Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of economics

Diploma Thesis

Relationship between transport infrastructure and economic growth: The case of Kazakhstan

Assyl Gabdulina

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Bc. Assyl Gabdulina

Economics and Management
Economics and Management

Thesis title

Relationship between transport infrastructure and economic growth: The case of Kazakhstan

---

Objectives of thesis

Main aim of the diploma thesis is to assess economic growth and economic development of Kazakhstan through the economic impact of transport infrastructure.
Research questions:
• Is the development of Kazakhstan's economy directly dependent on development of transport infrastructure of the country?
• Does an interrelation exist between GDP growth and the development of transport infrastructure of the country?
• Do Foreign Direct Investment (FDI) and Public-Private Partnership (PPP) into transport infrastructure have positive impact on GDP growth?

Methodology

The thesis will be divided into three parts.

The first part is a theoretical one and is based on literature search. It defines the current state of knowledge in the field of the development of transport infrastructure with the overlap to its influence on economic growth and development. In this part will be used articles, books, researches and different electronic resources to provide information about relations between transport infrastructure, economics of country and development process of country, to show examples, explain and prove importance of transport infrastructure in country. Methodologically this part of the thesis will be analysis of documents.

The second part will rely on the theoretical part and it is the key component of the thesis. Also will be used method of quantitative research such as statistical and mathematical methods. In practical part will be analysed situation in Kazakhstan according to secondary data what I will receive from Agency of statistics of the Republic of Kazakhstan, World Bank and some another resources.

The final part concludes the results of the previous parts and discuss it with another author.

60- 80 pages

Keywords

Economic growth, infrastructure, transport, development, PPP

Recommended information sources

Démurger, S. (2001). Infrastructure Development and Economic Growth: An Explanation for Regional Disparities in China? Journal of Comparative Economics, 29(1), 95–117. http://doi.org/10.1006/jcec.2000.1693

Farhadi, M. (2015). Transport infrastructure and long-run economic growth in OECD countries. http://doi.org/10.1016/j.tra.2015.02.006

Ferrari, C., Bottasso, A., Conti, M., & Tei, A. (2019). Economic Role of Transport Infrastructure: Theory and Models. Economic Role of Transport Infrastructure (1. vydání). Elsevier. http://doi.org/10.1016/c2016-0-03558-1

Hickman, R., Bonilla, D., Givoni, M., & Banister, D. (2015). Handbook on transport and development. Edward Elgar Publishing.

Lewis, M.; Grimsey, D. Public private partnerships: the worldwide revolution in infrastructure provision and project finance. Cheltenham: Edward Elgar, 2004. 268 s. ISBN 978-1-84720-226-0

Piet Rietveld, Frank Bruinsma, 1998, "Is Transport infrastructure effective? Transport Infrastructure and Accessibility: Impacts on the Space Economy" ISBN-13: 978-3-642-72234-9, e-ISBN:978-3-642-72232-5

Wang, C., Lim, M. K., Zhang, X., Zhao, L., & Lee, P. T.-W. (2020). Railway and road infrastructure in the Belt and Road Initiative countries: Estimating the impact of transport infrastructure on economic growth. Transportation Research Part A: Policy and Practice, 134, 288–307. https://doi.org/10.1016/J.TRA.2020.02.009

Yang, J., & McCarthy, P. (2013). Multi-modal Transportation Investment in Kazakhstan: Planning for Trade and Economic Development in a Post-Soviet Country. Procedia – Social and Behavioral Sciences, 96, 2105–2114. https://doi.org/10.1016/j.sbspro.2013.08.237

Expected date of thesis defence

2019/20 SS – FEM

The Diploma Thesis Supervisor

doc. Ing. Irena Benešová, Ph.D.

Supervising department

Department of Economics

Electronic approval: 9. 3. 2020

prof. Ing. Miroslav Svatoš, CSc.

Head of department

Electronic approval: 9. 3. 2020

Ing. Martin Pelikán, Ph.D.

Dean

Prague on 01. 04. 2020

Declaration

I declare that I have worked on my diploma thesis titled "Relationship between transport infrastructure and economic growth: The case of Kazakhstan" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

Prague, April 6, 2020 _____

Assyl Gabdulina

Acknowledgement

I would like to thank my heartiest gratitude to my friends, who was supporting me and assisting me with this thesis. I am especially grateful to my supervisor doc. Ing. Irena Benešová, Ph.D. for her advice, comments and recommendations during my work on this thesis.

Relationship between transport infrastructure and economic growth: The case of Kazakhstan

Abstract

This Master thesis is devoted to assess of economic growth and economic development of Kazakhstan through the economic impact of transport infrastructure.

For this research it was investigated a relationship between FDI for railway, automobile, pipeline, air, seaborne and riverine sector and economic growth of Kazakhstan. For the analysis it was used the annual data for the period 1998 to 2018 (almost the whole period of independence of Kazakhstan). Due to the regression analysis of Ordinary Least Square (OLS) was analysed all the data. Based on the empirical results, the analysis showed that there is a positive relationship between FDI for all modes of transportation and economic growth. My observations confirmed that foreign direct investment has a significant role in the development of republic. Indeed, Kazakhstan as a new developing economy attracts FDI to country. However, it should be noticed that economic growth of the republic largely based on natural resources.

In addition, it was analysed the interconnection between GDP, unemployment rate, oil price, mining and quarrying, manufacturing industry and gross output of agricultural products using Two-Stage Least Squares (2SLS) Regression Analysis in SW Gretl.

Keywords: transport infrastructure, Kazakhstan, World Bank, Foreign Direct Investment, GDP, public-private partnership, Big Almaty ring road, BAKAD, transportation modes, PPP Center.

Vztah mezi dopravní infrastrukturou a hospodářským růstem: případ Kazachstánu

Abstrakt

Tato diplomová práce je věnována zhodnocení ekonomického růstu a ekonomického rozvoje Kazachstánu prostřednictvím ekonomického dopadu dopravní infrastruktury.

Pro tento výzkum byl zkoumán vztah mezi přímými zahraničními investicemi pro železniční, automobilový, potrubní, letecký, námořní a říční sektor a hospodářský růst Kazachstánu. Pro analýzu byly použity roční údaje za období 1998 až 2018 (téměř celé období nezávislosti Kazachstánu). Kvůli regresní analýze byla provedena běžná nejmenší náměstí (OLS). Na základě empirických výsledků analýza ukázala, že mezi všemi přímými zahraničními investicemi existuje pozitivní vztah pro všechny druhy dopravy a hospodářský růst. Moje pozorování potvrdilo, že přímé zahraniční investice mají významnou roli ve vývoji republiky. Kazachstán jako nová rozvíjející se ekonomika skutečně přitahuje přímé zahraniční investice do země. Je však třeba si uvědomit, že ekonomický růst republiky je z velké části založen na přírodních zdrojích.

Dále bylo analyzováno propojení mezi HDP, mírou nezaměstnanosti, cenou ropy, těžbou a dobýváním, zpracovatelským průmyslem a hrubou produkcí zemědělských produktů pomocí regresní analýzy dvoustupňových nejmenších čtverců (2SLS) v SW Gretl.

Klíčová slova: dopravní infrastruktura, Kazachstán, Světová banka, Přímé zahraniční investice, HDP, partnerství veřejného a soukromého sektoru, Velký okruh Almaty, BAKAD, způsoby dopravy, PPP centrum.

Table of content

1. Introduction **11**

2. Objectives and Methodology **12**

2.1. Objectives **12**

2.2. Methodology **12**

3 Literature Review **14**

3.1. General overview of transport infrastructure **14**

3.1.1. The elements of the transport networks 14

3.1.2. The Infrastructural Endowment 16

3.1.3. The relation between transport infrastructure and economic performance 20

3.1.4. The influence of transport infrastructure on economic growth 25

3.2. The role of Public – Private Partnership on the development of transport infrastructure 26

3.2.1. Public – Private Partnership: Definition and characteristics 26

3.2.2. Types of public-private partnership (PPP) 29

4 Practical Part **31**

4.1. Brief overview of social and economic indicators of Kazakhstan 31

4.2. PPP Center in Kazakhstan 36

4.3. Transportation modes in Kazakhstan 37

4.3.1. Railroad transportation 39

4.3.2. Road transportation in Kazakhstan 41

4.3.3. Air transport 44

4.3.4. Water transportation 46

4.3.5. Pipeline transportation 47

4.4. Analysis of all modes transportation in Kazakhstan 49

4.4.1. One-equation model 49

4.4.2. Simultaneous model 55

5 Results and discussion **62**

5.1. Results 62

5.2. Discussion 63

6 Conclusion **65**

7 References **67**

8 Appendix **71**

List of charts

Chart 1. Links between transport and the economic performance 22
Chart 2. Types of PPP in accordance with the part of responsibility 30
Chart 3. Total GDP of Kazakhstan (current billion USD, 1998-2018) 33
Chart 4. FDI net inflows in Kazakhstan (current billion USD, 1998-2018) 34
Chart 5. The share of investment by countries in Kazakhstan (current billion USD, 2014-2018) 35
Chart 6. Gross inflow of FDI in Kazakhstan by type of of economic activities (million USD, 1998-2018) 35
Chart 7. Freight turnover of all types of transport modes of Kazakhstan (billion tonne-kilometres (tkm), 1998-2018) 39
Chart 8. The length of railway in Kazakhstan (thousand kilometres, 1998-2018) 40
Chart 9. The short outline of the BAKAD (Big Almaty Ring Road) project 43
Chart 10. Transportation of passengers by air transport of general use (thousand people, 1998-2018) 44
Chart 11. Transportation of freight by air transport (million tonne-kilometres, 1998-2018) 45
Chart 12. The length of pipeline in Kazakhstan in the period of time 1998-2018 48
Chart 13. Correlation matrix between explained and explanatory variables 52
Chart 14. The result of testing of Normality 54
Chart 15. The result of White's test for heteroscedasticity 54
Chart 16. The results of testing of Normality and Heteroscedasticity for 1st equation 60
Chart 17. The results of testing of Normality and Heteroscedasticity for 2nd equation 61

List of tables

Table 1. Rail and road infrastructural endowment –ratios on the surface areas 17
Table 2. Rail and road infrastructural endowment –ratios on the population 18
Table 3. Foreign Direct Investment (FDI) by transport type (current million USD, 1998-2018) ana total GDP of Kazakhstan (current billion USD, 1998-2018) 38
Table 4. Basic data on Korgas-Zhetygen railway concession project 41
Table 5. Basic data on Big Almaty Ring Road PPP project (BAKAD) 43
Table 6. The economic and econometric model for OLSM 49
Table 7. Data of Foreign Direct Investment (FDI) by transport type (current million USD, 1998-2018) ana total GDP of Kazakhstan (current billion USD, 1998-2018) 51
Table 8. The own results of analysis by using OLSM 52
Table 9. The results of P-values 53
Table 10. The results of Normality and Heteroscedasticity for OLSM 53
Table 11. Data set by calculation of elasticity with the time series from 1998 to 2018 55
Table 12. The economic and econometric model for TSLSM 56
Table 13. Data set with the time series from 1998 to 2018 for TSLSM 57
Table 14. The own results of analysis by using TSLSM 59
Table 15. The results of Normality and Heteroscedasticity for 1st equation 60
Table 16. The results of Normality and Heteroscedasticity for 2nd equation 61

List of maps

Map 1. Administrative and geographical structure of Kazakhstan 31
Map 2. Water basins of Kazakhstan 46

List of models

Model 1. OLS results from GRETL based on matrix X and vector Y using observations 1998-2018 51
Model 2. TSLS results from GRETL based on matrix X and vector Y using observations 1998-2018 58
Model 3. TSLS results with statistical significance of parameters of the 1st equation from GRETL based on matrix X and vector Y using observations 1998-2018 59
Model 4. TSLS results with statistical significance of parameters of the 2nd equation from GRETL based on matrix X and vector Y using observations 1998-2018 60

List of abbreviations

GDP	Gross Domestic Product
FDI	Foreign direct investment
OLSM	Ordinary Least Square Method
TSLSM	Two-Stage Least Squares Method
PPP	Public-private partnership
CBA	Cost-benefit assessment
ADB	Asian Development Bank
IDB	Inter-American Development Bank
DBB	Design-Bid-Build
OM	Operation and Maintenance
BOT	Build-Operate-Transfer
DBFO	Design-Build-Finance-Operate
CIS	Commonwealth of Independent States
OECD	Organisation for Economic Co-operation and Development
COSCO	China Ocean Shipping Company
JSC	Joint-Stock Company
UNECE	United Nations Economic Commission for Europe
EBRD	European Bank for Reconstruction and Development
NMSC	National Maritime Shipping Company
SCO	Shanghai Cooperation Organization
EEU	Eurasian Economic Union
OSCE	Organization for Security and Cooperation in Europe
OIC	Organization of the Islamic Cooperation
CSTO	Collective Security Treaty Organization

1. Introduction

After the breakdown of the Soviet Union, the ex-Soviet countries appeared and after created its independent countries. After they began the transition from centrally— planned economy to creating market economy. This diploma thesis presents a case study of Kazakhstan. The main aim of this thesis to review of the transport sector in the Kazakhstan, especially to assess of economic growth and economic development of Kazakhstan through the economic impact of transport infrastructure. Therefore, the estimation of effects of transport infrastructure (roads, railways, water, air, seaborne and riverine sector) on economic growth while controlling with other variables such as GDP, investments by FDI. The thesis principally covers development of transport infrastructure, condition of current situation, large-scaled projects in relation to transport sector of the country.

Kazakhstan is situated in the middle of Eurasia and therefore plays the main role in the transport and logistics between Asia and Europe, which is popular like "Modern Silk Road". In this diploma thesis it was used articles, books, statistical data, researches and different analytical materials and legislative frameworks, which were translated from the references that are in Kazakh and Russian language into English. This thesis creates different prospective for future research of transportation modes and infrastructure in Kazakhstan region and central Asia.

Indeed, the thesis was initiated studying the effect of Foreign Direct Investment on the Kazakhstan's economy, especially on transport infrastructure.

Attraction and effective method usage of foreign investment in the economy is important, particularly for the developing countries such as Kazakhstan. It is noteworthy that FDI affects economy by creating employment, technological development, triggering domestic investment and so on.

There is a huge number of empirical literature that investigates effect of FDI on economic growth. A large proportion of the existing literature claims that impact of FDI on economic growth of the host country is positive. In this case it was investigated and analyzed properly to prove the relation of FDI on transport infrastructure of Kazakhstan is positive.

2. Objectives and Methodology

2.1. Objectives

Main aim of this diploma thesis is to assess of economic growth and economic development of Kazakhstan through the economic impact of transport infrastructure. Likewise, the aim of thesis is to estimate the effects of transport infrastructure (roads, railways, water, air, seaborne and riverine sector) on economic growth while controlling with other variables such as GDP and investments by Foreign Direct Investment (FDI). Based on the main three research questions arise:

1. Is the development of Kazakhstan's economy directly dependent on development of transport infrastructure of the country?
2. Does an interrelation exist between GDP growth and the development of all modes of transport in the country?
3. Does Foreign Direct Investment (FDI) into transport infrastructure have positive or negative impact on GDP growth?

2.2. Methodology

In this diploma thesis the quantitative method has been used for analyses, especially the linear regression analysis with the time series data from 1998 to 2018 (almost the whole period of independence of Kazakhstan), for examine the correlation between GDP growth and FDI for railway, automobile, pipeline, air, seaborne and riverine sector. Likewise, there has been analysed for determining positive or negative impact FDI on GDP. To sum up, different resources of literature on FDI determinants have been assumed that FDI inflows into Kazakhstani economy, especially on transport infrastructure can be captioned by variables that can be important for the analysis, such as GDP and unemployment rate.

Also the relationship between GDP, oil price, mining and quarrying, manufacturing industry and gross output of agricultural products have been analysed in my practical part of the thesis. For estimation these parameters OLSM and TSLSM in SW Gretl approach have been used to this issue. Therefore, in practical part all my analyses have based on calculations, which it is calculated by the program SW Gretl.

In the first section of my practical part, the correlation coefficient between GDP and FDI for all modes of transport sector in the country have been analysed by using Ordinary Least Square Method (OLSM). The aim of this analysis is to find out positive or negative relations between GDP growth and all types of transport modes of the country, especially railway,

automobile, pipeline, air, seaborne and riverine sector. For this result, econometric model has been used which is represented by one-equation model.

In the second section of my practical part, there has been used variables such as GDP, unemployment rate, oil price, mining and quarrying, manufacturing industry and gross output of agricultural products by using Two-Stage Least Squares Method (TSLSM) regression analysis in SW Gretl. Due to this method the simultaneous-equation problem has been provided, which is checked by simultaneity test. With regard to the simultaneous model first equation has been GDP determined by the price of oil, mining and quarrying, manufacturing, gross output of agricultural products (services). Second equation has been unemployment rate determined by FDI for Railway, FDI in Automobile, FDI in Pipeline, FDI in Seaborne and riverine sector and FDI in Air. All of the assumptions for the simultaneous model should be approved after parameter estimations in Gretl.

3 Literature Review

3.1. General overview of transport infrastructure

3.1.1. The elements of the transport networks

Infrastructure is a common term used by many experts and laymen. But a closer examination of the term shows that it is not easy to provide a satisfactory definition. The majority of number of definitions for infrastructure (sometimes called social overhead capital) have been given in different literatures. For example, Piet Rietveld mentions properties such as: “provide services basic to any production capacity” and “large and costly installations”. Frank Bruinsma considers that infrastructure is capital that provides public services (Rietveld, P., and Bruinsma, F., 1998)

The infrastructure system is a network which is consisted of several routes connecting a number of terminals. This system together with the transport vehicles that circulate on it and the load of vehicles-passengers or cargo-forms the transportation system and other the combination of transport supply and demand (Blauwens, De Baere and Van de Voorde, 2008). According to Quinet, Touzery and Triebel (1982) it is useful to divide the transport system into two subsystems-infrastructures and services-to analyze the specificities that characterize the two.

Under the economic perspective, transport infrastructures are essential facilities for the production and the consumption function of the economic agents. They have a positive impact on the economic system raising the productivity of private inputs, reducing the cost of production and increasing the rate of total factor productivity growth.

These effects arise from the traffic that use the system of infrastructure; nevertheless, in the following we will focus on the economics of the infrastructural system, i.e., the opportunities offered to people to move or to purchase goods and services or the traffic.

This is the point of transport infrastructure: to make the economic and physical space narrow and consequently to provide the opportunity for a different plot of economic and social relations between the connected areas.

The infrastructure system is generally made of physical assets; the only exception is represented by the maritime and air transport modes that use natural (not manufactured) routes – water and air, respectively; but terminals are manufactured assets for all transport modes (Bektas and Crainic, 2007).

In general, any network is consisted of links and nodes. In the transport system, the nodes are the terminal facilities, the geographical points where trips start and end –whereas the links are the transport infrastructures. There is also an additional element describing the transport networks that is the mode of transport: air, sea-and, where it is possible, riverine-rail, road and pipeline transport. Consequently, it is possible to distinguish a transport network for each transport mode and most of cases the literature and the policies are focused on a single mode of transport; but terminal facilities make it also possible to switch from a mode to another can lead to transport intermodality. It should be pointed out that intermodality is something more than the mere spacial overlapping of two (or more) modal transport networks, it is instead the organization of a single trip through two or more transport modes without any breaks of bulk, in case of cargo movements or with suitable transit times in case of passengers, with the final goal to enhance mobility and the efficiency of the whole distribution process (Bektas & Crainic, 2007). This definition of intermodality shows that it effectively takes place when not only the trip is arranged to use a multiplicity of modes, where each of these modes may have a different transport carrier responsible for it, but also when intermodal transport means are involved (such as the ro-ro and rp-ro-pax ferries in maritime transport). In practice, it is usual to refer to multimodal transport when the cargo using several transport modes is moved under a single contract or bill of lading. Then, it is possible to higlight the main infrastructural components for each transport mode, as follows:

- Air transport
- Seaborne and riverine transport
- Rail transport
- Road transport
- Pipelines

Accepting a territorial approach, it emerges the notion of transport corridors. According to the definition by Premius and Zannoveld (2003) they are “narrow bundles of infrastructure that connect two or more regions dispersed over a certain space” (Drewello and Scholls, 2016). This definition has rapidly acquired success, namely due to its multiscalar and multidimensional nature.

Another eventual classification of transport infrastructure refers to the kind of services it serves. According to Martin and Rogers (1995), the infrastructure network is consisted of domestic infrastructure serving domestic business (and influencing on firms location) and international infrastructure serving the international business and trade.

Whether one considers the single element or different combination of elements of the infrastructural network they demand to be measured both in physical terms-especially the length of railways or roads or the amount of traffic they can serve-and in monetary terms, i.e., the stock of money invested in infrastructures.

Transport modes are intended to either carry passengers or freight, but majority of modes can carry a combination of both. For instance, an automobile has a capacity to care a certain freight while a passenger aircraft has a bellyhold which used for luggage and cargo. Each mode is designed by a set of technical, operational and commercial characteristics. With regard to technical characteristics are related to attributes, for instance, speed, productivity and motive technology whereas operational characteristics ensure the context which modes make the operation involving speed limits, conditions of security or operating hours. Therefore, the demand for transport and the property of modes are prevalent commercial characteristics.

3.1.2. The Infrastructural Endowment

The transport systems are the framework of the global economy, and its infrastructural component encourage. Due to the importance of the economic benefits following from infrastructures to people and firms located in a particular region, the infrastructural endowment has always been investigated to understand the attitude between infrastructural investment and GDP growth and where and when infrastructural investments are necessary. While the relation between investment in public infrastructures or main public infrastructure (something more closely related to transport infrastructure) will be focus on the analysis of the infrastructural endowment (or infrastructure supply) that predate usually pre any transport process (Banister & Berechman, 2001).

If it looks at the infrastructural endowment, a very long life period of infrastructures could imply the acceptance of a long-run perspective that focused at assuring to the economic agents the same opportunities of welfare, therefore avoiding any consideration about the short-run fluctuations of the demand of transport. Furthermore, because the transport demand, in general, has issued a growing path in the last two centuries, it makes sense to focus the attention on supply and postpone the balance between transport supply and demand to any particular infrastructural project. Finally, in a normative approach to infrastructures, extension of infrastructural supply may be decided to consider the economic development (actual or expected) or overcome the current or even to bottlenecks stimulate falling behind regions (Rietveld & Boonstra, 1995).

Moreover, it is necessary to have a set of possible measures of the infrastructural endowment that will refer to its capacity or to the number of people or firms that may be benefited in terms of lower prices (consumers), superior jobs (people), or higher profits (firms).

The several measures used in practice can be grouped into the following:

- physical/quantitative measures;
- qualitative measures;
- accessibility measures.

Physical or quantitative measures address the physical length of the different routes (such as the length of railways or roads). Consequently, the most common measures of infrastructural endowment invoke to the ratio of the length of railways and road routes to the population, or as an option the surface of the region they pass through. The **Table 1** shows some figures referred to a simple of countries considering this type of physical measures.

Table 1. Rail and road infrastructural endowment-ratios on the surface areas

	Rail (km/000 sqkm)	Road (km/000 sqkm)		Rail (km/000 sqkm)	Road (km/000 sqkm)
Algeria	1.8	36.8	Korea, Rep.	36.4	829.8
Argentina	9.0	25.0	Latvia	28.7	228.1
Austria	60.3	1592.7	Lithuania	27.1	1107.2
Azerbaijan	23.9	309.3	Luxembourg	106.2	1119.3
Bangladesh	19.1	13.6	Macedonia, FYR	27.2	374.7
Belarus	26.3	359.6	Malaysia	6.8	351.2
Belgium	117.2	3947.4	Mexico	13.6	70.0
Bosnia and Herzegovina	20.0	379.3	Moldova	34.2	261.0
Brazil	3.5	25.0	Mongolia	1.2	3.1
Bulgaria	36.2	173.3	Morocco	4.7	92.1
Cameron	2.1	8.6	Mozambique	3.9	7.9
Canada	5.2	41.6	Norway	10.8	196.7
Chile	7.3	24.0	Pakistan	9.8	232.5
China	7.0	361.2	Poland	60.6	897.8
Congo, Dem. Rep.	1.6	1.2	Portugal	27.6	773.1
Cote d'Ivore	2.0	20.2	Romania	45.2	209.2
Czech Republic	119.9	1656.7	Russian Federation	5.0	54.3
Denmark	49.5	1728.9	Saudi Arabia	0.7	22.1
Egypt, Arab Rep.	5.2	126.6	Serbia	43.1	316.9
Estonia	17.5	230.5	Slovenia	59.6	1923.3
Finland	17.6	147.7	South Africa	16.8	130.4
France	54.7	1873.0	Spain	33.3	1350.3
Gabon	3.0	4.1	Sudan	2.3	2.3
Georgia	22.6	274.2	Swaziland	17.3	62.1
Germany	93.6	1805.9	Sweden	21.7	302.7
Greece	17.0	313.4	Switzerland	87.4	1731.0
Hungary	84.8	828.6	Syrian Arab Republic	11.6	340.5
Indonesia	2.5	148.1	Tunisia	23.4	90.2
Iran, Islamic Rep.	4.9	91.9	Turkey	12.9	449.6
Iraq	4.9	137.0	Turkmenistan	6.4	97.5
Ireland	27.3	1366.5	Ukraine	35.7	275.2
Israel	54.1	841.2	United Kingdom	60.7	1619.1
Italy	56.5	1618.4	United States	23.2	437.8
Jordan	5.7	80.6	Uzbekistan	9.4	168.8
Kazakhstan	5.3	32.0	Vietnam	7.1	448.2

Source: The World Bank (for railways length and the surface area); CIA Factbook (for length of the paved roads).

Figures informed in **Table 1** clearly show that this approach of measuring infrastructural endowment is highly affected by some factors, such as the shape and size of countries, their geographical location, and also the step of development and the GDP level. The combination of these factors interprets, for instance, why the United States registers relevance well below those of countries with lower levels of GDP per capita. For example, according to the World Bank statistics, the United States registered in 2015 a value of GDP per capita

(pronounced in constant values 2011 and in Purchasing Power Parity, PPP) of 52.704$ against 38.865$ of United Kingdom and 10.911$ of Tunisia, however the US railways and road endowment in comparison with these countries is approximately 1:3 and 1:4 regarding of United Kingdom, and 1:1 and 1:2 regarding of Tunisia, respectively.

Comparable considerations could apply in case the infrastructural endowment is calculated on the population in place of the surface area, as shown for the same set of countries of the follow **Table 2.**

Table 2. Rail and road infrastructural endowment-ratios on the population

	Rail (km/000 sqkm)	Road (km/000 sqkm)		Rail (km/000 sqkm)	Road (km/000 sqkm)
Algeria	0.11	2.25	Korea, Rep.	0.07	1.65
Argentina	0.58	1.61	Latvia	0.93	7.38
Austria	0.59	15.64	Lithuania	0.60	24.65
Azerbaijan	0.22	2.81	Luxembourg	0.49	5.21
Bangladesh	0.02	0.01	Macedonia, FYR	0.34	4.64
Belarus	0.58	7.87	Malaysia	0.08	3.88
Belgium	0.32	10.73	Mexico	0.21	1.10
Bosnia and Herzegovina	0.27	5.09	Moldova	0.33	2.48
Brazil	0.14	1.03	Mongolia	0.62	1.65
Bulgaria	0.56	2.66	Morocco	0.06	1.21
Cameron	0.04	0.18	Mozambique	0.11	0.23
Canada	1.47	11.69	Norway	0.81	14.75
Chile	0.31	1.02	Pakistan	0.04	1.00
China	0.05	2.53	Poland	0.50	7.39
Congo, Dem. Rep.	0.05	0.04	Portugal	0.24	6.85
Cote d'Ivore	0.03	0.29	Romania	0.54	2.51
Czech Republic	0.90	12.41	Russian Federation	0.59	6.45
Denmark	0.38	13.20	Saudi Arabia	0.05	1.54
Egypt, Arab Rep.	0.06	1.41	Serbia	0.53	3.93
Estonia	0.60	7.93	Slovenia	0.59	18.91
Finland	1.09	9.15	South Africa	0.38	2.94
France	0.45	15.47	Spain	0.36	14.70
Gabon	0.48	0.65	Sudan	0.11	0.11
Georgia	0.42	5.13	Swaziland	0.24	0.85
Germany	0.41	7.96	Sweden	1.00	13.97
Greece	0.21	3.80	Switzerland	0.44	8.73
Hungary	0.80	7.81	Syrian Arab Republic	0.11	3.36
Indonesia	0.02	1.11	Tunisia	0.35	1.34
Iran, Islamic Rep.	0.11	2.05	Turkey	0.13	4.54
Iraq	0.06	1.69	Turkmenistan	0.59	8.96
Ireland	0.42	20.80	Ukraine	0.47	3.66
Israel	0.15	2.26	United Kingdom	0.23	6.10
Italy	0.28	8.02	United States	0.72	13.50
Jordan	0.07	0.97	Uzbekistan	0.14	2.46
Kazakhstan	0.83	5.04	Vietnam	0.03	1.63

Source: The World Bank (for railways length and the population, data refer to 2014); CIA Factbook (for length of the paved roads).

It should be pointed out that the above data give the perception that both the road and rail transport systems have been developed without all forms of coordination.

The Spearman correlation coefficient calculated on figures illustrated in **Tables 1 and 2** shows, in fact, only a weak correlation (equal to 0.154 in the case of infrastructural endowment measured regarding to the surface area and equal to 0.295 regarding of endowment measured respectively to population). Efficiently, the actual road and rail networks are the outcome of different investment decisions which happened over almost two centuries and made by some actors – private and public ones – at different level of governments – regional, national and most recently also supranational (as the European institutions). In particular, at the beginning of their relevant history investment were made without all form of coordination; as happened in United Kingdom in the mid-19th century during so-called "railways mania" (Ferrari, 2016; Odlyzko, 2010).

In the case of transport terminals, the supply measures are determined by their capacity, i.e., the maximum flow of passengers, vehicles, or cargo that these terminals may move in a period of time supporting a good level of the service. Possible measures for airports can invoke to the air terminal or to the runways, whereas with regard to seaports they can refer to the port terminals or to the port access channels.

All these type of measures of the infrastructure endowment do not take into consideration the quality of the infrastructures; they indirectly consider that the economic effects and the condition of transport services are definitely the same in case using an unpaved road or a highway. For instance, in the railways system, the opportunity that two different places are related by a single-track rail line (with trains going through both upward and downward) or a double-track rail line (with any truck specialized to a single direction) makes the capacity of the double-track lane more than twice the capacity of a single-track lane. At the same time, two single-track rail lanes connecting the same two places forthcoming different paths may lead to a higher potential capacity if each of them is targeted to a specific direction. These effects are lost when the infrastructural endowment is just measured by the length of rail tracks.

It is then important to put in place measures able to represents some qualities of infrastructures. To make commensurate physical data related to qualitatively different infrastructures belonging to the same transport mode, it is possible to apply appropriate coefficients (to be considered the differences in quality). As an option, the infrastructural endowment measures can be limited to the part of the network that is considered more advanced. Indeed, it is quite common to find comparisons extremely based on the high-speed railways length, or the length of highways, i.e., the best infrastructural elements each mode.

The third approach to measure the infrastructural endowment is introduced by accessibility measures. From the definition of accessibility as a possible of opportunities following from interactions (Hansen, 1959), the transport and regional economics literature, also planners, have offered several and different definitions and operationalisations (Geurs & Osth, 2016) of this concept. According to Geurs and van Wee (2004), it can be considered accessibility measures as “indicators for the impact of land-use and transport developments and policy plans on the functioning of the society in general”. Namely, we consider to measures interpreting the possibility offered to people and firms to reach a certain infrastructure within particular times or the physical distance from the infrastructure (or the travel cost of expense). These types of measures are specifically recommended for transport terminals; they accomplish the following forms: number of citizens (or firms) living within 100 km or during 1 hour of

travel from an airport or from a seaport; number of people that may access to highways or railways, comprising a limited number of kilometres or in limited amount of minutes, etc.

All the above measures of infrastructural endowment are extensively used in the current transport planning and represent most of the current transport policies.

3.1.3. The relation between transport infrastructure and economic performance

The starting point for awareness the possibility for wider economic effects of transport infrastructure projects is to imagine at the big picture and consider the importance of a valuable transport network on performance of modern economies. In fact, the society is dependent on availability that is the 'easy of reaching' for households and business from the point of view of employment, education, supplying and delivering of goods and services, leisure activities, etc. The transport network and its attributes have a critical effect on accessibility with regard to support connectivity within and between countries. Consequently, changes to the acceptable transport network through transport infrastructure projects and other transport policy interventions can affect economic performance in terms of consequences on overall output, i.e., gross domestic product (GDP). It should be noticed that infrastructure developments often also have implications on welfare that are not necessarily reflected through changes in GDP (e.g., benefits for passengers or leisure travel). The importance of transport infrastructure for economic growth is, for instance, critical in W.W. Rostow's model for economic development as regards preconditions for take-off (Rostow, 1971). Transport improvements can lead to changes in GDP owing to impacts on: (1) the volume of inputs used and (2) the performance of input usage, i.e., productivity impact. First, transport improvements can alleviate access to labour or the creation of new firms, which may lead to increases in employment and in its turn lead to a higher GDP. Second, impact on productivity from transport improvements could happen directly through reduced travel times (for instance, due to reduced expenses for staff on transport products to customers or bring materials from suppliers). This kind of impact is considered in standard transport cost-benefit assessment through monetary valuation of time savings. Other more indirect impact on the productivity are not taken into account, although these can be important for major transport infrastructure projects such as:

• improvement profitability of private investment; for instance, due to transport improvements that enable companies to expand the geographical area of their output markets, which could mean that investment not cost-effective before now becomes financially worth because of higher income.

• improvement of labour mobility; transport infrastructure investment could allow persons in a certain region to take into account that better paid employment opportunities in locations more remote that before were not available. This may in turn promote investment in skills.

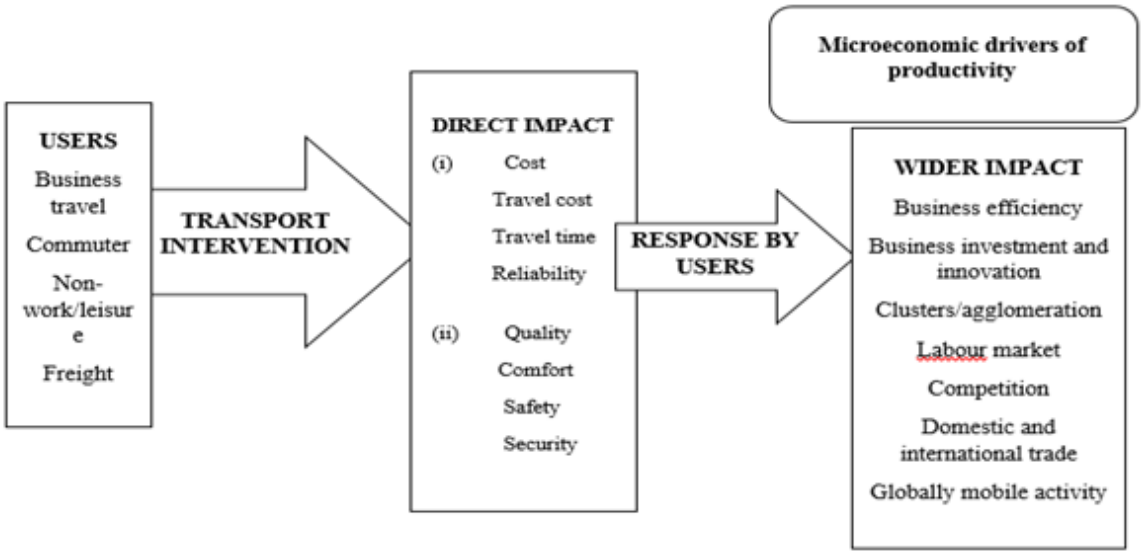
• make a stronger competition: transport developments could mean that companies in the same category but at different locations become competitors if the reduced transport expenses enable these companies to supply goods in each other's local market. Indeed, making a strong competition is one of the main drivers of productivity (for example: Office of Fair Trading, 2007).

A crucial distinction as regards productivity changes from transport is whether these happen as one-off effects or whether productivity growth could keep on going over longer periods. A sustainable productivity growth can be the outcome if there are positive effects on innovation, although it is quite difficult to identify the mechanisms through which transport can impact extent of innovation inside a geographical area or an industrial sector.

It should be pointed out that, although our focus is on how transport improvements are developing economic growth, there are likely also to be important feedback connection from economic growth to transport improvements (Berechman, 2001). Indeed, it has been proposed that higher-income countries could easier ensure the required funding towards transport infrastructure projects in comparison with other countries.

The several of historic examples to show the importance of transport improvements on economic growth will be given below. The relevance of railways in the nineteenth century and early twentieth century for delivering economic growth have been learnt by some authors, for instance Fogel (1964) in the case of the US and Hawke (1970) in the case of England and Wales. When it comes to freight transport in England and Wales, Crafts and Leunig (2006) calculate that welfare benefits of the railway investments in 1865 accounted for 4.1 per cent of gross national product (GNP). At the more project-certain level (and with a more present perspective), the opening of the high-speed rail station in Northern France (Lille) with fast links to Paris, Brussels and London has been a considerable boost to the local economy within the Lille Metropolitan Area, although partly at the expenditure of economic performance in more peripheral areas of the territory (Mann, 2006).

Chart 1. Links between transport and the economic performance



Source: Eddington (2006)

A graphical explanation of the connection between transport infrastructure improvement and the economy is included in **Chart 1**. This chart illustrates two key factors in order to transport interventions may lead in wider impacts: (1) the direct influence of a particular transport intervention; (2) reaction by users (business trip, commuter, non-work vacation and freight), which can in its turn influence productivity as reported by how they assess the changes to the characteristics of the transport system. The basic seven microeconomic driving forces of productivity are included in **Chart 1**. Below, each of these is shortly described:

• **Business efficiency:** the impact of transport improvements on business efficiency happens if these result may lead in changes to the price, time or accuracy of business/freight traffic. This could lead then to the result in cost savings for industry. Generally, impacts on business efficiency are considered in current assessment of transport infrastructure projects through valuating changes to travel time, vehicle operation costs and reliability.

• **Business investment and innovation:** transport improvements that facilitate to higher business investment or a larger-scale level of innovative performances could as a result have a positive impact on the productivity. A high investment level can be due to the direct transport cost savings received, which could lead to reorganization among companies involving the complete logistics process. The core effect, however, is due to growing the size of output markets with increased sales to cover fixed costs and the opportunity for lower unit costs in the production as the scope of operating expands. These impacts may lead to the result in additional business investments schemes would become financially achievable and consequently to be taken forward. Therefore, it could be argued that innovative activity would be positive affected.

Other mechanisms for productivity effects are connected to the probability that transport improvements can contribute the formation of clusters which would trigger technology transfer inside firms from the same sector (Sactra, 1999). However, in practice it is very difficult to determine specific connections between transport improvements and innovative activity surrounded by businesses.

• **Clusters/agglomeration:** economies of agglomerations are connected to the subsistence of external scale economies for specified locations due to (e.g. large urban areas): (1) better benchmarking of people to jobs; (2) large number of suppliers to select from companies; (3) accessibility of external services (e.g. public transport, conference places and restaurants); (4) widespread information between firms. All of these could imply that firms deciding to take place in such locations are more productive compared to in other locations, especially since unit costs for expenditure can be higher in large urban areas in comparison with other regions. At the general standard, the role of transport developments in the context of agglomeration economies is that these improvements can facilitate to provide security of productivity benefits with the help of reduced travel time and costs than may lead to make closer companies, employees and consumers in these areas. Nevertheless, until recently it has been very difficult to define this connection at the project-specific level. Moreover, one of the areas where progress is being made according to the understanding of the linkages and how these can be measured (Graham, 2007). In itself, this is important because of available evidence indicates that the contribution from large-scale projects on productivity through agglomeration economies can indeed be significant.

• **Labour market:** transport developments can assist the operation of the labour market, because the enhanced accessibility can enlarge the search area for people who looking for employments opportunities. Moreover, employers may also have advantages due to large numbers and different kind of applicants. It should be considered that this effect is important both for agglomeration and inhabited areas with the least of density. Therefore, the reduction of transportation costs could be particular important for low-income groups, even though strong coordination with the property market is required to prevent disadvantaged situations such as increases in house prices or rent. Generally, it is connected with transport improvements (Gibbons and Machin, 2006).

• **Competition:** the reduction of transport costs and improvement of availability can contribute competition as it expands market areas for companies, hence, increases the possibility that some firms will or can be attend in the same markets as competitors. Likewise, the increase of competitive pressure is one of the main drivers of productivity improvements

(Office of Fair Trading, 2007) owing to low-cost (high-productivity) companies are increasing their market share and spending cuts initiatives; for instance, because incumbents of the positions try to anticipate market entry.

• **Domestic and international trade:** transport developments can promote trade through the reduction of transport costs, which means fewer barriers to trade. Indeed, productivity could have a positive effect through higher trade: the export growth may facilitate specialization and usage of economies of scale in production and import growth may promote technology transfer between countries (Frankel and Romer, 1999). In this case, airport and port infrastructures play a crucial role but also surface transport connection. Moreover, it should be emphasized that transport development cannot only support international trade but also domestic trade with the help of lower transport costs.

• **Globally mobile activity:** the core connection between transport developments and global mobile activity is through influence of business location and foreign direct investments (FDIs) for companies existing on a global scale. Therefore, there are factors that transport links is one of the indication that are considered in the decision of where global businesses locate or promote FDIs. However, there are many evidence according to the contribution of FDIs on economic growth and productivity. Also, it suggests that the positive growth effects from FDIs are depend on other aspects such as a well-developed local financial markets (Alfaro, et. Al., 2010).

On the other hand, there are also a number of important cautions and counterarguments in relation to wider economic effects. The majority of impact of transport developments may be distributional instead of generative. This is emphasized by the two-way road argument where a transport infrastructure project is connected a retarded peripheral region with an advanced main region which may lead to economic performance migrating from the peripheral region to the core, otherwise to the intended impact of the intervention to facilitate the migration of activity from the core to the periphery (e.g. Vickerman et al., 1997). Subsequent issues are linked to crowding out. Redundant public investment can lead to higher tax rates and interest rates, hence, reducing private investment. Furthermore, redundant investment in road transport could reduce public investments in other industries that may have additional economic benefits. This involves non-road transport investments and direct contribution to industry. There is also the connected issue of leakage into higher costs. Where investment projects are purchased in non-competitive situations there is a risk that the investments could only leak into higher unit costs for construction and maintenance. In general, it is concluded that transport investment can be a necessary condition for economic development but it is not a sufficient condition.

Overall, the recent Eddington Study mentions that there are samples of countries and regions have been observed economic growth without considerable changes in the transport network (Eddington, 2006). However, it is also pointed out that economic growth without transport developments may sooner or later lead to restrictions on further economic development as congestion and other transport-linked bottlenecks start to become relevant. This may also emphasize that in developed economies where there are different economic centres are, overall, already have well-connection. There may be less scale for significant impact on economic growth with the help of entirely new transport links. Also It should be considered infrastructure projects which can solve capacity problems, such as those caused by considerable traffic growth and urbanization.

3.1.4. The influence of transport infrastructure on economic growth

The influence on growth of investment in the transport infrastructure fluctuates in the different stages of a country's economic development. Indeed, in low-income countries, investment in the core infrastructure maintenance can make a very large difference in the accessibility to education, jobs and services (Banister & Berechman, 2001). Likewise, as incomes rise, better transport services are necessary for increase the contribution of business activities, exports and creation of value, and the focus on the infrastructure investment replaces to supporting these sectors of the economy. With regard to more mature economies, priorities tend to depose towards solving issues of congestion and bottlenecks in rationally complete networks, the upgrade and support of existing assets, and ensuring for technological innovation. Generally, the economic influence of transport infrastructure is more transformative at lower stages of development, and the additional impact of new investment decreases at more advanced levels of development (Eddington, 2006). Transport infrastructure plays a crucial role in moving from a middle to high income economy. Therefore, theoretical and empirical studies have highlighted the positive relationship between high-quality infrastructure and economy-range productivity. This relationship is reinforced by a number of economic mechanisms stimulated by improvements in transport infrastructure, including the following:

• High-quality infrastructure is a precondition for the promotion of efficient transport services for transportation of goods and passenger movements, which consequently contributes the main economic activities and eliminates geographic barriers to the competition.

• Well-operating logistics systems stimulate trade through access lower costs to international markets and by ensuring the competitiveness of domestic firms.

• Passenger transport interconnection improves the productive capacity of the economy by extending and deepening labour markets and through agglomeration growth, promoting industrial specialisation and enabling face-to-face cooperation between businesses and professional workers in high-value service areas of the economy.

• Infrastructure could be an effective policy tool to eliminate social and territorial imbalances by connecting rural and distant areas to larger centres of production and consumption, establishing more economic opportunities for residents and reduction a number of migration (Graham, 2007).

Moreover, investment in infrastructure to improve connectivity is most effective at delivering long-term growth when it eliminates the restriction on productivity. The effectiveness of investment in generating growth and solving inequality could be measured and compared to alternatives are based on good project selection methodologies, involving high-quality estimation and transparent selection procedures (Arvis et al., 2014). Therefore, socio-economic cost-benefit assessment (CBA) is a necessary tool because it ensures a quantitative measure of the extent to which a project or initiative can bring the community benefits during whole lifetime that transcend the project's costs of construction and function (Pradhan and Bagchi, 2013). In this case, CBA is a strong basis for prioritisation, through which variants can be compared and selected. However, CBA also is affected by limitations, and infrastructure investment requires complementary analysis to provide in order to the government's policies towards social and regional equality are constituted in selection of projects and the allocation of resources.

3.2. The role of Public – Private Partnership on the development of transport infrastructure

Collaboration of public and private sector have become an instrument for a wide range of projects. It has evolved in part owing to financial lack of the public sector. The public-private partnership (PPP) projects have showed the ability to use complementary financial and operating efficiencies implicit to the private sector.

3.2.1. Public – Private Partnership: Definition and characteristics

There are some definitions of public-private partnership (PPP). The definition of PPP in accordance with the US National Council for Public-Private Partnerships is the following term: "A Public-Private Partnership (PPP) is a contractual agreement between government agency (federal, state or local) and juristic person of a private sector. Due to this agreement, the

expertise and assets of each sector (public and private) are distributed in delivering a facility or service for the usage of the general public. Moreover, dealing with resources, each sector divides the risks and potential rewards in providing of the service and/or facility" (The National Council for Public-Private Partnership, 2011).

Also, the Czech PPP Centrum identifies PPP as: "A partnership between the public and private sector for the aim of delivering a project or service traditionally ensured by the public sector. Public Private Partnership recognizes that both the public sector and the private sector have specified benefits in comparison with other in the implementation of particular tasks. Therefore, by enabling each sector to do what it does best, public services and infrastructure could be ensured in the most economically efficient manner" (PPP Centrum: Public Private Partnership, 2011).

Both of these definitions, which are mentioned above and all other definitions of PPP are based on two essential premises:

- Cooperation of public and private sector
- Purpose to build up, renovate, maintain or administrate public infrastructure, or ensure public services

Within that framework, PPP could be determined as a partnership between private and public sector that is restricted by a contract and leads to supplying of infrastructure and services with the help of the abilities of both partners through the most appropriate distribution of resources, responsibility and risks and hence, suitable profit (Bovaird, T., 2004).

The common determination given is suitable to any kind of PPP, given that in practice, the structure of the contract may fluctuate depending on the degree of ownership of assets and capital cost by the private partners. For instance, in the case of management contracts, the private partners have very restricted or no capital expenses, while in the event of a Design, Build, Own and Operate (BOOT) contract, the private partners have the responsibility for the design, building, operation and financing of a capital asset. Therefore, in these types of PPPs, private partners obtain payment whether from the government (through regular intervals), user fees or both for delivering the services (Chowdhury, et. Ch., 2016)

In accordance with the PPP Reference Guide published by the World Bank, the Asian Development Bank (ADB) and the Inter-American Development Bank (IDB), PPPs can be characterized by terms of three general parameters: (1) the type of asset implicated; (2) what functions the private sector is responsible for; and (3) which way the private sector is paid. With regard to the first parameter, many PPPs promote new assets often called 'greenfield projects', as the result of the private company takes over the financing, building and management of new

public assets. However, there are also projects which involve the upgrading and management of existing government assets referred to as 'brownfield projects'. In any case, a key feature of a PPP is that the assets or services given should be defined from the point of view of outputs instead of inputs, which define what is required as opposed to how it is to be done. According to the second parameter, PPP projects include several phases and functions which should be carried out by the private sector. Thus, functions may involve: design, build or exonerate, finance, maintain and/or operate. Finally, the third parameter is founded on the payment, where it has to be defined whether the private sector will be paid by collecting fees from users of services, by the government, or by a combination of the two, defining if it is conditional or not on performance (The EPEC PPP Guide, 2015).

Regarding the characteristics of the PPPs, the same Reference Guide described above also involves a list of the main attributes which all PPPs have, that other associated contracts have not. These essential attributes are listed below:

1) It's a long-term agreement between a public authority and a private company, under which the private company contributes providing a public service.

2) The private company obtains a revenue stream—which can be from government budget distribution, from user fees, or a combination of the two—that relies on the accessibility and quality of the transferred service. For this purpose, the agreement transfers risk from a public authority to the private company, including service accessibility or demand risk.

3) The private company generally need to make an investment to the company, even if it is restricted.

4) Further to budget distribution, the government can implement other types of contributions, for instance, providing or allowing access to the land; facilitating existing assets and providing debt or shared financing to encompass capital cost. The government can also ensure guarantees that permit risk to be distributed effectively between them and the private company.

5) When the PPP contract comes to the termination, the related assets return to the public ownership. Thus, these characteristics can be consolidated into various ways for creation a wide range of PPP contracts (The EPEC PPP Guide, 2015).

Over the past three decades, movement around the world has occurred towards privatization and deregulation. Indeed, there has been increasing dissatisfaction, especially in Anglo-Saxon countries and developing countries, with the implementation of government body owned enterprises, and in several cases recognized that development programs, in general, have

not worked. Government budgets were under pressure and thus, an effective tool should had been found it.

At the beginning, the PPP idea had developed and in the most way used in Great Britain. It has become dramatically popular as a method of acquisition and provision of public-sector infrastructure in areas such as: transportation (roads, railways, bridges, tunnels, ports or airports), social infrastructure (hospitals, schools, prisons, social apartments), public utilities (water supply, waste disposal, sewage treatment), government agencies, also other accommodation and dedicated services, for instance, communication networks or military equipment). It is clear that roads are the most vivid examples within the infrastructure. Their construction and service are funded completely from general and specialized taxes and from vehicle license charges (Lewis, M.; Grimsey, D., 2004).

3.2.2. Types of public-private partnership (PPP)

There are several sources which characterize the PPP differently. Indeed, we differentiate between five main types. Therefore, these types distinguish in the degree where is the private sector envolved in the project. In general, on the degree of envolvment depends the balance of risks between the public and private sector. The list of the five main types of PPP's is below:

1. DBB (Design – Bid – Build) – this kind is the most comparable to the classical tender which is used in the Czech Republic. With regard to the role of the private partner is to drafting the solution, proposal solution to the submitter and at last the construction. Consequently, the control and maintenance of the project is implemented by the submitter.

2. OM (Operation and Maintenance) – the main specific of OM type is the fact that the infrastructure is belonged to the public sector. As the function of the private sector is to control and take care of the ownership or service. Hence, the payment is implemented through classical payment calendar or with the help of motivation unit which is paid in the event of reaching a particular degree of "production". This type can be related to a usual "outsourcing" when the public sector, namely the government agency uses a private company that has lower expenses and better results.

3. BOT (Build – Operate – Transfer) – more frequently used type that is typical for incorporation of liability for preparation, realization, operation and service into one partnership contract and keeps it on one subject, which makes the project more effective and long-term. This is related to the proficiency and skills of the given subject with all parts of the project, used materials, technologies and other crucial aspects associated to the project implementation

and its operation. This type of project is occasionally changed in accordance with the real situation and demands of the project.

4. DBFO (Design – Build – Finance – Operate) – this kind is specific to moving of responsibility to the private partner throughout the project suggestion, project itself and its implementation, financing, functioning and, finally, service. It should be considered that is related to the ability of the private partner to secure an appropriate source of funding. This is highlighted as one of its largest positives because of the private sector is expected to be able to find an effective method of funding, including modern or extraordinary methods. Nevertheless, the project funding is frequently saddled with a debt that is often funded from the project revenues such as toll payments, grants or balance of payments.

5. BOO (Build – Own – Operate) – the BOO projects are quintessential for the expand of authority of private sector. Functioning and property goes into the hands of the private partner that implements finances, operates and maintains the project for the whole period of time. In order to follow some jurisdiction for the project operation, the public sector should keep some share of the properties (Bovaird, T., 2004).

Not all of these types are appropriate for all the PPP projects. These types are generally modified for certain projects because each situation has its special requirements and determinants. Therefore, the division in accordance with the potential expand of responsibilities and the types of PPP's is illustrated on the following figure:

Chart 2. Types of PPP in accordance with the part of responsibility

Source: Boivard, T. (2004)

4 Practical Part

4.1. Brief overview of social and economic indicators of Kazakhstan

Kazakhstan is located in the middle of Europe and Asia. Thus, It spreads from the Volga in the west part to the Altai mountains in east part and from the Siberian plain in the north part to the Central Asian Tian Shan mountains in the south part of country. The main part of the territory is occupied by plains. Likewise, the Tian Shan, Dzungarian Altay and Alatau are mountain ranges in the south and the southeast part of Kazakhstan. There are big amount of sparsely populated and uninhabited deserts and semi-deserts in the plains. The territory of Kazakhstan encompasses 2,724.9 thousand square km. Therefore, Kazakhstan has the ninth largest land area in the world after the Russian Federation, China, United States, Argentina, Brazil, Canada, India and Australia. Also, It has the second largest territory among the CIS (Commonwealth of Independent States) countries. The total length of the national border is 13,394 km, including 600 km along the shoreline of the Caspian Sea. Kazakhstan does not have open availability to the ocean. Kazakhstan is consisted of 14 regions, 2 cities of republican significance, 177 administrative level of rural districts, 87 cities, 30 villages and 6,668 rural settlements. The capital of Kazakhstan is Nur-Sultan, previously known as Astana, where it has moved in 1997 from Almaty city ("Kazakhstan, Unitary County" www.oecd.org., 2018).

Map 1. Administrative and geographical structure of Kazakhstan

Source: https://en.wikipedia.org/wiki/Kazakhstan

On 16 December, 1991 the Republic of Kazakhstan announced its independency from the Soviet Union. In accordance with the Statistic Agency of Kazakhstan, the population of the country consisted of 18.3 million people in 2018. More than 130 ethnic groups live in peace

and harmony within the country. The biggest amount of nationalities are Kazakhs (65.52%), Russians (21.47%), Uzbeks (3.04%), Ukrainians (1.76%) and others. The main language is Kazakh, which has come from Turkic group of languages. Also, in the same time Russian language is used equally with Kazakh within the country and considered as a cross-national language in the country. The national currency which is defined as a tenge has established since 1993 (Official website of the National Bank of Kazakhstan, 1993).

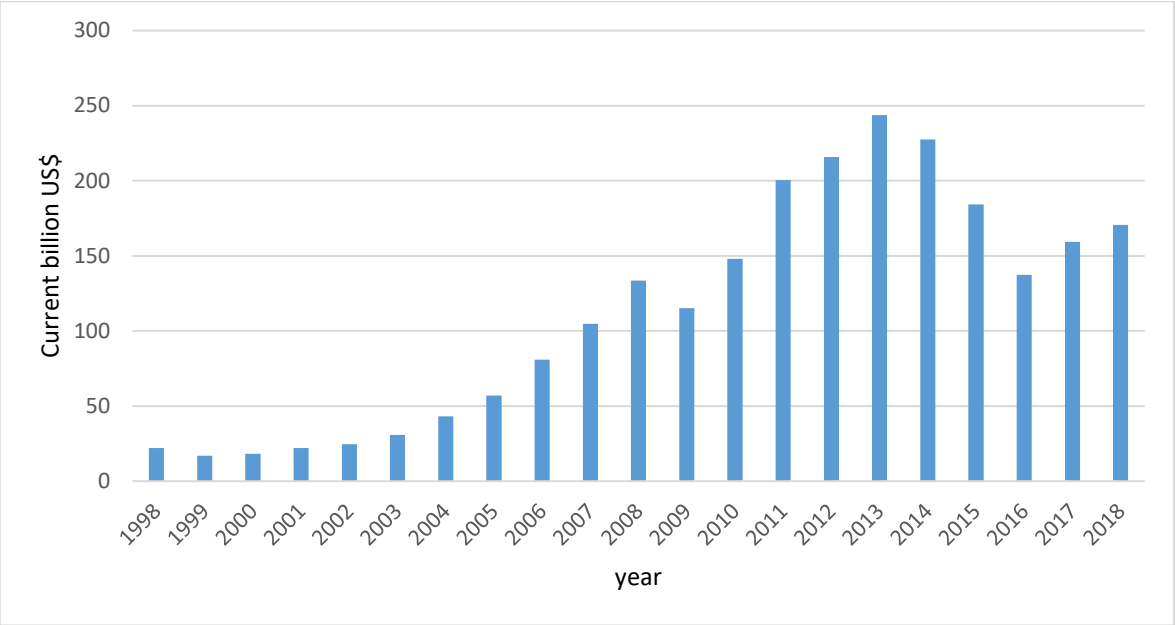
The Republic of Kazakhstan, according to the constitution, is a democratic, legal, unitary, secular republic with a presidential form of government (The Constitution of the Republic of Kazakhstan 1995). With regard to foreign policy of the Republic of Kazakhstan, the President of country determines and implements the work through the Ministry of Foreign Affairs of the Republic of Kazakhstan. Nowadays Kazakhstan is an active member of different world organizations such as United Nations, Shanghai Cooperation Organization (SCO), Eurasian Economic Union (EEU), Organization for Security and Cooperation in Europe (OSCE), Organization of the Islamic Cooperation (OIC), Collective Security Treaty Organization (CSTO) and others.

Over 20 years of independence, Kazakhstan's economy has passed many series of difficult steps. Throughout the given period of time, the country has suffered from the effects of several crises. The first systemic crisis of the Soviet Union, the second Asian crisis of 1998, then the global financial and economic crisis of 2007/08 and last one was falling oil prices in 2014-2015. Kazakhstan started its national economy development with a sharp divide of economic ties, especially from the economy of Soviet Union which was a part of integrated national economic complex. The reason of the insistence of Kazakhstan in maintenance of the existing economic cooperation with the other republics, especially Russia, was founded on the reason that Kazakhstan was the most integrated in the Union's economy. Loss of large market for Kazakhstan’s economy meant the loss of not only markets, but also automatically led to the collapse of the entire production sector in the country.

Despite of many difficulties that the country has faced since its independency, nowadays Kazakhstan is the strongest economy in Central Asia region and among the CIS countries. For the last two decades GDP of Kazakhstan has increased 22.3 times and amounted to 170.54 billion USD in 2018. It is noticeable that the most successful period of economic development was in 2000 – 2008 (**Chart 3**). During this period the annual growth of GDP was on average 9% per year. In the same period annual GDP in Kazakhstan has been gradually rising up and amounted to 243.78 billion USD in 2013.

Consequently, GDP of Kazakhstan grew 4.1% in 2018 compared to last year. **Chart 3** shows where the GDP figure in 2018 was 170.54 billion USD. The absolute value of GDP in Kazakhstan rose 11.14 billion USD with respect to 2017. Therefore, Kazakhstan is number 56 in the ranking of GDP of the 196 countries (The World Bank, 2018)

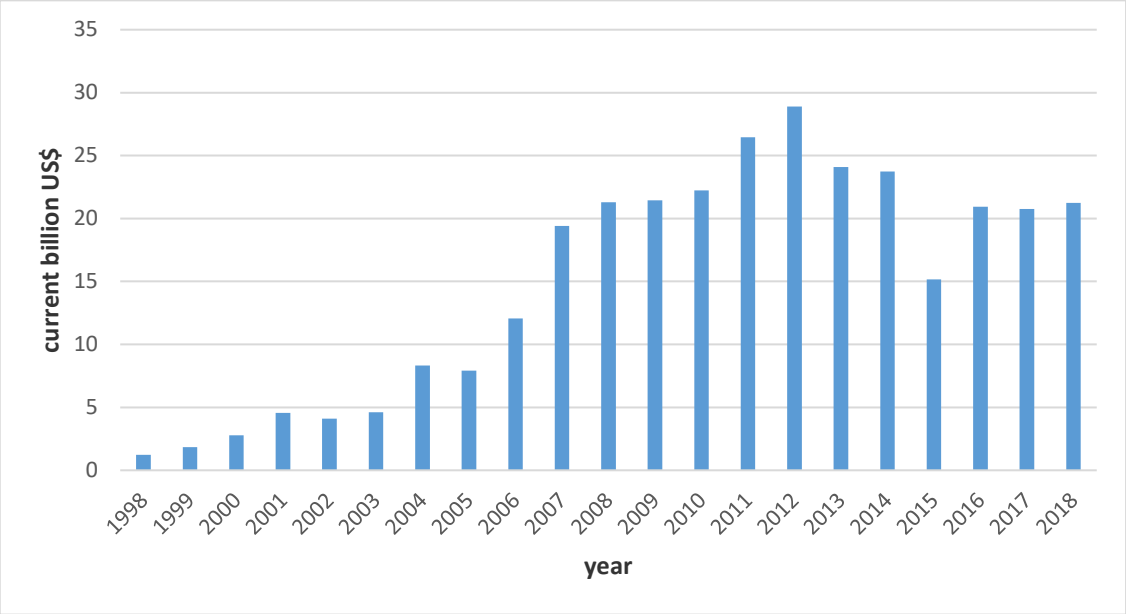
Chart 3. Total GDP of Kazakhstan (current billion USD, 1998-2018)



Source: Statistical collection from official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

It is surprising to note that, since independence in 1991, Kazakhstan has focused on its investment policy as one of the main factors for economic growth and development. It has been pointed out that investments contribute economic growth, which in turn provides an opportunity to a rise in living standards and social welfare. In just 28 years, the country has attracted over $320 billion of foreign direct investment and it can be seen from the **Chart 4** provided by Agency of statistics of the Republic of Kazakhstan. There is information about net inflows from Foreign Direct Investment (FDI) in Kazakhstan in the period of time 1998-2018.

Chart 4. FDI, net inflows in Kazakhstan (current billion USD, 1998-2018)



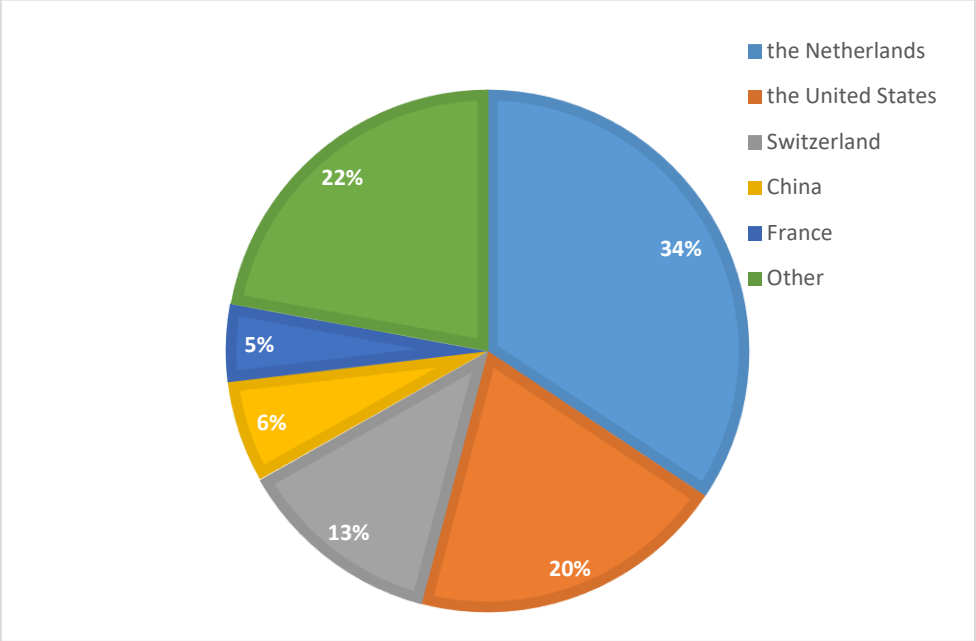
Source: Agency of statistics of the Republic of Kazakhstan

From 2006 till present time Kazakhstan has become as an important player in the global economy and an attractive investment destination. Indeed, the largest international trade corridors pass through the country due to the significant efforts on infrastructure development and active involvement. For instance, the international project by China's government "the Belt and Road Initiative", which involving infrastructure development and investment. Thus, the country's location allows to connect European, Asian and Middle Eastern markets, where 65% of the world's GDP is generated (OECD, 2019).

The results so far have been promising. According to Statistics of OECD, approximately 75 percent of FDI inflow has invested in Central Asia, Kazakhstan saw only over 20 billion USD of investment in 2018 (OECD, 2019).

Over the past five years, the major foreign investors in Kazakhstan have been the Netherlands (33.8 billion USD of investment), the United States (19.4 billion USD), Switzerland (12.5 billion USD), China (6.2 billion USD) and France (4.7 billion USD) (Official website of National Bank of Kazakhstan, 2018).

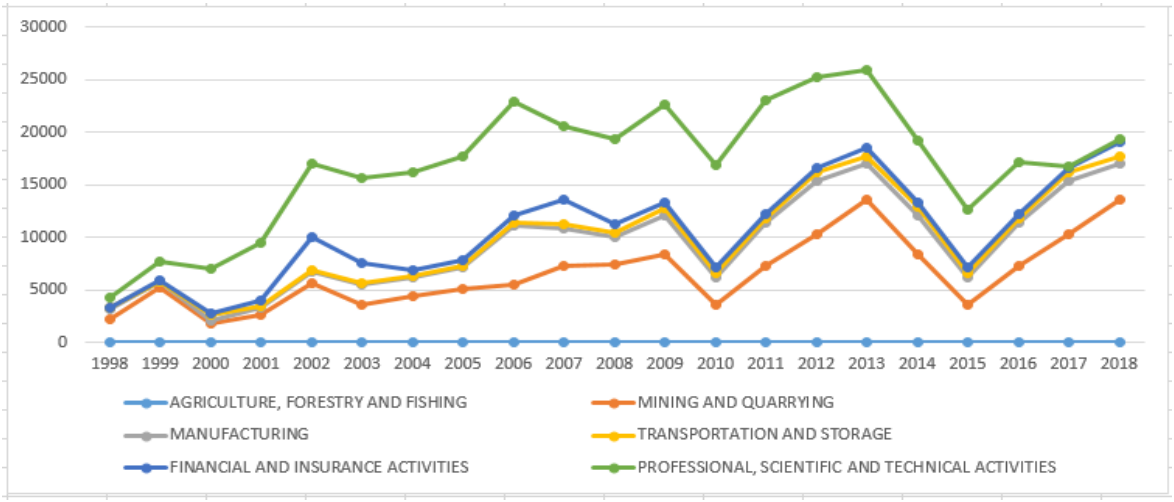
Chart 5. The share of investment by countries in Kazakhstan (current billion USD, 2014-2018)



Source: the data from Official website of National Bank of Kazakhstan

Notably, almost 60% of the investment projects are related to non-extractive sectors, including manufacturing, transportation, agriculture, as well as financial and insurance services. Accordingly **Chart 6**, there has been shown what types of economic activities was invested by foreign investors between 1998 and 2018.

Chart 6. Gross inflow of FDI in Kazakhstan by type of economic activities (million USD, 1998-2018)



Source: own processing based on data from official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

Undoubtedly, FDI inflow in Kazakhstan has shown positive dynamics over the past twenty years in **Chart 6**. However, the overall decline in FDI inflows globally has intensified competition for foreign investments with every country competing for foreign backers. Aiming to keep up the momentum, the Government of Kazakhstan has implemented a new structural approach for investment promotion and facilitation such as application of public-private partnership projects for the development of transport infrastructure in the country. It will be mentioned deeply about influence of public-private partnership on improvement of transport infrastructure of country in the next chapter.

4.2. PPP Center in Kazakhstan

The world economy has significant experience how to implement PPP projects in different sectors. In fact, many PPP projects are complied with the fields of industrial infrastructure, innovation, and military affairs. For instance, The United States, the U.K., Germany and France are leader states in the field of public-private partnerships. Hence, international experience in the field of PPP can be divided into two groups: countries, where the PPP development has a long history and is based on the implementation of specific projects, especially in developed countries and the second group, countries, where PPP is implemented through creation of appropriate legislative framework. The first group includes a number of the most developed countries of Western Europe, such as the U.K., France and Spain and the second group includes some countries such as South Korea, Chile, Australia, Singapore and Kazakhstan (Mouraviev, 2012).

Public-private partnerships were considered as a special type of cooperation to share risks, mainly financial risk, in social and infrastructure development, and attract foreign investment (Bishimbayev, K. V., 2008). Therefore, the Law of the Republic of Kazakhstan "On Concessions" is a legal framework for the implementation of concession, with the main model, which based on the build-operate-transfer (BOT) structure (PPP Center, 2015).

Most of experts in Kazakhstan argue that that they will reduce public debt and attract more private investment into the country’s infrastructure (Mouraviev, 2012). Thus, Kazakhstan also seeks using international best practices in infrastructure development. The government’s desire to be considered a developed modernized country due to PPPs attractive.

Kazakhstan considers PPPs as a way to be more like developed economies such as the United States, Canada, and Europe. Therefore, Kazakhstan hopes to achieve the following benefits due to implementing PPPs:

1. to make cost-efficient and improve time efficient management by implementing public infrastructure projects
2. to implement the integration of innovative technology into public infrastructure (PPP Center)
3. Risk Sharing
4. to have more and better financing options for new projects (Abdymanapov, S. A. and Abiesov J. A., 2013)

In fact, the Kazakhstan Public-Private Partnership Center (PPP Center) was established in August 2008. The only shareholder of the Kazakhstan PPP Center is the Government of the Republic Kazakhstan represented by the Ministry of National Economy of the Republic of Kazakhstan. The major reasons for creating this center in Kazakhstan were to ensure transparency, competency, and circumspection in the PPP project selection process, develop a framework to support PPPs in Kazakhstan and also to accumulate expertise and experience relating to PPPs.

Accordingly, the PPP Center of Kazakhstan has 42 active PPP projects, 5 projects of national significance and 37 local projects (**Appendix 1**).

These projects are at various stages (planning, tender, repeated tender procedures etc.) according to the project schedule. Likewise, it is noticeable that projects focused on non-primary goods. Consequently, the priority areas of these projects include transport infrastructure and the development of social and urban infrastructure. For instance, after establishment of PPP Center in Kazakhstan, there has been implementing social and economic significant large-scale projects such as the BAKAD (Almaty Ring Road) Project and Construction of the Korgas-Zhetygen Railway Line.

4.3. Transportation modes in Kazakhstan

The transport system of Kazakhstan is ensured by all transport modes: railway, automobile, pipeline (petro—and gas pipelines, conduits), and also water (river and sea) and air. Accordingly transport infrastructure of the country includes automobile and railroad sector, river navigable waters, several objects of transport infrastructure such as the stations and the airports, the service places, which ensuring repair of vehicles, services for transport workers and passengers (Panasyuk, Gafurov and Novenkova, 2013)

Table 3 includes data about the number of FDI (Foreign Direct Investment) for each transport mode of country during 1998-2018. FDI for transportation sector amounted to 1.174 billion USD in 2018, compared to 55.6 million USD in 1998. Investments in railway and automobile transport accounted for 41% of the total investments in 2018. The most noticeable

changes are the investment in railroad, air, seaborne and riverine sector because the quantity of investment by 3 sectors doubled in comparison with previous year. However, if it compares data of pipeline sector between 2017 and 2018, there is significant decrease of FDI by pipeline sector. This implies that transportation sector optimizes its capital expenditures in the period of moderate macroeconomic condition.

Table 3. Foreign Direct Investment (FDI) by transport type (current million USD, 1998-2018) and total GDP of Kazakhstan (current billion USD, 1998-2018)

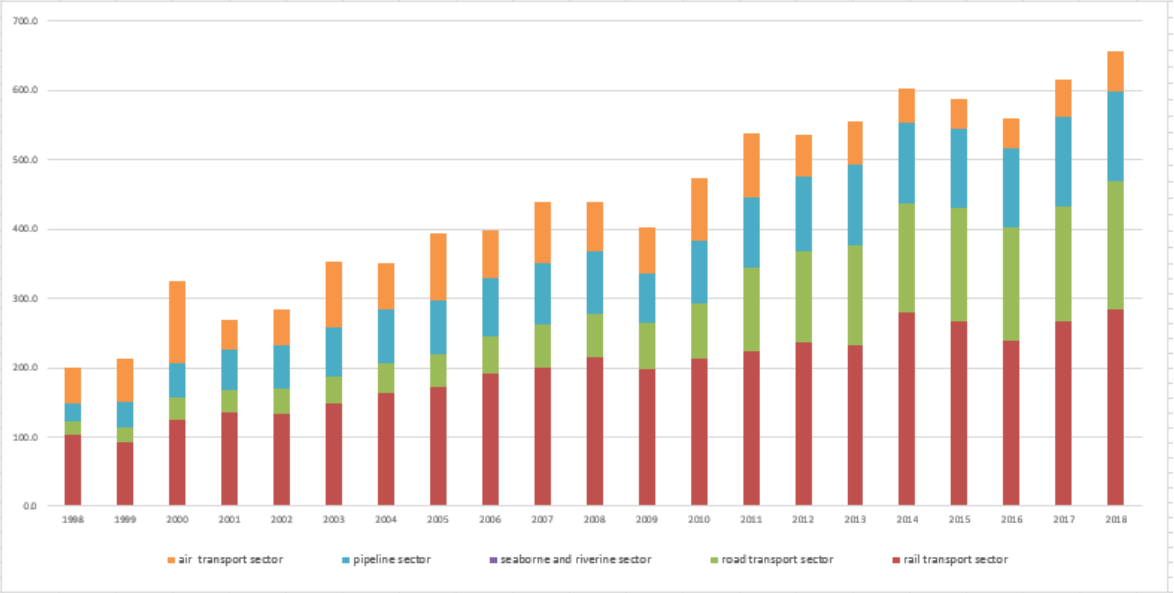
year	GDP, billion US$	FDI for Railway mil. USD	FDI in Automobile mil. USD	FDI in Pipeline mil. USD	FDI in Seaborne and riverine sector mil. USD	FDI in Air mil. USD
1998	22.14	25.22	3.20	2.31	10.75	14.12
1999	16.87	10.84	0.88	9.90	10.28	3.91
2000	18.29	15.85	1.45	39.09	1.98	0.26
2001	22.15	49.76	9.72	139.54	0.01	4.86
2002	24.64	14.61	22.47	134.29	0.06	48.67
2003	30.83	36.88	13.54	177.46	0.11	3.40
2004	43.15	26.76	11.37	169.84	0.18	2.74
2005	57.12	31.91	16.32	172.50	0.25	2.49
2006	81	46.14	18.88	175.35	0.31	3.51
2007	104.8	96.23	27.99	223.26	17.03	4.86
2008	133.44	163.81	14.03	608.31	7.52	5.89
2009	115.31	127.59	16.39	1326.40	12.60	6.16
2010	148.05	259.39	19.51	486.53	19.74	24.11
2011	200.38	570.29	63.27	386.05	52.28	26.86
2012	215.9	660.01	72.21	503.84	3.70	51.81
2013	243.78	634.01	77.92	1658.68	7.74	135.46
2014	227.44	536.76	72.45	1005.34	12.37	62.64
2015	184.36	456.56	121.36	835.90	3.87	31.23
2016	137.28	110.82	83.23	807.46	23.40	32.59
2017	159.4	102.33	165.20	975.59	29.07	39.80
2018	170.54	250.01	236.33	472.99	127.82	87.71

Source: own processing based on data from official websites Agency of statistics of the Republic of Kazakhstan and Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

Indeed, each type of transport modes in Kazakhstan has its own field of beneficial use (**Appendix 2**), which depends on the feature of the transported goods and field the range of transportation. In the structure of the transport complex, rail transport is the most common. In **Chart 7** the information about freight traffic of each type of transport modes in Kazakhstan can be seen which it was constituted over the period of time. Therefore, it has been pointed out that railways section was used significantly in comparison with other four types of modes over 20 years. With regard to road transport sector, it was increased 5 times throughout the given period from 18.7 billion tkm in 1998 to 185.2 billion tkm in 2018. However, air transport sector rose slightly, counting 50.8 billion tkm in the first year and 57.6 billion tkm in the final year. Moreover, the pipeline has gradual growth over the period given, 27 and 130.1 respectively.

The last considering seaborne and riverine sector, which it has the least share of all transport sectors.

Chart 7. Freight turnover of all types of transport modes of Kazakhstan (billion tonne-kilometres (tkm), 1998-2018)



Source: own processing based on data from official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

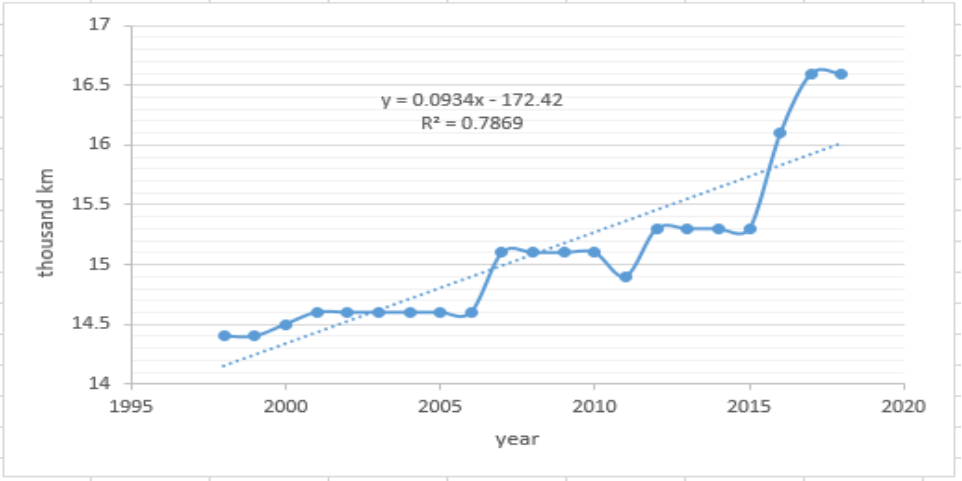
4.3.1. Railroad transportation

In fact, the railway system is an important mode of transportation in Kazakhstan with a total length of over 16,600 km, which is the third largest rail network within CIS countries after Russia and Ukraine as regards track length. It nonetheless, the density of Kazakhstan's track network is lower (5.5 km per 1,000 km2) in comparison with Ukraine (35.9 km), where the density of population in Kazakhstan was 7 per Km2 (18 people per mi2) and in Ukraine has consisted of 75 per Km2 (196 people per mi2) in 2018. It is surprising to note that Kazakstan has an approximately the same level as Russia (5.5 km), where the population density in Russia was 9 per Km2 (23 people per mi2) the same year (Kazakh Invest National Company, 2019).

After breakdown of Soviet Union, the development of railway transportation in Kazakhstan can be divided into 3 stages: The first period (1992–1996)—adaptation to consequences after breakdown of the USSR and practically new economic conditions. The beginning of the second stage (1997–2001) was the development of the first Kazakhstan railway enterprise "Kazakhstan Temir Zholy", unified in itself three Kazakhstan highways, were able to deal with the crisis phenomena and to provide a framework for the further reforming. The

last third period (since 2001 to the present)—is beginning of reforming of branch. Indeed, due to the creation of JointStock Company "National company" "Kazakhstan Temir Zholy" are realized of new reforms in branch. All changes are focused on transformation of a railway transportation of the country into the modern, highly effective transport system, which is considerably integrated into continental system of transportations and capable to follow the requirements of clients in conditions of the developed market competition (Kazakhstan Railroad, 2012). Therefore, **Chart 8** shows how the length of railway has changed from 1998 to 2018.

Chart 8. The length of railway in Kazakhstan (thousand kilometres, 1998-2018)



Source: own processing based on data from official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

It is noticeable that through the territory of Kazakhstan there are 6 railway, 6 automobile and 72 air corridors. The important and significant place in the transport of system of the country is positioned by two nodes located on international transport corridors. The first one is the railway junction "Dostyk" (**Appendix 3**) in the east and the second one is the sea trading port of Aktau in the west of the country. The main purpose of the development these two places is to effectively deliver domestic export goods to the foreign market and ensure a wide range of transport services to their users.

Likewise, It should be noted that Khorgos Gateway — a massive 600-hectare development area positioned in Kazakhstan right on the border with China.

It is interesting to mention that the Khorgos Gateway connects Kazakhstan to China by rail (**Appendix 4**). It has successfully marketed itself as the central station of the New Silk Road. Locating right at the heart of an developing network of trans-Eurasian rail lines, which directly has connection to 27 cities in China with 11 cities in Europe, all flow goods from China are delivered to destinations all over the Eurasian territory. From 2016 to 2017 the whole year

of high-grade operation, the port is has already handled over 1/5 of their 2020 goal of 500,000 TEU[1] per year, and with COSCO (China Ocean Shipping Company) and the Port of Lianyungang, cargo volumes are expected to receive a massive boost (South China Morning Post, 2017).

With regard to the part railway of Kazakhstan, in December 2011, the total length 293 km railway was completed from the Khorgos border crossing to Kazakhstan's Zhetygen terminal (**Appendix 5**). The railway lines from the Chinese and Kazakh sides of the borders were connected on December 2, 2012. From 2011 till present, about 65 trains carrying 6,200 TEU of cargo cross through Khorgos Gateway every month (report of JSC Samruk-Kazyna).

In addition, the cost of the Korgas-Zhetygen railway line project construction is estimated equal of $617 million (**Table 4**). Indeed, it is of significant strategic project for Kazakhstan, as this line offers the second connection with China through railway networks (KTZ, 2015). China-Kazakh transport corridors play a significant role in improving bilateral trade between two countries, which spread from the sea port of Lianyungang (China) to the border at Dostyk (KAZ) – Alashankou (CHN) stations within the territory of Kazakhstan, with further access to Russia's transport networks.

Table 4. Basic data on Korgas-Zhetygen railway concession project

Constructtion of Korgas-Zhetygen railway	Ministry of Transport and Communications	Concession agreement signed with «ENRC Logistics», April 18, 2008. Cost of construction – KZT 93047.3 million Term of concession: 2008-2036 Length – 298.4 kilometres

Source: UNECE (2009)

It is obviously that interconnection ports such as Khorgos help to make the international market more efficient and build cooperation between countries wanting to improve how they trade. For this reason, Kazakhstan over last decade try to concentrate on the development of transport infrastructure for economic growth.

4.3.2. Road transportation in Kazakhstan

Road transport in Kazakhstan over 20 years from point of economic importance came in third place after rail and pipeline sector.

[1] twenty-foot equivalent unit

According to Ministry of National Economy of the Republic of Kazakhstan Statistics committee, in 2018, the total length of general use it has roads consisted of 96.2 thousand kilometres in Kazakhstan compared to 85.2 thousand kilometres in 1998. It is clear that the length of road in the country has not extended over the given period of time. However, the existing road network allows transport cargo between all of the part of country. With regard to the quality of Kazakhstan's roads, it is more higher than average reaching 91% of the roads are asphalt/black top, 8% are gravel and only 1.1 % have unpaved dirt segments.

Due to geographical location of country the international transport lines on Kazakhstan's highways have three main directions:

- north – to Russia and then to Europe and the Far East;
- south and east – to China and then to the south-east Asia countries;
- west – to the countries of the Central Asian region and then to the countries of the Caucasus, Iran and Turkey.

It is noticeable that the development of Kazakhstan's public transport during last decade has been associated by numerous reforms, as a result public transport has reduced significantly, and the population switched basically to the use of personal cars. According to the database of the Ministry of Internal Affairs of the Republic of Kazakhstan as of January 1, 2019, 4 million 425 thousand 770 units of automobiles are registered in the country. Thus, there are 250 cars per 1000 people. Over 20 years ago, in 1998, the number of automobiles in the country did not exceed 1.3 million. Therefore, automobiles were 1 million 298 units. In 2018, there were officially registered 3 million 845 301 units of automobiles in Kazakhstan.

One of the successful projects is the creation of the international transit corridor "Western Europe-Western China" is considered the shortest and fast road route to Europe for the transportation of goods as well.

The BAKAD (it is abbreviation in Russion language, which it means Big Almaty Ring Road) concession project considers the construction at a length of 66 km long, six-lane ring road within Almaty city, having 21 bridges and 19 viaducts (Farchy, 2014). This project has important social and economic significance, and also it will be the connecting link to a transnational highway connecting Western China with Western Europe (**Appendix 7**). BAKAD (as outlined in **Chart 9**) is not only the first concession and priority project in Kazakhstan's road sector , but is also "absolutely ground-breaking", being the first such a project in Central Asia, according to Thomas Maier, managing director for infrastructure at European Bank for Reconstruction and Development (EBRD) (Farchy, 2014).

Chart 9. The short outline of the BAKAD (Big Almaty Ring Road) project

Source: Ministry of Investments and Development (2014)

Indeed, Almaty city is such an important contributor to the country's economy and job creation, finding a right way to solve the traffic problem for government. Big Almaty Ring Road is supported by public-private partnership (PPP), which helps to improve road safety, shorten transportation costs, and also reduce travel times for commuters. It will also reduce city noise and pollution.

It is surpising to note that International Finance Corporation (IFC) is the lead advisor for this PPP concession project to design, build, finance, operate, and maintain the road (The World Bank, 2018). Therefore, the winning bidder, specifically companies from Turkey and South Korea will maintain the road in compliance with specified criteria and collect tolls from the government of Republic of Kazakhstan. Hence, the government of the country will provide the private partner with annual payments.

This PPP project is important and scale for Kazakhstan because of will be a significant part of the New Silk Road connecting Western China with Western Europe—transforming Kazakhstan into a logistical hub. It is expected after completion Big Almaty Ring Road can improve the country's access to global markets for local businesses, promoting trade and stimulating economic growth.

Table 5. Basic data on Big Almaty Ring Road PPP project (BAKAD)

Contracting authority	Ministry of Investments and Development of the Republic of Kazakhstan
Sector	Transport; road
Type of PPP project	BOT (Build, operate, and transfer)
Total investment	680 million USD
Sponsors:	Makyol (33.3%), SK Corp.(25%), Korea Express (25%) and others

Multilateral Support	IFC, EBRD, IDB, ADB and other Asian Infrastructure Investment Bank
Project Completion Date	2018-2021 (estimated date on 25-th of June 2023)

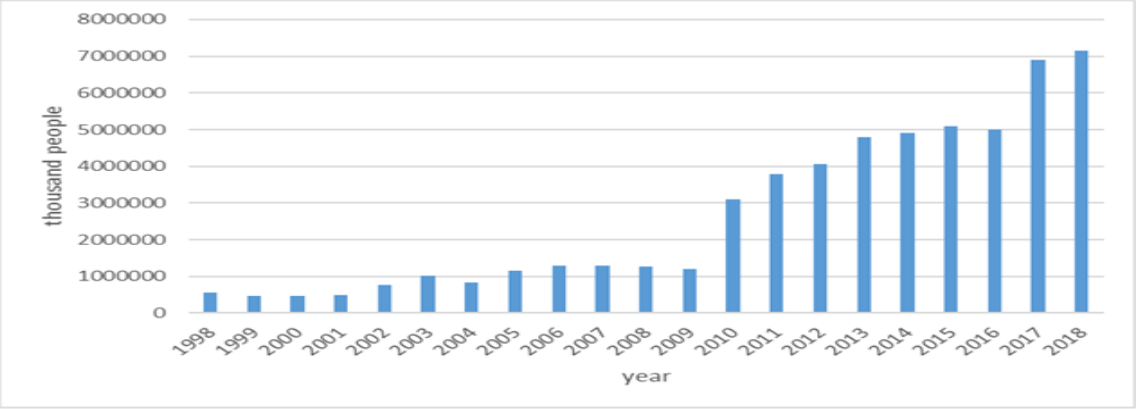
Source: the World Bank, 2018.

4.3.3. Air transport

Due to the large geographical extent of Kazakhstan, air transport plays a large role and often has no alternative. Kazakhstan has 23 major airports, of which 14 serve international transport. Most airports are underloaded, the capacity of the republic's air navigation system currently has more than five times the supply. Of great importance for the industry is the transit of cargo and passenger air transportation between Europe and Asia. The largest airline in Kazakhstan is Air Astana (**Appendix 8**).

According to Statistics of Ministry of Investments and Development, at the end of 2018, 7.2 million people were served in Kazakhstan, which is 6% more than for the same period in 2017. Therefore, the value for air transport, passengers carried in Kazakhstan was 7 million 143 thousand people as of 2018. As the graph below shows, over the past 20 years this indicator reached a maximum value of 7 million 143 thousand people in 2018 and a minimum value of 461 thousand people in 2000 (**Chart 10**). It is important to note that in the **Chart 10** the total number of air passengers of the country carried include both domestic and international aircraft passengers of air carriers registered in the country.

Chart 10. Transportation of passengers by air transport of general use (thousand people, 1998-2018)

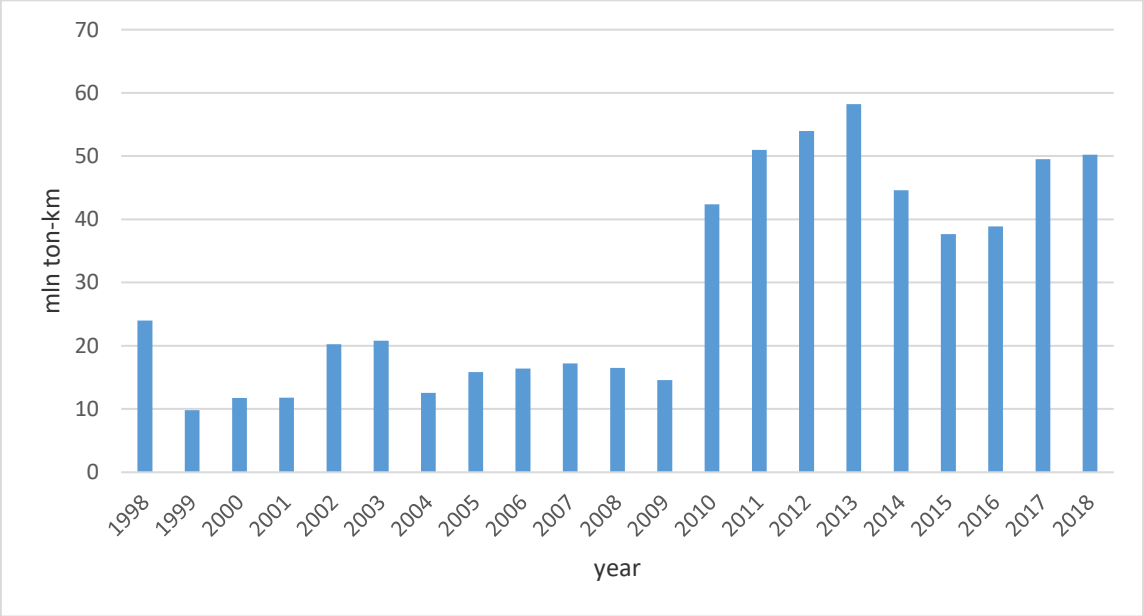


Source: the World Bank, 2018.

Large airports of Kazakhstan are very promising as transhipment bases between Europe and Asia, North and South, which makes them profitable for attracting foreign and domestic

capital. A network of air routes of the trans-Asian system of routes goes through the airspace of the republic. The main directions of transit flows passing through Kazakhstan are flows from Europe to the countries of Southeast Asia. According to the data from the World Bank, the value for air transport, especially freight in Kazakhstan was 50.22 as of 2018. As the graph below shows, over the past 20 years this indicator reached a maximum value of 58.20 in 2013 and a minimum value of 9.8 in 1999. It is interesting fact that air freight of the country is the volume of freight, express, and diplomatic bags are carrying on each flight stage, meaning the process of civil aviation from take-off to its next landing are measured in metric tons times kilometres travelled.

Chart 11. Transportation of freight by air transport (million tonne-kilometres, 1998-2018



Source: the World Bank, 2018.

Nevertheless, air transport in Kazakhstan has several problems with this mode of transportation concern at the lack of enough of investment for air transport. Over the past 20 years the country is struggling with the existing demand for the use of airspace such as:

- the speediest renewal of the aircraft fleet;
- liquidation of receivables and payables;
- serious modernization of all airports of the Republic;
- increasing the degree of coordination of existing airlines in the market of air transport services;
- improvement of technical system of air traffic control, navigation and communication.

4.3.4. Water transportation

Water transport in Kazakhstan is composed of seaborne and riverine sector of transport. The efficiency of using water transport depends on the accessibility of freights and coordination with other modes of transport. Indeed, there are eight water basins in the country such as Aral-Syrdarya, Balkhash-Ili, Irtyshsky, Ural-Caspian, Ishimsky, Nur-Sarysu, Shu-Talasskiy and Tobol-Turgayskiy. The location of these basins can be see below.

Map 2. Water basins of Kazakhstan

Source: https://ru.wikipedia.org

In Kazakhstan, due to geographical location, water transport over past 20 years played an insignificant role in the economy. The main reason was the limited scale of its activities on a territorial basis principle and seasonal work. Likewise, for these and other economic reasons, riverine sector of water transport is not widely used and also it is not a priority in transport policy, that it takes a small share in the transport infrastructure of the country.

The development of water transport, like other modes of transport, is closely connected with industrial development and the rich natural resources of the country.

According to Statistics of Ministry of Investments and Development, about 1,200 sea and river vessels are registered in the republic, of which 74 are passenger (6.6%). Consequently, of these 48 vessels are considered suitable for navigation. It should be noted that the average age of passenger ships is not more than 25 years. Transportation of passengers and freights is implemented by private shipowners on 530 vessels of different types. An important problem of riverine sector of water transport industry is the depreciation of the technical vessels, which

amounts to 85.0%. The government of the country are taking measure for updating and modernization of these transport.

Freight transportation by riverine sector of water transport in Kazakhstan is implemented in several regions of the republic. There is river transport is named Pavlodar river port JSC[2] in the northern part of country, which provides services on extraction and transportation of river sand to the construction objects of the country, and also participates in the transportation of transit freights. Therefore, fleet is composed of towboats, dry freight ships and bulk barges.

The Caspian Sea and more than 4 thousand kilometres of inland water routes - this is what the water transport system of Kazakhstan looks over the past 20 years. More than 300 vessels operate at sea, more than 700 operate on rivers and canals. Every year, water transport carries about 7 million tons of freight. The main directions are Russia, Iran, Azerbaijan. At the same time, the cargo flow in the Caspian Sea is several times higher than the traffic on the rivers.

The development of the Aktau port in conjunction with the solution of other projects, including the special economic zone (SEZ) is one of the promising directions for the development of transit through Kazakhstan. The successful development of the port, due to the growth in cargo traffic, will serve as an incentive for attracting investment. For the development of maritime transport, the National Maritime Shipping Company (NMSC), Kazmortransflot was created, thereby laying the foundations for creating its own merchant marine fleet in Kazakhstan (Kazmotransflot, 2011).

4.3.5. Pipeline transportation

Pipeline transport, which is called the transport of black gold and blue fire, is the most specialized compared to other modes of transport. This type of transport is important for the development of the oil and gas industry and frees the railway and water transport from a significant number of transportations, while at the same time reducing the transport costs of the national economy. The cost of constructing 1 km of the pipeline is almost half the cost of building 1 km of the railway and pays off in a very short time due to low operating costs.

According to Statistics of Ministry of Investments and Development, pipeline transport in terms of cargo turnover, since 1993 came in second place after rail transport.

[2] Joint-stock company

In 2018, the freight turnover of pipeline transport, compared with 1998, increased 4.8 times and reached 130.1 billion tonne-kilometre (tkm), which amounted to 19.8% of the freight turnover of all types of transport in the republic (as outlined in **Chart 7**) The length of the republic's pipeline in 1998 was more than 17 thousand km, which is 1.3 times more than in 2018 (**Chart 12**). The largest oil pipelines are Omsk-Pavlodar-Shymkent, with a length of over 2000 km along the territory of the republic, Ozen-Atyrau-Samara - 1,500 km, Ozen-Zhetybai-Aktau-141 km. and others.

Chart 12. The length of pipeline in Kazakhstan in the period of time 1998-2018

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
The length of pipeline, thousand km	17.6	17.8	17.6	17	17.1	16.8	16.8	16.7	16.2	16.2	16.2

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
The length of pipeline, thousand km	20.3	20.1	20.2	20.2	20.2	23.1	23.2	23.2	23.2	23.3

Source: data from official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

In Kazakhstan, export pipeline transport is a priority, due to the prospect of an increase in oil production. According to the data from World Bank, Kazakhstan increased its oil production in 2018 by 1 percent to 87 million tonnes in comparison with 86.2 million tonnes the previous year. As we know, in 1997, the National Company Kaztransoil was established with 100% state-owned shares. All main oil pipelines that pump 95% of the oil produced in the republic were transferred to the authorized capital of the Company. In 2002, two large companies, Ka-Zoyloil and Kaztransoil, were merged into one National Company Kazmunaigas, which has a leading influence on the economy of the Republic of Kazakhstan.

In general, in the construction of both domestic and trunk and transnational pipelines, it is necessary to take into account the specific conditions of Kazakhstan, which boil down to the following:

- significant technical difficulties due to the complexity of the relief, water barriers, long distances;

- lack of production of pipes and equipment for main oil and gas pipelines in the republic;

- high political risks due to the intersection of conflict zones, the intersection of a large number of countries;

- attracting major investments in increasing oil production both in exploited fields and in developing new promising fields.

4.4. Analysis of all modes transportation in Kazakhstan

4.4.1. One-equation model

For analysis of all modes transportation in Kazakhstan was used linear regression analysis with the time series data from 1998 to 2018 for determining the correlation between GDP growth and FDI for railway, automobile, pipeline, air, seaborne and riverine sector. Moreover, it was analysed for understanding positive or negative impact FDI on GDP. For estimation these parameters, the first method was used Ordinary Least Square Method (OLSM) in SW Gretl approach to this issue.

Also it was analysed relationship between GDP, oil price, mining and quarrying, manufacturing industry and gross output of agricultural products. For estimation these parameters were used Two-Stage Least Squares Method (TSLSM) in SW Gretl approach to this issue.

At the beginning of my analysis it was used economic and econometric model, which consisted of assumptions, application of mathematical and statistical models wih endogenous, exogenous and stochastic variables, parameters, declaration of variables and units. All these data have been represented in **Table 6**.

Table 6. The economic and econometric model for OLSM

For my analysis it was used three assumptions:	1. Is the development of Kazakhstan's economy directly dependent on development of transport infrastructure? 2. Does an interrelation exist between GDP growth and the development of all modes of transport in the country? 3. Does Foreign Direct Investment (FDI) into transport infrastructure have positive or negative impact on GDP growth?
Economic model of my analysis was represented as:	GDP growth in KZ has dependency on FDI for Railway, FDI in Automobile, FDI in Pipeline, FDI in Seaborne and riverine sector and FDI in Air mil. USD $y1t = f(x2t, x3t, x4t, x5t, x6t)$
Econometric model for my analysis:	$Y1t = \gamma12\ x2t + \gamma13\ x3t + \gamma14\ x4t + \gamma15\ x5t + \gamma16\ x6t + u1t$

Endogenous (dependent, explained) variable (regressand)	Y1t
Exogenous (explanatory) variables in time (regressors)	x2t , x3t , x4t, x5t, x6t
Stochastic variable (residual term)	u1t
Parameters	γ12, γ13, γ14, γ15, γ16
Declaration of variables	Y1t … GDP, billion US$ X2t … FDI for Railway mil. USD X3t … FDI in Automobile mil. USD X4t … FDI in Pipeline mil. USD X5t … FDI in Seaborne and riverine sector mil. USD X6t … FDI in Air mil. USD U1t …Random error, ~ nid (0, σ2)

Consequently, in **Table 6** all my collected data set can be seen with the time series from 1998 to 2018. The currency of all data was converted from KZ to USD, which Kazakhstani tenge to United States dollar history for February 2020 was 1 USD=377.93 KZT.

Table 7. Data of Foreign Direct Investment (FDI) by transport type (current million USD, 1998-2018) and total GDP of Kazakhstan (current billion USD, 1998-2018)

	Y	X2	X3	X4	X5	X6
year	GDP, billion US$	FDI for Railway mil. USD	FDI in Automobile mil. USD	FDI in Pipeline mil. USD	FDI in Seaborne and riverine sector mil. USD	FDI in Air mil. USD
1998	22.14	25.22	3.20	2.31	10.75	14.12
1999	16.87	10.84	0.88	9.90	10.28	3.91
2000	18.29	15.85	1.45	39.09	1.98	0.26
2001	22.15	49.76	9.72	139.54	0.01	4.86
2002	24.64	14.61	22.47	134.29	0.06	48.67
2003	30.83	36.88	13.54	177.46	0.11	3.40
2004	43.15	26.76	11.37	169.84	0.18	2.74
2005	57.12	31.91	16.32	172.50	0.25	2.49
2006	81	46.14	18.88	175.35	0.31	3.51
2007	104.8	96.23	27.99	223.26	17.03	4.86
2008	133.44	163.81	14.03	608.31	7.52	5.89
2009	115.31	127.59	16.39	1326.40	12.60	6.16
2010	148.05	259.39	19.51	486.53	19.74	24.11
2011	200.38	570.29	63.27	386.05	52.28	26.86
2012	215.9	660.01	72.21	503.84	3.70	51.81
2013	243.78	634.01	77.92	1658.68	7.74	135.46
2014	227.44	536.76	72.45	1005.34	12.37	62.64
2015	184.36	456.56	121.36	835.90	3.87	31.23
2016	137.28	110.82	83.23	807.46	23.40	32.59
2017	159.4	102.33	165.20	975.59	29.07	39.80
2018	170.54	250.01	236.33	472.99	127.82	87.71

Source: own processing based on data from official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

For the next step, parameters were estimated by using OLSM in Gretl in order to define matrix X and vector y; supply the output of Gretl estimation.

Model 1: OLS results from GRETL based on matrix X and vector Y using observations 1998-2018

Model 1: OLS, using observations 1998-2018 (T = 21)
Dependent variable: GDP billion USD

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	27.5883	7.55912	3.650	0.0024	***
FDIforRailway	0.237925	0.0301893	7.881	<0.0001	***
FDIinAutomobile	0.269372	0.153716	1.752	0.1001	
FDIinPipeline	0.0610407	0.0152683	3.998	0.0012	***
FDIinSeaborneand riverinese	0.266894	0.285720	0.9341	0.3650	
FDIinAir	−0.397764	0.237869	−1.672	0.1152	

Mean dependent var	112.2319	S.D. dependent var	77.32428
Sum squared resid	7112.179	S.E. of regression	21.77488
R-squared	0.940524	Adjusted R-squared	0.920699
F(5, 15)	47.44060	P-value(F)	1.15e-08
Log-likelihood	−90.96065	Akaike criterion	193.9213
Schwarz criterion	200.1884	Hannan-Quinn	195.2814
rho	0.046126	Durbin-Watson	1.885734

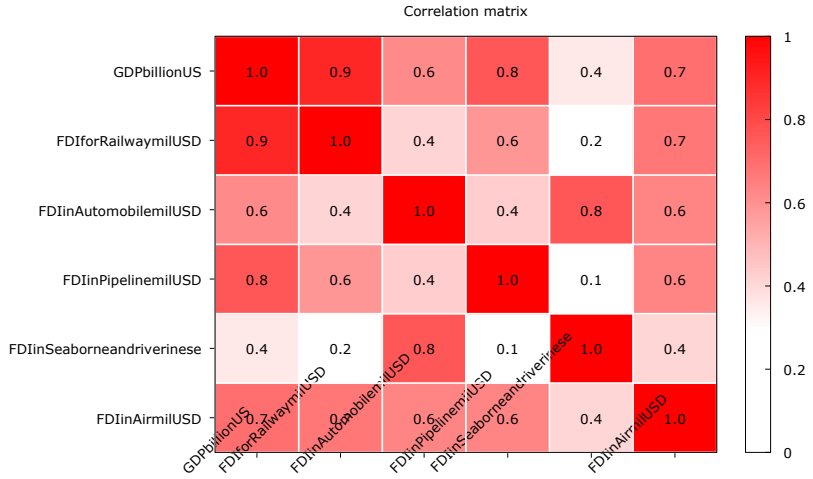
Source: own my calculations using the program SW Gretl

Therefore, due to using SW Gretl it was determined the result of OLSM, especially the equation of regression model, which it was equal to:

Y1 = 27.5883 + 0.237925 X2t + 0.269372 X3t + 0.0610407 X4t + 0.266894 X5t - 0.397764 X6t+ Ut

Thus, the correlation analysis was represented in **Chart 13**, where it was determined the correlation between GDP and FDI for all modes of transport sector.

Chart 13. Correlation matrix between explained and explanatory variables



Source: own my calculations using the program SW Gretl

According to Ordinary Least Square Method (OLSM), the next step was economic verification of the model, it means that comparison of model assumptions with the results. It has been assessed the direction and intensity of the effect caused by explanatory variable on the explained variable i.e. the accuracy of the signs and the size of the numerical values of the estimated parameters.

y1t = f (x1t, x2t, x3t, x4t, x5t, x6t)

Y1 = 27.5883 + 0.237925 X2t + 0.269372 X3t + 0.0610407 X4t + 0.266894 X5t - 0.397764 X6t+ Ut

The estimated parameters showed how FDI in all modes transportation change it if any/one of the explanatory variable will be changed. Therefore, based on my results additionally was checked my initial assumptions:

Table 8. The own results of analysis by using OLSM

Assumptions	Results from estimation
1. Is the development of Kazakhstan's economy directly dependent on development of transport infrastructure?	Our model explain changes in GDP in KZ for 94% based on Coefficient of Determination.
2. Does an interrelation exist between GDP growth and the development of all modes of transport in the country?	Approved, based on our model interpretation.

3. Does Foreign Direct Investment (FDI) into transport infrastructure have positive or negative impact on GDP growth?	Approved as well. In majority of the cases it has positive impact except air transport sector.

Based on OLSM results was also checked P-values and make statistical significance of parameters. The outcomes of test may be interpreted with the use of P-value that measures the strength of evidence in support of H0. If the p-value < α, then it is rejected the H0. For this reason it has been taken the P-values from SW Gretl for determining the level of significance (**Table 9**).

Table 9. The results of P-values

	p-value	*Level of significance*	*Result*
Constant	0.0024	0.05	Parameter Statistically Significant
X2	<0.0001	0.05	Parameter Statistically Significant
X3	0.1001	0.05	Parameter Statistically Insignificant
X4	0.0012	0.05	Parameter Statistically Significant
X5	0.3650	0.05	Parameter Statistically Insignificant
X6	0.1152	0.05	Parameter Statistically Insignificant

Source: own my calculations using the program SW Gretl

R-squared for my model is equal to 0.940524 or 94.05%. Meaning that my model explains changes in my dependent variable for 94.05% and remaining 5.95 % is with stochastic variables.

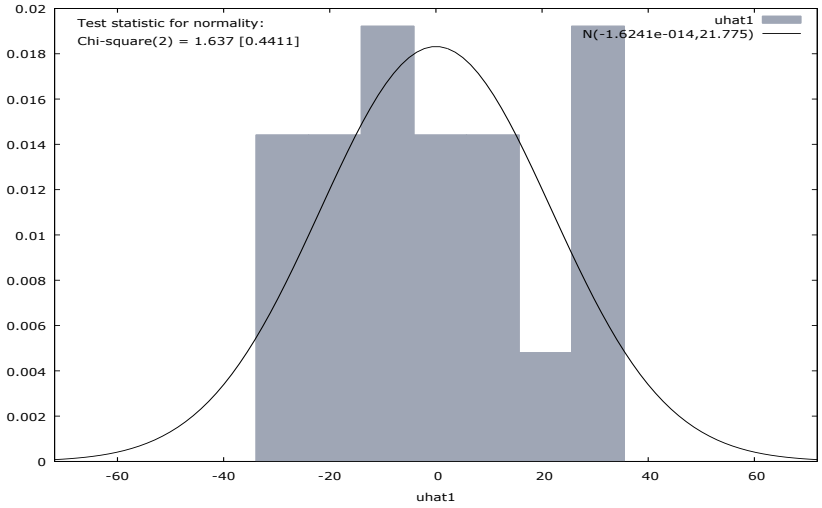
Also, it was used testing of Normality and Heteroscedasticity, which means: Null hypothesis (H0): $\gamma 12 = \gamma 13 = \gamma 14 = \gamma 15 = \gamma 16 = 0$. All regressors xi taken jointly are not significant (the entire model is false). Alternative hypothesis (H1): γi . H0 is not true. Normality tests are used to determine if a data set is well-modeled by a normal distribution and to compute how likely it is for a random variable underlying the data set to be normally distributed. Therefore, in **Table 10** shows how both results were approved in White Test and Normality as well. Moreover, in **Chart 14** and **15** there have been identified the quantity of P-value in both tests.

Table 10. The results of Normality and Heteroscedasticity for OLSM

Type	**Test used**
Heteroscedasticity	White's test
Normality	Frequency distribution
H_0: Hypothesis	Normal distribution of random variable, Homoscedasticity
H_1: Hypothesis	Not normal distribution of random variable, Heteroscedasticity

	P-value	Alpha	Result
White Test	0.150253	0.05	H_0 approved
Normality Test	0.441134	0.05	H_0 approved

Chart 14. The result of testing of Normality:



Source: own my calculations using the program SW Gretl

Due to Testing of Normality, it can be seen normal distribution of the data. Moreover, it was examined Testing of Homoscedasticity in order to find out the variance of the error term is a function of the regressors. Null hypothesis (H0): the error variances are all equal (homoscedasticity). Alternative hypothesis (H1): the error variances are multiplicative function of one or more variables (there is a heteroscedacticity).

Chart 15. The result of White's test for heteroscedasticity

White's test for heteroskedasticity
OLS, using observations 1998-2018 (T = 21)
Dependent variable: uhat^2

	coefficient	std. error	t-ratio	p-value	
const	257.401	128.142	2.009	0.0723	*
FDIforRailwaymil~	5.93402	2.44269	2.429	0.0355	**
FDIinAutomobilem~	3.22489	8.51423	0.3788	0.7128	
FDIinPipelinemil~	−0.455105	1.19032	−0.3823	0.7102	
FDIinSeaborneand~	−7.59821	9.08993	−0.8359	0.4227	
FDIinAirmilUSD	−9.40319	8.00876	−1.174	0.2676	
sq_FDIforRailway~	−0.00914637	0.00359674	−2.543	0.0292	**
sq_FDIinAutomobi~	−0.0210338	0.0444557	−0.4731	0.6463	
sq_FDIinPipeline~	0.000322350	0.000777372	0.4147	0.6871	
sq_FDIinSeaborne~	0.0559031	0.106632	0.5243	0.6115	
sq_FDIinAirmilUSD	0.0415967	0.0749003	0.5554	0.5909	

Unadjusted R-squared = 0.691795

Test statistic: TR^2 = 14.527693,
with p-value = P(Chi-square(10) > 14.527693) = **0.150253**

Source: own my calculations using the program SW Gretl

In both of the scenarios, it has been gotten Normal distribution of random variable, namely Homoscedasticity in my simultaneous model. Also, for my analysis it was estimated coefficients of elasticity, which respond for the model application. It has been shown the impact of individual variables on the value of dependent variable and it was expressed as a percentage for the certain period. Calculation it has done with main formula.

Elasticity calculation for the whole periods can be done based on above formula.

$$Y1 = 27.5883 + 0.237925\ X2t + 0.269372\ X3t + 0.0610407\ X4t + 0.266894\ X5t - 0.397764\ X6t + Ut$$

Table 11 indicates the result of all my data set by calculation of elasticity with the time series from 1998 to 2018.

Table 11. Data set by calculation of elasticity with the time series from 1998 to 2018.

year	Y theoretical	E X2	E X3	E X4	E X5	E X6
1998	31.84	0.19	0.03	0.00	0.09	-0.18
1999	32.20	0.08	0.01	0.02	0.09	-0.05
2000	34.56	0.11	0.01	0.07	0.02	0.00
2001	48.64	0.24	0.05	0.18	0.00	-0.04
2002	25.97	0.13	0.23	0.32	0.00	-0.75
2003	49.52	0.18	0.07	0.22	0.00	-0.03
2004	46.34	0.14	0.07	0.22	0.00	-0.02
2005	49.18	0.15	0.09	0.21	0.00	-0.02
2006	53.04	0.21	0.10	0.20	0.00	-0.03
2007	74.26	0.31	0.10	0.18	0.06	-0.03
2008	107.14	0.36	0.04	0.35	0.02	-0.02
2009	144.24	0.21	0.03	0.56	0.02	-0.02
2010	119.94	0.51	0.04	0.25	0.04	-0.08
2011	207.15	0.66	0.08	0.11	0.07	-0.05
2012	215.20	0.73	0.09	0.14	0.00	-0.10
2013	248.85	0.61	0.08	0.41	0.01	-0.22
2014	214.56	0.60	0.09	0.29	0.02	-0.12
2015	208.54	0.52	0.16	0.24	0.00	-0.06
2016	118.95	0.22	0.19	0.41	0.05	-0.11
2017	147.91	0.16	0.30	0.40	0.05	-0.11
2018	178.83	0.33	0.36	0.16	0.19	-0.20

Source: own my calculations using the program SW Gretl

As a result of elasticity calculation, scenarios' simulation and interpretation is combined like that: 1) in case if GDP in Kazakhstan increase by 10% then FDI for railways will increase by 3.3% (10*0.33). 2) in the second scenario as per our elasticity model increase FDI for automobiles by 5% will lead to increase GDP on health to 1.8 % (5*0.36). 3) in case if GDP in Kazakhstan increase by 10% then FDI for pipeline will increase by 1.6% (10*0.16). 4) in case If FDI in Seaborne and riverine increase by 1% then it will lead to increase GDP by 0.19%, which is not significant increase. 4) in the last case if investment in AIR increase by 1%, it will lead to decrease on GDP by 0.2% per annum.

4.4.2. Simultaneous model

As it was mentioned before, for my analysis also it has been analysed the relationship between GDP, oil price, mining and quarrying, manufacturing industry and gross output of

agricultural products in order to show what type of sector in the country has the biggest influence on GDP of the country. For estimation these parameters were used Two-Stage Least Squares Method (TSLSM) in SW Gretl approach to this issue.

Table 12. The economic and econometric model for TSLSM

For this issue it was used two assumptions before analysis:	1. Do new factors have better influence on GDP our model than our first model in one equation? 2. Does unemployment rate has direct influence on change of GDP?
My economic model:	1) Y1t = f (y2t, x1t, x8t, x9t, x10t) GDP determined by the price of oil, Mining and quarrying mil, Manufacturing, Gross output of agricultural products (services) mil. USD 2) Y2t = f (y1t, x1t, x2t, x4t, x5t, x6t) Unemployment rate determined by FDI for Railway, FDI in Automobile, FDI in Pipeline, FDI in Seaborne and riverine sector and FDI in Air.
My econometric model looks like this:	y1t= β12 y2t + y11 x1t + y17 x7t + y18x8t + y19x9t + y110x10t + u1t y2t= β21 y1t + y11 x1t + y22 x2t + y23x3t + y24x4t + y25x5t + y26x6t + u2t
Declaration of variables, it means how my all variables are identified:	Y1t … GDP, billion US$ Y2t … Unemployment rate in % X2t … FDI for Railway mil. USD X3t … FDI in Automobile mil. USD X4t … FDI in Pipeline mil. USD X5t … FDI in Seaborne and riverine sector mil. USD X6t … FDI in Air mil. USD X7t … The price of oil, in USD X8t … Mining and quarrying mil. USD X9t … Manufacturing industry mil. USD X10t … Gross output of agricultural products (services) mil. USD U1t …Random error, ~ nid (0, σ2)

	U2t - random error, ~ nid (0, σ2)

Consequently, **Table 13** shows all my data set with the time series from 1998 to 2018. The currency of all data was converted from KZ to USD as well, which Kazakhstani tenge to United States dollar history for February 2020 was 1 USD=377.93 KZT.

Table 13. Data set with the time series from 1998 to 2018 for TSLSM

	Y2	x2	x3	x4	x5	x6
year	GDP, billion US$	FDI for Railway mil. USD	FDI in Automobile mil. USD	FDI in Pipeline mil. USD	FDI in Seaborne and riverine sector mil. USD	FDI in Air mil. USD
1998	22.14	25.22	3.20	2.31	10.75	14.12
1999	16.87	10.84	0.88	9.90	10.28	3.91
2000	18.29	15.85	1.45	39.09	1.98	0.26
2001	22.15	49.76	9.72	139.54	0.01	4.86
2002	24.64	14.61	22.47	134.29	0.06	48.67
2003	30.83	36.88	13.54	177.46	0.11	3.40
2004	43.15	26.76	11.37	169.84	0.18	2.74
2005	57.12	31.91	16.32	172.50	0.25	2.49
2006	81	46.14	18.88	175.35	0.31	3.51
2007	104.8	96.23	27.99	223.26	17.03	4.86
2008	133.44	163.81	14.03	608.31	7.52	5.89
2009	115.31	127.59	16.39	1326.40	12.60	6.16
2010	148.05	259.39	19.51	486.53	19.74	24.11
2011	200.38	570.29	63.27	386.05	52.28	26.86
2012	215.9	660.01	72.21	503.84	3.70	51.81
2013	243.78	634.01	77.92	1658.68	7.74	135.46
2014	227.44	536.76	72.45	1005.34	12.37	62.64
2015	184.36	456.56	121.36	835.90	3.87	31.23
2016	137.28	110.82	83.23	807.46	23.40	32.59
2017	159.4	102.33	165.20	975.59	29.07	39.80
2018	170.54	250.01	236.33	472.99	127.82	87.71

	y2	x7	x8	x9	x10
year	Unemployment Rate (%)	The price of oil, in USD	Mining and quarrying mil. USD	Manufacturing industry mil. USD	Gross output of agricultural products (services) mil. USD
1998	13.13	12.8	510.81	1,152.09	652.98
1999	13.46	17.9	1,073.90	1,496.18	879.62
2000	12.75	28.4	2,086.20	2,147.29	1,054.08
2001	10.43	24.45	2,312.26	2,407.56	1,395.70
2002	9.33	25.01	2,921.46	2,632.21	1,457.30
2003	8.78	28.83	3,575.49	3,178.99	1,599.61
2004	8.4	38.1	5,385.00	3,994.90	1,814.77
2005	8.13	54.38	8,140.04	4,845.87	1,953.73
2006	7.79	65.14	9,809.90	6,274.26	2,153.20
2007	7.26	72.52	11,594.01	7,678.91	2,841.30
2008	6.63	96.99	16,248.06	8,762.29	3,663.16
2009	6.55	61.51	14,350.21	7,683.59	4,280.93
2010	5.77	79.47	19,351.48	10,027.54	4,752.29
2011	5.39	111.27	26,293.66	12,522.90	7,095.42
2012	5.29	111.63	26,713.06	14,206.07	6,242.97
2013	5.2	108.56	27,899.44	15,264.58	7,692.77
2014	5.06	99.03	28,846.87	15,882.85	8,199.26
2015	4.93	52.35	19,616.55	15,517.93	8,625.26
2016	4.96	43.55	24,510.63	20,987.57	9,609.54
2017	4.9	54.25	30,173.40	24,519.05	10,617.66
2018	4.885	71.06	38,801.98	27,135.06	11,669.20

Source: own processing based on data from https://www.macrotrends.net/countries/KAZ/kazakhstan/unemployment-rate and official website Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

Thus, model identification has been gotten for my analysis, which predetermined variables in whole model: k = 10 (x1t, x2t x3t, x4t, x5t, x6t, x7t, x8t, x9t, x10t). However, it should be pointed out that endogenous variables of econometric model are represented in whole model like that: g = 2 (y1t, y2t)

$y1t = \beta 12\ y2t + y11\ x1t + y17\ x7t + y18x8t + y19x9t + y110x10t + u1t$

$y2t = \beta 21\ y1t + y11\ x1t + y22\ x2t + y23x3t + y24x4t + y25x5t + y26x6t + u2t$

Normally, identification for next equations represent like that: $k^{**} \geq g\Delta - 1$, which it meant in my 2 equations:

1st equation $K^{**} = 5 > G\Delta - 1 = 1$ => model is over identified

2nd equation $K^{**} = 4 > G\Delta - 1 = 1$ => model is over identified

Therefore, the model is over-identified. It means that reduced form of this model doesn't correspond to several structural forms. That's why its content is unequivocally determined and we can use TSLSM for estimation of parameters.

Thus, the estimation of parameters in both equations by using Two-Stage Least Squares Method (TSLSM) in SW Gretl were carried out due to the **Model 2** below:

Equation 1 : $y_{1t} = -121 + 6.55\ y_{2t} + 2.16\ x7t - 0.00405\ x8t - 0.00477\ x9t + 0.0348\ x10t + u1t$

Equation 2: y_{2t}= 12.0722 – *0.06091 y1+ 0.000931455 x2t - 0.00594 x3t + 0.0007 x4t + 0.01329 x5t + 0.00717 x6t + u2t*

Model 2: TSLS results from GRETL based on matrix X and vector Y using observations 1998-2018

Model 1: TSLS, using observations 1998-2018 (T = 21)
Dependent variable: Y1GDPbillionUS
Instrumented: Y2UnemploymentRate
Instruments: const X2FDIforRailwaymilUSD X3FDIinAutomobilemilUSD X4FDIinPipelinemilUSD X5FDIinSeaborneandriverin X6FDIinAirmilUSD X7ThepriceofoilinUSD X8MiningandquarryingmilU X9Manufacturingindustrymil X10Grossoutputofagricultur

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−120.716	88.7446	−1.360	0.1938	
Y2UnemploymentRate	6.55184	6.50099	1.008	0.3295	
X7Thepriceofoilin USD	2.16493	0.657372	3.293	0.0049	***
X8Miningandquarr yingmilU	−0.00404641	0.00372107	−1.087	0.2940	
X9Manufacturingi ndustrymil	−0.00476792	0.00397908	−1.198	0.2494	
X10Grossoutputof agricultur	0.0347805	0.00801749	4.338	0.0006	***

Mean dependent var	112.2319	S.D. dependent var	77.32428
Sum squared resid	4070.260	S.E. of regression	16.47272
R-squared	0.966013	Adjusted R-squared	0.954684
F(5, 15)	85.78298	P-value(F)	1.72e-10
rho	−0.218226	Durbin-Watson	2.318711

Model 2: TSLS, using observations 1998-2018 (T = 21)
Dependent variable: Y2UnemploymentRate
Instrumented: Y1GDPbillionUS
Instruments: const X2FDIforRailwaymilUSD X3FDIinAutomobilemilUSD X4FDIinPipelinemilUSD X5FDIinSeaborneandriverin X6FDIinAirmilUSD X7ThepriceofoilinUSD X8MiningandquarryingmilU X9Manufacturingindustrymil X10Grossoutputofagricultur

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	12.0722	0.660572	18.28	<0.0001	***
Y1GDPbillionUS	−0.0609100	0.0170860	−3.565	0.0031	***
X2FDIforRailway milUSD	0.00931455	0.00446561	2.086	0.0558	*
X3FDIinAutomobi lemilUSD	−0.00594217	0.0104758	−0.5672	0.5795	
X4FDIinPipelinem ilUSD	0.000704013	0.00140053	0.5027	0.6230	
X5FDIinSeabornea ndriverin	0.0132968	0.0180767	0.7356	0.4741	
X6FDIinAirmilUS D	0.00717554	0.0160704	0.4465	0.6621	

Mean dependent var	7.572619	S.D. dependent var	2.841460
Sum squared resid	24.87935	S.E. of regression	1.333078
R-squared	0.846449	Adjusted R-squared	0.780641
F(6, 14)	13.10665	P-value(F)	0.000049
rho	0.556367	Durbin-Watson	0.735953

Source: own my calculations using the program SW Gretl

Consequently, for whole my analysis, also it was used economic verification of the model, in order to comparison of model assumptions with the results.

First equation

Y1t = f (y2t, x1t, x8t, x9t, x10t)

y1t= -121+ 6.55 y2t + 2.16 x7t – 0.00405 x8t – 0.00477 x9t +0.0348 x10t + u1t

According to the first equation, the results can be interpreted like this:1) if price of oil increase by 1 USD, then GDP will increase by 2.16 billion USD/year; 2) if mining and quarrying increase by 1 mil. USD then GDP will decrease by 0.004 billion USD/year; 3) if manufacturing industry increase by 1 million USD, then GDP in KZ will decrease by 0.00477 billion USD/year; 4) if gross output of agricultural products (services) increase by 1 mill USD, it will lead to increase on GDP by 0.0348 billion USD/year.

Second equation

Y2t = f (y1t, x1t, x2t, x4t, x5t, x6t)

y2t=12.0722 – 0.06091 y1+ 0.000931455 x2t - 0.00594 x3t + 0.0007 x4t + 0.01329 x5t + 0.00717 x6t + u2t

Likewise, according to the second equation, the results can be interpreted like this: 1) if FDI on railways increase by 1 mill USD, then unemployment rate will increase by 0.0009% per year; 2) if FDI on automobile increase by 1 mill USD, then unemployment rate will decrease

by 0.0059% per year; 3) if FDI on Pipeline increase by 1 mill USD, then unemployment rate will increase by 0.007%; 4) if FDI on in seaborne and riverine sector increase by 1 mill USD, then unemployment rate will increase by 0.013% per year; 5) if FDI in Air increase by 1 mill USD, then unemployment rate will increase by 0.007% per year. Therefore, based on above mentioned of results additionally was checked my initial assumptions:

Table 14. The own results of analysis by using TSLSM

Assumptions	Results
1. Do new factors have better influence on GDP our model than our first model in one equation?	Changes in price of Oil has most significant influence among the others.
2. Does unemployment rate has direct influence on change of GDP?	Approved.

Based on TSLSM results it was checked P-values and make statistical significance of parameters of the first equation. From my results, it was proved that parameters of X7 and X10 are statistically significant (**Model 3**).

Model 3. TSLS results with statistical significance of parameters of the 1st equation from GRETL based on matrix X and vector Y using observations 1998-2018

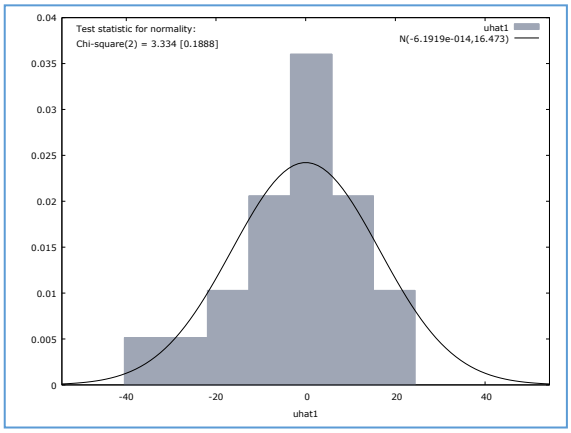
Model 1: TSLS, using observations 1998-2018 (T = 21)

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−120.716	88.7446	−1.360	0.1938	
Y2Unemployment Rate	6.55184	6.50099	1.008	0.3295	
X7 The price of oil in USD	2.16493	0.657372	3.293	0.0049	***
X8Miningandquarrying milU	−0.00404641	0.00372107	−1.087	0.2940	
X9Manufacturingindustry mil	−0.00476792	0.00397908	−1.198	0.2494	
X10 Gross output of agriculture	0.0347805	0.00801749	4.338	0.0006	***

Source: own my calculations using the program SW Gretl

Likewise, as the one-equation model it was used testing of Normality and Heteroscedasticity in this simultaneous model (**Chart 16**).

Chart 16. The results of testing of Normality and Heteroscedasticity for 1st equation




```
Pesaran-Taylor test for heteroskedasticity
OLS, using observations 1998-2018 (T = 21)
Dependent variable: uhat^2

            coefficient   std. error    t-ratio   p-value
  ---------------------------------------------------------
  const      94.7291       87.0409        1.088    0.2901
  yhat^2      0.00543226    0.00334397    1.624    0.1207

  Unadjusted R-squared = 0.121955

Test statistic: HET_1 = |0.005432| / 0.003344 = 1.624494,
with p-value = 2 * P(z > 1.624494) = 0.104
```

Source: own my calculations using the program SW Gretl

Due to Testing of Normality, normal distribution of the data can be seen as well.

Table 15. The results of Normality and Heteroscedasticity for 1st equation

Type	**Test used**
Heteroscedasticity	Pesaran-Tylor
Normality	Frequency distribution

H_0: Hypothesis	Normal distribution of random variable, Homoscedasticity
H_1: Hypothesis	Not normal distribution of random variable, Heteroscedasticity

	P-value	**Alpha**	**Result**
Pesaran-Tylor	0.104	0.05	H_0 approved
Normality Test	0.18882	0.05	H_0 approved

Second equation

Based on TSLSM results it was checked P-values and make statistical significance of parameters. From my results, you can see that only parameter of Y1, X2, are statistically significant (**Model 4**).

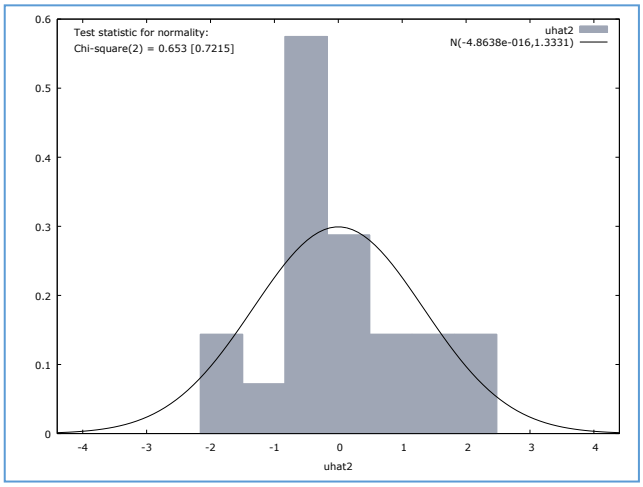
Model 4. TSLS results with statistical significance of parameters of 2nd equation from GRETL based on matrix X and vector Y using observations 1998-2018

Model 2: TSLS, using observations 1998-2018 (T = 21)

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	12.0722	0.660572	18.28	<0.0001	***
Y1 GDP billion USD	−0.0609100	0.0170860	−3.565	0.0031	***
X2 FDI for Railway mil USD	0.00931455	0.00446561	2.086	0.0558	*
X3FDIinAutomobilemilUSD	−0.00594217	0.0104758	−0.5672	0.5795	
X4FDIinPipelinemilUSD	0.000704013	0.00140053	0.5027	0.6230	
X5FDIinSeabornea ndriverin	0.0132968	0.0180767	0.7356	0.4741	
X6 FDI in Air mil USD	0.00717554	0.0160704	0.4465	0.6621	

Source: own my calculations using the program SW Gretl

Chart 17. The results of testing of Normality and Heteroscedasticity for 2nd equation



Source: own my calculations using the program SW Gretl

Table 16. The results of Normality and Heteroscedasticity for 2nd equation

Type	**Test used**
Heteroscedasticity	Pesaran-Tylor
Normality	Frequency distribution

H_0: Hypothesis	Normal distribution of random variable, Homoscedasticity
H_1: Hypothesis	Not normal distribution of random variable, Heteroscedasticity

	P-value	**Alpha**	**Result**
Pesaran-Tylor	2.36	0.05	H_0 approved
Normality Test	0.721464	0.05	H_0 approved

Thus, testing of Normality and Heteroscedasticity helped me to understand whether our second model in simultaneous equation fitted within statistical verification of our equation. Based on Pesaran-Tylor and Normality rest we can see that in both of the cases our Null Hypothesis was approved. Meaning that our second equation is fitting within the economic verification requirement and can be used for further statistical calculation.

5 Results and discussion

5.1. Results

In our linear regression model after the estimations, there out of three assumptions have been confirmed. Our verification for development of Kazakhstan's economy directly dependent on development of transport infrastructure of the country is confirmed. Second assumption on does an interrelation exist between GDP growth and the development of all modes of transport in the country have been approved based on estimation results. Number of tests allowed determining no autocorrelation, homoscedasticity and normal distribution of random variable in the one - equation model. The most effect development in GDP in one-equation model has been proved for FDI in Automobile and railway of the Kazakhstan as its elasticity coefficient reached the highest level among the others and it was equal to 0.36% and 0.33% in 2018 respectively. For scenario, simulations for done for all year but final years of the observation were chosen and basically were concerned about increase/decrease of any of the independent variables against the dependent variable.

In the second part of the analysis of my diploma thesis an obvious simultaneous-equation problem is provided, which has been checked by simultaneity test. With regard to the simultaneous model first equation was GDP determined by the price of oil, Mining and quarrying, Manufacturing, Gross output of agricultural products (services). Second equation was Unemployment rate determined by FDI for Railway, FDI in Automobile, FDI in Pipeline, FDI in Seaborne and riverine sector and FDI in Air. All of the assumptions for the simultaneous model were approved after parameter estimations in Gretl. Our estimations shows that our first assumption about new factors that have better influence on GDP our model than our first model in one equation was approved. It is certainly that price of oil change has most significant effect on Kazakhstan GDP change. Our second assumption in simultaneous equation about unemployment rate has direct influence on change of GDP has been approved as well. One equation model seems to better in comparison to simultaneous model since adjusted R-squared is greater and equal to 94% in the one equation model. Number of tests have been performed and no autocorrelation, homoscedasticity and normal distribution of random variables were detected in simultaneous model for both equations. The scenario simulations were applied to 2018 about how changes on independent variables will influence spending on GDP or changes on unemployment rate.

5.2. Discussion

As a result, it can be argued that FDI is an important factor for economic growth, especially for emerging and developing economies such as the Republic of Kazakhstan. Indeed, the influence of FDI on economic growth is not always positive because it depends on characteristics of the investment triggered by FDI, such as type, sector, scope, period of time, proportion of domestic businesses in the sector, and so on. In my analysis it was proved that the most effect development in GDP of Kazakhstan has been FDI in automobiles and railways in comparison with other modes of transport sector.

Nevertheless, many studies are related to FDI have found its positive influence on economic growth of the country, at the same time using different data and methodologies. For instance, Laura Alfaro (2003) claims that the inflows of FDI to growth depend on the sector of the economy. She found that FDI on infrastructure, especially on transport infrastructure of the country has positive impacts on growth while the FDI to the primary sector tends to have a negative effect on economic growth. Alfaro et al (2010) ensured evidence that the core connection between transport developments and global mobile activity is through influence of business location and foreign direct investments (FDIs) for companies existing on a global scale. He proved that the impact of FDI on growth depends on the local condition of the host economies. Better local conditions not only can attract foreign companies but also allow host country to maximize the benefits of foreign investments.

Hansen and Rand (2004) explored the relationship between FDI and GDP of 31 developing countries during the period time 1970-2000. Their results suggested that a higher ratio of FDI on the development of infrastructure of the country has positive impact on the level of GDP and hence on growth. Also they discovered that FDI and growth have a positive relationship, but the direction of causality is unclear.

It should be noted that some research argued that the contribution of FDI to growth of the host country is not positive. For example, Carkovic and Levine (2002) argue that FDI inflows do not exert an independent influence on economic growth. They postulate that the lack of positive effect of FDI on growth do not depend on human capital, level of economic development or openness of the economy.

Also it has been considered some research studying of the impact of FDI through transport infrastructure on economic growth in Kazakhstan. Lee, Baimukhamedova and Akhmetova (2009) examined the relationship between FDI, transport infrastructure and economic growth of the Kazakhstan during the ten years (1997-2006). Their results

demonstrated that FDI has a minimum or not a statistically significant impact on GDP growth. They argued that FDI in Kazakhstan have a minimal effect on achieving economic growth and national competitiveness of the country. Indeed, according to my analysis GDP of Kazakhstan has the most effect from changing the price of oil compared to other sectors such as inflow of FDI to the country, unemployment rate, mining, manufacturing and agricultural sector.

Khoich and Madiyarova (2011) explored the impact of FDI on economic growth of Kazakhstan from 1991 to 2009. In their investigation was proved that 70 percent of all FDI inflows involved in primary sector, which it means mining and quarrying, agriculture sector and so on. In the same time less than 10 percent of FDI falls on manufacturing sector. They noted that Kazakhstan is FDI attractive, but has highly dependence on energy sector, and this influence can lead to negative effect for economy.

This chapter shows that discussions about the impact of FDI on economic growth have not been completed and this issue will be interesting for many researchers. As you can see that most of scientific and research works agree that influence of FDI on growth is positive but depends on economic condition in the host country.

6 Conclusion

Transport has always been, is and will be an important branch of the country's economic and political life. The vast territory of Kazakhstan, low population density, remoteness of settlements from each other, the growing processes of integration and globalization in the world make it one of the priority areas of development in the country.

Kazakhstan occupies the ninth place in the world in terms of area, and in such conditions, transportation becomes the only way to overcome large distances between regions, this applies both to the transport of goods and services, also the movement of people. It is also known that the country has no access to the seas and oceans, except for the Caspian, and as a result, the main share of all transportation falls on land modes of transport, especially on automobiles and railway sector. According to statistics of the World Bank, Kazakhstan has shown excellent economic performance for the last two decades. Kazakhstan is also a leader of economic development in the CIS.

This Master thesis aimed to assess of economic growth and economic development of Kazakhstan through the impact of transport infrastructure. Likewise, the aim of the thesis was to estimate the effects of transport infrastructure on economic growth by different kind of modes of transport such as automobiles, railways, water, pipeline, air, seaborne and riverine sector. Moreover, investments by FDI was an important factor for analysing of my issue.

At the beginning of the thesis have been described main stages of development of transport infrastructure all over the world. There has been analysed deeply what type of factors influence on the improvement and development of transport infrastructure of the countries. Also it has been considered majority of articles and researches providing information about relations between transport infrastructure, economics of country and development process of country. Therefore, it has been explained and proved the importance of transport infrastructure in country and mutual relationship between transport infrastructure and GDP.

The next part of this thesis has been continued by practical part, where it was divided on two main parts. The first one described the country, especially how the main economic indicators have been changed during over 20 years. Kazakhstan has faced a number of serious transformations since independence, for example devaluation, privatization, different reforms and financial crises. Undoubtedly, this was reflected in the country’s economy. It was explained by charts, which has shown the fluctuation of GDP of the country. Then, it has been investigated all modes of transport sector of Kazakhstan. It is noteworthy that each of them are characterized specifically and has totally different effect on development economy of the

country. One more important factor on the development of transport infrastructure of country is the implementation of public-private partnership projects by PPP Center of Kazakhstan. It has been given some examples, especially are considered large-scale projects, which have been approved for implementation over the past 10 years, especially around the time the PPP Center was established.

In the second section of my practical part, it was conceived to analyze the investments of FDI for railway, automobile, pipeline, air, seaborne and riverine sector of Kazakhstan for understanding the relationship between all modes of transport and economic growth of country. For the analysis it was used the Ordinary Least Square regression analysis to estimate the data, which covered over 20 years from 1998 to 2018. The main regression results indicated that FDI on transport sector has a positive effect on GDP. FDI in our model was indicated that FDI on railway, automobile, pipeline, seaborne and riverine sector lead to increase of GDP of country by exception air transport sector. The results showed that this mode of transport sector has negative effect on economic growth. Nevertheless, it does not change meaning that FDI on transport infrastructure has a direct positive effect on the economic growth of Kazakhstan. Moreover, it was used Two-Stage Least Squares regression analysis in SW Gretl program. This simultaneous model was examined in order to determine GDP by the price of oil, Mining and quarrying, Manufacturing, Gross output of agricultural products (services). Consequently, the result was proved the obvious fact that these kind of factors have better influence on GDP of Kazakhstan. Therefore, the model showed us that changing of price of oil has most significant effect on Kazakhstan GDP change. Also, unemployment rate has direct influence on change of GDP has been approved as well.

Our results confirmed that Kazakhstan as a new rapidly growing economy involves FDI to the country. However, it has been noted that Kazakhstan should conduct more balanced policy and implement projects in relation to transport infrastructure by public-private partnership. It can be help to improve the economic situation of country and attract more investments of FDI.

7 References

"Constitution of the Republic of Kazakhstan" (1995), www.zan.kz [Accessed 27.3.2020].
"Kazakhstan, Unitary County" (PDF). www.oecd.org. Archived (PDF) from the original on 6 February 2018 https://www.oecd.org/regional/regional-policy/profile-Kazakhzstan.pdf [Accessed 27.3.2020].
Abdymanapov, S. A. & Abiesov J. A. (2013) Public-Private Partnership in the Republic of Kazakhstan from: http://blogs.ft.com/beyond-brics/2014/12/08/kazakhstan-hopes-ppp-will-unblock-roads-and-unlock-finance/ [Accessed 27.3.2020].
Alfaro L. (2003), Foreign direct investment and growth, does the sector matter?, 215-220.
Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and Sayek, S. (2010), How does foreign direct investment promote economic growth? Exploring the effects of financial markets on linkages, Journal of Development Economics, 91(2), 242-56.
Arvis, J.F., Saslavsky, D., Ojala, L., Shepherd, B., Busch, C., Raj, A., 2014. Connecting to Compete 2014. Trade Logistics in the Global Economy. The Logistics Performance Index and Its indicators Available at:
http://www.worldbank.org/content/dam/Worldbank/document/Trade/LPI2014.pdf, [Accessed 27.3.2020].
Banister, D., & Berechman, J. (2001). Transport investment and the promotion of economic growth. Journal of Transport Geography, 9, 209-218
Bektas, T., & Crainic, T.G. (2007). A brief overview of intermodal transportation. University of Montreal, Interuniversity research centre on Enterprise Networks, Logistics and transportation.
Berechman, J. (2001), Transport investment and economic development: is there a link, in ECMT, Transport and Economic Development, Report of the 119th Roundtable on Transport Economics, Paris, https://www.itf-oecd.org/sites/default/files/docs/02rt119_0.pdf [Accessed 27.3.2020].
Bishimbayev, K. V. (2008), Theoretical and practical problems of public-private partnerships. Problems of management theory and practice, 5, 36-39.
Blauwens, G., De Baere, P., & Van de Voorde, E. (2008). Transport economics (3rd ed.) Antwerp: Uitgeverij De Boeck, 136-139.
Bovaird, T. (2004), 'Public-Private Partnerships: From Contested Concepts to Prevalent Practice', International Review of Administrative Sciences, vol. 70, no. 2, 199-215.
Carkovic, M & Levine, R (2002), Does Foreign Direct Investment Accelerate Economic Growth? University of Minnesota. Working Paper.
Chowdhury, Ks, Sharma, Platz; Jomo, Anis, Krishnan, Daniel, (2016), "Public-Private Partnerships and the 2030 Agenda for Sustainable Development: Fit for purpose?" Department of Economic & Social Affairs, United Nations.
Crafts, N. and Leunig, T. (2006), The Historical Significance of Transport for Economic Growth and Productivity, research annex for the UK Eddington Study, London, 205-215.
Drewello, H., & Scholl, B. (2016). In Integrated spatial and transport infrastructure development. Berlin: Springer.

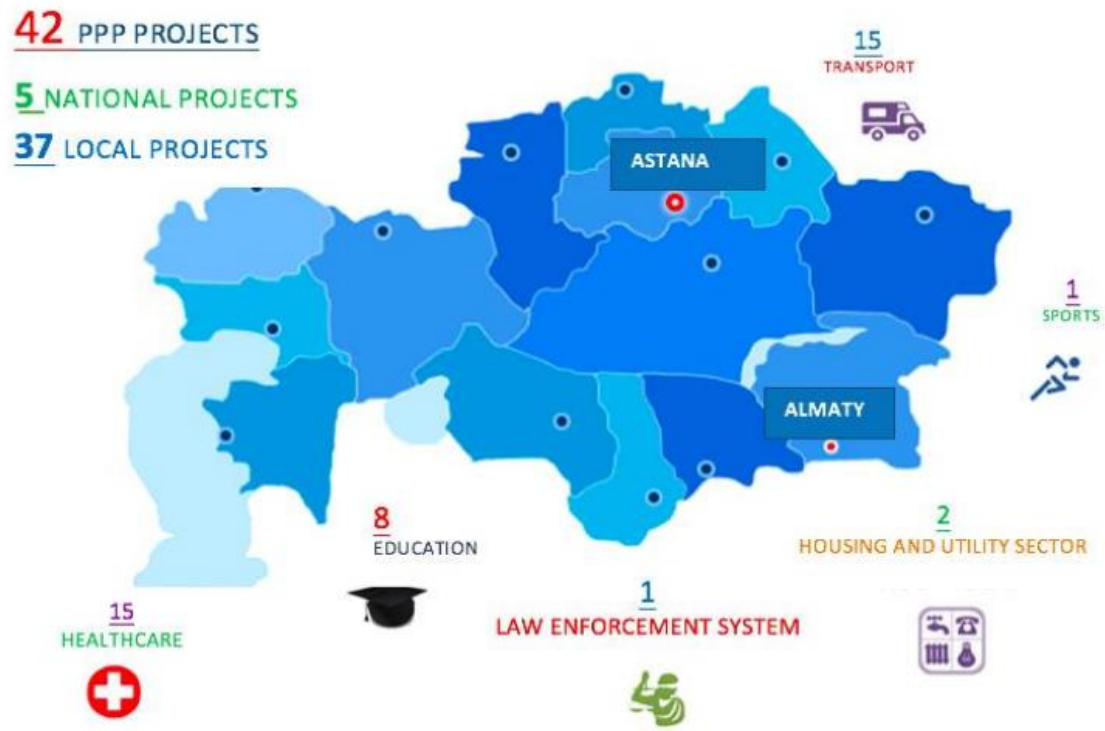
Eddington, R. (2006), The Eddington Transport Study – Transport's Role in Sustaining the UK's Productivity and Competitiveness, main report from the Eddington Transport Study, London: HMSO.
EPEC PPP Guide. (2015) How to Procure, Prepare and Deliver PPP Projects. Payment Mechanism. Available at: http://www.eib.org/epec/g2g/annex/6-payment/index.htm [Accessed 27.3.2020].
Farchy, J. (2014). Kazakhstan hopes PPP will unblock roads and unlock finance.
Ferrari, C. (2016). The rationale for the colonial train: An economic perspective. Available at: https://www.unece.org/fileadmin/DAM/ceci/ppt_presentations/2009/ppp/tilebaldinov.pdf [Accessed 27.3.2020].
Fogel, R.W. (1964), Railroads and American Economic Growth, Baltimore: Johns Hopkins University Press.
Frankel, J. and Romer, D. (1999), Does trade cause growth? American Economic Review, LIXXXX, 379-99.
Geurs, K.T., & Osth, J. (2016). Advances in the measurement of transport impedance in accessibility modelling. European Journal of Transport and Infrastructure Research, 16(2), 294-299.
Geurs, K.T., & van Wee, B. (2004). Accessibility evaluation of land-use and transport strategies: Review and research directions. Journal of Transport Geography, 12, 127-140.
Gibbons, S. and Machin, S. (2006), Transport and Labour Market Linkages: Empirical Evidence – Implications for Policy and Scope for Further UK Research, report to the UK Eddington Study.
Graham, D. (2007). Transport Investment and Agglomeration Economies, International Transport Forum Discussion Paper Series, paper no. 2007-11, Paris: OECD Publications Service.
Hansen, H & Rand, J (2004), On the casual link between FDI and growth in developing countries, Discussion papers, Institute of Economics, University of Copenhagen, pp. 4-30.
Hansen, W.G. (1959). How accessibility shapes land use. Journal of the American Institute of Planners, 25(1), 73-76.
Hawke, G.R. (1970), Railways and Economic Growth in England and Wales, 1840-1870, Oxford: Clarendon Press.
Kazakh Invest National Company, 2019, Invest in Kazakhstan. Available at: https://invest.gov.kz/, [Accessed 27.3.2020].
Kazakhstan Railroad. (2012). Kazakhstan - The new silk way: A strategic vector of transport logistics in Kazakhstan. Available at: http://www.railways.kz/en/node/3321 [Accessed 27.3.2020].
Khoich, A & Madiyarova, (2011). Impact of Foreign Direct Investment on Economic Growth in Kazakhstan, International Conference on Sociality and Economics Development IPEDR vol.10, IACSIT Press, Singapore.
KTZ, Kazakhstan Railways (2015). Construction of the railway line Korgas-Zhetygen. Available at: http://railways.kz/en/node/3413 [Accessed 27.3.2020].
Lee, JW, Baimukhamedova, GS & Akhmetova, S, (2009). The effect of Foreign Direct Investment on economic growth of developing country: from Kazakhstan, Proceeding of the Academy for Economics and Economic Education, Volume 12, Las Vegas, pp. 22-27.

Lewis, M.; Grimsey, D. (2004). Public private partnerships: the worldwide revolution in infrastructure provision and project finance, ISBN 978-1-84720-226-0
Mann, M. (2006). Step Change Transport Improvements: An Assessment of the Potential for Step Change, research annex for the UK Eddington Study.
Martin, P., & Rogers, C.A. (1995). Industrial location and public infrastructure. Journal of International Economics, 39, 335-351.
Ministry of Investments and Development of the Republic of Kazakhstan Available at: http://mid.gov.kz/ [Accessed 27.3.2020].
Ministry of National Economy of the Republic of Kazakhstan Statistics committee Available at: www.stat.gov.kz [Accessed 27.3.2020].
Mouraviev Nikolai, (2012) "What Drives the Employment of Public-Private Partnerships in Kazakhstan and Russia: Value for Money?" Organizations and Markets in Emerging Economies, 3, No.1
National Bank of Kazakhstan. Available at: https://nationalbank.kz/?&switch=kazakh [Accessed 27.3.2020].
National Maritime Shipping Company, Kazmotransflot. Available at: https://www.kmtf.kz/en/about/about-company/ [Accessed 27.3.2020].
Odlyzko, A. (2010). Collective hallucinations and inefficient markets: The British Railway Mania of the 1840s. Available at http://www.dtc.umn.edu/~odlyzko. [Accessed 27.3.2020].
Office of FAIR Trading (2007), Productivity and Competition: An OFT Perspective on the Productivity Debate, OFT Publication, London: HMSMO.
Organisation for Economic Co-operation and Development. Available at: https://www.oecd.org/about/. [Accessed 27.3.2020].
Panasyuk, M. V., Gafurov, I. R., & Novenkova, A. Z. (2013). Influence of international transport and logistics systems on economic development of the region. World Applied
PPP Center in Kazakhstan. Available at: https://kzppp.kz/en/. [Accessed 27.3.2020].
PPP Center JSC (2015). Types of PPP (PPT slides). Available at: http://kzppp.kz/public/upload/files/Types_of_PPP.ppt. [Accessed 27.3.2020].
PPP Centrum: Public Private Partnership. (2011). Available from website: http://www.pppcentrum.cz/index.php?cmd=home&lang=en. [Accessed 27.3.2020].
Pradhan and Bagchi, (2013), Effect of transportation infrastructure on economic growth in India: the VECM approach R.P. Pradhan and T.P. Bagchi Res. Transp. Econ., pp. 139-148.
Premius, H., & Zonneveld, W. (2003). What are corridors and what are the issues? Introduction to special issue: The governance of corridors. Journal of Transport Geography, 11(3), 167-177.
Quinet, E., Touzery, L., & Triebel, H. (1982) Economie des Transports. Paris: Economica.
Report of JSC Samruk-Kazyna, RAILWAY INFRASTRUCTURE "Upside Transit Potential" (2017) Availbale at: https://sk.kz/upload/iblock/d23/d23a0c84f62fb49326f88509caa04fae.PDF.
[Accessed 27.3.2020].
Rietveld P, Bruinsma F, (1998), "Is Transport infrastructure effective? Transport Infrastructure and Accessibility: Impacts on the Space Economy" ISBN-13: 978-3-642-72234-9, e-ISBN:978-3-642-72232-5
Rietveld, P., & Boonstra, J. (1995). On the supply of network infrastructure. The Annals of Regional Science, 29, 207-220.

Rostow, W.W. (1971), The stages of Economic Growth: A Non Communist Manifesto, Cambridge: Cambridge University Press.
Sactra (1999), Transport and the Economy, Final Report, London: The Standing Advisory Committee on Trunk Road Assessment. Sciences Journal, 27, 135–139. Available at: https://invest.gov.kz/about-kazakhstan/infrastructure/transport/. [Accessed 27.3.2020].
South China Morning Post, 2017. Available at: https://multimedia.scmp.com/news/china/article/One-Belt-One-Road/khorgos.html. [Accessed 27.3.2020].
The National Council for Public-Private Partnership: How PPP's work (2011). Available at: http://ncppp.org/howpart/index.shtml#define. [Accessed 27.3.2020].
UNECE (2009). "Kazakhstan Public-Private Partnership Center" JSC: Public Private Partnership in Kazakhstan. Available at: http://www.unece.org/. [Accessed 27.3.2020].
Vickermaqn, R., Spiekermann, K. and Wegener, M. (1997), Accessibility and economic development in Europe, Regional Studies, 33(1), 1-15.
World Bank. Available at : https://www.worldbank.org/ [Accessed 27.3.2020].
World Bank, the Asian Development Bank (ADB), and the InterAmerican Development Bank (IDB). "Reference Guide: Public-Private Partnerships." (2014). Version 2.0. Washington, DC, p.18. Available at: file:///C:/Users/u891084/Downloads/903840PPP0Refe0Box385311B000PUBLIC0.pdf [Accessed 27.3.2020].

8 Appendix

Appendix 1
PPP projects map



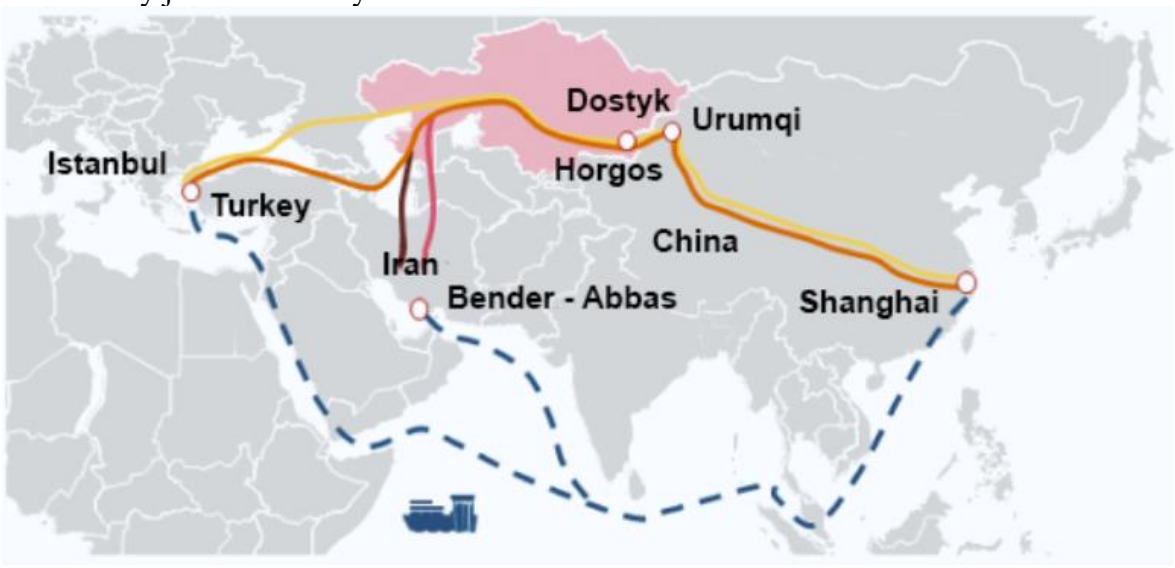
Source: PPP Center, 2018 www.kzppp.kz

Appendix 2
Map of Kazakhstan road and rail routes.

Source: Ministry of National Economy of the Republic of Kazakhstan Statistics committee www.stat.gov.kz

Appendix 3

The railway junction “Dostyk”



Source: Kazakh Invest National Company, 2019, Invest in Kazakhstan, https://invest.gov.kz/.

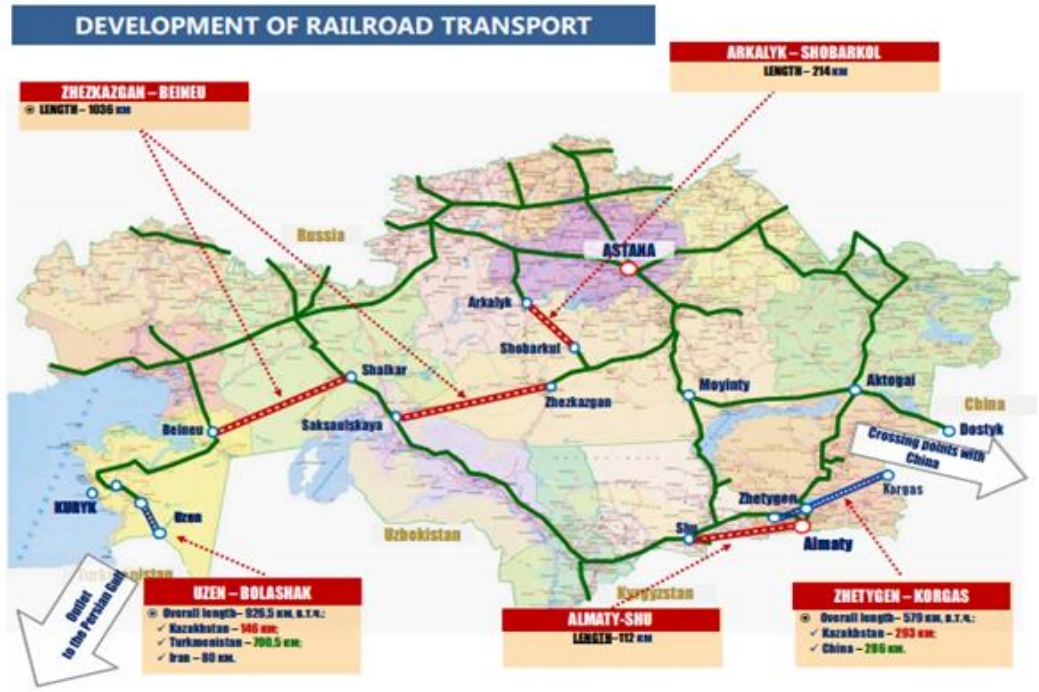
Appendix 4

Khorgos Gateway map

Source: South China Morning Post, 2017, https://multimedia.scmp.com/news/china/article/One-Belt-One-Road/khorgos.html

Appendix 5

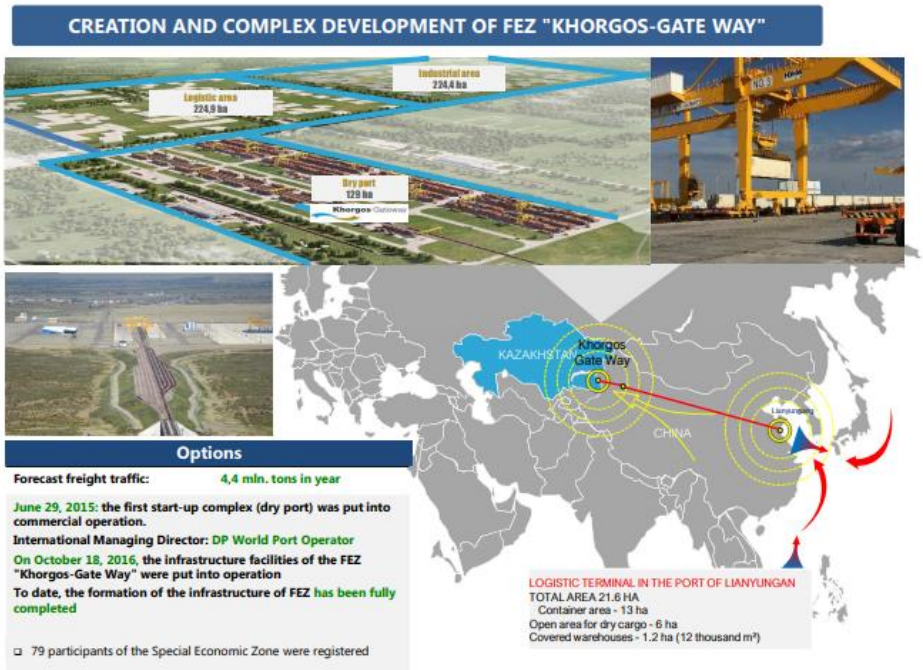
The Korgas-Zhetygen railway line construction



Source: Transport landscape of the Republic of Kazakhstan, 2018. Available at: https://www.unescap.org/sites/default/files/Session%201%20-%20Kazakhstan.pdf

Appendix 6

Creation and complex development of "Khorhos-gate way"



Source: Transport landscape of the Republic of Kazakhstan, 2018. Available at: https://www.unescap.org/sites/default/files/Session%201%20-%20Kazakhstan.pdf

Appendix 7

"BAKAD Concession Project"

Source: Ministry of National Economy of Kazakhstan, 2014, https://stat.gov.kz/

Appendix 8

List of airlines of Kazakhstan

AIRLINE	IMAGE	ESTABLISHED	ICAO	IATA	DOMESTIC CODE	CALLSIGN
Air Astana		2001	KZR	KC		ASTANALINE
Air Trust		2012	RTR			AIR TRUST
Bek Air		2011	BEK	Z9		BEKAIR
Berkut Air		2000	BEC			
Caspiy		2011	TLG			
Euro-Asia Air		1997	EAK		ЕЦ	EAKAZ

Jupiter Jet		1996	AMA			ADIK
Kaz Air Trans		2012	KUY			KAIGA
Kazaviaspas		2003	KZS			SPAKAZ
Mega Aircompany			MGK			MEGLA
Qazaq Air		2015	QAZ	IQ		**SAMRUK**
SAPSAN		2009				
SCAT		1997	VSV	DV		VLASTA
Semeyavia			SMK		ШК	ERTIS
Sky Service (Kazakhstan)		2004	KVR			KAVAIR
Sunday Airlines		2013	VSV	DV		VLASTA
Zhetysu (airline)		1994	JTU			KAVAIR
Aerotrans		2000	ATG			
Aerotur Air		2006	RAI			
Air Almaty		2005	LMY			
Avia Jaynar		2001	SAP	JN		Tobol
Comlux KZ		2009	KAZ			KAZLUX
East Wing		2006	EWZ			
Excellent Glide		2007	EGB			
Fly Jet KZ		2008	FJK			

InvestAvia		2007	TLG	IV		
Jet Airlines		2008	SOZ			
Kaz Air Jet		2008	KEJ			
Kazakhmys		2007				
Khozu-Avia		2002	OZU			
Prime Aviation		2005	PKZ			
SA Regional Airlines		2010	SMK	E8		
Sayat Air		2007	SYM			
Skybus (Kazakhstan)		2008	BYK			
Zhezair		1996	KZH			

Source: https://en.wikipedia.org/wiki/List_of_airlines_of_Kazakhstan#cite_note-ATM-1