life higher than in other regions. In 2001, more than a half of rural population in all regions of Kazakhstan lives below the poverty line, while in Mangistaw

region 95.5% of rural population (Statistical Agency of Kazakhstan 2009). See Appendix Figures A8 and A9.

In unitary states, the regional policy carried out by the central government, which equally resorts to using of macro and micro leverages. In the first years of independence and recovering from systemic crisis, the central government had been focusing on profitable giants of mining industry, in order to achieve macroeconomic stability, however this had strengthened the sectoral and regional disparities. Regional investment policy focused on oil and gas industry, the largest share of investment was in the Western region (Aqtobe, West Kazakhstan, Atiraw, Mangistaw regions), where hydrocarbon materials are extensively produced. Concentrating only 18% of investment potential, these regions, in 2000–2001, have accumulated more than 50% of all investments in the country. The investment climate in the Southern region is also improving, which creates prerequisites for the forthcoming of investment growth centers and poles. Unfortunately, the volume of investments decreased in Qaragandi, Qostanay, Kereku and East Kazakhstan regions, where the main investment potential of the country has focused. The experience of many countries teaches: the policy of uneven distribution of investment, especially in respect of old industrial regions, may lead to changes in territorial structure of the economy and in the level of interregional disparities in socio-economic development. It is also fraught with gradual transformation of these regions in the problematic and depression regions. In sectoral structure of investments most of them fall on the industry, the transport and development of communications infrastructure and agriculture. From this perspective, the regions also have their characteristics. Among economic regions the Western Kazakhstan has the highest proportion of industrial investment, the Eastern and Northern Kazakhstan in transport and communications, the Southern in agriculture (Statistical Agency of Kazakhstan 2009).

## **5.6 Labor market development during Soviet and Independence periods in Kazakhstan**

Although, all the proceeding stages in population development are very important for current level of human capital in Kazakhstan, we think that the turbulent political and social transformations in the Kazakhstani society since the announcement of the legendary “Perestroika” (1985, April) are the most significant in order to understand the mechanisms of current levels of human capital in Kazakhstan. The opinion, that there is little connection between level of educational attainment and level of real income has firmly established in Kazakhstan since “perestroika” and following “shock reforms”. The system of education and professional training existed in Soviet Kazakhstan had a directivity distinction in technical and vocational education and training of skilled workers for specific industrial sectors with preferential orientation to narrow professional fields. Therefore, although the overall level of education and training could be estimated as quite high, nevertheless it did not favor the mobility and successful adaptation of the individual in labor market. As a result workers were less mobile and highly attached to one job and occupation during their lifetime

horizon. Even though the general level of schooling was relatively high among Soviet workers and employees, this narrow education did not provide the skills and knowledge demanded by the market economy after collapse of the Soviet Union. The processes and changes of recent decades differently influenced different social groups and newly formed strata, and accordingly these groups began to show apparent differences in their general socio-economic and demographic behavior.

Nesterova and Sabirianova (1998) classify the system of socialist labor compensation and indicate that it was mainly based on an idea of state (public) ownership of the labor force and labor effort:

- 1) the labor force was distributed and allocated across industries and regions by central planning;
- 2) the government bore all expenses of education and on-the-job training;
- 3) all results of production belonged to the government, so labor income was regulated by the government and the government determined the size of nominal and real wages.
- 4) the system of centralized wage-setting, which was realized through various phenomena of the centrally planned economy: a tariff wage scale for each job category; regional wage coefficients; centrally or regionally planned distribution of many important public goods such as housing, kindergartens, medical services and deficient commodities” (Nesterova and Sabirianova 1998:12).

According to Nesterova and Sabirianova (1998) the expectations of consumer, producer and worker were formed in a world of stable prices, wages, labor demand and labor supply. The equalizing principle of the income distribution became the strongest stereotype of Soviet labor management. Government compensation policy decisions were mostly aimed at attracting a new labor force to the armaments industry or enterprises with poor working conditions. While the previous Soviet centralized wage-setting system resulted in a weak correlation between wage and personal success, on the one hand, and education, on the other. The connection between earnings and labor effort became weaker, which strengthened the role of informal (shadow) labor incentives and rewards: right of entry to the channels of distribution of deficient commodities, access to the shadow fields of power, hidden social nets, opportunity to obtain unearned incomes, etc. (Nesterova and Sabirianova 1998).

“As a result of the centralized wage-setting system imposed relatively small or even perverse returns to human capital. This conclusion was bolstered by the empirical studies of Graeser (1988) and Gregory and Kohlhase (1988). They investigated the determinants of Soviet earnings from the Soviet Interview Project (SIP), consisting of almost 2 800 interviews with Soviet Jewish emigrants to the United States between 1979 and 1982. The principal findings of the SIP investigations can be generalized in the following statements:

1. The return to education is low for Soviet workers. Only those who had completed higher education yields a positive rate of return. The returns to added years of schooling calculated by Graeser (1988) vary from 2.3% for secondary education to 5% for a university degree.
2. The Soviet gender earnings gap is about 20%, holding other factors including occupation constant; without occupation held constant, Soviet women earn from 22 to 29% less than men. Females in the Soviet Union had relatively higher returns to schooling than males. This

phenomenon can be explained by the fact that Soviet males had more opportunities to receive a high salary without investment to education. For Soviet women, investment in education was one of a few factors which assisted in reducing the gender wage differentials.

3. Returns to experience are lower than in market economies. Gregory and Kohlhase estimate the rate of return on one more year of experience as 2.3%” (Nesterova and Sabirianova 1998:13).

The previous centralized tariff system and ideological preferences in setting returns to education and skills had disappeared after collapse of Soviet economic system. Workers had been assigned the responsibility for finding a job by themselves. Wage and prices had been allowed to adjust to market forces. Unconstrained wage-setting and structural changes supposed to shift returns in favor of the more educated individuals. However, the changes, during the transition period, in labor force composition, devaluation of some skills, a declining supply of skilled jobs and unemployment growth among educated and experienced people were causing a number of opposite tendencies which account for the declining returns to human capital over the transformation period.

In transition period Kazakhstan, the demand for skilled jobs was decreasing relative to the demand for unskilled jobs: there was a significant disproportion between the available supply of skills and the firm demand for skills. In 1990’s situation in labor market of Kazakhstan was characterized by a large discrepancy between the available educational capital and the market demand for skills. As we have already stressed, the previous system of education was mostly directed to the training of narrow-skilled specialists for particular industries, and this narrow education does not develop the skills and knowledge which are now demanded by the market economy. Earnings of Kazakhstani workers were measured in many ways, taking into account such phenomena of the transition economy as multiple job-holding, in-kind payments, and income from self-employment and arrears of wages. It should be noted that the estimation of the standard earnings equation for Kazakhstan condition may be distorted owing to considerable regional differences in price and income levels.

## **5.7 Summary and discussions**

The modern competitive advantages of a country and its potential for modernization are directly related to the size of accumulated human capital in that country. Educated, skilled and professionally experienced population mainly determines the opportunities and frontiers of economic change. We searched for the peculiarities of human capital in Kazakhstan, peculiarities associated with population (its history, composition). As we saw in this chapter the population of Kazakhstan faced several completely different socio-economic and political processes in comparatively short periods of history, which have influenced its trends of development and resulted to its current characteristics. For most of the 20<sup>th</sup> century Kazakhstan was a centrally planned economy, wrapped up in the Soviet planning structure as much as any Soviet state. Kazakhstan, as with all of the former centrally planned economies has been forced into significant macroeconomic and institutional changes as a result of the very significant restructuring required

after the fall of the Soviet Union. The external factors forced changes in existing institutional structure of Kazakhstan developed during the Soviet system. The economic performance in Kazakhstan at the end of the Soviet era was characterized by:

- the rapid decline in GDP since independence from the former Soviet Union in 1991;
- significant macroeconomic instability including virtual hyper inflation;
- an outdated industrial infrastructure;
- a legacy of high government involvement and central planning in directing industry;
- a poor record of both foreign and domestic investment;
- a lack of contact with western markets and business practices and a business mentality that had little experience of dealing outside the central planning system. This was a more isolated environment compared to the former Central and Eastern Europe socialist countries.

Charman (2007) points out that Kazakhstan has started its independence with some of the least developed market institutions. The transition to a market economy for Kazakhstan during the early 1990's focused on rapid privatization and liberalization of markets. The focus of transition since the initial euphoria of liberalization and increased private sector ownership was on the development of institutions to regulate the economy, including governance, competition laws, development of public sector service provision. This is taking time and is by no means completed and the role of the state is an issue, as the system of laws in Kazakhstan is evolving, and the state is operating in a society that had, in 1991, a virtual complete lack of modern market institutions, and where private ownership had never been supported by the legislature. The institutional framework for competition, governance, the labor market institutions, and the financial sector, the social protection and the welfare state are still evolving in the country, and therefore Kazakhstan lacks the "complementarity" between the institutions and the regulatory framework. The consequences of a weak core of public sector institutions in Kazakhstan are considerable. As with most of the former centrally planned Republics of Eastern Europe and the CIS, the type of economic relations that has developed in Kazakhstan has been very dependent on the economic and institutional legacy that was left at the demise of central planning, and has been strongly influenced by the social and economic systems that are inherent to the local culture. In the case of Kazakhstan the legacy of the former Soviet Union was particularly disadvantageous, and the need to continue to build a new Kazakhstan society, govern a very large and sparsely populated country with no institutional framework, was particularly strong, which is still evolving (Charman 2007).

Kazakhstan has faced tremendous social changes after collapse of the U.S.S.R. It was not only collapse of political regime, but also the collapse of established socio-economic relations in the society. The legacy of planning was to leave the Kazakhstan stretched beyond its means, and the collapse, in terms of employment, and social infrastructure. It seemed that for the moment society stuck in the condition of sovereignty euphoria while facing revolutionary transition to unknown for the society new political socio-economic and other conditions.

Doubtlessly all these socio-economic and political changes did influenced demographic processes in Kazakhstan in a special post-communistic condition. Pavlík (1994) indicate that post-

communistic societies have their own peculiarities in demographic development. He wrote that in post-communist states the altered situation due to political, economic and social change created conditions for accelerated demographic behavior transformations. The transition into a market economy and all its social consequences, its new opportunities of self-realization, led to demographic behavior changes. In new conditions, people faced higher demands on the labor market, experience was valued and significant work flexibility was expected and unemployment appeared as a new reality. Increased competition on the labor market led to more frequent studying and further qualified preparation. Furthermore the endeavor to achieve a higher position, better income and the concurrent risk of not finding or losing one's job have become important conditions in the demographic decision-making process.

The social self responsibility appeared as another new phenomenon at this new reality. Nobody could understand clearly what exactly the new conditions can bring, but everybody understood that there is nothing planned and controlled. It took some time for population to realize the actual benefit of self-reliable well-being strategy. This was the new view of the changing world. Fortunately, the state never denied continuing of conduction the social policy, by implementing different programs. Keeping the tradition of advantageous sides of former Soviet social policy the government tried, at same time, to introduce new philosophy of social responsibility of the state, i.e. to teach people to fish instead of granting them fish. In this respect we think this new philosophy have changed not only the role of state in human capital formation, but also led to more practical implications of human capital accumulation by every citizen him/herself.

Swift shift from one established system of relations to another had forced people to expedite the relocation and re-evaluation of their human capital. As we have written before, the human capital develops in conditions of overall development of basic capital and other types of human capital and components of population quality. In Kazakhstan the development of human capital in the beginning of independence went under following conditions:

1. Re-Evaluation of human skills and adoption of market based skills by population;
2. Ruling of the "young government" with little experience in new market economy;
3. Global economic changes (increasing role of human skills and service sphere);
4. Change of income and consumption structures;
5. Continuing activization of the Demographic Transition in Kazakhstan and Central Asia.

Existing peculiarities of population resettlement in the country had led to the significant differences in development of infrastructures between rural and urban communities of the country. In turn the infrastructure is a major factor in the integration of regional systems and nexus of disparate parts of regional socio-economic space. The competitiveness of national economy depends to large extent on the state of productive and social infrastructure. Effective economic development is impossible without an adequate quality of informational, telecommunication and transport infrastructures. Among the numerous social infrastructures the availability of institutions and organizations of health, education, culture and public services, especially in rural areas has a paramount importance.

Fundamentally new regional problems arise during the transition to a postindustrial and informational society and due to the globalization of economy. In periods of transformation of economic, social and political relations the state regulations of regional issues have played an important role in the development of most countries of the world. In all countries of the world the differences in geographic location, climatic conditions, demography, history of development and other factors are affecting the socio-economic development of their regions. Each country is striving for improvement of standard of living in its underdeveloped regions, i.e. to implement the regional policy aimed at evening the conditions and opportunities for socio-economic development of all regions, and thereby enhance the level and quality of human capital. The regional policy in almost all countries is the main means of state regulations of socio-economic processes of the troubled regions to eliminate social and environmental tensions.

The current state of regional development in Kazakhstan reflects the main features of the transition period. The system of regulations of regional development and regional policy is developing and becoming a major factor in the success of sustainable development of the country. The aim of regional policy of Kazakhstan is the effective use of natural and human resources potential, the removal of unacceptable disparities in economic prosperity of regions.

As the logical result, all these new socio-economic conditions led to significant demographic changes. Population had faced new conditions of return on human capital. In current chapter we have tried to show how new political and socio-economic conditions after independence, gathered economic and social difficulties of proceeding years before the collapse had lead to social and demographic changes in Kazakhstani society. The mentioned difficulties and immediate depreciation of human capital was not only because of the rapid socio-economic changes, but also due to the lack of awareness and misunderstanding of the phenomenon of human capital in previous communistic society. As it was discussed in this chapter the concept of human capital for a long period during the Soviet era was not fully correctly comprehended.



## **Chapter 6**

# **Measuring human capital for Kazakhstan by education-based approach**

### **6.1 Introduction**

Throughout whole human history and especially today when economic relations, production methods, technological facilities and competitiveness principles change quickly in response to international demands and challenges, the better-educated workers and employees are more able to adapt to new circumstances and contribute to the development of different technologies and reveal limitless potentials for development. The focus which was set in previous years in Kazakhstan on building a cadre of people with good comprehensive education and technical skills has been invaluable. Kazakhstan set a goal to successfully educate the majority of citizens in order to prepare them for an economy in which workers and employees need to be able to learn new tasks, thoroughly and quickly. The economic literature postulates that a relevant stock of human capital (educational attainment of the population) improves the competitive structure of a country, stimulates its high-tech sector, and fosters economic growth.

In this chapter we will assume 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 within this Chapter 6, rather than introducing more or less arbitrary and sophisticated ones.

Chapter 6 investigates the dynamics and trends, as well as, presents stages and constructed series on human capital in Kazakhstan stretching as far back as 1959 onwards and ending with 1999, as well as including time series data results of demographic multi-state projection for Kazakhstan implemented by International Institute for Applied Systems Analysis (IIASA) and the Vienna Institute of Demography (VID) methodology and estimation which describe human capital

in the country both with retrospective view from 1970–2000 that is compared with real observed trends, and prospective view from 2000 up to 2050. All the estimates and analysis draw basis on data of educational attainment in different forms of education, as well as the size and age distribution of population.

As summarized by Lutz et al. (2005) there are multitude works which explain the significance of education and its relation to many other phenomena, such as: education and development (Sen 1999), education and fertility (Bledsoe et al. 1999), education and mortality (Alachkar and Serow 1988), education and economic growth (Haddad et al. 1990; Barro and Sala-I-Martin 1995), returns to investment in education (Psacharopoulos and Patrinos 2002), education as the factor which lowers the risk of conflict (Collier and Hoeffler 2000) etc. (in Lutz et al. 2005:2). The majority of earlier studies were directed to capture the basic trends and influence of educational factors at individual level and positive consequences investments in education, ranging from higher lifetime income to individual empowerment, and greater social participation to better health and longevity of the educated persons and their families. While, the works which can evaluate the effects of educational achievements on national level (macro-level) are less certain. A few studies attempting to evaluate the effect of human capital and educational achievement at macro level arise partly as accounting identities, such as the effect of population size on GDP, or the effects of population age structure on aggregate labor supply and savings, effect of fertility decline on female labor supply, and the effect of longevity on the incentives to save and to retire and etc.

We hope that this chapter in this respect would be able to serve as an attempt to assess the macro effect of education at national level. However, we fully understand that these macro level studies go far beyond the scope of this chapter and even the entire dissertation work to sort out the influence of education on economic performance in a country. Nonetheless, obviously, no previous efforts have been made to study the long-term development of the stock of human capital in Kazakhstan. The primary purpose of this chapter is to present the first evaluations for Kazakhstan during 1959–1999 and projections from 2010 to 2050, of the educational attainment and the stock of human capital due to formal education at the aggregate level into several different categories of education.

The Chapter 6 contains six sections. The opening section provides an overview of education- based approach (educational attainment method) for the case of Kazakhstan. Section 2 gives a brief outline of the educational system in Kazakhstan from the late 18<sup>th</sup> century to the present. It forms a necessary background to the following section, where description of data and the construction of time series is presented. Section 4 highlights some characteristics of the development of human capital formation on the basis of real observed data obtained for the period 1959–1999, including evaluations of the total stock as well as decomposition into various components (primary school, secondary level, etc.). Section 5 concentrates on the trends in the population size according to educational attainment both by investigating the real observed data and by introducing the results of IASA and VID estimations of human capital for Kazakhstan. Section 6 summarizes the results and the approach and concludes.

## **6.2 Historical development of education in Kazakhstan**

This section presents a rough historical outline of the education system in Kazakhstan and its development up to date as a background for the interpretation of the data and sketches main stages and history of development of educational achievement in Kazakhstan:

By the end of the 18<sup>th</sup> century the organization of "Garrison Schools" in border areas was started. In 1789, the Asian school had been opened in Omsk, which was preparing interpreters and clerks for the local administration, in 1813 was opened a military school, later converted into the Siberian Cadet Corps in 1847. In 1825, another military school was founded in Orenburg, which was also converted into Orenburg Cadet Corps, by 1844. In all these schools, along with Russian children, the children of Kazakh nobility were trained. The curriculum of schools was quite extensive. At the "Asian department" of Orenburg Cadet Corps, for example, besides the military disciplines, during lessons: the history, geography, mathematics, mineralogy, zoology, botany, forestry, Russian language, and several oriental languages were taught. In 1841 by the Khan Headquarters was organized a school where, also, mainly children of Kazakh elite were studying. In 1850, a seven-year school was opened in Orenburg where pupils were taught Russian and Tatar languages, geography, arithmetic, the Islamic creeds, fundamentals of business papers preparation in Russian and Tatar languages. All of these educational institutions contributed to the spread of Russian literacy in the region (Alekseenko and Alekseenko 1999).

With the development of capitalist relations in Kazakhstan there arose a need in large number of educated people in the country. At the end of the 19<sup>th</sup> century a series of schools were established in towns and villages as well as the polytechnic and female educations were initiated. During this period more than 100 two-year schools with an enrolment of over 4000 students were operating. In the beginning of the 20<sup>th</sup> century the network of Russian and Russian-Kazakh schools continued to grow. Compared with 1897 their number had doubled by 1911. However, the population had continued to receive education in secular and religious schools (mektep and medrese), most of them existed in an illegal condition (since the special permission of the colonial authorities was required for their opening) (Abdakaimov 1994).

A significant event of the late 19<sup>th</sup> and the early 20<sup>th</sup> centuries was the introduction of "new-method" schools (jadid). The ideological inspiration of Jadidism in education was given by Crimean enlightener Ismail Bey Gaspirali. Proponents of the "new method" stood for the reform of the Muslim schools, and for the widespread introduction of secular subjects (geography, history, science, and Russian language) and principally new method of training. However, the colonial government opposed the opening of "new method" secular schools and recognized as "literate" only those who graduated from Russian-Kazakh and Russian schools. Despite this fact the movement for the "new method" was activated in the beginning of the 20<sup>th</sup> century on the territory of Kazakhstan, covering big cities and larger populated settlements. Since 1900, some of "old method" secular and religious schools were gradually transformed into "new method" ones (Abdakaimov 1994).

More or less complete statistical picture of the literacy level of Kazakhstan's population is available since the 1897 census. However, due to neglecting other languages than Russian by the census officials and members, probably a certain amount of literacy in other languages not been registered. The literacy rate of certain ethnic groups studied in their own languages and alphabets is assumed to be understated in the Census-1897.

Because there were no institutions of higher education in Kazakhstan, many Kazakhs studied at the universities and institutes of St. Petersburg, Moscow and Kazan. Some representatives of the Kazakh youth studied abroad. Approximately more than 100 Kazakhs had the higher education at the beginning of the 20<sup>th</sup> century (Abdakaimov 1994).

One of the undoubted achievements of the Soviet regime was the development of public education system and the implementation of universal literacy. The "Declaration on the Unified Labor School" and "Regulations of the Unified Labor School" were adopted in 1918, where the basic principles of Soviet education system were proclaimed, such as free education, joint boys and girls' education, the exclusion of theological disciplines, the abolition of all forms of punishment, self-management of school. All schools were divided into two stages: the first, for children of 8–13 years, and the second, for children of 13–17 years. The medreses, mekteps and Russian-Kazakh school actively were transformed into Soviet schools. By the end of the civil war, in Kazakhstan, there were 2410 schools with 144 000 pupils (the share of Kazakh pupils was 21.5%). However, the growing number of schools during severe economic situation has led to the drop in the quality of education system. The majority of schools were operating in the rooms hardly accommodated for teaching. There was no common curriculum and textbooks. The 99% of Kazakh schools did not have their own buildings, for example, in 1927 only 1.5% of Kazakh schools and 28% of Russian schools had their own premises. In 1911 in average 17 rubles were spent per pupil in Russian-Kazakh school, while in 1927, in Russian School, approximately, 16 rubles were spent per pupil, and 7.7 rubles per pupil in Kazakh school. High school pupil in average was invested 180 rubles in 1913, whereas in 1927 only 22.7 rubles (Alekseenko and Alekseenko 1999).

Nevertheless, the Soviet authorities made great efforts to eradicate illiteracy. In 1930 the transition to universal compulsory primary education was declared, and in 1931 a seven-year compulsory education was imposed. The network of boarding schools was enhancing, where more than 24 000 pupils were enrolled by 1934. Since 1925, in Kazakhstani schools the uniform sample of school certificates, 5-grade scale assessment, the common length of school year and holidays, the streamlined structure of schools were set (Kuzembayuli and Amanzholuli 1999).

One of the major components of the education system in 1920's and 1930's was the elimination of illiteracy among the adult population. Census-1920 showed that the Kazakhstan was in last place according to the level of literacy within the Soviet Union. In 1919 a decree on the elimination of illiteracy of population was passed, all literate were mobilized to fight against illiteracy, three-week pedagogical training courses were organized to prepare the "liquidators of illiteracy". In 1921, the Government of Kazakhstan established the Central Emergency Committee on Elimination of illiteracy (KazGramChek), which led the entire work on the organization of offices, where the adult

population possessed the alphabetic literacy. The branch of All-Soviet Society "Down with Illiteracy" was formed in Kazakhstan (1924). Census-1926 confirms the progress made in overcoming illiteracy in Kazakhstan where a significant increase in literacy was observed, however, there remained a significant gap between the literacy levels of men and women, urban and rural populations. From 1921 to 1927 almost 200 000 people, in 1929 – 150 000, and in 1930 – about 500 000 people had been trained at these offices. Despite the fact that by 1935 the education in Kazakhstan had reached 91% enrolment of children of school ages, only a third of them attended a seven-year and secondary schools, while Kazakh language secondary schools did not exist at all. In the 1920's and 1930's the extensive work was carried out on methodological support of schools. In 1921 the manuals "Esep Qurali", "Oqu Qurali" and "Til Qurali" by A. Baytursinuli and M. Dulatuli were printed. In the 1927–1928 academic years more than 30 various textbooks with total amount of 575 000 copies have been issued for Kazakh primary schools. The transition of the Kazakh language from Arabic alphabet to Latin alphabet in 1929 caused a serious damage to established education system. Arabic alphabet allowed the population to read any Turki language publications, including those printed abroad, which were considered politically harmful by Soviet government. Hundreds of thousands of Kazakhs, who could read in Kazakh by Arabic-based script, had to once again become illiterate and learn a new alphabet (Kuzembayuli and Amanzholuli 1999).

During the Soviet period a system of higher (tertiary) education institutions began to develop in Kazakhstan. In 1928 the Kazakh State University in Almaty was established. Two years later, it was re-named as Kazakh Pedagogical Institute, and in 1935 received the name of Abay Qunanbayuli. Following institutions were established in Kazakhstan: the Veterinary Institute of Almaty (1929), the Agriculture Institute (1930), Almaty Medical Institute (1931), The Mining and Metallurgical Institute (1934), the Kazakh State University (1934). There were opened several institutes in Oral, Semey, Aqtobe, Qiziljar, Shimkent and Qostanay. During the 1930's a system of distance education begun to develop. The new resolution (1936) unscrambled the procedure for admission to universities and led to adoption of a universal teaching-methodological guide. In 1938, at the Kazakh State University the first post-graduate course in Kazakhstan was opened.

The intensive efforts to eradicate illiteracy in Kazakhstan, which was conducted in the 1920's and 1930's started to yield results. According to the Census-1939 the literacy rate among the population of 9–49 years was 83.6%. The gap in literacy rates of different population groups reduced significantly. The literacy rate of the urban population equaled 87.5% (males 93.4%, females 80.8%), rural population 81.9% (males 89.1%, females 73.7%). During the 1930's the literacy remained a major focus of cultural activities among the population. Following resolutions were passed: "On the work for illiteracy liquidation" (1929), "On the work of educating the illiterate and uneducated" (1936). In 1930, the universal primary education was introduced, by this time 10 931 teachers were working in 5 097 schools. By 1940, there were operating 5 289 primary, 1 770 seven-year and 698 secondary schools with 1 138 187 pupils. The education personnel were mainly prepared in the Kazakh State University, in 13 pedagogical institutions and 23 pedagogical colleges across the country (Abdakaimov 1994; Kuzembayuli and Amanzholuli 1999).

The Second World War hampered the complete eradication of illiteracy among population. The war caused the great damage to public education, during the war the number of pupil and students declined by 30%, the number of teachers declined by 14%. However, despite the harsh conditions of the war, people had to survive and continue to live, and the younger generation to receive education, during 1941–1945 18 primary, seven-year and secondary schools with 4 800 000 places had been constructed and put into operation, as well as 4 new higher education institutions, where about 15 000 students were studying. During the Second World War to Kazakhstan 149 children's institutions and 19 000 children were evacuated from the Western regions of the USSR, the number of orphanages had increased substantially. The system of vocational and specialized secondary education developed rapidly. In 35 professional schools established in 1940, annually more than 26 000 people were trained during the war. There were 120 specialized secondary schools in the country in the late 1930's in which more than 5 000 specialists were trained (Alekseenko and Alekseenko 1999).

After the war, there arose a need for a fundamental restructuring of public education: the adjustment of curricula, strengthening the material base of schools. The work to eradicate the illiteracy was recommenced and took a wide scope. In 1959, 12 000 teachers, using the experience of 1920's and 1930's participated in the eradication of illiteracy. The postwar period is characterized by the work on reconstruction and creation of conditions for further development of the education system. It was necessary to secure the coverage of children of primary school again. In order to centralize the management of higher educational institutions in Kazakhstan the State Committee was formed (1959), which later was transformed into the Ministry of Higher and Secondary Special Education of Kazakhstan. According to the Census-1959 literacy rate among the population 9–49 years was 96.9% (males 98.8%, females 95.1%). Among the urban population 96.9% (males 98.9%, females 95.2%), rural population 96.8% (males 98.7%, females 95.0%) (Alekseenko and Alekseenko 1999).

The Khrushchev's idea of “drawing near” the mental and physical labor and strengthening the links between schools and production have led to the radical reform in education since the late 1950's and early 1960's. According to law on “Strengthening the tie between school and life” (1958) instead of seven and ten-year compulsory education the eight years education was introduced, after which the graduates were required to work for three year, in factories or in agriculture, combining work with study or study in secondary polytechnic-schools with vocational training. Admission to the universities since was conditioned by working experience, rather than theoretical preparation of the matriculant. The transition to the new system in Kazakhstan was completed by 1962–1963. This reform had aroused ambiguous effects. The increasing number of “transiting” workers willing to enter the institutes caused a high turnover at the workplace. The prestige of higher education had fallen, scholars and intellectuals used for physical, non-productive work to the detriment of their professional activities at the institutions. In 1964, some conditions of the reform were revised, and ten years of compulsory secondary education was re-introduced, the development of new training programs and plans begun (Alekseenko and Alekseenko 1999).

The Statutes of Secondary School, adopted in 1970, introduced three levels of education: primary (up to 3 classes), eight years and secondary (10 years). Leavers of “eight-year” schools could continue their studies in the ten-year school or in vocational and secondary-specialized schools, and then had the opportunity to enter the institution of higher education. In 1970’s, the decrease in the number of schools and the increase in enrolment is observed. For example, in 1966: 2 852 000 pupils were trained in 10 728 schools; in 1976: 3 346 400 pupils in 9 604 schools, and in 1979: 3 257 200 pupils in 8 910 schools. Since the mid-1970’s there was a trend of reduction in the number of pupils, which was mainly due to demographic reasons. There were 26 institutions of higher education in Kazakhstan by 1950’s, while by 1980 this number had increased up to 55 with over 250 000 students attending these institutions (Kuzembayuli and Amanzholuli 1999).

After independence the educational system of Kazakhstan underwent tremendous changes in educational system: from cross-teaching methods by old Soviet system and new system in early 1990’s, to rapid expansion of private educational institutions from mid-1990’s which has led to so-called “education inflation”, and to active introduction of international education after 2000’s. Nevertheless, in 2009, Kazakhstan ranked the first place in Education for All Development Index (EDI) by UNESCO. Today Kazakhstan partakes in a number of international education initiatives and represents a range of education experiences.

### **6.3 Data**

The human capital stocks presented here, covering the period 1959–1999, are evaluated from the data on educational attainment of the population and its distribution at the moment of censuses. Since the purpose of Chapter 6 is to construct stocks of human capital estimated by educational attainment, we are interested in distribution of the population according to highest level attained and age-gender distribution of the population. It should be noted that the definition and meaning of different educational attainments have changed since 1959 several times, up to date due to several educational reforms held in the USSR and independent Kazakhstan. In order to implement the analysis of relative change and importance of primary, secondary and tertiary and other forms of education the explicit consideration of distinct levels of educational attainment is needed. The population data (for period 1959–1999) emanate from the official statistics of Soviet Union and Kazakhstan of given period. From this source, the population according to educational level attained has been compiled for each census-year. Formal education in the model comprises six categories which correspond to the ISCED defined Levels of education:

- 1) *Primary* – (Level 1) Primary education or first stage of basic education;
- 2) *Basic secondary* – (Level 2) Lower secondary or second stage of basic education;
- 3) *General secondary* – (Level 3) (Upper) secondary education;
- 4) *Professional secondary* – (Level 4) Post-secondary non-tertiary education;
- 5) *Unfinished higher* – refers to persons who currently attend or previously attended higher education institutions and completed at least half of a basic program). Persons who

completed less than half of a higher program were classified by Statistical Agency of Kazakhstan as having either general secondary (unqualified) or professional education (vocational);

6) *Higher education* – (Level 5 and Level 6) – First and Second stage of tertiary education.

It is known that IIASA is conducting the research for constructing a dataset on human capital (educational attainment levels by age and gender) for 120 countries in the period 1970–2000 which has been reconstructed using demographic multistate back-projection methods. As we mentioned in Chapter 4 (page 63) the initial input data for Kazakhstan within the model came from various sources which were used by IIASA experts.

If one compares these results with real observed data (1959–1999) for Kazakhstan and the results of retrospective projections of educational attainment development in Kazakhstan implemented by IIASA for the period from (1970–2000), s/he can easily notice that the general trends in both sets are following the same direction and logic<sup>3</sup>. This implies the certain level of accuracy of IIASA projections. Thus, we acknowledge the reliability of the estimation results by IIASA and present both the retrospective projection (for comparison) and prospective projection (for capturing probable future trend in development) in this chapter, which, in fact, helped us to evaluate future human capital development in Kazakhstan up to 2050.

However, before looking into the future human capital distribution of Kazakhstan, it is instructive to look at the real observed heritage of past education policies and outcomes, to identify trends in education, and to examine some of the boons and obstacles to reaching a highly-educated society.

## **6.4 General trends in human capital (educational) composition of Kazakhstan: 1959–1999**

We have separately constructed age-pyramids according to educational attainment for urban and rural populations, as well as presented the aggregated age-pyramid for total population with and without uneducated population. The pyramids contain 10 age groups: 15–19; 20–24; 25–29; 30–34; 35–39; 40–44; 45–49; 50–54; 55–59 and 60 and over. The concentration on the working age population does not imply that other age groups have no human capital at all. What we argue in this chapter is that the human capital embodied in the working age population is most directly related to economic activities and needs a separate treatment at the forefront of the measurement of human capital.

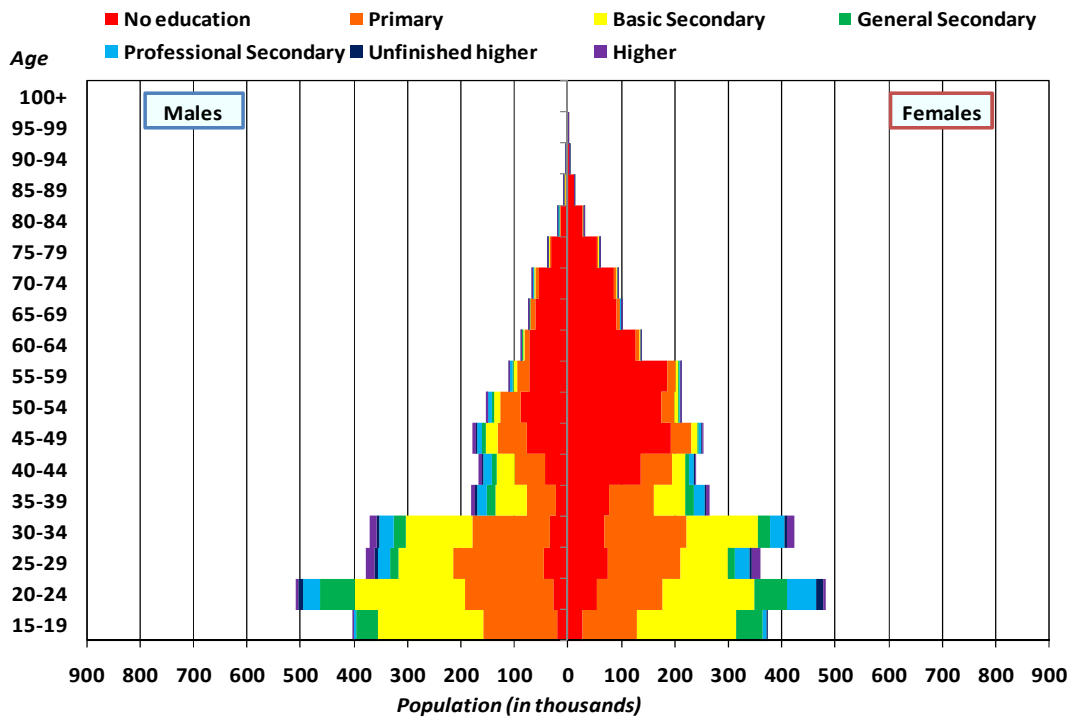
In this section we will present evaluations of human capital for Kazakhstan to illustrate what would be involved in trying to produce human capital for Kazakhstan. Figures from 6.1 to 6.5 show the population pyramids for Kazakhstan in the selected years 1959–1999.

---

<sup>3</sup><http://www.iiasa.ac.at/Research/POP/edu07/index.html>

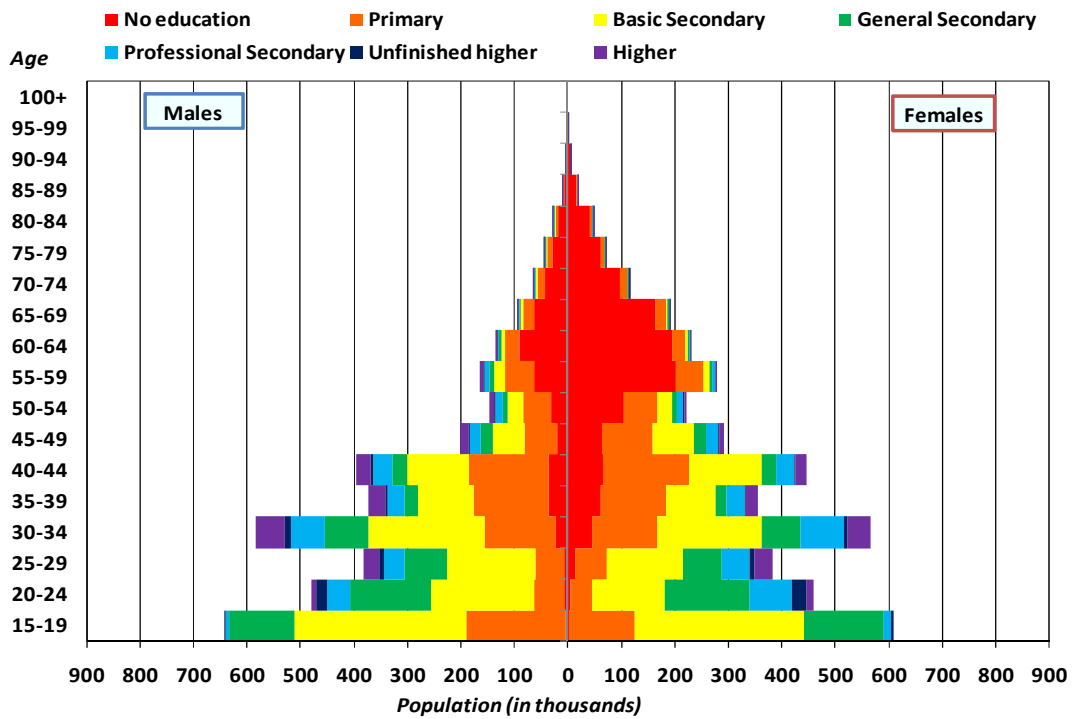


Fig. 6.1 – Age pyramid by level of formal education for Kazakhstan in 1959



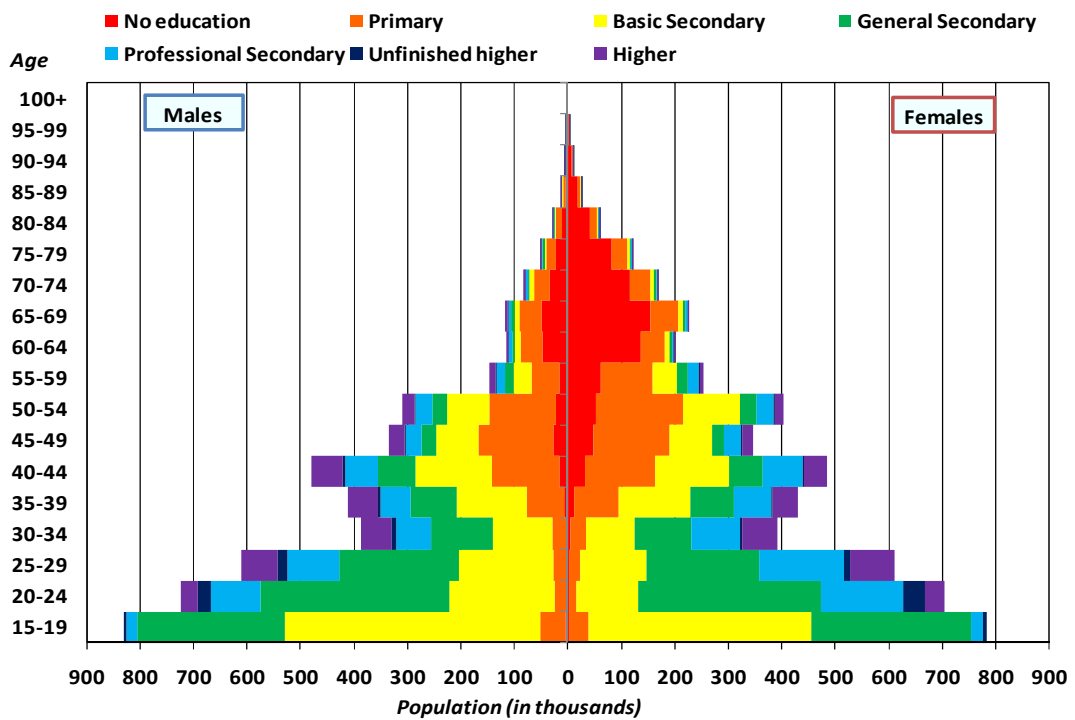
SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010)

Fig. 6.2 – Age pyramid by level of formal education for Kazakhstan in 1970



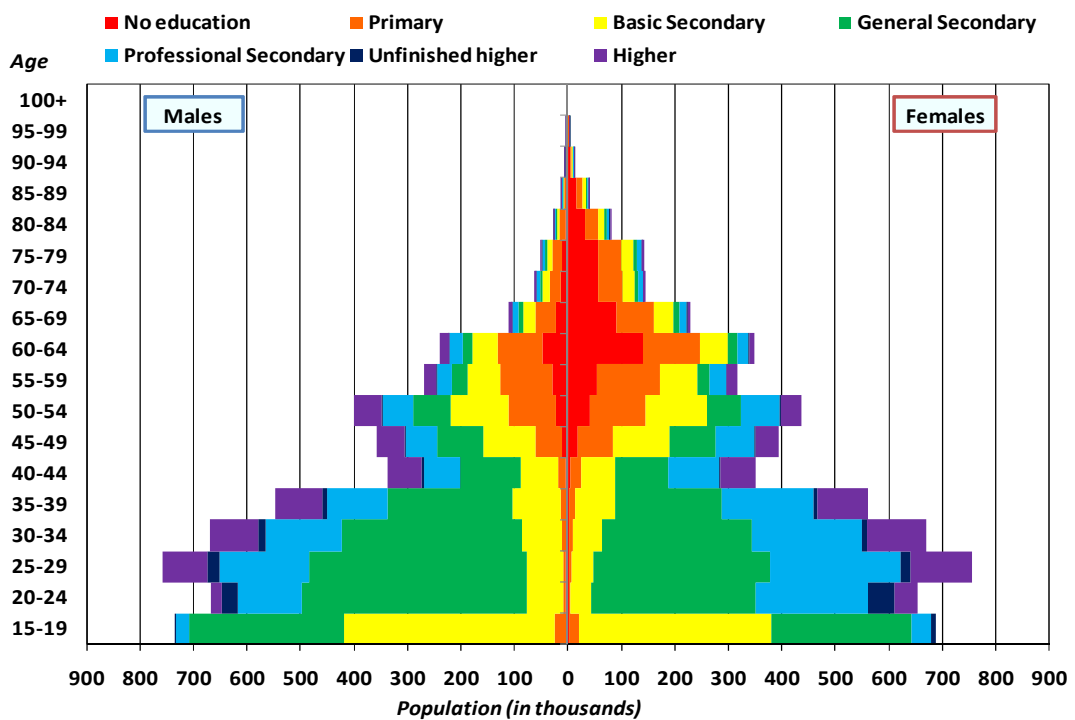
SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010)

Fig. 6.3 – Age pyramid by level of formal education for Kazakhstan in 1979



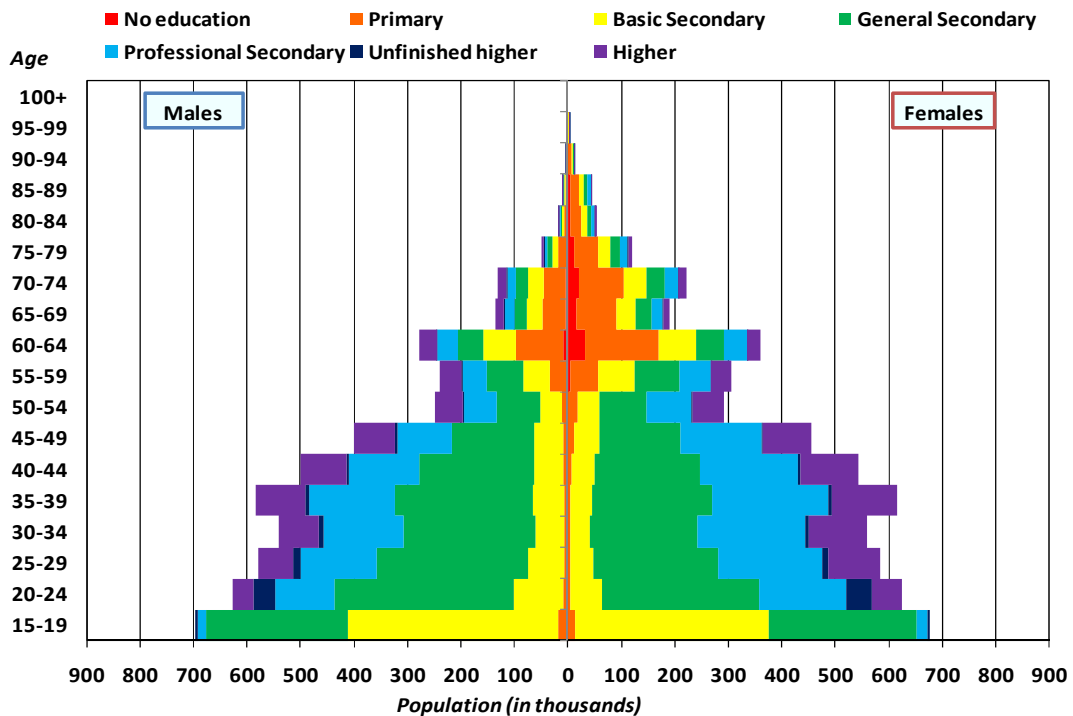
SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010)

Fig. 6.4 – Age pyramid by level of formal education for Kazakhstan in 1989



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

Fig. 6.5 – Age pyramid by level of formal education for Kazakhstan in 1999

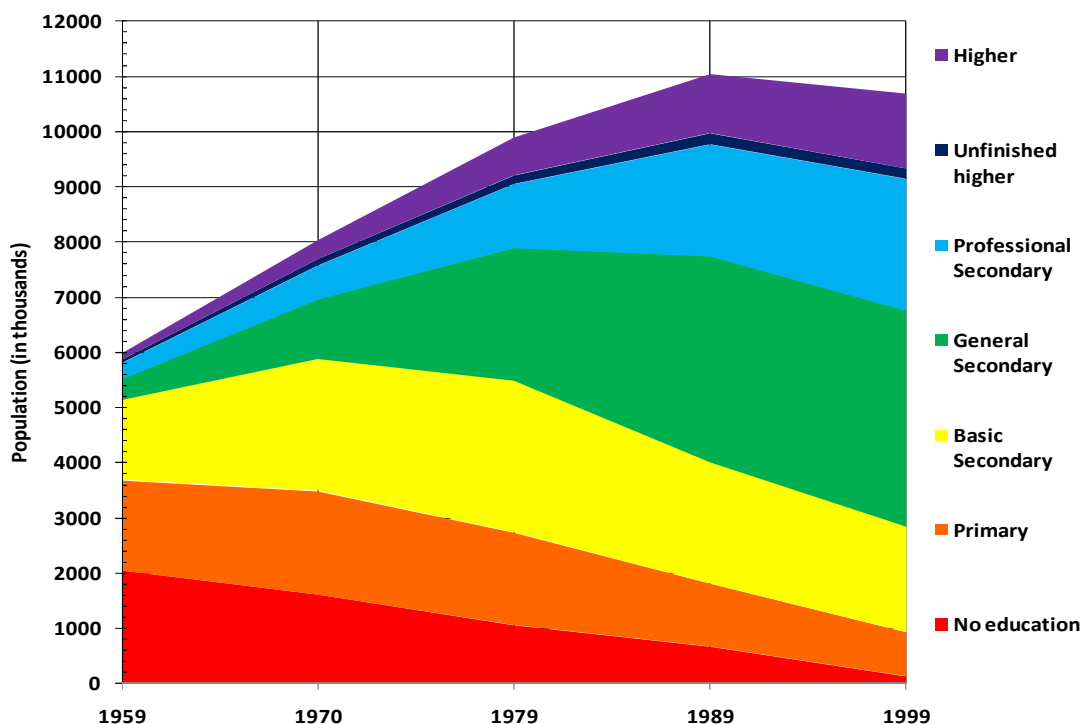


SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010)

The absolute number of students enrolled in school increases over time, and the average level of educational attainment of the adult population rises. It is obvious that the level of human capital in Kazakhstan has 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 (Abdulkarimov and Zakirov 2000).

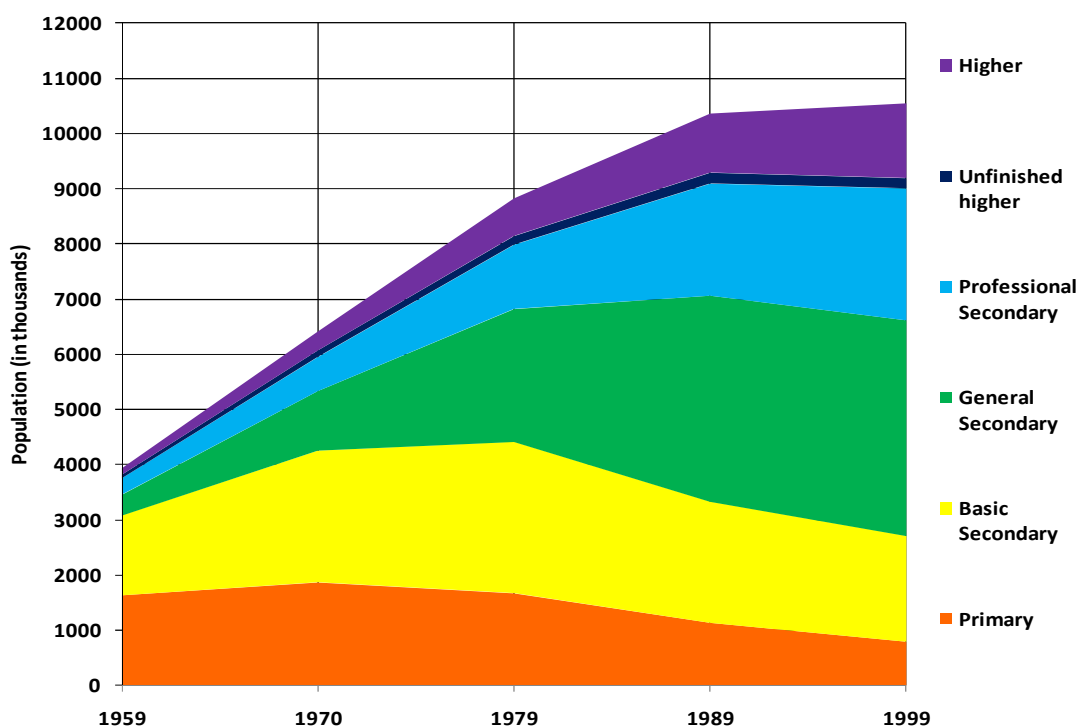
Attainment of secondary education rises with younger age groups. The portion of the population aged 15 and over with no education starts at 34.3% in 1959 and by 1999 it made up only 1.3%. The results show that, both the urban and rural populations had become better educated on average over the recent decades (See Appendix Figures A10–A12). By 1999 only a small fraction of the urban adult population was without any education. Even in rural areas, this proportion significantly declined from 41.1% (1959) to 1.7% (1999). Interestingly in 1959 the rural male educated population was a bit more than urban males with education, though the majority of them were with primary and general secondary education. In addition, in 1959 the rural population of Kazakhstan surpassed the urban population in terms of the total size of its working age population (15.3% more), but in terms of the educational composition of the population urban population had 8.3% more educated working age population (Abdulkarimov and Zakirov 2000).

Fig. 6.6 – Population aged 15 and over by educational level (all), both genders, Kazakhstan, 1959–1999



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

Fig. 6.7 – Population aged 15 and over by educational level (only educated), both genders, Kazakhstan, 1959–1999



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

The stacked-area figure 6.6 allows capturing the trend of declining of uneducated population and especial rapid increase of population with general secondary education by 1999. It is also visible that the absolute total number of working age population has fallen during 1989–1999 (by 3.2%) which is believed to be caused by significant demographic processes and profound changes in political and economic system after the Independence.

However, the next Figure 6.7 shows that the number of educated people alone has not declined, on contrary their total number has increased slightly (by 1.8% from 1989 to 1999). It seems that population decline in Kazakhstan which started from the late 1980's to the late 1990's had affected mainly the urban population, significantly decreasing both the total and educated population. The size of total population declined for 5.1% (1989–1999), population with education declined for 0.9%, while the rural population had marginally declined only in terms of total population size for 0.3%, on contrary the size of population with education in 1999 had risen for 5.9% comparing to 1989. See Appendix Figure A12 (Abdulkarimov and Zakirov 2000).

Figures from 6.1 to 6.7 show in real observed numbers the clear increase in educational attainment throughout time since 1959. In Kazakhstan the educational attainments of men and women appear to be more balanced and symmetric, which appears to be an advantage in human capital reproduction, since several developing countries in the world face difficulties in arranging equal educational enrolment for male and female populations. In 1959, the portion of population without schooling was higher among females than among males, among rural population than among urban. Since 1970 both in terms of share and size of educated people the rural population in Kazakhstan started to lag behind the urban population (Abdulkarimov and Zakirov 2000).

In terms of education trends, the Appendix Figures A10–A12 show, in observed data for 1959–1999, the clear decline in the proportion of adults with no education for younger age groups in Kazakhstan, and as a mirror, the portion of people who have attained primary or upper educational level, rises the younger the age-group.

## **6.5 Retrospective and perspective projections by IIASA for Kazakhstan**

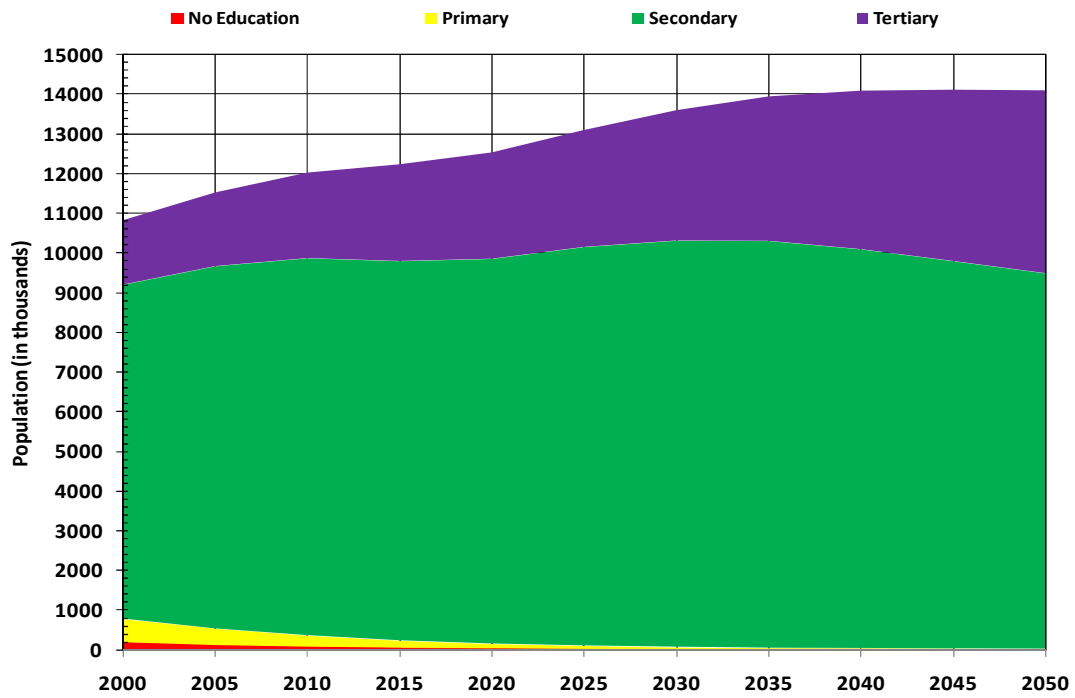
As we wrote in the introduction of this Chapter, International Institute for Applied Systems Analysis (IIASA) and the Vienna Institute of Demography (VID) have developed the dataset of human capital for several countries. Even though the increasing awareness of the importance of human capital in economic growth and development has stimulated several attempts to estimate the distribution of the population by education for the past, only few attempts were made to estimate the future educational composition for a population. IIASA has implemented both retrospective and prospective projections, hence we can engage in two different estimation projects. Apparently, two types of projections have different methodology and assumptions. Unlike retrospective projection which has observed general trends but lack in data specification, the prospective projections are in need of certain future trend scenarios. Therefore the prospective projection for the period 2000–2050 has 4 distinct scenarios: 1) Constant enrolment number (CEN) scenario; 2) Constant

enrolment ratio (CER) scenario; 3) Global education trend (GET) scenario; 4) The fast-track (FT) scenario.

All the scenarios except GET scenarios obviously the artificial scenarios, however, in general all the scenarios are not to be interpreted as predictions or forecasts, but as exercises in ‘what if’ reasoning. We used the results from GET scenario in this chapter. According to authors of the projection, the GET scenario is the ‘complex’ scenario that is not derived from a single, simple assumption. The GET scenario informally assumes that a country’s educational expansion will converge on an expansion trajectory based on the historical trend. Identification of the historical trend is based on a data-driven judgmental analysis. Neither mechanistic application of a statistical model, nor a mere ‘expert estimate’ is used to derive the results. The results were actually based on the application of domain knowledge to the empirical data. From a theoretical perspective, the limiting constraints of educational expansion differ at different stages. It is assumed that the rate of change in the transition to primary school and to secondary school as observed over the past decades continues into the future. To estimate the historical trend, it is assumed that each birth cohort’s age-specific educational attainment can be used as a proxy for schooling at the time the birth cohort was of primary or secondary school age. To translate these birth-cohort attainments into schooling, it is assumed that primary school entry occurs, on average, by age 10, while secondary school entry occurs on average at age 15. In this way, the primary educational attainment of the birth cohort of 1975 is an indication of the transition into primary school in 1985. This trend is assumed to continue in a logarithmic fashion up to 2050 (IIASA). This approach of cohort-extrapolation is being applied, for instance, by the UNESCO Institute for Statistics (UIS) in some projection research.

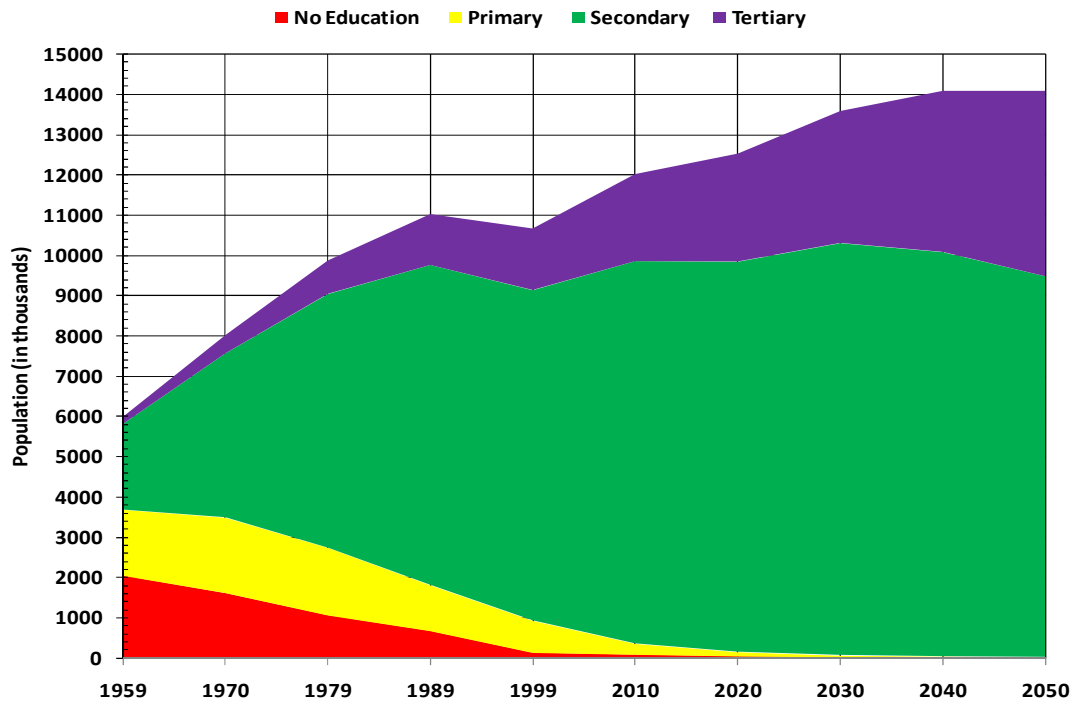
In both projections authors applied the demographic multi-state method, where the educational attainment became a state for a certain population. We acknowledge that only the experts from IIASA widely used demographic methods to estimate a comprehensive and detailed dataset on human capital by age and gender for the years 1970–2000 and 2000–2050. In this respect these results and methodology the most demographic methods of measuring human capital in a particular country which are known for the author. As genuine demographers the IIASA researchers widely use the term “age-specific human capital” to estimate on the impact of its growth on economic growth. They believe that since the dynamics of change in the different age-specific human capital indicators follow very different patterns, it is problematic to pool them together in one indicator covering all age-groups. According to IIASA fellows more demographic precision in the form of age-specific information can provide a more appropriate picture. “It should be noted that a similar problem of lacking age detail applies to the very aggregate indicator of life expectancy that is frequently used in regressions aimed at explaining economic growth. Demographic analysis shows that depending on the level of life expectancy, improvements in this indicator either result from a decline in child mortality or from declines in old age mortality. These are two very different phenomena when it comes to assessing their possible effects on personal investment strategies and consequently economic growth.” (Lutz et al. 2005:3).

Fig. 6.8 – Population aged 15 years and over by levels of education, both genders, the GET scenario of the IIASA projection, Kazakhstan, 2000–2050



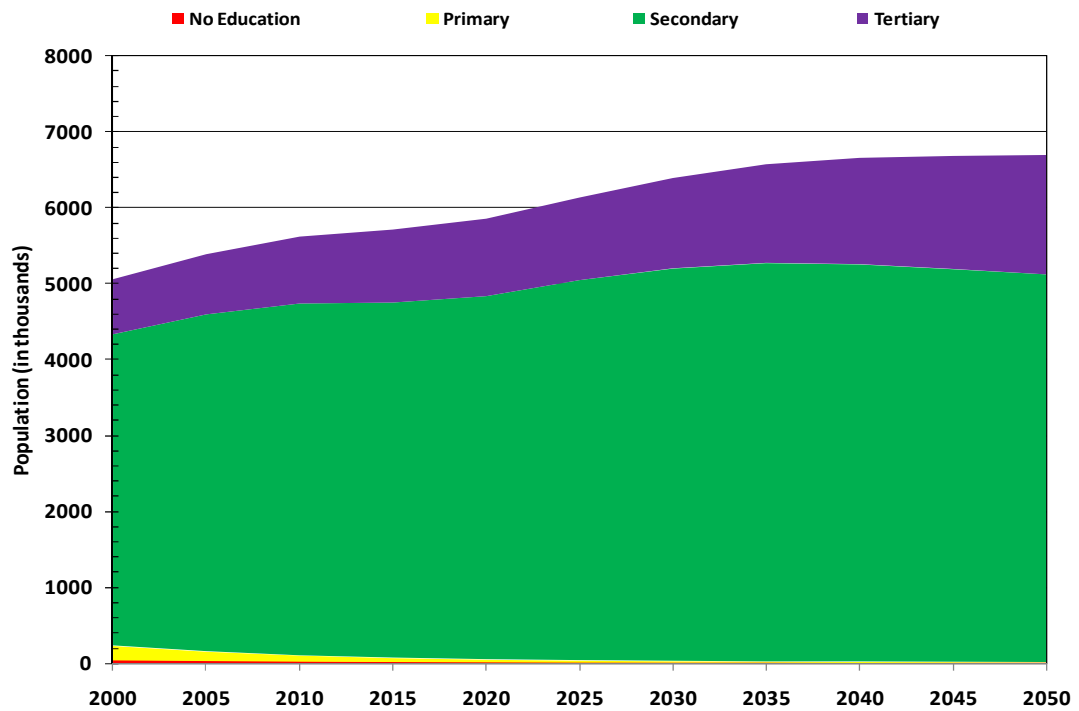
SOURCE: Created by author based on data from Lutz et al. 2001. GET Scenario.

Fig. 6.9 – Population aged 15 years and over by levels of education, both genders, 1959–2050



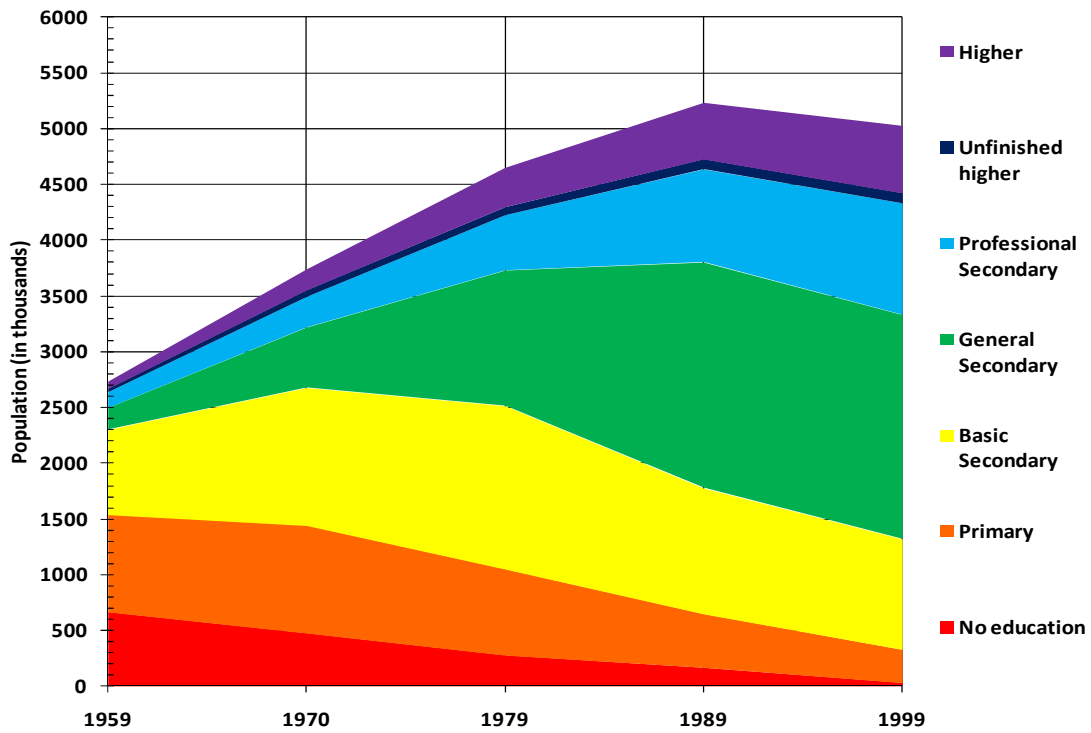
SOURCE: Created by author based on data from Statistical Agency of Kazakhstan (2010); Lutz et al. 2001. GET Scenario.

Fig. 6.10 – Population aged 15 years and over by levels of education, males, the GET scenario of the IIASA projection, Kazakhstan, 2000–2050



SOURCE: Created by author based on data from Lutz et al. 2001. GET Scenario.

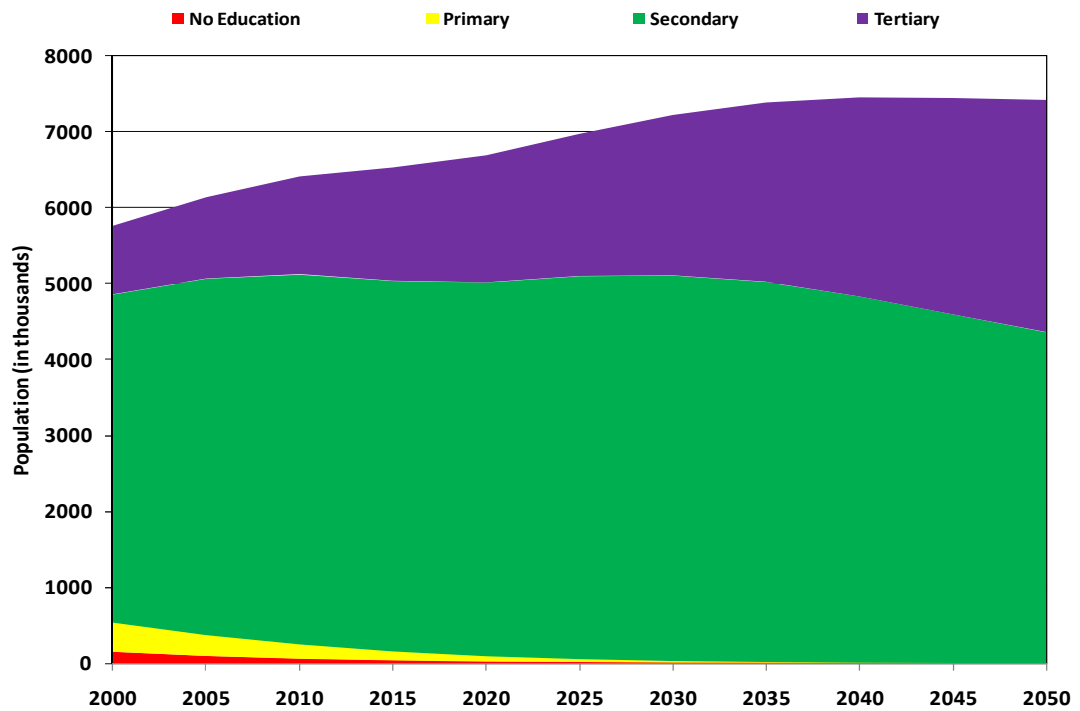
Fig. 6.11 – Population aged 15 years and over by levels of education, males, 1959–1999



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

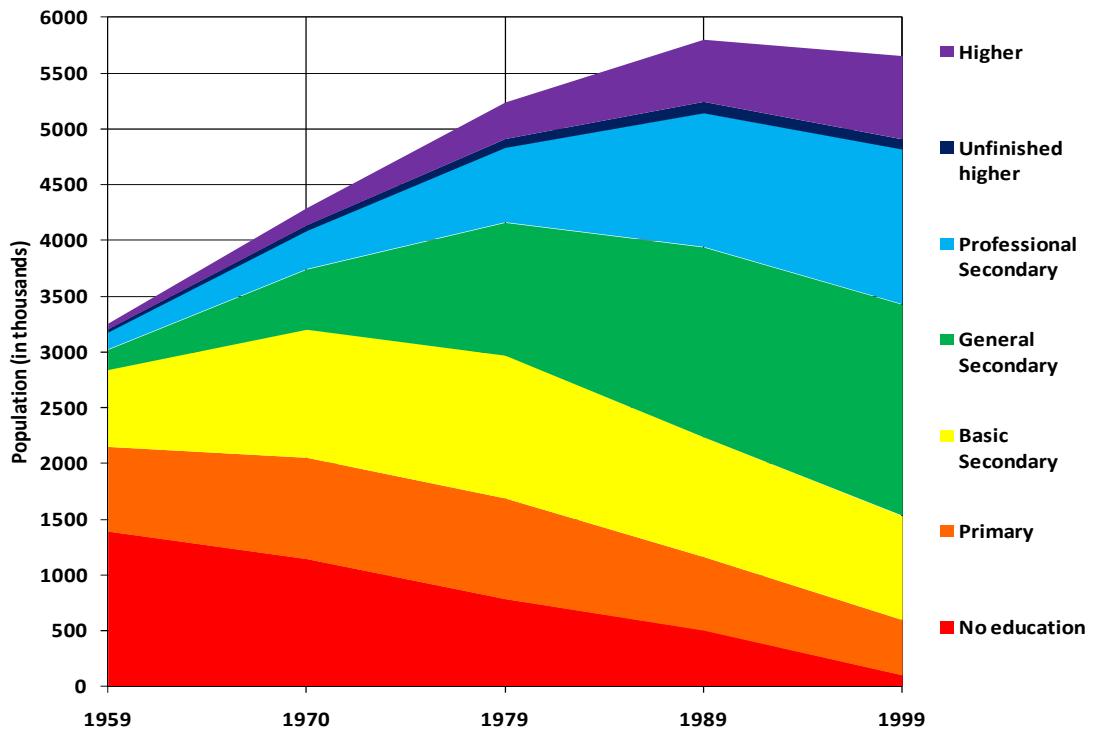


Fig. 6.12 – Population aged 15 years and over by levels of education, females, the GET scenario of the IIASA projection, Kazakhstan, 2000–2050



SOURCE: Created by author based on data from Lutz et al. 2001. GET Scenario.

Fig. 6.13 – Population aged 15 years and over by levels of education, females, 1959–1999



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

One can find more on input data specification for projection and methodology of projection implementation for years 1970–2000 and 2000–2050 in the works of IIASA as well as more detailed information on all the educational assumptions and scenarios for future distribution of population according to education and results of the scenarios. The region specific assumptions for Central Asia which were used for Kazakhstan presented in Appendix Tables A1–A3.

Comparing the total distribution of educated people in 2000 from the Figure 6.8 and in 1999 from the Figure 6.6 one can trace the same basic distribution which inherent in both chart for that period (1999–2000). In Figure 6.9 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.

Concordances are present also in Figures 6.10 – 6.13 from real observed and IIASA projected data for Kazakhstan in charts for males and females distributions. 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. See Appendix Figures from A13 to A15 for separate males and females distribution (Abdakarimov and Zakirov 2000; Lutz et al. 2001).

Initially, our intention at the beginning of the study was to apply multi-state method to implement our own projection of human capital for Kazakhstan, independently, from the results of IIASA experts using *PDEPROJ2* software with our study-specific assumption with corrections for the latest data available and for the latest trend changes in transition from state to state. However, we understood that this tremendous work can not be done by our simple assumptions. Hence, we analyzed the results by IIASA and VID, and decided to apply the results of the organizations in our study. However, this does not mean that we have decided to choose a plain way in order to estimate the human capital in Kazakhstan. On contrary, it would be more relevant for us to derive our own result even if they are less accurate than those of IIASA and VID. Nevertheless, following the aim to be as much closer as possible to the reality we chose to apply IIASA and VID results. Virtually, the assumptions by IIASA and VID multi-state projection method are very well-founded and well-grounded, so can be implemented in practice for many countries in the world. Realizing that we see our main task within this Chapter to estimate the possible development of human capital stock (or capacity) with as more accurate and tested results as possible adding our own assumptions, views and interpretations. Mainly we use the statistical data and projection results to explain our

cogitations on human capital reproduction in Kazakhstan. Nevertheless, considering that good theory is always supported with good data, we see in future to, meticulously, implement our own estimations by multi-state method for Kazakhstan.

## **6.6 Summary on main findings and discussion of the method**

It is not an easy task to conclude on the results which are very elusive and conclusive in nature and requiring no concluding summary. Nevertheless, we would like to briefly introduce the combined results of human capital estimations by education-based approach presented here from 1959 to 2050 for Kazakhstan.

Obviously, some progress is embedded in the labor force of Kazakhstan, thanks to the Soviet education policy. 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 the 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%) (Abdulkarimov and Zakirov 2000; Lutz et al. 2001).

The human capital estimations illustrate the changing educational composition of the population, which is significant not only for individual development but also for a nation's institutional and economic performance. In this context it is useful to look at absolute numbers of workers by skill levels rather than at the proportions discussed above. Data presented in Figure 6.9 trace the trend of education composition development in Kazakhstan in terms the working age population size (age of 15 and over) by educational attainment. The data presented is taken from official censuses for Kazakhstan (1959–1999) and projections implemented by IIASA for Kazakhstan (GET scenario). The total working age population of Kazakhstan has more than doubled in 50 years (1959–2010) from 5 987 280 to 12 025 300 in absolute numbers. It is also expected that the total number of working-age population will reach 14.1 million people by 2050. At the same period the absolute number of population with tertiary education in 2010 (2.1 million) surpassed of those with no education in 1959 (2 million). Starting from 1989 the number of females with tertiary education outnumbered males (females 660 200 v/s males 599 000), moreover by 2050 it is expected that it will be 2 females with tertiary education for 1 male with the same qualification. According to projection, by 2050, 99.8% of the working age population will be better educated (secondary plus tertiary education attainments), who amounted only 38.4% in 1959. The main reason for this lies in the investment in primary and secondary education over the last decades. These significant future changes in the numbers of skilled workers are likely to have far reaching consequences for the weights in the economic system.

The heritage of investment in education will be beneficial to the long-term educational development of Kazakhstan. This chapter shows empirical examples of improvement momentums in the human capital stock, how larger human capital stock differentials begin to show up after two or three decades. The GET Scenario of IASA projection for Kazakhstan shows that changing educational achievement can begin to improve human capital within decades mainly because current promotion and education enrolment affect largely those who already in school at the moment. It usually takes a while until the improvements in human capital fully take effect due to the inertia of the educational structure. The Chapter 6 also demonstrates that past improvements in education, that are reflected in today's distribution of education by age, will continue to improve the human capital stock over the coming years, even if no additional efforts in expanding educational enrolment will be made (this was proved by the CEN and CER scenarios). This significant momentum of improvements in human capital stock is very important to keep in mind when setting political targets and when studying the costs and benefits of investments in education. More and detailed information on trends divided specifically for urban-rural, male-female population you can find in charts presented in Appendix Figures from A10 to A15.

Kazakhstan and in general all the Post-Soviet transition countries own a significant stock of human capital enhanced by comparatively high levels of education. The former Soviet Union was a leader in different technology fields such as metallurgy, precision instruments, space technologies, computer software, aircraft building and development of new materials. Conforming to the international standards, the Soviet Union gained a significant level of development in transport and infrastructure sectors, mass education and in the basic applied research. This progress relied on the valuable science establishment and broad networks between research institutes and experimental laboratories coordinated at national level (Intriligator et al. 2001).

So Kazakhstan and other Post-Soviet transition countries seemed to be expected to exploit their comparative advantage in skill-intensive manufacturing and in high-tech goods and to create significant intra-industry trade due to the pools of human capital and comparatively high educational achievements inherited from the Soviet era. However, the evidence so far is not supported by the experience of the Post-Soviet transition countries, which still lag behind in terms of sustainable economic development. Kerr (2002) also argues that the role of human capital in economic success should not be exaggerated at the expense of more critical issues. He pointed out that, for instance, noting that the Soviet Union had excellent scientists and engineers whereas Switzerland has the lowest university attendance and graduation rates in the OECD.

In Chapter 3, we discussed how demographic processes and factors can influence the economic performance in the country. Specific demographic conditions, as well as favorable age-gender-education composition can speed up economic development of a country however these conditions are only possible potential, whether or not this potential can be enjoyed is the question of many other factors and processes. The similar caveat should be taken into account while presenting the flattering development of the human capital in Kazakhstan after 1959. Nonetheless, considerable circumstantial evidence also indicates that countries develop more rapidly when

education and other skills are more abundant. All the data presented here mainly discuss how the situation concerning positive educational achievement has developed. Reasonably, different kinds and levels of education do not have the same impact on economic growth. Vandenbussche et al. (2006) on the basis of data for OECD countries show that tertiary education becomes instrumental for economic growth as soon as a country attains a certain technological level and independently produce innovations, whereas lower levels of education are more important when a country still is acquiring the technological benefits.

“Another important aspect of education in the broader development context is the numerous byproducts created by educational achievement, the outcomes that occur as a result of cross-sectoral consequences of the education process. There are significant positive side effects of improving education on other important goals that are not directly related to education. It is established beyond a doubt that improvements in the educational structure of the adult population have important positive cross-benefits and plays a very strong role in health, active civic participation, individual income and etc” (Lutz et al. 2005:34).

The systematic studies of past, current, and future educational attainment by age and gender can make important contributions to the better understanding of human capital reproduction dynamics. For human capital projections the multi-state method presented in this chapter seems to be more favorable for using, instead of simplistic projection method of just drawing a line between the starting point and the goal set for future. There is no good reason for not using it systematically since the demographic multi-state method requires a bit more effort in the preparation of data and in the definition of the specific model assumptions, but the data is readily available for Kazakhstan and the method is well tested and established in the scientific literature.

Writing this chapter we also aim to help to prepare the ground for better age-specific indicators of human capital that will subsequently allow for the calculation of models with more age precision. More demographic precision in the form of age-specific information can provide a more appropriate picture. In this brief description it was not possible to do more than draft the theory and refer to some of the empirical researches which consider the vital and manifold role of human capital formation in personal, national and global economic development. After all, it is evenhanded to conclude that albeit the considerable levels of human capital may not guarantee the economic growth at a certain time and place, the harmonized growth and reproduction of human capital appear to be a necessary factor to insure sustained economic development.

## Chapter 7

### Measuring human capital for Kazakhstan by lifetime labor income-based approach

#### 7.1 Description of the measuring method

##### 7.1.1 Introduction

In this chapter, in order to measure human capital in Kazakhstan we use two lifetime labor income-based methods adopted from Le (2005a, 2006) work, where human capital stock of New Zealand is measured as well as Gu and Wong (2008) work, where human capital stock of Canada is measured. In order to adjust these studies for the case of Kazakhstan we made some modifications in the methods, which are discussed in following sub-chapters. In this chapter we specify human capital, according to the measurement approach as follows:

*human capital embodied in an individual is the total discounted present value of expected future stream of labor incomes (wages) that an individual at a particular age<sup>4</sup>, gender, place of residence and educational level expects to generate (earn) in the labor market over his/her working lifetime.*

The assumption of this measuring method represents general consideration of income-based approach that differences in wages perfectly mirror differences in labor productivity and acts as a proxy for human capital. However, Le et al. (2005a) warn: “in reality, income indicators and labor productivity do not always follow the same path. If income (wage) varies for other reasons than changes in labor productivity, the results obtained from such methods will be biased. The fact that the equality between wages and labor productivity fails to hold, hence casts doubts on the results of such measurement” (Le et al. 2005a:496).

Nevertheless, being a proponent of income-based approach, Le (2005a) himself points out that such criticism “may suggest that a measure of human capital based solely on labor productivity should be less biased. However, the productivity-based measure of human capital is the index

---

<sup>4</sup> in our case age-group

method<sup>5</sup> per se, which makes it not the ever-superior solution for measuring human capital across different countries and time periods. While, the labor income-based measurement, in contrast to the productivity-based index method, gives a monetary value of human capital in a society which makes it more meaningful measure than indices in comparisons with other types of capital or with human capital from other countries or within a particular country across the time” (Le et al. 2005a:496). Therefore, according to Le (2005a) the lifetime labor income-based approach has many merits of a good measure of human capital after all, in spite of its imperfections and Le (2005a) also believes that the popularity of the approach tends to hold reasonably well in the long term. Actually, the approach is widely accepted in economic and social sciences despite the fact that it is based on controversial assumptions. See also works of Wei (2008), Averbach et al. (2009), Li et al. (2009), Liu and Grecker (2009), Jones and Chiripanhura (2010).

Similar to Le, we take into account only the lifetime labor incomes (human capitals) of those who are at working age, employed and only their contributions within the labor market activities<sup>6</sup> (while Jorgenson and Fraumeni used lifetime income-based approach to account also for contributions that employed individuals made inside and outside the work). Our calculations are based on data related to labor income in every education/residence/age-group profiles, which are then combined and weighted with the employment rates, survival probabilities, educational transition probabilities to further educational level and intensities of taking educational activities (i.e. education enrolment rates) allowing the worker to “jump” from one education-earning profile to another.<sup>7</sup> We also need to incorporate and project the workers’ expected real labor income growth rates<sup>8</sup> and discount<sup>9</sup> these incomes back to the present, i.e. estimate the present value of lifetime labor income, for a person of a given educational level, place of residence and age-group.

We assume that the potential working life extends from age of 15 to 64. Applying the same technique as in Gu and Wong (2008) and Le (2005a, 2006) methods, we also assume that all workers in Kazakhstan leave the labor market at age 65 and have no further labor income, therefore they have zero human capital after age of 65. Thus, first of all we have to derive a worker’s lifetime

<sup>5</sup> Index method refers to the method which helps to derive an index value instead of a monetary measure in income-based measurement framework. More about the Index Method read on page 80.

<sup>6</sup> It is evident that results based on this model concern only labor market incomes so the value of human capital stocks used in the non-labor market production may be missed, but such a restricted focus is also common in studies measuring the returns to education. Moreover, as we discussed in Chapter 4, non-labor market activities are not so easy to capture and they do not necessarily describe the labor productivity.

<sup>7</sup> See more about advantages, drawbacks and peculiarities of the method which were discussed in Chapter 4, pages 77–79.

<sup>8</sup> In general, there are many approaches how to derive appropriate income growth rate. For example, Li et al. (2009) assume that “the technology is labor-augmenting” and one can specify the aggregate production function as:

$$Y = (T \times L) \times \Phi$$

where  $Y$  is output,  $T$  denotes a technology factor,  $L$  denotes labor input, and  $\Phi$  physical capital input. The product of labor equals the real wage when the labor market is in equilibrium, and labor productivity and the real wage can be expected to grow at the same rate. Therefore, “the growth rate of real output per employed worker can serve as a reasonable estimate for the growth rate of the real wage” Li (2009).

<sup>9</sup> Due to data at disposition in our calculations we use interest rates. Even though the calculation of the discount rate shows that the interest rate is only a component in the estimation of the discount rate. The interest rate is used to capture part of the risks of the project, but the appropriate calculation of the discount rate also incorporates the risk of the equity. Therefore there could essentially be many interest rates. However, for any specific endeavor, there should only be one discount rate. More discussions on using interest rates see in section Data page 167.

labor income (or human capital) during or in the age-group “60–64” which is equal to his/her labor income in the current period (the last period) only, because s/he is going to retire after this period. The value of labor income for the current period is derived by weighting the period long amount of income with employment rate for the corresponding age-group and education-earning profile.

Further we evaluate a worker’s lifetime labor income (i.e. human capital) in penultimate age-group “55–59” which is equal to his/her labor income during the current 5-year period plus the lifetime labor income of the following 5-year period (i.e. the last age group of “60–64”) which is discounted and adjusted by income growth and survival factors, and so forth working *backward recursion* in this way for all possible combinations of educational levels and places of residence, all workers' individual lifetime labor incomes (human capitals) at each age-group can be derived.

The backward recursion technique represents the fact that the present value of lifetime labor income (human capital) for an individual of given age (in our case age-group) is just his/her expected labor income in current period plus the present value of his/her expected labor income in the subsequent period incorporated by corresponding income growth rate, discount rate and survival probabilities. Obviously, such calculations of this measuring approach must start from the last age-group (or the last age) and doing so we can properly derive the present value of expected lifetime labor income for individuals at all age-groups. Using the logic of backward recursion technique you can easily perceive the specificity of our formula outlined below, where the value of current age-group (or age) is possible to derive only after deriving the value of subsequent (older) age-group (or age).

So, according to our approach the individual’s human capital  $H$ , in age-group  $x$  with educational level  $e_i$ , is defined as the total discounted present value of his/her expected future stream of labor incomes, and we specify our formula as (7.1):

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

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)

In our formula we derive the age/education/residence specific employment rates by dividing those who are employed at certain age-group, in certain place of residence and with certain educational



attainment to economically active population with the same age (age-group), place of residence and educational attainment. We realize that this is not the original method<sup>10</sup> to derive the specific employment rates; nevertheless we are convinced that this indicator successfully represents the actual proportion of employed people in the certain educational group in labor market specified by age/education/residence. According to our opinion, this information on such kind of ratio and proportion in labor market is more important for measurement of human capital distribution and in the better manner represents the demographic parameters during the estimations, that is why these employment rates satisfy our measuring approach.

We group our data on employed population obtained from Statistical Agency of Kazakhstan and divide it according to educational attainments. According to our own classification we decided to divide the employed population to four principal levels of educational attainment:

- 1) *Unqualified* – no more than school certificate or more frequently the primary, basic and general secondary educations defined by Statistical Agency of Kazakhstan where "primary general" includes persons with complete primary education, and "basic secondary" refers to persons with incomplete secondary. Generally refers to the Level 1 – Level 3 of the ISCED defined levels of education: primary education or first stage of basic education; lower secondary or second stage of basic education; (upper) secondary education;
- 2) *Vocational education* – includes all post-school, non-degree qualifications: primary professional and secondary professional (special) educations defined by Statistical Agency of Kazakhstan. Generally refers to the Level 4 of the ISCED defined levels of education: post-secondary non-tertiary education;
- 3) *Unfinished-higher education* – refers to persons who currently attend or previously attended higher education institutions and completed at least half of a basic program. Persons who completed less than half of a higher program were classified by Statistical Agency of Kazakhstan as having either general secondary (unqualified) or professional education (vocational).
- 4) *Higher education* – Bachelor's degree and higher defined by Statistical Agency of Kazakhstan. Generally refers to the Level 5 and Level 6 of the ISCED defined levels of education: first and second stage of tertiary education.

Apparently, some workers leave the labor market and study for higher educational degrees since they expect to improve their education-earning profiles. The lifetime labor income-based approach additionally allows accounting for human capital of those people who are currently attending to any formal educational activity and trying to jump onto a higher education-earnings profile. We agree with authors of the approach who point out, if the effect of education enrolment is ignored, the potential to contribute to country's human capital stock of those who decide to study will not be adequately captured (Jorgenson and Fraumeni 1992, Le 2006) Hence, we assume that the population generally faces two possible lifetime labor income streams: one with continuous work

---

<sup>10</sup> **Employment rate** – an indicator expressed as a ratio of the number of employed persons of a certain age to the total population of the same age. <http://regionai.stat.gov.lt/en/savokos.html>

and the other with the possibility of delaying work for further education. That means the lifetime labor income (*ergo* human capital) for a particular education-earning profile (cohort) members is composed by these two general earnings streams.

In order to account for the changes in worker's income at the new upgraded education earning profiles and to cumulate the value of additional human capital for those who decide to study for further educational attainments we need to weight human capital of a worker in the higher education earning profiles by corresponding educational enrolment rates and education transition probabilities to that higher educational levels, considering the number of years that an individual spends in average studying for the higher educational levels.

Hereby, the extended formula to account for additional human capital resulted from higher educational levels of those currently studying takes a form (7.2):

$$H_x^{e_i} = (n \times I_x^{e_i}) \times R_x^{e_i} + \prod_{T=e_i}^{T_x^{e_j}} (1 - T_x^{e_{i-j}} \times E_x) \times H_{x+n}^{e_i} \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$$

$$+ \sum_{y=1}^{Y^{e_{i-j}}} \frac{(T_x^{e_{i-j}} \times E_x)}{Y^{e_{i-j}}} \times H_{x+y}^{e_j} \times p_{x+y} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^y$$

where:

$T_x^{e_{i-j}}$  – education transition probability from  $i$  type of education attainment to  $j$  type, where  $i < j$ ;

$E_x$  – age-specific educational enrolment rate;

$Y^{e_{i-j}}$  – number of years that the individuals with educational attainment  $e_i$  spend in average to complete a higher level of educational attainment  $e_j$ ;

$y$  – each ordinal year of study, where  $\sum y = Y^{e_{i-j}}$ , and the value of  $Y^{e_{i-j}}$  depends on individual's current educational attainment.

$x, x+n$  – age-group, next age-group;

Students are tracked from their initial educational attainment until they transit to the next higher educational levels. Where the additions in human capital will also include the study long adjustments for labor income (wage) growth and discounting (in our case we use interest rates). The degrees of discounting and income growth depend on the number of years  $Y$  it takes to transit to all possible higher educational levels given the current level of educational attainment until students realize the highest level of lifetime labor income. In order to implement these calculations we have made several assumptions for estimating workers' human capital in Kazakhstan:

- Individuals are assumed to study only for the higher educational level than they already have.
- No drop-outs return to school and the education continues without a break. All studies, if taken, will and must finish at the end of the prescribed study period, neither earlier nor later. This is a strong assumption given that in reality there are some students finishing their studies earlier and some others later than the standard study periods. However, this assumption could be supported

by the fact that these two factors that some finish earlier and some later will cancel out with each other to some extent, thus we keep our prescribed standard period for study to all students.

- We took and applied different conditional educational transition probabilities<sup>11</sup> which depend on what type of educational activity and level a particular cohort (education earning profile) member has. For example some people with vocational education who are willing to jump onto higher educational level should at first be matriculated and become members of cohort with unfinished higher education and only after admission and graduation they can be workers with higher education. Similar assumptions hold for other profiles.
- Obviously some unqualified workers aiming to gain the “higher education” degree have the possibility to enroll either in study towards a “vocational” labor qualification or directly in study towards a “higher education”, nonetheless we assume that the total study length in average for all unqualified workers in the country takes 5 years in order to gain all possible higher qualifications according to the model (See Appendix Figure A16), no matter which specific path the worker chooses. This assumption considers the mean length of educational path for unqualified workers which in any particular way will be equal to 5 years. Thus, the total length of study for unqualified workers is 5 years, where 2 years in average are assumed to be spent studying for vocational education, another year for unfinished higher education, and 2 more years to fulfill the higher education. For workers with vocational level it takes 3 years in average to accomplish the higher education while the workers with unfinished higher education in average study 2 years to graduate from a university. See Appendix Figure A16.
- Education enrolment rates<sup>12</sup> are specified only according to age and there is no study after age of 50.
- We do not apply negative values for current earnings of workers during the study period since the direct costs of study are offset by part-time earnings. The tuition fees for many degrees in Kazakhstan are granted and subsidized. Therefore, this assumption is quite reasonable, which also a standard assumption in studies on returns to education. This assumption was adopted from Le’s (2005a, 2006) works.
- Since the Statistics of Kazakhstan has no data on earnings specified by age of worker, we have decided to use the wage distribution patterns according to age in Liu and Greaker (2009) study of Norwegian workers. We understand that some can argue that the “Norwegian distribution” should not necessarily be relevant for the case of “Kazakhstani distribution”; nonetheless this template adopted gives us more meaningful idea about earnings of Kazakhstani workers according to age, than just applying universal average wage regardless the worker’s age. We convinced that in reality the wages do differ according to the age of worker, that is why we prefer to apply rather than not to apply some age-specific distribution of earnings (wages) from other studies.

---

<sup>11</sup> See section Data to learn more how these probabilities were obtained.

<sup>12</sup> See section Data to learn more how these rates were obtained.

### 7.1.2 Personal human capital of a worker with higher education

Considering the assumptions outlined above, the equation (7.2) can then be specified for each “education cohort”, i.e. education-earning profile. For those who have the “higher education” the estimation of expected lifetime labor income is simplified by the fact that these workers have reached the highest educational level allowed by the model. Additional educational enrolments within this profile are ignored regardless of the age because these individuals have reached the highest educational level and have no better educational profile to jump to, and human capital is measured as follows (7.3):

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

where  $H_x^h$  is human capital of the worker with higher education,  $I_x^h$  represents the annual labor-income of a worker with higher education in age-group  $x$  during the period  $n$  and  $R_x^h$  refer to age-specific employment rate of workers with higher education. Table 7.1.1 and simple mathematical operations outlined below present the principles of calculation technique to obtain human capital for a worker with higher education in urban Kazakhstan for 2003.

*Tab. 7.1.1 – The estimations of a worker’s human capital, higher education, urban population, 2003, Kazakhstan, in USD, deflated for 2008*

| $x$   | $(n \times I_x^h) \times R_x^h$ | $H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$ | $p_{x,x+n}$  | $H_x^h$        |
|-------|---------------------------------|--|--------------|----------------|
| 15–19 | 0                               | 141,137  | 0.994        | <u>141,137</u> |
| 20–24 | 4,063                           | 133,315  | 0.990        | 137,378        |
| 25–29 | 10,563                          | 119,990  | 0.984        | 130,553        |
| 30–34 | 14,413                          | 103,639  | 0.979        | 118,052        |
| 35–39 | 16,846                          | 85,680   | 0.974        | 102,527        |
| 40–44 | 19,020                          | 66,798   | 0.962        | 85,818         |
| 45–49 | 19,838                          | 48,233   | 0.945        | 68,071         |
| 50–54 | 18,850                          | 31,409   | 0.924        | 50,259         |
| 55–59 | <u>18,543</u>                   | <u>15,180</u>  | 0.897        | <u>33,722</u>  |
| 60–64 | <u>17,066</u>                   | 0  | <u>0.857</u> | <u>17,066</u>  |

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).

\* The values of  $g$  (income growth rate) and  $d$  (discount rate) are equal for the study period to 9.3% and 8.5% correspondingly, while  $n$  equals 5 years. See section Data to learn more how these rates were obtained, also <http://nationalbank.kz/index.cfm?docid=158>.

The very first step in the calculations is the obtaining human capital value of a worker at the last age-group. Since this age-group is the last one, the present value of a worker’s expected lifetime labor income in the subsequent period which has to be added to the labor income in the current period is equal to zero, just because, there is no subsequent working period after “60–64” and workers are going to retire after age of 64, so the calculation takes the following form:

$$H_{60-64}^h = 17\,066 + 0 = 17\,066$$

Thus the lifetime labor income of a worker with higher education in age-group “60–64” is estimated as **17 066 USD** (See Table 7.1.1). This value represents the remaining amount of earnings which is expected to be gained by the worker of this age (age-group) during the stay in labor market, i.e. his/her human capital.

To obtain the value of human capital for the worker with higher education at next younger age-group we first must derive the present value of expected lifetime labor income of the worker with higher education at the age-group “55–59”, which is equal to his/her expected lifetime labor income at the subsequent age-group (i.e.  $H_{60-64}^h$ ) weighted by corresponding survival probability as well as adjusted by income growth intensities and discounted back to the present, and finally exponentiated conformable to the length of observation period step (in our case 5 years) (See Table 7.1.1):

$$H_{60-64}^h \times p_{60-64} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n = \text{present value of expected lifetime labor income}$$

$$17\,066 \times 0.857 \times \left\{ \frac{(1+0.093)}{(1+0.085)} \right\}^5 = \mathbf{15\,180}$$

After obtaining the present value of expected lifetime labor income for a worker at age-group “55–59” (**15 180 USD**) we add it to the labor income of the worker with higher education at the current period (**18 543 USD**). This sum gives us the value of human capital for a worker with higher education at age-group “55–59” (See Table 7.1.1):

$$H_{55-59}^h = 18\,543 + 15\,180 = \mathbf{33\,722}$$

Hereby the lifetime labor income of a worker with higher education in age-group “55–59” is estimated as **33 722 USD**. This value represents the remaining amount of earnings which is expected to be gained by the worker with higher education of this age (age-group “55–59”) during the stay in labor market, i.e. his/her human capital. Consequently, by further implementing the backward recursion we estimate the total lifetime labor income (human capital) for the worker with higher education in Kazakhstan for 2003 as **141 137 USD**.

The same procedures were applied for other years using corresponding input data in all calculations, for the period 2004–2008 to estimate the value of human capital for workers with higher education.

### 7.1.3 Personal human capital of a worker with unfinished higher education

For the cohorts whose highest current qualification is unfinished higher education we have specified the following formula (7.4):

$$H_x^u = (n \times I_x^u) \times R_x^u + (1 - T_x^{u-h} \times E_x) \times H_{x+n}^u \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$$

$$+ \frac{(T_x^{u-h} \times E_x)}{2} \times H_{x+n}^h \times p_{x+n} \times \frac{(1+g)}{(1+d)} + \frac{(T_x^{u-h} \times E_x)}{2} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^2$$

where  $H_x^u$  is human capital of the worker with unfinished higher education,  $I_x^u$  represents the annual labor-income of a worker with unfinished higher education in age-group  $x$  during the period  $n$  and  $R_x^u$  indicates the age-specific employment rate of a worker with unfinished higher education.

The additions in human capital of a worker with unfinished higher education due to jumping to the upper education-earning profile are derived by weighting human capital of the worker with higher education  $H_x^h$  who is  $n$  years older with the probability of surviving at the next  $n$  years older age-group  $x+n$  ( $p_{x+n}$ ), as well as with the age-specific education enrolment rate  $E_x$  and the probability of transition to become a worker with higher education  $T_x^{u-h}$  (i.e. the graduation of higher education in this case), where the influencing forces of which are divided according to the length of the whole study period in average. Further the additions in human capital should also include the study long adjustments for labor income (wage) growth and discounting (in our case we use interest rates). For workers with unfinished higher education it takes 2 years in average until students realize the highest level of lifetime labor income. That worker in the next period who is continuing his/her work holding the same educational level as before earns the income of  $H_{x+n}^u \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$  with the probability of  $(1 - T_x^{u-h} \times E_x)$ .

Originally using these formulas Le as well as Gu and Wong have specifically captured the additions in lifetime labor income for every single study-year, because they had the complete data (non-abridged) at disposal in their calculations. Unlike them we do not separately calculate human capital value by each study-year, since we have only abridged data at disposal, thus we assume that the age-specific human capital values which should be weighted by age-specific risks of dying for majority of workers in an age-group are corresponding to values of the next age-group during the whole study period (all study years together as one step). Since all educational activities last at most 5 years in average, all these values lie within the proceeding 5-year age-group characteristics. Hence, we assume that our age-specific survival probabilities and lifetime labor incomes are considered to be the same for a worker during the whole study period. Therefore, our assumptions for educational transitions are specific (and hopefully relevant) for the case of Kazakhstan.

In order to make it easy to track our calculations for the reader we have designated the parts of the formula (7.4) by series of symbols in Table 7.1.2, then summing them up have derived the lifetime labor income (human capital) for a worker with unfinished higher education. Table 7.1.2 provides the description and explanation of particular parts and construction of the formula (7.4) to help reader clearly understand the formula, while Table 7.1.3 presents the values for designated parts of the formula describing the calculations of human capital for a worker with unfinished higher education in urban Kazakhstan for 2003. The principles of calculation techniques are described in the table where the calculations start from the last age-group again.

Let us explain the calculations in more details. The first step is obtaining the value of human capital for a worker at the last age-group (See also Tables 7.1.2 and 7.1.3):

$$H_{60-64}^u = CPI_{60-64}^u + CWI_{60-64}^u + UEI - 1_{60-64}^u + UEI - 2_{60-64}^u$$

$$H_{60-64}^u = 11\,667 + 0 + 0 + 0 = \mathbf{11\,667}$$

Next step is obtaining the value of human capital for a worker with unfinished higher education at the penultimate age-group, i.e.  $H_{55-59}^u$  (See also Tables 7.1.2 and 7.1.3)

$$H_{55-59}^u = CPI_{55-59}^u + CWI_{55-59}^u + UEI - 1_{55-59}^u + UEI - 2_{55-59}^u$$

$$H_{55-59}^u = 13\,153 + 10\,378 + 0 + 0 = \mathbf{23\,531}$$

Tab. 7.1.2 – Description of acronym (designated parts of the formula – 7.4)

| Symbol            | Description                        | Part of formula  |
|-------------------|------------------------------------|--|
| CPI <sup>u</sup>  | Current Period Income              | $(n \times I_x^u) \times R_x^u$  |
| CWI <sup>u</sup>  | Continuing Work Income             | $(1 - T_x^{u-h} \times E_x) \times H_{x+n}^u \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$       |
| UEI1 <sup>u</sup> | Upgraded Education Income (year 1) | $\frac{(T_x^{u-h} \times E_x)}{2} \times H_{x+n}^h \times p_{x+n} \times \frac{(1+g)}{(1+d)}$                    |
| UEI2 <sup>u</sup> | Upgraded Education Income (year 2) | $\frac{(T_x^{u-h} \times E_x)}{2} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^2$ |

SOURCES: Author's notations based on Le (2006), Gu and Wong (2008).

Tab. 7.1.3 – The estimations of a worker's human capital, unfinished higher education, urban population, 2003, Kazakhstan, in USD, deflated for 2008

| x     | CPI <sub>x</sub> <sup>u</sup> | CWI <sub>x</sub> <sup>u</sup> | UEI1 <sub>x</sub> <sup>u</sup> | UEI2 <sub>x</sub> <sup>u</sup> | H <sub>x</sub> <sup>u</sup> |
|-------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|-----------------------------|
| 15–19 | 2,113                         | 30,947                        | 49,009                         | 49,378                         | 131,447                     |
| 20–24 | 3,186                         | 81,427                        | 10,619                         | 10,699                         | 105,931                     |
| 25–29 | 7,253                         | 68,961                        | 9,558                          | 9,630                          | 95,401                      |
| 30–34 | 10,178                        | 67,800                        | 1,591                          | 1,603                          | 81,172                      |
| 35–39 | 11,031                        | 55,592                        | 1,315                          | 1,325                          | 69,264                      |
| 40–44 | 12,603                        | 44,675                        | 111                            | 112                            | 57,500                      |
| 45–49 | 11,985                        | 33,537                        | 80                             | 81                             | 45,683                      |
| 50–54 | 13,149                        | 21,916                        | 0                              | 0                              | 35,065                      |
| 55–59 | <u>13,153</u>                 | <u>10,378</u>                 | 0                              | 0                              | <u>23,531</u>               |
| 60–64 | <u>11,667</u>                 | 0                             | 0                              | 0                              | <u>11,667</u>               |

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).

The total lifetime labor income (human capital) for the worker with unfinished higher education in Kazakhstan for 2003 is estimated as **131 447** USD (See also Table 7.1.3). This value represents the amount of earnings which is expected to be gained by the worker with unfinished higher education during the whole working lifetime, i.e. the worker's human capital.

The same procedures were applied for other years using corresponding input data in all calculations for the period 2004–2008 to estimate the value of human capital for workers with unfinished higher education.

#### 7.1.4 Personal human capital of a worker with vocational education

The formula to estimate human capital for the worker with vocational education takes a form (7.5):

$$\begin{aligned}
 H_x^v = & (n \times I_x^v) \times R_x^v + (1 - T_x^{v-u} \times E_x) \times (1 - T_x^{u-h} \times E_x) \times H_{x+n}^v \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n \\
 & + \frac{(T_x^{v-u} \times E_x)}{3} \times H_{x+n}^u \times p_{x+n} \times \frac{(1+g)}{(1+d)} + \frac{(T_x^{u-h} \times E_x)}{3} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^2 \\
 & + \frac{(T_x^{u-h} \times E_x)}{3} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^3
 \end{aligned}$$

where  $H_x^v$  is human capital of the worker with vocational education, Accordingly,  $I_x^v$  represents the annual labor-income of a worker with vocational education in age-group  $x$  during the period  $n$  and  $R_x^v$  indicates the age-specific employment rate of a worker with vocational education.

The additions in human capital of a worker with vocational education due to jumping to the upper education-earning profiles are derived by weighting human capital of the workers with unfinished higher and higher educational attainments ( $H_x^u$  and  $H_x^h$ ) who are  $n$  years older with the probability of surviving at the next  $n$  years older age-group  $x+n$  ( $p_{x+n}$ ), as well as with the age-specific education enrolment rate  $E_x$  and the probabilities of transition to become a worker with unfinished higher and higher education ( $T_x^{v-u}$  and  $T_x^{u-h}$  – i.e. the graduation of higher education in this case), where the influencing forces of which are divided according to the length of the whole study period in average. Further the additions in human capital should also include the study long adjustments for labor income (wage) growth and discounting (in our case we use interest rates). For workers with vocational education it takes 3 years in average until students realize the highest level of lifetime labor income. That worker in the next period who is continuing his/her work holding the same educational level as before earns the income of  $H_{x+n}^v \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$  with the probability of  $(1 - T_x^{v-u} \times E_x) \times (1 - T_x^{u-h} \times E_x)$ .

In order to make it easy to track our calculations for the reader we have designated the parts of the formula (7.5) by series of symbols in Table 7.1.4, then summing them up have derived the lifetime labor income (human capital) for a worker with vocational education. Table 7.1.4 provides the description and explanation of particular parts and construction of the formula (7.5) to help reader clearly understand the formula, while Table 7.1.5 presents the values for designated parts of the formula describing the calculations of human capital for a worker with vocational education in urban Kazakhstan for 2003. The principles of calculation techniques are described in the table where the calculations start from the last age-group.



Let us explain the calculations in more details. The first step is obtaining the value of human capital for a worker at the last age-group (See also Table 7.1.5):

$$H_{60-64}^v = CPI_{60-64}^v + CWI_{60-64}^v + UEI - 1_{60-64}^v + UEI - 2_{60-64}^v + UEI - 3_{60-64}^v$$

$$H_{60-64}^v = 10\,314 + 0 + 0 + 0 + 0 = 10\,314$$

Next step is obtaining the value of human capital for a worker with vocational education at the penultimate age-group, i.e.  $H_{55-59}^v$  (See also Tables 7.1.4 and 7.1.5):

$$H_{55-59}^v = CPI_{55-59}^v + CWI_{55-59}^v + UEI - 1_{55-59}^v + UEI - 2_{55-59}^v + UEI - 3_{55-59}^v$$

$$H_x^v = 12\,176 + 9\,174 + 0 + 0 + 0 = 21\,350$$

Tab. 7.1.4 – Description of acronym (designated parts of the formula – 7.5)

| Symbol   | Description                        | Part of formula  |
|----------|------------------------------------|--|
| $CPI^v$  | Current Period Income              | $(n \times I_x^v) \times R_x^v$  |
| $CWI^v$  | Continuing Work Income             | $(1 - T_x^{v-u} \times E_x) \times (1 - T_x^{u-h} \times E_x) \times H_{x+n}^v \times p_{x+n} \times \left\{ \frac{(1+g)^n}{(1+d)} \right\}$ |
| $UEI1^v$ | Upgraded Education Income (year 1) | $\frac{(T_x^{v-u} \times E_x)}{3} \times H_{x+n}^u \times p_{x+n} \times \frac{(1+g)}{(1+d)}$  |
| $UEI2^v$ | Upgraded Education Income (year 2) | $\frac{(T_x^{u-h} \times E_x)}{3} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)^2}{(1+d)^2} \right\}$                           |
| $UEI3^v$ | Upgraded Education Income (year 3) | $\frac{(T_x^{u-h} \times E_x)}{3} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)^3}{(1+d)^3} \right\}$                           |

SOURCES: Author's notations based on Le (2006), Gu and Wong (2008).

Tab. 7.1.5 – The estimations of a worker's human capital, vocational education, urban population, 2003, Kazakhstan, in USD, deflated for 2008

| $x$   | $CPI_x^v$     | $CWI_x^v$    | $UEI1_x^v$ | $UEI2_x^v$ | $UEI3_x^v$ | $H_x^v$       |
|-------|---------------|--------------|------------|------------|------------|---------------|
| 15–19 | 2,662         | 7,497        | 23,720     | 32,918     | 33,166     | 99,964        |
| 20–24 | 4,853         | 54,625       | 4,871      | 7,133      | 7,186      | 78,667        |
| 25–29 | 8,405         | 50,281       | 4,125      | 6,420      | 6,468      | 75,700        |
| 30–34 | 9,162         | 58,023       | 675        | 1,069      | 1,077      | 70,005        |
| 35–39 | 9,907         | 48,862       | 553        | 883        | 890        | 61,095        |
| 40–44 | 10,901        | 40,993       | 47         | 74         | 75         | 52,090        |
| 45–49 | 11,737        | 30,173       | 35         | 54         | 54         | 42,053        |
| 50–54 | 11,765        | 19,885       | 0          | 0          | 0          | 31,650        |
| 55–59 | <u>12,176</u> | <u>9,174</u> | 0          | 0          | 0          | <u>21,350</u> |
| 60–64 | <u>10,314</u> | 0            | 0          | 0          | 0          | <u>10,314</u> |

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).

The total lifetime labor income for the worker with vocational education in Kazakhstan for 2003 is estimated as **99 964** USD (See also Table 7.1.5). This value represents the amount of earnings which is expected to be gained by the worker with vocational education during the whole working lifetime, i.e. the worker's human capital.

The same procedures were applied for other years using corresponding input data in all calculations for the period 2004–2008 to estimate the value of human capital for workers with vocational education.

### 7.1.5 Personal human capital of an unqualified worker

The formula to estimate human capital for an unqualified worker takes a form (7.6):

$$\begin{aligned}
 H_x^a &= (n \times I_x^a) \times R_x^a \\
 &+ (1 - T_x^{a-v} \times E_x) \times (1 - T_x^{v-u} \times E_x) \times (1 - T_x^{u-h} \times E_x) \times H_{x+n}^a \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n \\
 &+ \frac{(T_x^{a-v} \times E_x)}{5} \times H_{x+n}^v \times p_{x+n} \times \frac{(1+g)}{(1+d)} + \frac{(T_x^{v-u} \times E_x)}{5} \times H_{x+n}^u \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^2 \\
 &+ \frac{(T_x^{u-h} \times E_x)}{5} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^3 + \frac{(T_x^{a-v} \times E_x)}{5} \times H_{x+n}^a \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^4 \\
 &+ \frac{(T_x^{u-h} \times E_x)}{5} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^5
 \end{aligned}$$

where  $H_x^a$  is human capital of the unqualified worker. Also,  $I_x^a$  represents the annual labor-income of an unqualified worker in the age-group  $x$  during the period  $n$  and  $R_x^a$  indicates the age-specific employment rate of an unqualified worker.

The additions in human capital of an unqualified worker due to jumping to the upper education-earning profiles are derived by weighting human capital of the workers with vocational, unfinished higher and higher educational attainments ( $H_x^v$ ,  $H_x^u$  and  $H_x^h$ ) who are  $n$  years older with the probability of surviving at the next  $n$  years older age-group  $x+n$  ( $p_{x+n}$ ), as well as with the age-specific education enrolment rate  $E_x$  and the probabilities of transition to become a worker with vocational, unfinished higher and higher education ( $T_x^{a-v}$ ,  $T_x^{v-u}$  and  $T_x^{u-h}$  – i.e. the graduation of higher education in this case), where the influencing forces of which are divided according to the length of the whole study period in average. Further the additions in human capital should also include the study long adjustments for labor income (wage) growth and discounting (in our case we use interest rates). For unqualified workers it takes 5 years in average until students realize the highest level of lifetime labor income. That worker in the next period who is continuing his/her work holding the same educational level as before earns the income of  $H_{x+n}^a \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$  with the probability of  $(1 - T_x^{a-v} \times E_x) \times (1 - T_x^{v-u} \times E_x) \times (1 - T_x^{u-h} \times E_x)$ .

In order to make it easy to track our calculations for the reader we have designated the parts of the formula (7.6) by series of symbols in Table 7.1.6, then summing them up have derived the lifetime labor income (human capital) for an unqualified worker. Table 7.1.6 provides the description and explanation of particular parts and construction of the formula (7.6) to help reader clearly understand the formula, while Table 7.1.7 presents values for designated parts of the formula describing the calculations of human capital for an unqualified worker in urban Kazakhstan for 2003. The principles of calculation techniques are described in the table where the calculations start from the last age-group.

Let us explain the calculations in more details. The first step is obtaining the value of human capital for a worker at the last age-group (See also Table 7.1.7):

$$H_{60-64}^a = CPI_{60-64}^a + CWI_{60-64}^a$$

$$+ UEI - 1_{60-64}^a + UEI - 2_{60-64}^a + UEI - 3_{60-64}^a + UEI - 4_{60-64}^a + UEI - 5_{60-64}^a$$

$$H_{60-64}^a = 6\ 207 + 0 + 0 + 0 + 0 + 0 + 0 = 6\ 207$$

Next step is obtaining the value of human capital for an unqualified worker at the penultimate age-group, i.e.  $H_{55-59}^a$  (See also Tables 7.1.6 and 7.1.7):

$$H_{55-59}^a = CPI_{55-59}^a + CWI_{55-59}^a$$

$$+ UEI - 1_{55-59}^a + UEI - 2_{55-59}^a + UEI - 3_{55-59}^a + UEI - 4_{55-59}^a + UEI - 5_{55-59}^a$$

$$H_{55-59}^a = 6\ 528 + 5\ 521 + 0 + 0 + 0 + 0 + 0 = 12\ 049$$

Tab. 7.1.6 – Description of acronym (designated parts of the formula – 7.6)

| Symbol            | Description                        | Part of formula  |
|-------------------|------------------------------------|--|
| CPI <sup>a</sup>  | Current Period Income              | $(n \times I_x^a) \times R_x^a$<br>$(1 - T_x^{a-v} \times E_x) \times (1 - T_x^{v-u} \times E_x)$                      |
| CWI <sup>a</sup>  | Continuing Work Income             | $\times (1 - T_x^{u-h} \times E_x) \times H_{x+n}^a$<br>$\times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^n$ |
| UEI1 <sup>a</sup> | Upgraded Education Income (year 1) | $\frac{(T_x^{a-v} \times E_x)}{5} \times H_{x+n}^v \times p_{x+n} \times \frac{(1+g)}{(1+d)}$                          |
| UEI2 <sup>a</sup> | Upgraded Education Income (year 2) | $\frac{(T_x^{a-v} \times E_x)}{5} \times H_{x+n}^v \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^2$       |
| UEI3 <sup>a</sup> | Upgraded Education Income (year 3) | $\frac{(T_x^{v-u} \times E_x)}{5} \times H_{x+n}^u \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^3$       |
| UEI4 <sup>a</sup> | Upgraded Education Income (year 4) | $\frac{(T_x^{u-h} \times E_x)}{5} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^4$       |
| UEI5 <sup>a</sup> | Upgraded Education Income (year 5) | $\frac{(T_x^{u-h} \times E_x)}{5} \times H_{x+n}^h \times p_{x+n} \times \left\{ \frac{(1+g)}{(1+d)} \right\}^5$       |

SOURCES: Author's notations based on Le (2006), Gu and Wong (2008).

**Tab. 7.1.7 – The estimations of an unqualified worker’s human capital, urban population, 2003, Kazakhstan, in USD, deflated for 2008**

| $x$   | $CPI_x^a$    | $CWI_x^a$    | $UEI1_x^a$ | $UEI2_x^a$ | $UEI3_x^a$ | $UEI4_x^a$ | $UEI5_x^a$ | $H_x^a$       |
|-------|--------------|--------------|------------|------------|------------|------------|------------|---------------|
| 15–19 | 1,205        | 2,852        | 5,580      | 5,622      | 14,447     | 20,050     | 20,201     | 69,957        |
| 20–24 | 3,110        | 29,197       | 1,224      | 1,233      | 2,967      | 4,344      | 4,377      | 46,453        |
| 25–29 | 4,643        | 26,788       | 1,127      | 1,135      | 2,512      | 3,910      | 3,940      | 44,056        |
| 30–34 | 5,323        | 33,192       | 188        | 190        | 411        | 651        | 656        | 40,610        |
| 35–39 | 6,106        | 27,665       | 159        | 160        | 337        | 538        | 542        | 35,507        |
| 40–44 | 6,558        | 23,260       | 14         | 14         | 28         | 45         | 46         | 29,965        |
| 45–49 | 6,708        | 17,087       | 10         | 10         | 21         | 33         | 33         | 23,902        |
| 50–54 | 6,731        | 11,222       | 0          | 0          | 0          | 0          | 0          | 17,954        |
| 55–59 | <u>6,528</u> | <u>5,521</u> | 0          | 0          | 0          | 0          | 0          | <u>12,049</u> |
| 60–64 | <u>6,207</u> | 0            | 0          | 0          | 0          | 0          | 0          | <u>6,207</u>  |

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).

The total lifetime labor income for the unqualified worker in Kazakhstan for 2003 is estimated as **69 957** USD (See also Table 7.1.7). This value represents the amount of earnings which is expected to be gained by unqualified worker during the whole working lifetime, i.e. the worker’s human capital.

The same procedures were applied for other years using corresponding input data in all calculations for the period 2004–2008 to estimate the value of human capital for an unqualified worker.

### 7.1.6 Total human capital stock in the country

The aggregate value of human capital stock for a whole education earning-profile in particular place of residence can be measured by combining the estimates of age-specific human capital of an individual with the data on population size (number of individuals) of each corresponding cohort (i.e. education earning-profile), in other words, the workers’ individual lifetime labor income streams according to the place of residence and education-earning profile at each age-group must be aggregated with the number of working-age population concerning that age-group. Then summing these aggregated lifetime labor income (human capital) values for all ages, one can obtain the value of total human capital stock of a whole education-earning profile in certain place of residence,

$total H_{x-\omega}^{e_i}$  (7.7):

$$total H_{15-64}^{e_i} = \sum_{x_{min}=15}^{x_{max}=64} r H_x^{e_i} \times r P_x^{e_i}$$

where  $r H_x^{e_i}$  and  $r P_x^{e_i}$  are accordingly referred to individual human capital (lifetime labor income) and the number of individuals in the conformable age-group ( $x$ ), place of residence ( $r$ ), and educational attainment ( $e$ , of  $i$  type).

Table 7.1.8 shows how we managed to derive the aggregate human capital stock for unqualified workers in urban Kazakhstan in 2003, where symbols represent following:

- $H$  – individual human capital (lifetime labor income);  
 $P$  – population size;  
 $Ur$  – urban labor market;  
 $a$  – unqualified education-earning profile;  
 $x$  – age-group;

**Tab. 7.1.8 – The estimations of aggregate human capital for unqualified workers, urban population, 2003, Kazakhstan, in USD, deflated for 2008**

| $x$   | $UrP_x^a$ | $UrH_x^a$ | $UrH_x^a \times UrP_x^a$ |
|-------|-----------|-----------|--------------------------|
| 15–19 | 75,900    | 69,957    | 5,309,708,695            |
| 20–24 | 97,700    | 46,453    | 4,538,423,182            |
| 25–29 | 107,100   | 44,056    | 4,718,401,515            |
| 30–34 | 101,800   | 40,610    | 4,134,143,974            |
| 35–39 | 81,400    | 35,507    | 2,890,306,042            |
| 40–44 | 98,300    | 29,965    | 2,945,526,341            |
| 45–49 | 95,600    | 23,902    | 2,284,989,894            |
| 50–54 | 86,900    | 17,954    | 1,560,163,367            |
| 55–59 | 35,600    | 12,049    | 428,945,570              |
| 60–64 | 37,600    | 6,207     | 233,399,238              |
|       |           |           | <b>29,044,007,819</b>    |

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).

Thus the aggregate human capital stock for urban unqualified workers in Kazakhstan ( $UrH_{15-64}^a$ ) approximates 29 billions USD.

The equation 7.7 can also be applied to estimate the aggregate stock of human capital for every educational earning-profile separately to urban and rural working-age populations. See also Appendix Tables A18 and A19 to follow the calculation procedures how we derived the aggregate human capital stock for particular education-earning profiles for urban and rural workers for other years in the period 2003–2008.

As long as we have derived the aggregate human capital stocks for all according education-earning profiles, we can sum them up in order to estimate the aggregate human capital stocks in each place of residence separately. The simple arithmetical calculations outlined below describe the way how we obtained the aggregate human capital stocks for urban and rural workers (all educational-earning profiles combined) (7.8):

$$totalH_{15-64}^{a-h} = totalH_{15-64}^a + totalH_{15-64}^v + totalH_{15-64}^u + totalH_{15-64}^h$$

$$\text{Total Urban Human Capital Stock} = 242.2 = 95.4 + 12.8 + 104.9 + 29.0$$

(7.9):

$$\frac{RuH^{a-h}}{totalH^{a-h}_{15-64}} = \frac{RuH^a}{totalH^a_{15-64}} + \frac{RuH^v}{totalH^v_{15-64}} + \frac{RuH^u}{totalH^u_{15-64}} + \frac{RuH^h}{totalH^h_{15-64}}$$

$$\text{Total Rural Human Capital Stock} = \mathbf{107.2} = 17.9 + 4.1 + 40.9 + 44.4$$

where:

$\frac{UrH^{a-h}}{totalH^{a-h}_{15-64}}$  – the aggregate human capital stock of urban workers;

$\frac{RuH^{a-h}}{totalH^{a-h}_{15-64}}$  – the aggregate human capital stock of rural workers;

$a, v, u, h$  – accordingly unqualified, vocational, unfinished higher and higher education earning-profiles;

$Ur, Ru$  – urban and rural places of residence;

Furthermore, by summing up all the aggregate stocks of human capital across all classified categories (education and place of residence) one can obtain the aggregate value of total human capital stock of a country,  $\frac{Ur-RuH^{a-h}}{totalH^{a-h}_{15-64}}$  (7.10):

$$\frac{Ur-RuH^{a-h}}{totalH^{a-h}_{15-64}} = \frac{UrH^{a-h}}{totalH^{a-h}_{15-64}} + \frac{RuH^{a-h}}{totalH^{a-h}_{15-64}}$$

$$\text{Total Country Human Capital Stock} = \mathbf{349.4} = 242.2 + 107.2$$

Apparently these total human capital stock estimates in the section displayed in USD billions and related to the year 2003 in Kazakhstan. See also calculations results and proportions on total human capital stock for every single education-earning profile, place of residence and whole Kazakhstan during 2003–2008 in Appendix Table A20.

### 7.1.7 Sensitivity analysis

In order to assess the sensitivity of human capital evaluations in the lifetime labor income-based approach a number of alternative estimates are obtained and compared by using alternative income growth rates and discount rates. The results are listed in Table 7.1.9 where in the upper panel the discount rate is fixed at 5% and we test the impact on the value of the human capital stock of alternative income growth rate ranging from 0 to 10%. In the lower panel of the table, we have fixed the income growth rate as 5% and tested the impact on the value of human capital stock of alternative discount rate ranging from 0 to 10%. The main conclusion is that 2.5% percent increase in income growth rate (in discount rate) with discount rate (with income growth rate) fixed will lead to increase (decrease) in the stock of human capital from 26.4% up to 48.0% (from –19.8% to –34.6%). The increases and decreases depend on the departure of changes in income growth rate and discount rate.

**Tab. 7.1.9 – Sensitivity analysis on changes in income growth and discount rate to human capital value of urban population, 2003, in USD billions, deflated for 2008**

| Income growth rate | Discount rate | Human capital stock | Change |
|--------------------|---------------|---------------------|--------|
| 0.0                | 5.0           | 130.7               | ×      |
| 2.5                | 5.0           | 165.3               | 26.4%  |
| <b>5.0</b>         | <b>5.0</b>    | <b>219.1</b>        | 32.6%  |
| 7.5                | 5.0           | 306.4               | 39.8%  |
| 10.0               | 5.0           | 453.3               | 48.0%  |
| 5.0                | 0.0           | 472.9               | ×      |
| 5.0                | 2.5           | 309.1               | -34.6% |
| <b>5.0</b>         | <b>5.0</b>    | <b>219.1</b>        | -29.1% |
| 5.0                | 7.5           | 166.3               | -24.1% |
| 5.0                | 10.0          | 133.3               | -19.8% |

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).

## 7.2 Data

### 7.2.1 Introduction

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 which 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 measuring approach used in this chapter.

Due to data limitations for the case of Kazakhstan we took only aggregated data for both genders together. We understand that the gender differences are very important in human capital studies, especially if one is interested in demographic dimensions of human capital and decomposing by gender could give finer picture in the country. However we met many difficulties in obtaining gender-specific data for Kazakhstan, beginning from number of employees according to educational level and age and ending with education enrolment rates according to gender etc. We have used the data from Statistical Yearbooks of Economically Active Population of Kazakhstan, from section of employed population according to age and educational attainment. Interestingly, the data are specified separately for urban and rural populations. Suitable data for our measuring approach have been available from 2003 till 2008 at the moment of calculations. From the statistical yearbooks, one can obtain the general distribution of employed population separately according to

age, gender, urban-rural residence and educational attainment (Appendix Tables A4 and A5), however, there is no data by educational attainment, age, gender and residence of workers all in one table or set. Unfortunately, the data concerning education level and age is given only as aggregate number without specification of gender. Gender specifications are available only within overall age-groups regardless worker's education or age structure of educated working age population is presented without specifying gender of worker (Appendix Tables A6 and A7). Nevertheless we displayed the share of genders in working age population according to educational attainment (specifications by age are not available) in order to capture the contribution of male and female working population by educational attainment (Appendix Table A8).

### **7.2.2 Educational attainment of employed population**

Appendix Tables from A4 to A8 show the distribution of all employed population by education beginning from age of 15. It is clear that the overall share of people with higher education has increased, from 18.8% in 2003 to 23.7% in 2008. Conversely, the proportion of the population with vocational education has fallen. Any education-based approach would note this change as an improvement in human capital; however that approach can not give the monetary value of this change. Males make up more than a half of the total economically active population. However, the share of females has slightly grown recently. Also, females are major labor force with higher education (Appendix Table A8). Whereas urban males represented the majority of employed population in the beginning of the study period with 28.3% share, in total labor force composition of Kazakhstan, by the end of the period rural males outnumbered the urban males in labor market and made up 25.6% of all employed. While urban females became absolute majority in labor market by the end of study period with 26.1% share, who also presented the highest number of workers with higher education during all study period. As for the share of rural females, they remained with the least share in labor market throughout the whole period.

### **7.2.3 Employment**

Appendix Tables A11 and A12 display the employment rates (i.e. the proportion of those in the labor force who are working for pay). Since our focus is on market activities, those who work for family without pay are not counted in the labor force and neither are those whose employment status is "not specified". However, we have displayed the distribution of population working without pay for family in Appendix Tables A9 and A10 specified by gender, age groups and urban-rural residence. It is clear that people working for family without pay mostly live in rural areas. They are in average 8 times more than urban people working for family without pay.

On average, the employment rate rose by 2.2 percentage points from 2003 to 2008 (from 91.2% to 93.4%). Population with unfinished higher education was hit hard during the study period, interestingly the unqualified workers succeeded better than other education-earning profiles in terms of employment intensity during the study period. In general, males are employed more frequently than females, both in urban and rural areas.



### 7.2.4 Education enrolment rates and education transition probabilities

Although Le et al. (2005a) had ignored the educational enrolment data in their study, considering that further study can affect only a small fraction of the population. We have tried to incorporate educational transition and enrolment data into the measuring approach. We used the National Report on Condition and Development of Education in Kazakhstan by Ministry of Education and Science of Kazakhstan (2009). The schemes outlining the educational transition probabilities as well as the general trends of educational enrolment by age for Kazakhstan with comparison to other Post-Soviet countries are presented in Appendix Table A13 Appendix Figures A17 and A18. We prefer to apply the education transition probabilities from one education level to higher one, since we think they represent the logic of assumptions we have made in our measuring approach. The educational transition probabilities describe the likelihood that several people according to their age and current educational status can attend and finish successfully the degree s/he intended to finish. We combined in the measuring approach age-specific education enrolment rates and educational transition probabilities, assuming the population which is probable to transit from one education level to another, first of all should enroll in particular educational activity, where age is also one of important characteristics.

### 7.2.5 Income growth rate, discount rate and labor incomes

We used data from Statistical Agency of Kazakhstan on the index of real wage growth<sup>13</sup>. We think it can represent the situation around the growth of the working population's real labor income and closely related to changes in labor market during the study period. Assuming the average labor productivity growth rate reflects the real income (wage) growth rate, we also have to take into account that real income more probably grows at different rates for the urban and rural population. However, the data limitations do not allow us to estimate them separately. We hope all these issues should be solved in further studies when data needed are available.

The discount rate for evaluation of expected future incomes in present terms has to reflect the rate of return from investments over a particular time period. Thus, the officially prescribed interest rates by the National Bank can be a good proxy. We use the value of the official interest rate by National Bank of Kazakhstan observed during 2003–2008<sup>14</sup>.

Both income growth (9.3%) and interest rate (8.5%) are taken in constant values for the study period and we have two reasons to do so:

1. Our main task within this measuring approach is to test the demographic changes in labor market and labor market conditions *per se*. Meanwhile, the sensitivity analysis (see description of the analysis and table with results and discussions on page 164) shows that changes in these two rates result in substantial fluctuations of the human capital value which can lead to

---

<sup>13</sup> Source: Statistical yearbook. Standards of living in Kazakhstan. «Уровень жизни населения в Казахстане» Статистический сборник / 2009 – 172 с. Под редакцией А.Смаилова. [http://www.stat.kz/publishing/DocLib/Urovenzjisni\\_rus\\_09.pdf](http://www.stat.kz/publishing/DocLib/Urovenzjisni_rus_09.pdf)

<sup>14</sup> Source: National bank <http://nationalbank.kz/index.cfm?docid=158>

unjustified biases in finding the real level of human capital and revealing the role of demographic characteristics in human capital reproduction and development.

2. Indeed these rates have not changed significantly during 2003–2008 in Kazakhstan and remained at relatively constant level. Hence, these constant rates are representing the real picture not only in labor market, but also in general economic situation in the country and by no means distort the reality.

The Appendix Tables from A15 to A17 present data on annual earning according to education and age.

### **7.2.6 Probability of surviving**

The probabilities of surviving were calculated using data from Demographic Yearbooks by Statistical Agency of Kazakhstan (see Appendix Table A14). Due to data constraints, survival probabilities are not broken down by the level of education. Like Le, we also had to assume that the probabilities of surviving did not vary with education. However, this assumption would understate differences in general lifetime income between education-earning profiles, nonetheless we believe that the resulting bias is trivial and the differences should be negligible<sup>15</sup>.

## **7.3 Basic results**

The measuring method of this chapter treats the lifetime labor income as an indicator of human's intangible capital. Therefore, before starting to present the basic results we decided to guide you through changes of the lifetime labor income values among the workers of Kazakhstan between 2003 and 2008. Table 7.3.1 presents the individual lifetime labor income (measured in USD) of different educational-earning profiles. The lifetime labor income represents the total income which the individual is expecting to earn over his/her working life.

Influenced by certain factors according to input data from the basic formulas (7.1–7.6), the value of lifetime labor income in Kazakhstan was constantly increasing during the observation period. The lifetime labor income gap between workers of urban and rural Kazakhstan is considerably big. The biggest gap was observed in 2006 between urban and rural workers with higher and vocational educations, when rural workers expected to earn only 69.7% of the income earned by urban workers in their lives, while the smallest gap was in 2008 between urban and rural unqualified workers, when rural worker was expected to earn almost 73.0% of lifetime labor income of urban worker. The ratios of lifetime labor incomes between urban and rural workers in all education-earning profiles show that basically each urban worker earned during 2003–2008, in average 1.4 times more lifetime labor income compared to rural worker.

---

<sup>15</sup> As Le et al. (2005) noted when equal survival probabilities are assumed between men and women, the ratio of average lifetime income between the two genders changes marginally, from 56.9% to 56.4%.

Tab. 7.3.1 – Individual lifetime labor income by educational level, Kazakhstan, in USD, deflated for 2008

|                             | Urban   |         |         |         |         |         |
|-----------------------------|---------|---------|---------|---------|---------|---------|
|                             | 2003    | 2004    | 2005    | 2006    | 2007    | 2008    |
| Higher education            | 141,137 | 181,168 | 216,687 | 258,302 | 347,448 | 395,357 |
| Unfinished higher education | 131,447 | 168,205 | 202,029 | 241,781 | 320,567 | 363,246 |
| Vocational education        | 99,964  | 128,115 | 153,465 | 184,433 | 246,226 | 278,080 |
| Unqualified                 | 69,957  | 89,852  | 107,400 | 129,237 | 172,481 | 195,343 |
|                             | Rural   |         |         |         |         |         |
|                             | 2003    | 2004    | 2005    | 2006    | 2007    | 2008    |
| Higher education            | 98,803  | 128,511 | 152,813 | 180,146 | 249,306 | 284,876 |
| Unfinished higher education | 91,968  | 120,665 | 143,060 | 169,051 | 230,207 | 264,722 |
| Vocational education        | 69,995  | 91,842  | 108,829 | 128,575 | 176,130 | 202,720 |
| Unqualified                 | 49,048  | 64,393  | 76,389  | 90,453  | 124,019 | 142,519 |

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).

In Table 7.3.2 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.

The volume of disparity in aggregate human capital between urban and rural workers during the 2003–2008 period derived by simple arithmetical calculations shows following patterns: unqualified workers in rural Kazakhstan managed to face 6.3 times higher human capital compared to their urban colleagues, while in the same period the smallest disparity between urban and rural workers with unfinished higher education reached 2.4 times. Even though at individual level the volume of gaps in human capital differences between urban and rural workers was pretty similar for all workers. Another notable pattern is the narrowing of human capital disparity between urban and rural workers in relative values (See Tables 7.3.1, 7.3.2 and Appendix Table A20).

The development of aggregate human capital stock share of all profiles, as well as changes in absolute numbers are presented in Appendix Table A20. The share in total human capital stock of workers with higher education has risen from 32.4% in 2003 up to 39.5% in 2008 and became the biggest share within all educational levels, all other shares of workers with other educational level have fallen between 2003 and 2008: workers with vocational education from 41.7% to 36.6%, unqualified workers from 21.0% to 19.3% and the workers with unfinished higher education from

4.8% to 4.5%. In general during the observation period the ratio 69/31 was kept in terms of human capital distribution among urban and rural workers in Kazakhstan (See Appendix Table A20).

**Tab. 7.3.2 – Aggregate human capital stock by worker’s educational level, Kazakhstan, in USD billions, deflated for 2008**

|                             | <i>Urban population</i> |              |              |              |               |               |
|-----------------------------|-------------------------|--------------|--------------|--------------|---------------|---------------|
|                             | 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          |
| <b>Total</b>                | <b>242.2</b>            | <b>332.1</b> | <b>412.2</b> | <b>513.2</b> | <b>674.7</b>  | <b>772.0</b>  |
|                             | <i>Rural population</i> |              |              |              |               |               |
|                             | 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         |
| <b>Total</b>                | <b>107.2</b>            | <b>147.1</b> | <b>174.5</b> | <b>213.4</b> | <b>339.1</b>  | <b>395.2</b>  |
|                             | <i>Total population</i> |              |              |              |               |               |
|                             | 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         |
| <b>Total</b>                | <b>349.4</b>            | <b>479.2</b> | <b>586.7</b> | <b>726.5</b> | <b>1013.7</b> | <b>1167.2</b> |

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 (See table 7.3.3). 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 7.3.3).

In Table 7.3.4 we present per capita human capital, i.e., the ratio of human capital and population according to place of residence over the reference population. The development of per capita human capital follows the same path as the development of lifetime labor income and total

human capital stock in Kazakhstan. More detailed picture of per capita human capital development you can observe in Appendix Table A21.

**Tab. 7.3.3 – Human capital and physical capital, 2003–2008, in USD 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).

**Tab. 7.3.4 – Per capita human capital, urban and rural Kazakhstan, in USD, deflated for 2008**

|                         | 2003          | 2004          | 2005          | 2006          | 2007           | 2008           |
|-------------------------|---------------|---------------|---------------|---------------|----------------|----------------|
| Urban population        | 62,933        | 83,869        | 101,836       | 123,887       | 170,941        | 191,662        |
| Rural population        | 35,687        | 47,240        | 55,820        | 67,304        | 94,298         | 105,840        |
| <b>Total population</b> | <b>50,987</b> | <b>67,744</b> | <b>81,780</b> | <b>99,355</b> | <b>134,402</b> | <b>150,378</b> |

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).

Table 7.3.5 presents estimates of additional individual lifetime labor incomes gained due to investment in education by counting the differences in the lifetime labor income gaps between two consecutive educational levels. In many studies which apply lifetime labor income-based approach this technique was summoned to show the returns from investments made in order to proceed to the next education-earning profile.

**Tab. 7.3.5 – Returns on human capital due to investment in education, in %, deflated for 2008**

|                             | <i>Urban population</i> |      |      |      |      |      |
|-----------------------------|-------------------------|------|------|------|------|------|
|                             | 2003                    | 2004 | 2005 | 2006 | 2007 | 2008 |
| Higher education            | 7.4                     | 7.7  | 7.3  | 6.8  | 8.4  | 8.8  |
| Unfinished higher education | 31.5                    | 31.3 | 31.6 | 31.1 | 30.2 | 30.6 |
| Vocational education        | 42.9                    | 42.6 | 42.9 | 42.7 | 42.8 | 42.4 |
|                             | <i>Rural population</i> |      |      |      |      |      |
|                             | 2003                    | 2004 | 2005 | 2006 | 2007 | 2008 |
| Higher education            | 7.4                     | 6.5  | 6.8  | 6.6  | 8.3  | 7.6  |
| Unfinished higher education | 31.4                    | 31.4 | 31.5 | 31.5 | 30.7 | 30.6 |
| Vocational education        | 42.7                    | 42.6 | 42.5 | 42.1 | 42.0 | 42.2 |

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).

Note: Based on the table 7.3.1

We present in Table 7.3.5 values of returns in relative numbers because we think they help to notice the actual patterns of human capital augmentation. For example, in 2003 urban unqualified workers who upgraded their education-earning profile to “vocational education” profile have met 42.9% of increase in their individual lifetime labor income, while in the same year urban workers with

incomplete higher education who managed to become the workers with higher education could enjoy only 7.4% growth in their lifetime labor income. Returns in absolute numbers presented in Appendix Table A22.

We have divided the obtained lifetime labor income (considering income growth and discount rates, changes in income in higher educational profile to which worker had a probability to transit) to the average length of working life in the cohort, and obtained the average value of income that the worker is expected to earn for one period (month). We call this earnings – *expected mensal labor income*. The difference between the expected mensal labor income and real monthly wage observed (data on mensal salaries from Statistical Agency of Kazakhstan 2003–2008) for the worker in that cohort shows the probable augmentation in monthly income due to favorable working conditions, income growth and discount rates, changes in earning profile due to obtained education. Again we present these differences in relative numbers in Table 7.3.6, while Appendix Table A23 shows them in absolute numbers.

**Tab. 7.3.6 – Differences between expected mensal labor income and average mensal salary, by worker's educational level, in %, deflated for 2008**

|                             | <i>Urban population</i> |      |      |      |      |      |
|-----------------------------|-------------------------|------|------|------|------|------|
|                             | 2003                    | 2004 | 2005 | 2006 | 2007 | 2008 |
| Higher education            | 10.1                    | 18.1 | 18.2 | 19.5 | 21.0 | 21.2 |
| Unfinished higher education | 48.4                    | 54.0 | 52.9 | 55.2 | 64.2 | 58.7 |
| Vocational education        | 16.4                    | 23.1 | 21.7 | 22.9 | 17.5 | 18.3 |
| Unqualified                 | 44.8                    | 51.7 | 50.4 | 51.6 | 54.4 | 55.5 |
|                             | <i>Rural population</i> |      |      |      |      |      |
|                             | 2003                    | 2004 | 2005 | 2006 | 2007 | 2008 |
| Higher education            | 18.9                    | 26.0 | 26.2 | 27.6 | 26.0 | 25.4 |
| Unfinished higher education | 60.1                    | 66.1 | 64.0 | 66.2 | 71.1 | 66.0 |
| Vocational education        | 25.7                    | 32.7 | 30.6 | 31.2 | 22.0 | 23.9 |
| Unqualified                 | 56.6                    | 63.4 | 61.9 | 62.5 | 61.1 | 62.9 |

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).

We also have estimated two independent earning streams for each educational-earning profile. The first earning stream was calculated taking into account probable promotion of worker to the higher education-earning profile. We name it – “*investment-stream*” because it represents the earning stream which is influenced by probable additional lifetime labor income due to education and other favorable conditions in the labor market). The second stream was calculated without any educational changes for a worker. We name it – “*stable-stream*” because it represents the earning stream which is not influenced by probable additional lifetime labor income due to education and other favorable conditions in the labor market. The difference of these two labor income streams shows the positive change which was obtained due to additional study by the workers in Kazakhstan. The results of these estimations are presented in Appendix Table A24.

## 7.4 Decomposition of changes in human capital (2003–2008)

### 7.4.1 Introduction

The stock of human capital for Kazakhstan which we have estimated in this chapter is composed of the human capital of all education/age/urban-rural cohorts in the population. These compositional elements are subject to change; therefore, the total human capital stock is connected with several flow numbers which determine the value of human capital stock in the country. Hui Wei (2008) has developed the framework of these relations between stocks and flows of human capital reproduction. He writes: “at an individual level, the growth of human capital takes various forms, such as parenting, formal education, on-the-job training and informal learning. At the aggregate level, the stock of human capital also depends on demographic changes such as birth and net migration. In order to provide a full account of the growth of human capital, it is necessary to establish an integrated stock-flow accounting system in which changes in the stock of human capital can be fully explained by investment and other flows in human capital.”

The human capital flow accounts allow decomposition of change in the net worth of human wealth between the beginning and the end of the accounting period due to demographic changes including migration and enhanced productive capacity (investment in education and on-the-job investment). Since the education and migration are the key determinants of human capital resource, the accuracy of our flow measures of human capital largely depends on data availability and its quality on education and migration. The sum of investment in education and training, new members of the working-age population and net migration form the *gross human capital* formation.

In this section we use the accounting framework to estimate formation and changes in human capital stock over the period 2003–2008, in order to estimate the scales of human capital reproduction and associated flows. The current stock of human capital can be expressed as (7.4.1):

$$\sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^y \times H_{x,r,e}^y$$

and the corresponding stock in a past period (7.4.2):

$$\sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^{y-n} \times H_{x,r,e}^{y-n}$$

where:

- $P$  – size of cohort;
- $H$  – individual human capital (lifetime labor income);
- $y$  – current period;
- $y-n$  – past period.
- $x$  – age-group;
- $r$  – place of residence (1 – urban, 2 – rural);
- $e$  – education level (1 – unqualified, 2 – vocational, 3 – unfinished higher, 4 – higher);

The change in the human capital stock between year  $y-n$  and year  $y$  is (7.4.3):

$$\sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^y \times H_{x,r,e}^y - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^{y-n} \times H_{x,r,e}^{y-n}$$

The population growth and increments in lifetime labor incomes due to investment in formal education result in human capital augmentation. The changes in lifetime labor incomes over time for each age/residence/education groups represent the *revaluation* on human capital while the ageing, deaths and emigration cause the *depreciation* on human capital. According to Hui Wei the *net human capital formation* derived from the difference between the gross human capital formation and depreciation on human capital. The sum of human capital formation, net of human capital depreciation and revaluation reflects the changes in human capital stock during the study period.

Further the changes can be specified by age-groups of interest (7.4.4):

$$\begin{aligned} & \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^{2008} \times H_{x,r,e}^{2008} - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} \\ &= \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{19} P_{x,r,e}^{2008} \times H_{x,r,e}^{2008} + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=20}^{64} P_{x,r,e}^{2008} \times H_{x,r,e}^{2008} \\ & - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=60}^{64} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} \end{aligned}$$

The first term on the right-hand side of the equation represents the newcomers into the labor market (in ages 15-19), while the second and third term indicate the human capital ‘transferred’ from the previous to the next period, i.e. over-time changes in human capital stock for the same residence/education cohorts. Fourth term represents those people (in ages 60-64) in previous period who retired from the labor market in current period.

Note that (7.4.5):

$$\sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=20}^{64} P_{x,r,e}^{2008} = \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x+5,r,e}^{2008} = \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} + P_{x+5,r,e}^{2008} - P_{x,r,e}^{2003}$$

Consequently considering (7.4.4) and (7.4.5) we come to (7.4.6):

$$\sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=20}^{64} P_{x,r,e}^{2008} \times H_{x,r,e}^{2008} - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} =$$



$$\begin{aligned}
&= \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} (P_{x,r,e}^{2003} + P_{x+5,r,e}^{2008} - P_{x,r,e}^{2003}) \times H_{x+5,r,e}^{2008} \\
&- \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times H_{x,r,e}^{2008} + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times H_{x,r,e}^{2008} \\
&- \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} = \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times (H_{x+5,r,e}^{2008} - H_{x,r,e}^{2008}) \\
&+ \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times (H_{x,r,e}^{2008} - H_{x,r,e}^{2003}) + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} (P_{x+5,r,e}^{2008} - P_{x,r,e}^{2003}) \times H_{x+5,r,e}^{2008}
\end{aligned}$$

#### 7.4.2 Depreciation

The decreases in lifetime labor incomes for the same cohorts through different age periods represent the depreciation on human capital. The difference  $H_{x+5,r,e}^{2008} - H_{x,r,e}^{2008}$  reflects the depreciation in human capital. As people get older they have a shorter lifetime labor income period, hence their human capital depreciates. Human capital depreciates too, like any other type of assets produced or acquired. Any type of capital has a normal working life and is subject to deterioration and obsolescence. In the case of human capital, skills may become trite and knowledge may be forgotten. Due to the progress of the knowledge-based economy acceleration, human skills may also become obsolete. Since in economic theory the value of an asset is equal to the present value of its future earnings, the economic depreciation of human capital refers to decline in the remaining earnings and its net present value due to ageing of asset, all else remaining equal. The net effect on human capital of ageing heavily depends on such parameters as gender/education/age and other characteristics.

Obviously, the individuals' lifetime labor incomes (human capital) vary with age. As one becomes one year older, there is one less year available for generating incomes in the labor market, therefore the human capital depreciates over time, however, at the same time, due to possible additional investments in on-the-job training which is also closely related to age, one year older may mean more investment in human capital. Therefore, the depreciation can be positive in case the effect of experience on a worker's earnings prospects is large enough to outweigh the effect of ageing. Apparently, only by the end of individual's working life one can ultimately judge the depreciation of human capital embodied in this person.

#### 7.4.3 Revaluation

The term  $H_{x,r,e}^{2008} - H_{x,r,e}^{2003}$  represents the revaluation of human capital. Revaluation refers to the fact that certain cohorts have earnings, employment and mortality rates that are different from their

counterparts in the past period, thus the value of their human capital would be different. Since mortality rates change little, revaluation of human capital mainly captures changes in labor market conditions. Human capital can augment through regular use and working experience. The changes in the quality of human capital over time can be observed by quantifying changes in lifetime labor incomes from period to period for individuals with a given gender/education/age/residence characteristics. These changes can affect demand and supply for various levels of skilled workers and therefore their wage and salary growth rates.

#### 7.4.4 Changes in population composition

$P_{x+5,r,e}^{2008}$  differs from  $P_{x,r,e}^{2003}$  because during the period 2003–2008 people immigrated, emigrated, died, or improved their qualification. So (7.4.7):

$$\begin{aligned} & \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} (P_{x+5,r,e}^{2008} - P_{x,r,e}^{2003}) \times H_{x+5,r,e}^{2008} \\ &= \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} (I_{x,r,e}^{2003-2008} - E_{x,r,e}^{2003-2008} - D_{x,r,e}^{2003-2008}) \times H_{x+5,r,e}^{2008} \\ &+ \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} \{ - (J_{x,r,e_1-e_2}^{2003-2008} + J_{x,r,e_1-e_3}^{2003-2008}) \times H_{x+5,r,e_1}^{2008} + (J_{x,r,e_1-e_2}^{2003-2008} - J_{x,r,e_2-e_3}^{2003-2008}) \times H_{x+5,r,e_2}^{2008} \\ &+ (J_{x,r,e_1-e_3}^{2003-2008} + J_{x,r,e_2-e_3}^{2003-2008} - J_{x,r,e_3-e_4}^{2003-2008}) \times H_{x+5,r,e_3}^{2008} + J_{x,r,e_3-e_4}^{2003-2008} \times H_{x+5,r,e_4}^{2008} \} \end{aligned}$$

where  $I_{x,r,e}^{2003-2008}$ ,  $E_{x,r,e}^{2003-2008}$ , and  $D_{x,r,e}^{2003-2008}$  are respectively the numbers of people aged  $x$  in 2003 who have immigrated, emigrated or died and  $J_{x,r,(e_i-e_j)}^{2003-2008}$  the number of people who have upgraded their education profile before year 2008.

The number of persons in each cohort at the end of accounting period is equal to the sum of persons at the beginning of accounting period, plus number of persons who transferred in from lower educational groups due to additional schooling activities, minus number of persons who transferred out to higher educational groups, plus immigrants and minus number of emigrants and those who died.

In reality, as empirical observations for those who immigrated, emigrated or who have upgraded their education profile are rarely available, it is the great challenge to extrapolate figures for demographic changes. Thus, the sum of separately estimated flow components may not be exactly equal to the actual changes in the human capital stock during the accounting period. Therefore, Wei (2008) argues that a residual element could be inevitable for decomposition analysis.

Given (7.4.5) – (7.4.7), the (7.4.4) can be rewritten as (7.4.8):

$$\begin{aligned}
& \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^{2008} \times H_{x,r,e}^{2008} - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{64} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} = \\
& = \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{19} P_{x,r,e}^{2008} \times H_{x,r,e}^{2008} - \tag{1} \\
& - \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=60}^{64} P_{x,r,e}^{2003} \times H_{x,r,e}^{2003} + \tag{2} \\
& + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times (H_{x+5,r,e}^{2008} - H_{x,r,e}^{2008}) + \tag{3} \\
& + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} P_{x,r,e}^{2003} \times (H_{x,r,e}^{2008} - H_{x,r,e}^{2003}) + \tag{4} \\
& + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} (I_{x+5,r,e}^{2008} - E_{x,r,e}^{2003} - D_{x,r,e}^{2003}) \times H_{x+5,r,e}^{2008} + \tag{5} \\
& + \sum_{r=1}^2 \sum_{e=1}^4 \sum_{x=15}^{59} \{ - (J_{x,r,e_1-e_2}^{2003-2008} + J_{x,r,e_1-e_3}^{2003-2008}) \times H_{x+5,r,e_1}^{2008} + (J_{x,r,e_1-e_2}^{2003-2008} - J_{x,r,e_2-e_3}^{2003-2008}) \\
& \times H_{x+5,r,e_2}^{2008} + (J_{x,r,e_1-e_3}^{2003-2008} + J_{x,r,e_2-e_3}^{2003-2008} - J_{x,r,e_3-e_4}^{2003-2008}) \\
& \times H_{x+5,r,e_3}^{2008} + J_{x,r,e_3-e_4}^{2003-2008} \times H_{x+5,r,e_4}^{2008} \} \tag{6}
\end{aligned}$$

Hence, this final formula of decomposition allows measuring the net additions to human capital stock for working-age population and the changes in human capital stock during any accounting period into following elements:

- new workers joining the labor force 1
- retired workers 2
- depreciation 3
- revaluation 4
- changes in population composition (investment in education, net migration, etc) 5, 6

### 7.4.5 Results

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 7.4.1.

**Tab. 7.4.1 – Decomposing human capital stock change to the components, by place of residence, 2003–2008, Kazakhstan, in USD billions, deflated for 2008**

| Elements of change                               | 2003–2008    | Share         |
|--|--------------|---------------|
| <b>Total population</b>                          |              |               |
| 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%          |
| <b>Total stock changes in human capital</b>      | <b>817.8</b> | <b>100.0%</b> |
| <b>Urban population</b>                          |              |               |
| 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%          |
| <b>Total stock changes in human capital</b>      | <b>529.9</b> | <b>100.0%</b> |
| <b>Rural population</b>                          |              |               |
| 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%         |
| <b>Total stock changes in human capital</b>      | <b>288.0</b> | <b>100.0%</b> |

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).

The detailed decomposition results on human capital change during the period 2003–2008 according to place of residence, age, educational level are available in Appendix Figures and Tables. See in Appendix Figures from A19 to A24, as well as Appendix Table A25.

## **7.6 Summary on main findings and discussion of the method**

This chapter was intended to serve for four practical purposes:

1. To show the feasibility of applying the lifetime labor income-based approach to measuring human capital stock by using available data for Kazakhstan.
2. To expound and document detailed implementation methodologies employed for the estimations of human capital in Kazakhstan, which will be applied for other years in future studies as well.
3. To present a snapshot of human capital stock for Kazakhstan during the period 2003–2008. By reporting comprehensive information such as employment rates, annual income and lifetime labor income, formal education enrolment rates and education transition probabilities etc. distributed by age-groups, place of residence and educational attainment, as well as general info on survival, discounting and real income growth.
4. To decompose the components of aggregate human capital stock by establishing an integrated stock-flow accounting system for human capital, where changes in human capital stock can be allocated among the human capital flows for each year.

Moreover, we aim to detect the compositional change of human capital stock according to demographic and non-demographic components. The detailed composition pattern of the human capital stock may improve our understanding of the human capital stock and its components. The objective of this chapter was to find the factors behind the evolution of the human capital in Kazakhstan during the study period. Decomposition to human capital change components allow us to see where we should make improvements. For example when human capital growth in the form of newcomers into the labor market and net migration slowed down, the key issue for sustainable development of human capital can be investment in education and training.

Obviously, the human capital stock has increased in Kazakhstan during the observed period 2003–2008. The close look at compositional change in population characteristics show that the number of educated people has increased during the observation period. However, we have been interested in the market value of human capital in Kazakhstan.

Rural workers of Kazakhstan had more favorable conditions for development of their human capital. Compared to values in 2003, rural workers with higher education could accumulate 4.7 times higher human capital by 2008, while rural workers with unfinished higher education accumulated 4 times more human capital during the same period. The least human capital augmentation in relative terms was observed among the urban unqualified workers, only 2.2 times increase. These results show how the value of aggregate human capital depends on demographic characteristics of specific cohort (education-earning profile). As for individual human capital (individual lifetime labor income of a worker) according to education we have observed that the changes did not vary much. All urban workers had 2.8 times increase of their individual human capital, while rural workers increased their individual human capital up to 2.9 times (See Tables 7.3.1 and 7.3.2, as well as Appendix Table A20).

The returns on human capital due to investment in education have interesting patterns for urban and rural workers in Kazakhstan. Additions in human capital value due to educational upgrade for urban workers have the clear regularity for the whole period: the value of return decreases with transformation levels, i.e. it seems that the workers face less and less augmentation with the next higher educational level; however this is true when we compare returns in relative numbers. These patterns are different in absolute numbers (See Table 7.3.5 and Appendix Table A22).

It is notable that workers with unfinished higher education and unqualified workers expected to enjoy larger monthly income difference between fixed salary for their prescribed education-earning profile in the country and their expected human capital during their lifetime labor activities compared to the workers with vocational and higher education (See Appendix Table A24).

The share of education-earning profile in total number of workers in Kazakhstan and the share of their human capital in total human capital stock are not the same, since various labor market conditions are influencing human capital stock in education-earning profiles. The interplays of changes between labor market conditions and demographic components (in this case working-age population size according to education) in certain education-earning profiles and their share in total human capital stock are presented in Appendix Figure A25.

In our estimations we made few modifications designed to be more consistent with the data on Kazakhstan and suitable for circumstances in the country. As this measurement framework is based on a number of controversial assumptions, the limitations of its estimates are obvious. First, this measuring approach treats the differences in the existing wage structure as reflecting the different amounts of human capital invested through education and training. In the institutional settings of Kazakhstan, this assumption could be questioned. As the estimates of human capital stock presented in this chapter are confined to market activities only, the full value of human capital embodied in the whole population is obviously underestimated. In spite of these reservations, this approach does draw attention to the issue of systematic measurement of human capital, with a pertinent policy implication.

One should be very careful not to use the results of this approach uncritically. It is important to state that, although we attempt in our measuring approach to be relatively comprehensive, its collection of statistics is not complete. Space and resource considerations have necessitated a degree of selection from the available information. This was done on the basis of covering the breadth of publicly available data sources often with the use of higher level summary statistics. In this respect, the issue of appropriate general statistics for Kazakhstan arises very urgent.

There are big differences between distribution of workers according to types of economic activity and industry in Kazakhstan by place of residence, educational level, wages, employment, labor-force participation. The assumption of all-encompassing and universal wages level, employment intensity, educational composition and probability of involving in further education, survival probabilities, returns, age-gender-education-residence distribution and so on, heavily understate some and overstate other aspects of real situation in labor market of Kazakhstan. Nonetheless we believe that the general average numbers existing in the statistics of Kazakhstan

came from the reality and they anyhow in the best way suit the aggregating assumption inherited in the measuring approach. Unfortunately, we could not solve several limitations caused by data un-availability. For example, the wages in some regions surpass the Almaty and Astana (these two cities are well over the average level), while some regions lag far behind. The deviation is considerable and wages are not specified by gender for urban and rural population separately. Obviously, the educational enrolment intensities as well as education transition probabilities are not constant and vary with gender, urban-rural residence of an individual, again there is no data which allow us to specify education enrolment rates according to the gender and place of residence.

We think that the best way to resolve these mentioned limitations is to provide deliberate data for the estimations. The alternative approaches such as modeling and imputations of needed data, we suppose, could be biased anyway. So, the issue of data limitations led us to the opening a question of specific data availability for human capital estimation which exists in Kazakhstan today, unfortunately. We hope that this study has also contributed to the issues of data collection techniques elaboration and methodologies for further data collection.

We are going to apply the lifetime labor income-based approach to further evaluations of human capital stock in Kazakhstan for other years. We think that this will lay a ground for further analysis on the evolution of human capital in Kazakhstan across years paying special attention to demographic components, decomposing main components in human capital reproduction, based on which a full account of human capital along with physical account in national accounting systems may be constructed, which facilitates the possibility of international comparison of the human capital of Kazakhstan in the future.

## **Chapter 8**

### **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.

Demography has its one of the most powerful tools – the life table. Although life table was initially created to measure the patterns of mortality in the population, various scientists have used life table in various studies. For example, the life table is employed in healthcare, economics, business, logistics and many other studies of longevity, fertility, migration, population change and in making projections of population size and characteristics and in studies of widowhood, orphanhood, length of married life, length of working life, and length of disability free life. Traditionally there are two main approaches in constructing life tables: *prevalence-based* approach (cross-sectional data) and *incidence-based* approach (flow data). The best known versions of these models are the prevalence based Sullivan method and the incidence based multi-state method.

We think that the life table as a tool and concept can be used in the study of the labor force dynamics and human capital. In labor economics, the prevalence-based approach is applied to show the share of those employed and people belonging to the labor force, i.e. labor market resource information, at a given time. This approach also describes the average life span in light of mortality data and structural data on population health conditions or labor market participation within an existing population. By contrast, the incidence-based method uses the probability of transition from one labor market status to another, e.g. transitions into the labor force or transitions out of the labor force. The approach shows how the various phases of life are distributed in the average life span. All of the calculations concern the number of expected years of life at age 15. In the case that all



transition rates would stay constant over a long period of time the results of the two methods would be the same.

Apart from these two approaches there are two basic techniques on elaborations of working life expectancy: *population based measure* (expectation of active life) and *labor-force based measure* (average remaining number of years of active life). This measure assumes that all people in working-age population (active and inactive) have an equal probability of participating in the labor force. The two measures serve different purposes. The population based measure in better manner describes the working life expectancy of the population regardless of his/her current labor-force status, while the labor-force based measure is appropriate in capturing of the remaining years of work of a currently active working-age population.

The working life tables can help make assessment of future trends of labor force more accurately. Also, these tables allow calculations of rates of accession to and separation from labor market, as well as the ratio of replacement in the labor market. Thus, the working life tables can provide very useful information for manpower planners and policy makers in planning for labor force replacement and designing appropriate policies for retirement.

The first working life tables were designed in the late 1940's, however, few studies so far have analyzed the interplay between family life and labor market interactions and work life expectancy. Millimet et al. (2008) convinced that human capital is closely related to the family background, to the impact of children and marriage on labor supply, housework, and earnings.

Millimet et al. (2008) provided the unique method of constructing working life table to measure the working life expectancies by gender, age, education, race, marital and parental status, conditional on current labor force status. According to authors these detailed results enable one to obtain much more precise measures of the stock of human capital. In order to estimate work life expectancies, authors calculated transitional (or conditional) probabilities using a multinomial logit framework conditional on initial labor force status.

Generally, all the "expectancies" (life expectancy, health expectancy, working life expectancy etc.) are the tempo indicators. The tempo effect or calendar of event is the time when certain event is going to happen. This tempo indicator can be multiplied by stock number (for example, population size). Such technique was introduced and employed in potential demography, when the number of expected years of life for particular cohort was multiplied by the number people in that cohort. The product was called the potential of the population (in terms of surviving potential) or demographic potential. Doing the same procedure with working life expectancy we presume to derive some sort of working (labor) potential of a population or total working capacity of the population (also specified by groups as long as data is available). We think the product (the total numbers of years expected by entire working age population to be in labor market) in this case can report a special feature and dimension of human capital in a society.

Although working life table can be useful in many circumstances, it should never be thoughtlessly applied<sup>16</sup>. It is not widely accepted in the scientific disciplines to treat working life expectancy and population working potential (labor potential) as a proxy for human capital. We have to note that the working life tables are mostly the labor-based approach in measuring human capital. This method mostly measures the working potential and/or labor potential of a society. The working life expectancy is the indicator of national human capital (labor capital), it is not appropriate to measure human capital at individual level.

Even though, the working life tables do not account for market value of labor potential and sometimes do not regard (especially in early versions) education and cost issues, we hope that further works in related field will incorporate these issues. Working life tables give one valuable piece of information – the tempo indicator of labor potential. Today when issues of ageing are becoming very urgent working life tables can supplement valuable info to human capital studies. The information: how early an individual is entering the labor market and how long s/he remains in it; is the useful information. Moreover, after reviewing a set of different approaches to measuring human we have realized that working life table is comprehensible and agreeable tool to assess the dimension of human capital in the country. Certainly, a considerable amount of work should be done before to start to employ this method fully to describe the human capital stock.

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.

In Appendix Figures A26–A28 we present working life expectancies for workers in Kazakhstan according to gender and place of residence.

---

<sup>16</sup> Bongaarts and Feeney (2003) discussed the biases of tempo indicator occurring in mortality. Feeney has demonstrated, using an artificial example, that cohort changes in the death distribution within an age interval can distort the period death rate for the age interval, where all deaths occur only at one point in the age range and the point shifts linearly among cohorts. Other shortcomings of life expectancy have been discussed in subchapter 6.5. page 140.

## **Chapter 9**

### **Conclusion**

#### **9.1 Discussion on demographic components of human capital reproduction in Kazakhstan**

In order to answer the questions: 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? First of all we have to define what the human capital is. The definition of human capital is needed not for making our conclusion more meaningful, academically rich, scientific or attractive. In fact, many authors do understand human capital differently, hence on the basis of these differences they are differently approaching the measurement issues of human capital. In this work we define and measure human capital in Kazakhstan according to three main approaches: education-based, lifetime labor income-based and demographic approach.

Kazakhstan is comparatively huge country with considerable regional diversity in terms of living, working, consuming and developing conditions. Any researcher dealing with certain phenomena in the whole Kazakhstan has to pay a special attention to the regional peculiarities of development in the country. Unfortunately, there is no deliberate data on regional level which promote the implementation of this venture. We have only the aggregate data on urban and rural populations at hand for our calculations and analysis for Kazakhstan. So we have estimated human capital, in aggregate form, for urban and rural Kazakhstan. However, we would like to stress that one must be generally aware about regional differences in Kazakhstan during the estimations as well as the interpretations of results.

The demographic components of human capital create the base of long term trends in human capital formation, accumulation and reproduction. This base is inherent in almost all human capital measurement approaches and methods (education-based, cost-based, income-based etc.). Thus, the demographic components unite all measurement approaches and methods. Whereas demographic

components explain the basis of human capital reproduction, there exist other temporal factors as labor market conditions, socio-economic conditions, political situation, etc., which also instantly influence and determine the human capital formation, accumulation and reproduction process. Therefore, we suppose that the human capital in particular country can be described as human capital potential (long term factors, basically demographic) and human capital level (or quality, basically affected by other temporal socio-economic, political and other factors).

According to all results obtained from various measurement approaches the human capital in Kazakhstan has risen. However, the uneven distribution of human capital and income inequality are more dangerous than just raise or decline in human capital stock. Simple raising the average human capital in the country without changing its distribution can be useless in terms of social policy issues, issues of sustainable development, economic growth and human development. Therefore the demographic approach can help to answer the question how national human capital stock is distributed among the population or what is its demographic structure. There is a question of different approach to this issue if one considers gaps in the individual human capital accumulation between urban and rural workers of Kazakhstan only in absolute terms s/he will notice that gap gain in breadth, however in relative numbers one can observe that this difference remained almost unchanged and fall in pretty narrow range from 69.1% to 73.0%. Similar trend is attributable to aggregate country human capital stock, i.e. in absolute terms we observe widening gap, however in relative terms the gap definitely has narrowed by the end of observation period. Another pattern which deserves attention is the slope of the gap. It is observed the higher the educational level the higher the intensity of individual human capital change, while in aggregate country human capital stock the intensities of changes are also defined by intensities of changes in working-age population size according to education. These trends were observed due to specification of human capital reproduction according to demographic components (See Tables 7.3.1 and 7.3.2).

Our main aim in this work was to observe the role of demographic components in human capital reproduction during mentioned period. Decomposition method of human capital change tried to capture the influence of population composition on human capital reproduction in Kazakhstan. The matter of population growth affected the final value of human capital stock, as well as educational achievements by the working-age population. As for the age structure or the influence of retirement on the human capital reproduction we have to note that the people who left labor market in Kazakhstan during study period could not influence much the human capital reproduction, while the newcomers into the labor market made a considerable impact. This can suggest that the demographic situation have positively influenced the human capital reproduction in Kazakhstan. We have observed a number of works on the basis of data for developed countries measuring human capital by lifetime labor income-based approach, the general trend in most of these countries that the ageing has adversely affected human capital stock in the countries.

We can ascertain according to the evaluated results that demographic components played significant role in human capital reproduction of Kazakhstan. In order to observe the impact of specific population groups on human capital reproduction in the country one need the detailed

decomposition according to educational level, place of residence, gender, age, per capita human capital development for different categories of population. The reproduction and accumulation of human capital depends on various factors, and in order to understand all variety of factors and to derive the role of demographic factors among them we have set the aim within this work to examine the main factors influencing human capital reproduction. According to lifetime labor income-based approach the income growth rates and discount rates play a very important role along with demographic composition of labor force. As it is seen in the sensitivity analysis the value of human capital stock according to the lifetime labor income is highly dependent on the values of income growth and discount rates applied in the measuring approach, i.e. we found that the level of human capital estimates is sensitive to the choice of the expected future income growth and the discount rate used to discount the future income<sup>17</sup>.

The implementation of demographic approach to human capital measurement in Kazakhstan has revealed following regularities in human capital stock change during the observation period:

- The decomposition to certain components in human capital change in 5 years from 2003 to 2008 indicates that the significance of revaluation is most notable. In this human capital revaluation component the workers with vocational education of Kazakhstan have made the highest contribution, however these workers had also the highest level of depreciation, which have resulted in final total human capital changes (See Appendix Table A25).
- Interestingly, the net human capital formation of urban unqualified workers and workers with vocational education had a negative value. This negative value of urban workers formed the total all-country negative value for unqualified workers and workers with vocational education (See Appendix Table A25). These results suggest where the government should direct its investments in order to increase human capital effectively.
- In general the workers with higher education benefited more from new members of labor market, nevertheless in rural area new “unqualified” workers contributed more to human capital stock change among the workers of all education-earning profiles in rural Kazakhstan (See Appendix Table A25).
- In absolute terms urban workers accumulated more human capital than rural workers. Only rural unqualified workers had larger share in total human capital stock with comparison to their urban colleagues (See Table 7.3.2 Appendix Table A20).
- As for the gross human capital formation, the workers with higher education have the highest share. The highest retirement effect was noticed among workers with vocational education (See Appendix Table A25).
- The net human capital formation was high among workers with higher education both for urban and rural areas (See Appendix Table A25).

---

<sup>17</sup> See page 164

## **9.2 Discussion on demographic approach to human capital measurement in Kazakhstan**

Human capital can not be developed in isolation. Rather, it is influenced by the interaction of complex demographic, socio-economic and political factors. The basis of human capital is people. Therefore, the key factor that influences the character and the size of a country's human capital stock is demographic. The attainable level of human capital stock can be promoted or limited fundamentally by population. In addition, the characteristics of population (for example, its age profile) have a large influence on the potential stock of human capital – both for today and in the future. Following this consideration we tried to measure the human capital in Kazakhstan in this work, paying special attention to the demographic factors. Investigating the main approaches to human capital measurement we have implemented the evaluation of human capital for Kazakhstan by education-based approach and lifetime labor income-based approach.

We saw in previous chapters how ideas, concepts and theories concerning population quality and human capital have developed, what are the types, structure and components of human capital, what are the factors which form human capital and what kind of cycles determine human capital reproduction. We suggest every researcher dealing with human capital paying a special attention to issues of population reproduction. Herewith the population studies can act as a corner stone of researches devoted to human capital.

The human capital studies emphasize the role of population studies. Therefore, we consider the demographic history of Kazakhstan discussing the specific trends pertinent to particular historical periods in Kazakhstan, which have affected the modern population reproduction in the country. The special attention was paid to peculiarities of regional development in Kazakhstan. Afterwards, we tried to develop the demographic approach to measuring human capital in a particular country, reviewing well-known approaches, methods of human capital measurement, applying some of them for the case of Kazakhstan.

Review of the human capital measurement methods is an amusing investigation. We come to conclusion that many authors do understand human capital in very different ways. As we have seen there is a plenty of different measurement approaches and methods. However, most of them are based on economic assumptions and economic knowledge. One has to be very familiar with economic laws and concepts to successfully deal with all these methods. It is a very interesting and very endless task to find for all encompassing and concrete model to measure human capital which can satisfy broad area of studies and research questions. Indeed, all the different methods of measurement can show practically the same results if perfect economical conditions are existing.

However, there raises the question, not only of the approach to measuring human capital itself, but also of the adequacy of statistical data relating to human and national wealth. There is therefore a considerable need for statistics to review its programs of development in these areas in light of the growing research interest in the links between human capital formation and income generation, human capital reproduction and productivity growth, economic growth. Practically, the official

statistical agencies do not include human capital in their capital stock measures, this situation underpin the need for development of accurate human capital measures in any country. Despite the fact, that historically the monetary estimates of human capital were originated before the development of national statistical accounts. Unfortunately, the statistics of Kazakhstan can not brag about being perfect during its history, its relevance and limitations was discussed in previous chapters. Despite these difficulties, it is essential for us to provide empirical measures for assisting and encouraging the analysis of the role of demographic components in human capital reproduction. Therefore, this dissertation attempts to meet this challenge. It is hoped that some of the methods and results developed here will also be applicable to the other studies in future. The growing interest in links between human capital, future incomes and economic growth, is definitely expected to continue to grow. The situation with the socio-economic, political and demographic processes to date in Kazakhstan leaves a big implication on the conclusions about population quality and human capital in the country.

During studying main factors of human capital formation and reproduction, inevitably, one can come to conclusion that the real level and character of human capital development, notwithstanding all mentioned theoretical issues, are highly dependent on political situation and political decisions in a country. We clearly realize that mixing of politics with science is not always good approach. However, we have to allude that in fact the human capital reproduction is strongly dependent on policy and political decisions. All the theories and recommendations, researches and discoveries concerning this topic will not release from the frames of discussions, papers and publications without setting the issues of policy. If we really want to prosper human capital development, we have to address issues of human capital reproduction to politicians and political decision makers.

In addition, we think that it is hardly possible to derive the final real beneficial value of human capital in the country. All the estimations of human capital are only the evaluation of possible potential and value of human factors in the productivity. Since human factors affect and are affected by other factor at the same time, it is very difficult to exactly calculate the real value of human capital and say with certainty that human has this particular amount or level of value at certain time. All the estimations are only “*exact approximations*” of human capital and human factor in the production, development and growth. In fact, to answer the question what is the real level of the human capital and what are the real factors which determine its level and dimensions, a considerable amount of variables should be incorporated in one model or maybe the human capital can not be estimated by a single model. Most likely the multi-approached model will be needed. Moreover, human capital influences, changes and develops not only an earning behavior and earning structure, but also a consumption behavior and consumption structure. Therefore the consumption can also brings the benefit for an individual and can be considered as a factor of human capital accumulation and used in human capital measurement models. Furthermore, since the level of human capital obtained can vary from human to human, even in the case of similar volume of investments in each, similar earning profile for each, etc., here we have to acknowledge the importance of conditions as another source of human capital accumulation. The conditions

determine significantly the character of final accumulation of human capital as well. We would like to suggest taking into consideration the condition varieties and condition studies, during human capital measurement.

Obviously, the idea of human capital is not just a simple description of population abilities to reproduce needed labor qualities for development. The idea of human capital represents the form of complex human interaction of every member of society with social environment. If one has set the aim to compare human capital across countries, especially those values which were calculated by different authors, one will definitely face the issue of multi-assumptions. Apparently, every single country and each situation requires its specific assumptions, which are true only for this country-specific situation, and which should be considered in order to approach the accuracy. However this is very sophisticated approach, where a researcher is at a risk of mixing various comprehensions of country-specific realities behind these assumptions. On the other hand not to account for these specific assumptions is also direct way at least to simplifications. Therefore, we assume that researchers of human capital will always assume some specific considerations, though, unfortunately several assumptions in first conditions (country, time) do not necessarily applicable in the second conditions (country, time). This will lead to biases in comparing different calculations for different countries made by different authors, according to different assumptions. Even the universal assumptions in measuring human capital for different countries will still lead to biases, just because, it is very simplifying to take one assumption for all countries and conditions. Since human capital is very specific entity which represents relationship between people, even though the majority of relations are universal across societies, there will be still some issues which are specific for the types of relations in that society. So, whenever we are comparing different countries by human capital we have to keep in mind that these figures represent some conditional phenomena, and the picture which is true somewhere around these figures. One has to develop a special skill of interpretation and comprehension to look at the results of such measurements with taking into consideration these types of peculiarities in human capital calculations, i.e. develop the skill to be able to abstract in reality, and concretize in abstractions at the same time.

From the beginning of the research we tried to get to know the approaches which in the most successful manner represent the demographical components of human capital formation, reproduction, accumulation, circulation and estimation. Generally, human capital can be (or should be) comprehended as a dynamical (non-static) form of capital. It is considerably difficult and not always correct to measure the human capital in the particular momentum. Preliminary we suggest treating human capital level as the longitude indicator rather than cross sectional (sections here mean series of moments at which human implements its economical activity). Since the human capital (costs spent, earning streams expected, skills gained, knowledge obtained, productivity showed and conditions enjoyed) reproduction process continues certain life span of a human, we are convinced that demographic tools can enrich the human capital reproduction studies. The longitude approach can catch diverse characteristics of human capital. Even the human capital considered being a stock number, we believe that it represents the flow phenomena, and treating or applying



the flow-numbers measurement approach from demography can also reveal several aspects of human capital development. There are many demographic tools and methods which in general can help to observe the growth rates, compositional and structural changes, calendar/intensity, tempo/quantum, etc. indicators of human capital.

We fully realize that the concepts as population quality and human capital are not substitutes for the set of characteristics of demographic processes, but it is a focus on the unity of these characteristics as mutually complementary elements of population reproduction, explaining their conditions and patterns of change. Certainly, the phenomenon of qualitative characteristics of population can not be expressed only by one measure and one notion or by a single idea, and today the issue of forming a clear system of indicators becomes utterly urgent for adequate scientific reflection of the population quality phenomenon.

Human capital studies expresses the certain level of the cognition of population, the certain level of knowledge about population, which enables us to allocate population among the many other objects of study and differentiate the various types of population. The “population quality” and human capital as a scientific category describes the processes of population reproduction in specific historical conditions, fixes the correspondence of population and the surrounding environment, indicates the causes of changes in population under the influence of transformation of socio-economic, climatic, techno-economic, socio-cultural and other factors. The population quality and human capital expresses and identifies the united characteristic which underlies the basis of population properties and their changes by reflecting different specificities of interaction of these properties. All this enables us to consider the “population quality” and human capital as a nodal category of general population theory, and its elaboration as a prerequisite for an integrated approach to the study of the population.

So, whether we like it or not, whether it makes difficulties for us or on contrary creates the space for endless scientific speculations, there is no direct measure of human capital today, “unfortunately”, and seems to prevail to be so. Instead of this desired direct measures we have plenty of proxy measures and system of various indirect indicators (*direct and indirect proxies; descriptive and explanatory proxies; simple and sophisticated proxies; original and estimated proxies, narrow-purpose and multifaceted proxies*). Traditionally all education based measures considered as proxies, while the cost-based, the income-based and other approaches tended to be treated as some sort of “imputed evaluations” of human capital, but we think, in fact, they seems to be other forms of proxies, which are mathematically manipulated and developed before being interpreted. In principle, human capital can not be directly measured, what one can measure are the indirect factors linked to the concept of human capital. Thus, we suppose that human capital will always be measured through such proxy measures and indicators since human capital in previous times was measured and valued by other factors and components which are not valued fully today. The new methods of human capital measurement will always be needed according to the actual time; hence the issues of human capital measurement will be always topical.

### 9.3 Concluding remarks

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 discipline 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.

## REFERENCES

- ABDAKAIMOV, A. (1994). *Istoriya Kazahstana*. Almaty: Respublikanskii izdatel'skii kabinet po uchebnoi i metodicheskoi literature.
- ABDUKARIMOV, S. and ZAKIROV, E. (2000). *Itogi perepisi naseleniya 1999 goda v Respublike Kazahstan: Naselenie Respubliki Kazahstan po urovnyu obrazovaniya*. Almaty: Agentstvo Respubliki Kazahstan po statistike.
- AHUJA, V. and FILMER, D. (1995). Educational attainment in developing countries: New estimates and projections disaggregated by gender. Washington D.C.: The World Bank. (Policy Research Working Paper 1489).
- ALAM, A. and BANERJI, A. (2000). Uzbekistan and Kazakhstan: A Tale of two transition paths. Washington D.C.: The World Bank. (Policy Research Working Paper WPS2472).
- ALACHKAR, A. and W.J. SEROW. (1988). The socioeconomic determinants of mortality: An International comparison. *Genus* 44(3–4): 131–151.
- ALEKSEENKO N.V. (1999). *Statisticheskie istochniki po demografii Kazahstana*. Ust Kamenogorsk: Shygys baspa.
- ALEKSEENKO N.V. and ALEKSEENKO A.N. (1999). *Naselenie Kazahstana za 100 let (1897–1997)*. Ust Kamenogorsk: Shygys baspa.
- ALEKSEENKO N.V. and ALEKSEENKO A.N. (2007). *Demograficheskie krizisy v Kazahstane*. Ust Kamenogorsk: Media Al'yans.
- ARABSHEIBANI, G. R. and MUSSUROV, A. (2006). Returns to schooling in Kazakhstan: OLS and instrumental variables approach. Bonn: Institute for the Study of Labor (Discussion Paper 2462).
- AULIN-AHMAVAARA, P. (2002). *Human capital as a produced asset*. Paper presented at the 27th General Conference of the International Association for Research in Income and Wealth, Stockholm, 18-24 August.

- AVERBACH, E., HAZAN, O., TUR-SINAI, A., CAPLAN, T., ROMANOV, D. (2009). *Immigration, occupation, education and their influence on the human capital in Israel*. Tel Aviv: Israeli Central Bureau of Statistics.
- BARRO, R. J. and LEE, J. W. (2001). International data on educational attainment: Updates and implications. *Oxford Economic Papers* 53(3): 541–563.
- BARRO, R. and SALA-I-MARTÍN X.. 1995. *Economic Growth*. New York: McGraw-Hill.
- BECKER, C. M., MUSABEK, E. N., SEITENOVA, A. S., and URZHUMOVA, D. S. (2005). The migration response to economic shock: Lessons from Kazakhstan. *Journal of Comparative Economics* 33(5): 107–132.
- BECKER, C. M. and URZHUMOVA, D. S. (1998). Pension burdens and labor force participation in Kazakhstan. *World Development* 26(11): 2087-2103.
- BECKER, G. S. (1993). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York: NBER.
- BLACK, D., SANDERS, S., TAYLOR, L. (2003). Measurement of Higher Education in the Census and Current Population Survey. *Journal of the American Statistical Association* 98(463): 545–554.
- BLED SOE, C.H., J.B. CASTERLINE, J.A. JOHNSON-KUHN, and HAAGA J.G.. (1999). *Critical perspectives on schooling and fertility in the developing world*. Washington, D.C.: National Academy Press.
- BLOOM, D. E., CANNING D. and FINK G. (2010). Implications of Population Ageing for Economic Growth. *Oxford Review of Economic Policy* 26(4): 283-612.
- BONGAARTS, J., and FEENEY, G. (2003). Estimating mean lifetime. *Proceedings of the National Academy of Sciences*. 100(23): 127–133.
- BOUCEKKINE, R., CROIX D. and PEETERS D. (2008). Demographic, economic, and institutional factors in the transition to modern growth in England: 1530–1860. *Population and Development Review* 34(8): 126–148.
- CARSON, C. S. (1996). Design of Economic Accounts and the System of National Accounts. In: (eds.) Kendrick J. *The New System of National Accounts*. Boston: Kluwer. Economic Thought. 25–64
- CLARIDGE, T. (2004). A comprehensive resource on social capital and its research. [electronic resource] Brisbane, Australia: University of Queensland. Social Capital and Natural Resource Management. <http://www.socialcapitalresearch.com>.
- CHARMAN K. (2007). Varieties of Capitalism: Kazakhstan – A Liberal Market Economy? [electronic resource] Paisley, Scotland: The University of the West of Scotland. Studies in Economic Transition. [www.uws.ac.uk/schoolsdepts/business/cces/documents/KenCharman.rtf](http://www.uws.ac.uk/schoolsdepts/business/cces/documents/KenCharman.rtf)

- COCKERHAM, W.C., HINOTE, B. P., ABBOTT, P. and HAERPFER, C. (2004). Health lifestyles in central Asia: The Case of Kazakhstan and Kyrgyzstan. *Social Science & Medicine* 59(4): 1409–1421.
- COHEN, D. and SOTO, M. (2001). Growth and human capital: Good data, good results. Paris: OECD. (Development Centre Technical Paper 179)
- COLLIER, P. and HOEFFLER, A. (2000). Greed and Grievance in Civil War. Washington, D.C.: The World Bank. (Policy Research Paper 2355).
- CONRAD, K. (1992). Comment on D. W. Jorgenson and B. M. Fraumeni, “Investment in education and US economic growth”. *Scandinavian Journal of Economics* 94(2): 71–74.
- CRESPO CUARESMA, J. and LUTZ W. (2007). Human capital, age structure and economic growth: Evidence from a new dataset. Vienna: International Institute for Applied Systems Analysis (Interim Report IR-07-011).
- DAGUM, C. and SLOTTJE, D. J. (2000). A new method to estimate the level and distribution of household human capital with application. *Structural Change and Economic Dynamics* 11(2): 67–94.
- DE la FUENTE, A. and DOMENECH, R. (2000). Human capital in growth regressions: How much difference does data quality make? Paris: OECD (Working Paper 262).
- DOEPKE, M. (2004). Accounting for fertility decline during the transition to growth. *Journal of Economic Growth* 9(3): 347–383
- EDERER, P., SCHULLER, P. and WILLMS, S. (2007). *The European Human Capital Index: The Challenge of Central and Eastern Europe*. Brussels: The Lisbon Council.
- EKNOYAN, G. (2008). Adolphe Quetelet (1796–1874) – The average man and indices of obesity. *Nephrol. Dial. Transplant* 23(1): 47–51.
- FARMER A. and TERRELL, D. (1996). Discrimination, Bayesian Updating of Employer Beliefs and Human Capital Accumulation. *Economic Inquiry* 34(4): 204–219.
- FILER, R. K., GYLFASSON, T., JURAJDA, Š. and MITCHELL, J. (2001). *Markets and growth in the post-communist world*. Prague: CERGE-EI.
- GALOR, O. (2005). From stagnation to growth: Unified growth theory. *Handbook of Economic Growth* 2005: 171–293.
- GALOR, O and WEIL, D. (2000). Population, technology, and growth: From the Malthusian regime to the demographic transition and beyond. *American Economic Review* 90(4): 806–828.
- GOOTZEIT, M. J. (1976). David Ricardo. *Journal of Economic Literature* 2(6): 470–471.
- GRAESER, P. (1988). Human capital in a centrally planned economy: Evidence. *Kyklos* 41(1): 75–98.
- GRAHAM, J. W. and WEBB, R. H. (1979). Stocks and depreciation of human capital: New evidence from a present-value perspective. *Review of Income and Wealth* 25(2): 209–224.

- GREGORY, P. R. and KOHLHASE, J. E. (1988). The earnings of Soviet workers: Evidence from the Soviet Interview Project. *Review of Economics and Statistics* 70(2): 23–35.
- GRIMES, P. W. and MILLEA, M. J. (2003). Developing human capital in Kazakhstan: An Evaluation of economic understanding and attitudes toward market economics. Starkville: Mississippi State University, College of Business and Industry. (Working Paper 03-01)
- GU, W., and WONG, A. (2008). *Human Development and its Contribution to the Wealth Accounts in Canada*. Ottawa: Statistics Canada, Micro Economic Analysis Division.
- HADDAD, W.D., M. CARNOY, R. RINALDI, O. REGEL. (1990). Education and development evidence for new priorities. Washington, D.C.: The World Bank. (Discussion Paper 95).
- HANSEN, G. and PRESCOTT E. (2002). Malthus to Solow. *American Economic Review* 92(4): 1205–1217.
- HANUSHEK, E. A. and KIMKO, D. D. (2000). Schooling, labor force quality, and the growth of nations. *American Economic Review*. 90(5): 1184–1208.
- HAY, R. (1998). *Political Arithmetick of William Petty*. Hamilton: McMaster University Press.
- HEAN, S., COWLEY S. and FORBES A.. (2003). The M-C-M cycle and social capital. *Social Science Medicine* 56(3): 1061–1072.
- HENDRICKS K. (2002). How important is human capital for development? Evidence from immigrant earnings. *The American Economic Review*. 3(2): 198–219.
- INKELES, A. (2000). Measuring social capital and its consequences. *Policy Sciences* 33(1): 245–268.
- INTRILIGATOR M., BRAGUINSKY S. and SHVYDKO V. (2001). *Human capital in the new Russia: Transition gone*. Stanford: Stanford University Press.
- IIASA. (2010). Population and Human Capital. [electronic database] Vienna, Austria: International Institute for Applied Systems Analysis. The Demography of Human Capital Formation. (IIASA)<http://www.iiasa.ac.at/Research/POP/humancapital.html>.
- ISTITUTE OF HISTORY. (1967). *Istoriya SSSR*. Moskva: Akademiya Nauk SSSR, Institut Istorii.
- JACKA T. (2007). Population governance in the PRC: Political, historical and anthropological perspectives. *The China Journal* 58(7): 111–126.
- JEONG, B. (1998). *Measurement of human capital input across countries: New method and results*. Prague: CERGE-EI
- JONES, R. and CHIRIPANHURA, B. (2010). Measuring the UK's human capital stock. *Economic and Labour Market Review* 4(11): 33–60
- JORGENSON, D. W. and FRAUMENI, B. M. (1992). The output of the education sector. In: Griliches, Z., (eds.) *Output Measurement in the Services Sector*. Chicago: The University of Chicago Press: 303–338

- JUDSON, R. (2002). Measuring human capital like physical capital: What does it tell us? *Bulletin of Economic Research* 54(3): 209–231.
- JUMASULTANOV T. (2005). *Narod Kazahstana: Sovremennoe sostoyanie narodonaseleniya v Respublike Kazahstan*. Almaty: Klassika.
- KALEMLI-OZCAN S, RYDER H, WEIL DN (2000). Mortality decline, human capital investment, and economic growth. *Journal of Development Economics* 62(1): 1–23.
- Kazakhstan. National report on condition and development of education in Kazakhstan (2005). [Official State Document]. Astana: National Center for Educational Quality Assessment. Ministry of Education and Science of Kazakhstan.
- Kazakhstan. National report on condition and development of education in Kazakhstan (2009). [Official State Document]. Astana: National Center for Educational Quality Assessment. Ministry of Education and Science of Kazakhstan.
- Kazakhstan. President's Appeal to the nation of Kazakhstan (1997, 2004, 2007 and 2008). [Official State Document]. Astana: The Administration of the President of Kazakhstan.
- Kazakhstan. The Concept of public policy on labor market and employment of human resources in Kazakhstan for 2010–2019. (2010). [Official State Document] Astana: Ministry of Labor and Social Security. October 27.
- Kazakhstan. The Concept of regional policy of Kazakhstan. (2002). [Official State Document]. Astana: The Government of Kazakhstan. Approved by the Government of Kazakhstan. December 9.
- Kazakhstan. The Resolution #561. (1999). "On providing assistance to areas with depressed economies." [Official State Document]. Astana: Approved by the Government of Kazakhstan. May 11.
- Kazakhstan. The Resolution #735. (2001). The strategic plan of development of Kazakhstan till 2010. [Official State Document]. Astana: Approved by the Decree of the President of Kazakhstan. December 4.
- Kazakhstan. The Resolution #1096 (2003) The Strategy of Industrial-Innovation Development of Kazakhstan for 2003–2015. [Official State Document]. Astana: Approved by the Decree of the President of Kazakhstan. May 17.
- Kazakhstan. The State Program of youth policy of the republic of Kazakhstan for 2010–2014. (2010). [Official State Document]. Astana: Approved by the Government of Kazakhstan. February 23.
- KENDRICK, J. W. (1996). *The New System of National Accounts*. Boston: Kluwer. Economic Thought.
- KERR, R. (2002). Making sense of the knowledge economy. *The Independent* 27(2): 10.

- KOMAN, R. and MARIN, D. (1999). Human capital and macroeconomic growth: Austria and Germany, 1960–1997: An Update. Munich: University of Munich, Department of Economics (Discussion Papers in Economics 569).
- KREMER, M. (1993). Population growth and technological change: One million BC to 1900. *Quarterly Journal of Economics* 108(3): 681–716.
- KRITSKI' M. M. (1995). Kritski M. M. Teoriya chelovecheskogo kapitala kak prioritetniy, faktor reformirovaniya ekonomiki. *Ekonomicheskaya teoriya i hozyaistvennaya reforma* 1(5): 28.
- KUZEMBAIULY, A. and AMANZHOLULY, E. (1999). *Istoriya Respubliki Kazahstan*. Astana: FOLIANT.
- KYRIACOU, G. (1991). *Level and growth effects of human capital: A Cross-country study of the convergence hypothesis*. New York: New York University Press.
- LADD, H. (1992). Population growth, density and the costs of providing public services. *Urban Studies* 29(2): 273–295.
- LAGERLOEF, N. P. (2003). From Malthus to modern growth: Can epidemics explain the three regimes? *International Economic Review* 44(2): 755–777.
- LAU, L. J., JAMISON, D. T., and LOUAT, F. (1991). Education and productivity in developing countries: An Aggregate production function approach. Washington D.C.: The World Bank. Policy, Research, and External Affairs (Working Paper 612).
- LAZEAR, E. P. (2003). Firm-Specific Human Capital: A Skill-Weights Approach. New York: NBER (Working Paper 9679: 28).
- LE, T., GIBSON, J. and OXLEY, L. (2005a). Measuring the stock of human capital in New Zealand. *Mathematics and Computers in Simulation* 68(2005): 485–498
- LE, T., GIBSON, J. and OXLEY, L. (2005b). Measures of Human Capital: A Review of the Literature. Wellington: New Zealand Treasury (Working paper 05/10).
- LE, T. (2006). Estimating the monetary value of the stock of human capital for New Zealand.[PhD Thesis]. Christchurch: The University of Canterbury, Department of Economics.
- LEPING K. O. (2006). *Measuring the Specificity of Human Capital: A Skill-based Approach*. Tartu: University of Tartu. Pärnu College Press.
- LI, H., FRAUMENI, B. M., LIU, Z. and WANG, X. (2009). Human capital in China. National Bureau of Economic Research. New York: NBER (Working Paper 15500).
- LIU, G. and GREAGER, M. (2009). *Measuring the stock of human capital for Norway. A lifetime labor income approach*. Oslo: Statistics Norway Press.
- LUTZ, W., GOUJON, A. and WILS, A. (2005). Forecasting human capital: Using demographic multi-state methods by age, gender and education to show the long-term effects of investments in education. Washington, D.C.: Education Policy and Data Center (Working Paper WP-07-03).



- MASINI, E. B. (2004). *The Legacy of Aurelio Peccei Twenty Years after his Passing and the Continuing Relevance of his Anticipatory Vision*. Vienna: European Support Centre of the Club of Rome.
- MARX, K. (1990). *Capital*. Volume I. London: Penguin. Ben Fowkes.
- MCKENZIE, D. A. (1981). Statistics in Britain. Chapter 3. The Social construction of scientific knowledge. Edinburgh: Edinburgh University Press. Cited in Wikipedia
- MILLER, R. (1996). *Measuring what people know: Human capital accounting for the knowledge economy*. Paris: OECD
- MILLIMET, D.L., NIESWIADOMY, M., and SLOTTJE, D. (2008). Detailed estimation of worklife expectancy for the measurement of human capital: Accounting for marriage and children. *Journal of Econometrics* 1(13): 83–113.
- MINCER, J. (1993). *Studies in Human Capital: Collected Essays*. Vol. 1, 2 Cambridge: Edward
- MUHAMEDKARIMOVA, Z. H. (2002). *Issledovanie sel'skih depressivnyh raionov*. Astana: Ministerstvo ekonomiki i razvitiya RK.
- MULLIGAN, C. and SALA-I-MARTIN, X. (2000). Measuring Aggregate Human Capital. *Journal of Economic Growth* 5(3): 215–252.
- NEHRU, V., SWANSON, E., and DUBEY, A. (1995). A new database in human capital stock in developing industrial countries: Sources, methodology and results. *Journal of Development Economics* 46(2): 379–401.
- NESTEROVA, D. V. and SABIRIANOVA, K. Z. (1998). Investment in human capital under economic transformation in Russia. Kyiv: Economic Education and Research Consortium (EERC). (Working paper 99/04).
- OECD (2001). *The Well-being of Nations: The Role of human and social capital*. Paris: Centre for Educational Research and Innovation.
- OSIPIAN, A. (2007). *Human capital: Economic growth nexus in the former Soviet Bloc*. Nashville: Vanderbilt University
- PAVLÍK, Z. (1994). Population Trends on the Territory of the Czech Republic. *Journal of the Czech Geographical Society* 2(1994): 101-110.
- PERLMAN, B. J. and GLEASON, G. (2005). Comparative perspectives on third generation reform: Realignment and misalignment in Central Asian reform programs. *International Public Management Review*. 6(1): 100–116
- PIACHAUD, D. (2002). *Capital and the Determinants of Poverty and Social Exclusion*. London: London School of Economics. Centre for Analysis of Social Exclusion.
- POMFRET, R. (2003). Central Asia since 1991: The Experience of the new independent states. Paris: OECD (Working paper 212).

- PORTES, A. (1998). Social Capital: Its origins and applications in modern sociology. *Annual Review of Sociology* 24(1): 1–24
- PSACHAROPOULOS, G. and ARRIAGADA, A. M. (1992). The educational composition of the labor force: An International update. *Journal of Educational Planning and Administration* 6(2): 141–159.
- PSACHAROPOULOS, G. and PATRINOS, H.A. (2002). Returns to Investment in Education: A Further Update. Washington, D.C.: The World Bank. (Working Paper 2881).
- RAMSDEN, Edmund. (2002). *Carving up Population Science: Eugenics, Demography and the Controversy over the 'Biological Law' of Population Growth*. Thousand Oaks: Sage Publications Ltd.
- SCHMID, A. A. (2002). Affinity as social capital: Its role in development. *The Journal of Socio-Economics* 29(2): 159–171.
- SCHNEIDER, W. H., ROSENBERG, C. and JONES, C. (2002). *Quality and Quantity: The Quest for Biological Regeneration in Twentieth-Century France*. Cambridge: Cambridge University Press.
- SCHNEIDER, D. and MEANS, G. (2000). *MetaCapitalism: The e-Business Revolution and the Design of 21st-Century Companies and Markets*. Hoboken: Wiley, John & Sons, Inc.
- SCHULTZ, T. (1994). *Human capital, family planning and their effects on the population growth*. New Haven: Yale University, Economic Growth Center.
- SEN, A. 1999. *Development as Freedom*. Oxford: Oxford University Press.
- SHAGDAR, B. (2006). Human capital in Central Asia: Trends and challenges in education. *Central Asian Survey* 25(4): 515–532.
- SHER, R. B. (2004). New light on the publication and reception of the Wealth of Nations. *The Adam Smith Review* 1(4): 3–29.
- SHOKAMANOV, Y. K. (2006). Scenarii, prognozy i prakticheskie rekomendacii po demograficheskomu razvitiyu Kazahstana. Astana: Agentstvo po Statistiki Respubliki Kazahstan. (Otchet: Kazahstanskogo instituta social'no-ekonomicheskoi informacii i prognozirovaniya po Dogovoru o gosudarstvennyh zakupkah uslug po issledovaniyam v sfere nacional'noi i ekonomicheskoi bezopasnosti). Lot №2
- SMITH, S. S., and KULYNYCH, J. (2002). It may be social, but why is it capital? The social construction of social capital and the politics of language. *Politics & Society* 30(2): 149–186.
- STATISTICAL DOCUMENTS. [electronic database] Astana: Statistical Agency of the Republic of Kazakhstan. Population. <http://www.eng.stat.kz/Pages/default.aspx>
- STROOMBERGEN, A., ROSE, D. and NANA, G. (2002). *Review of the statistical measurement of human capital*. Wellington: Statistics New Zealand.
- STRUMILIN S. G. (1982). *Problemy ekonomiki truda*. Moscow: Nauka.

- TAO, H. L. and STINSON, T. F. (1997). An alternative measure of human capital stock. Minneapolis: University of Minnesota (Development Center Bulletin 97/01).
- TAZHIN M. and TAZHIMBETOV M. (1993). *Regionalnaya sociologiya*. Almaty: Atamura.
- TATIBEKOV, B. L. (2004). *Peculiarities of demographic processes and labor markets development during the transition period in Kazakhstan*. Almaty: Institute of Economics.
- THE WORLD BANK (2006) Measurement of Human Capital [electronic database] Washington D.C.: The World Bank. Adjusted Net Saving.  
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTEEI/0,,contentMDK:20502388~menuPK:1187778~pagePK:148956~piPK:216618~theSitePK:408050,00.html>
- THE WORLD BANK. (2009) Social Capital in Operations. [electronic database] Washington D.C.: The World Bank. Social Capital Library.  
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/EXTSOCIALCAPITAL/0,,menuPK:401021~pagePK:149018~piPK:149093~theSitePK:401015,00.html>
- TOMER, J. F. (2009). Organizational capital [electronic resource]. New York: Manhattan College. John Tomer's vita. <http://home.manhattan.edu/~john.tomer/organizational.html>
- UNESCO (1993). *World Education Report*. Paris: UNESCO.
- VANDENBUSSCHE, J., AGHION, P. and MEGHIR, C. (2006) Growth, distance to frontier and composition of human capital. *J Econ Growth* 11(6): 97–127.
- WACHTEL, P. (1997). A labor-income-based measure of the value of human capital: An Application to the states of the US: Comments. *Japan and the World Economy* 9(2): 193–196.
- WALCH, J. R. (1935). Capital Concept Applied to Man. *The Quarterly Journal of Economics* 49(1935): 255–285.
- WEI, H. (2008). *Measuring Human Capital for Australia: Issues and Measures*. Paper presented at the 30th General Conference of the International Association for Research in Income and Wealth. Portoroz, Slovenia, 24-30 August.
- WEISBROD, B. A. (1961). The valuation of human capital. *Journal of Political Economy* 69(5): 425–436.
- WOOD, J. C. (1996). *Critical assessments of leading economists*. Oxon: Taylor & Francis.
- WOODWARD, J. L. (2008). The Field of Population Quality. *Social Forces* 17(4): 468–477.
- WOBMANN, L. (2003). Specifying human capital. *Journal of Economic Surveys* 17(3): 239–270.
- ZACHARIEV, E. (2002). Peter Drucker's conception of the new management paradigm. *Facta universitatis* 1(10): 15–24.