INDUSTRIAL CONCENTRATION IN KAZAKHSTAN

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ABSTRACT

This study focuses on geographical concentration of industries in Kazakhstan at 2, 4 and 5-digit disaggregation level, across 16 regions of Kazakhstan during 1990 - 2013. The main objective of this study is to identify the change in regional concentration of industries during the sample period. There are certainly considerable differences in levels of concentration between industries and their changes during the sample period. Thus, sectors like utilities, food and beverage industries show less concentration, whereas industries with high knowledge intensity present very high levels of spatial concentration during the whole sample period. In addition, there was a considerable decline in concentration of oil and gas and related extractive industries during the period of under consideration both in absolute and relative terms. It happens to be that many new industries with high knowledge intensity have emerged since 1990 and that there are many sectors that are negligibly small.

Key Words: industries, industrial concentration, Gini index, absolute concentration, relative concentration.

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INTRODUCTION

Transition economies are very likely to experience significant shifts in spatial distribution of economic activities. The time period subsequent to the collapse of the Soviet Union is unique and interesting from the analytical point of view because it corresponds to the period of economic transition from planned economy to an economy based on market conditions. The necessary transformations in economic policy terms of international trade and regional policy intensified by integration to the world economy and accompanied by further increase of mobility of the production factors and natural resources and significant reduction of transaction and transportation costs created conditions of inevitable spatial shifts of economic activities in Kazakhstan. Moreover, recent economic integration of Kazakhstan with Belarus and Russia into the so-called Eurasian Economic Union created regimes of considerable trade liberalization with among these trade partners and neighboring countries that are to prepare to the accession, the spatial effects of which are to be seen in the years to come.

The issues of industrial concentration, agglomeration, localization and regional specialization are highly interrelated and are frequently discussed together in different contexts. This topic is frequently discussed with relation to industries in the United States (US). Classical well known examples of industrial concentration include Silicon Valley, automotive industry in Michigan, financial institutions in New York City, insurance industry in Connecticut and etc. Concentration and specialization in many cases are positively interrelated. This can be retrieved from the *New Economic Geography*.

Our study includes industries in Kazakhstan during the time period from the very beginning of its existence as an independent state. The aim of this study is to identify spatial relocation of the industries during the sample period on the given territory. The main contribution of this study, however, is the high level of disaggregation of industries which reaches 4 and 5 digit level. Such a deep disaggregation level permits us to construct a rather precise and detailed picture of the spatial dynamics of the industries in Kazakhstan. Given that studies on spatial allocation of economic activities in Kazakhstan are extremely infrequent and out of focus in policy making, we hope that we will contribute to better understanding and clarification of this issue contribute to stimulation of further research on this and related fields of study.

THEORETICAL BACKGROUND

The earliest scientifically consistent theory developed on locational economics belongs to Prussian economist von Thunen (1826), who identified transportation cost and crop price as the determining factors of location of farm lands relative to urban centers. His theory referred to Prussian farmlands during the last years before the industrial revolution came there and this was a pioneering insight on spatial agglomeration that was generally accepted and remains important until nowadays and it is heavily cited and revised in academic literature. The main advantages of von Thunen's theory and its linkages with the New Economic Geography are presented by Fujita (2011).

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Further theories concerning locational determinant of industries were developed by Marshall (1920), Weber (1909), Christaller (1933), Losch (1940) and others. Marshall (1920) tried to explain the existence of industrial agglomerations. He identified three main reasons of spatial concentration of industries: emergence of related industries, formation of labor with specific skills and knowledge spillover. Weber (1909) in his theory focused his attention on cost minimization. According to his theory, the fundamental incentive that stands behind the decision of location choice is the minimization of costs. Weber's theory underlines the two notions that are undisputedly important in spatial economics, which are economies of scale and the role of historical accidents. The two theories have many similarities and in many aspects complement each other and explain rather well the emergence and existence of industrial agglomerations. Weber with his industrial location theory also contributed to the development of industrial organization (Perreur, 1998). The theories of Weber (1909) and Marshall (1920) gain much more explicative power when analyzed together (Inamizu and Wakabayashi, 2013).

The most recent theory concerning locations of firms is attributed to Krugman (1991). His ideas concerning geographical economics of the US were described in his famous monograph called *Geography and Trade*. In this book, he explains the current locational feature of the economic activities in the US. According to this theory, historical accidents play the fundamental role in the formation of industrial belts. However, the further development of industrial agglomerations is strictly dependent on economies of scale, transportation cost and demand. Firms always try to serve large markets from one geographic location and the largest markets are usually those that already have high concentration of other firms. Moreover, historically when most of the current industrial agglomerations were emerging the transportation costs were extremely high. That is why initially firms were oriented to local markets. According to Krugman (1991), the totality of these factors explains the agglomeration of industries in the North-Eastern US. Comparing US to the European Union (EU) he also points out an amazing fact that in the US industries are more concentrated and regions are more specialized than in the EU. This approach was further developed into *New Economic Geography* by Fujita et al. (1999).

Many economic theories concerning a distribution of economic activity across territory are closely tied to trade theories. The well-known Ricardian trade model is one of the basic and comprehensive models that explain trade (Ricardo, 1817). It explains the trade through comparative advantage, which results from the difference in labor productivity between two countries. However, Ricardian trade model is too simplistic and it requires too many unrealistic assumptions to be hold. Another famous model called is Heckscher-Ohlin model, which explain trade between countries by the differences in endowments of factors of production (Heckscher, 1919 and Ohlin, 1933). According to this theory, labor abundant countries specialized in labor intensive industries and capital abundant countries specialize in capital abundant industries. However, these theories, despite their huge contributions to the formation of the basics of international trade, were in many aspects inconsistent with complexities of modern trade processes and required too many restrictive assumptions. In this sense, the *New Trade Theory*

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was developed in order to adapt the theory to the complexities of the reality. Unlike other theories, this new approach takes into consideration returns to scale, allows imperfect competition, takes into account the demand side of production and allows many other realistic conditions to intervene. However, due to the specificities of our data, in our analysis we leave trade factors out of our focus.

Forces that lead to industrial concentration and dispersion are associated with other factors too. Many studies test spatial allocation of economic activities relative to other reasons. Low transportations costs decrease concentration of industries (Rossi-Hansberg, 2003). Lafourcade and Mion (2004) find that bigger plants have more incentive to concentrate than smaller ones in Italian industries. Before that, the idea of linkage was developed by Ellison and Glaeser (1997), which underlines the importance of natural advantages in spatial concentration of industries. Specialization and concentration react in parallel to changes in transport costs (Aiginger and Rossi-Hansberg, 2006). Finally, concentration degrees may largely depend on the specific features of each industry (Athreye and Kapur, 2003).

LITERATURE REVIEW

Spatial concentration of certain economic activities is tackled directly or indirectly in various contexts. Amess and Roberts (2006) analyze the change in industrial concentration in Poland during the transition era between 1989 and 1993 in the context of the type of property ownership.

With recent Eastward expansion of the EU the issues concerning spatial dynamics of economic activities, including industrial concentration have started to be mentioned more frequently in academic literature. This can be seen in Traistaru et al. (2002) who analyzed regional specialization and concentration of industries in Bulgaria, Romania, Estonia, Hungary and Slovenia between 1990 and 1999 and found evidence of significant increase in industrial concentration in these countries. It is worth to mention that all these countries entered the EU very recently and still experience a heavy pressure of trade liberalization with the rest of the EU. East European countries that recently became EU members have gained special interest among scholars when it comes to industries. There is a great study made on Romania by Goschin et al. (2009), who found an increasing trend towards concentration of most economic activities starting from the year of the accession of Romania into the EU in 2007.

Hallet (2000) in his study on EU member states on regional level finds no major changes in concentration of 17 industries between 1980 and 1995. However, he finds considerable differences between different economic sectors. The most concentrated industries according to Hallet (2000) are industries related to some specific raw material processing. In general, according to Hallet (2000) the EU was a rather homogenous structure in terms of industrial concentration.

Another research on Europe with a very big geographical scale and extraordinarily deep level of industrial disaggregation was done by Brülhart and Traeger (2004). This study encompasses the time period from 1975 to 2000 and was done by entropy indices. They found no

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significant changes in concentration of aggregate employment. Also they detected a significant shift towards concentration in manufacturing sector relative to the spatial spread of total employment whereas relative to physical space it decreased during the sample period. Textiles, clothing and footwear sectors experienced the most pronounced decrease in the relative concentration level.

There are numerous studies conducted on geographic concentration of industries in developing countries that recently have gone through policies of trade liberalization, which make them similar to Kazakhstan. Trejo Nieto (2009) in her research on Mexican industries between 1988 and 2003 found evidence of significant geographic dispersion of industries mainly towards northern border-states. She also states that only a third of all industries became more concentrated during the sample period. The most concentrated industries by Trejo Nieto (2009) were pharmaceuticals and machinery and equipment while tortillas and beverages were among the most dispersed ones.

There are a plenty of studies that consider concentration of industries in the scope of trade regimes. Burghardt (2013) in his research on concentration of industries in Switzerland in the context of trade liberalization with the EU found a significant increase in concentration in industries with low R&D. Nozaki (2014) studying the case of Thailand found a significant dispersion of industries from the capital city after implementing an export oriented economic policy.

There is a study by He et al. (2008) that concludes a similar statement about Chinese economy. Particularly, He et al. (2008) note an increasing concentration of industries that are export oriented in the coastal provinces of China. They also found that firms when choosing location rely more on comparative advantage.

Naude (2006) finds high industrial concentration levels in South Africa between 1972 and 1996. Aparecida et al. (2003) in their studies on industrial concentration and labor productivity in Brazil from 1985 to 1998 found evidence of increase in concentration of industries since trade liberalization during 1990s. Fedderke and Simbanegavi (2008) in their study on South African manufacturing find a very high level of spatial concentration. Tipuric and Pejic Bach (2009) on their test on Croatian industries found that two fifths of industries had declining concentration levels and only one fifth had increasing levels of concentration. Another study on Croatia was made by Pervan et al. (2013) which focused on food and beverage industry only between 1999 and 2011 and found a clear pattern of concentration.

DATA DESCRIPTION

All the data that figure in this study are taken from the official website of the Agency of Statistics of the Republic of Kazakhstan (ASRK). Particularly, major part of the data on output of industries disaggregated till the 4 and 5-digit level is taken from the statistical yearbooks called "Industries in Regions of Kazakhstan" and published on a yearly basis from 2002 to 2014 covering the period from 1998 to 2013. The data on industries till the 2-digit level disaggregation and aggregated industrial output that

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cover the time period from 1990 to 2013 is also available on the website of the Agency of Statistics of Kazakhstan and is updated every year.

The statistical yearbooks provide very detailed data source on output by hundreds of economic activities. However, these data are not standardized and number of industries, level of disaggregation and the names of industries change from year to year, which makes it difficult to extract a continuous dynamic picture of the concentration of industries during our observation period. In order to avoid this and make our study comparable to other studies on industrial concentration we approximate our data to the fourth revision of the International Standard Industrial Classification of All Economic Activities (ISIC), which is widely used as a format of different reports and official publications on national and international levels. The ISIC is also frequently used as a benchmark in many studies whenever a disaggregated classification of industries is necessary. Unfortunately, due to the structure of data that is available, we cannot use only one disaggregation level along our observation period. Nor can we use a single disaggregation level during each year of observation. For this reason, for the observation period from 1998 to 2013 we use a full 4-digit level disaggregation and partial 5-digit level disaggregation of industries. The latter two disaggregation levels are largely conventional due certain peculiarities of the data. However, the emphasis will be always made on 4-digit level disaggregation whenever it is possible without a loss of continuity of the data. All the 6-digit level data are aggregated to 5-digit level. As for the 2-digit level disaggregation data which is used for the whole observation period along with 4 and 5 digit disaggregation levels the original data provided by the Agency of Statistics of Kazakhstan is standardized in accordance with the ISIC. The numerical description of the data can be summarized in Table 1:

Table 1. *Data Availability.*

Year	2-digit level			4-digit level			5-digit level		
	Number of industries available	Total ISIC industries	Units of measurement	Number of industries available	Total ISIC industries	Units of measurement	Number of industries available	Total ISIC industries	Units of measurement
1990	31	36	Tenges	0	161	Various	0	263	Various
1991	31	36	Tenges	0	161	Various	0	263	Various
1992	31	36	Tenges	0	161	Various	0	263	Various
1993	31	36	Tenges	0	161	Various	0	263	Various
1994	31	36	Tenges	0	161	Various	0	263	Various
1995	31	36	Tenges	0	161	Various	0	263	Various
1996	31	36	Tenges	0	161	Various	0	263	Various
1997	31	36	Tenges	0	161	Various	0	263	Various
1998	32	36	Tenges	41	161	Various	83	263	Various
1999	32	36	Tenges	46	161	Various	95	263	Various
2000	32	36	Tenges	47	161	Various	95	263	Various
2001	32	36	Tenges	51	161	Various	200	263	Various
2002	32	36	Tenges	53	161	Various	197	263	Various
2003	32	36	Tenges	53	161	Various	204	263	Various
2004	32	36	Tenges	51	161	Various	221	263	Various

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2005	32	36	Tenges	51	161	Various	217	263	Various
2006	32	36	Tenges	52	161	Various	217	263	Various
2007	32	36	Tenges	52	161	Various	216	263	Various
2008	32	36	Tenges	53	161	Various	208	263	Various
2009	32	36	Tenges	49	161	Various	180	263	Various
2010	32	36	Tenges	47	161	Various	181	263	Various
2011	32	36	Tenges	54	161	Various	180	263	Various
2012	32	36	Tenges	51	161	Various	176	263	Various
2013	32	36	Tenges	53	161	Various	171	263	Various

Source: Author's calculations based on the data from ASRK.

There is a lack of data on four industries on 2-digit level throughout all the sample period. These are *18-Printing and reproduction of media*, *30-Manufacture of other transport equipment*, *32-Other manufacturing*, *39- Waste management*. Till 1998 there is another missing industry which is *37- Sewerage*. Obviously, at two digit level not all data are provided in our data source. At four digit level that covers the time period from 1998 to 2013 some existing industries are also not represented. These are *0721 - Mining of uranium and thorium ore, 0910 - Support activities for petroleum and natural gas extraction, 0990 - Support activities for other mining, 1075 - Prepared meals, 3700 – Sewerage* and *3811 - Collection of non-hazardous waste*. Several other industries that in fact uninterruptedly existed throughout the observation period from year to year disappear from the statistical records of the ASRK. Despite this kind of minor failures of continuity of data, its coverage is enough for an analysis.

The complete set of industries that we consider in this study is listed in Table 12. One can notice that there was a growth of the number of existing industries at 4 and 5-digit levels from 1998 to approximately 2003. This can be attributed to improvement of data collection of the ASRK, switches of classification system and to certain emergence of new type of industrial activity. On the other hand, this limits the degree of objectivity of the analysis leading us to think that 1998 was a breaking point in the industrial structure of the regions, which would be wrong.

METHODOLOGY

As it was mentioned above, in order to measure the industrial concentration we consider its spatial distribution, which implies a measurement of the size of different industrial activities. Based on our data, we take the production as a measurement of industries. There are two types of techniques of measuring concentration as well as specialization: absolute and relative. Measurements of absolute concentration detect any kind of gathering of industries in a certain territorial unit without making reference to the overall distribution of economic activities. Thus, absolute measurements of industrial concentration are not very precise when overall industries are far from being uniformly distributed. Relative measurements of industrial concentration are more preferable to absolute measurements because they take into account the general distribution of industrial activity and detect any difference between overall industrial activities and in some particular industry. As a measurement of absolute concentration of industries we use the Herfindahl-Hirschman (HH) Index (Herfindahl, 1950, Hirschman, 1964), which is expressed as follows:

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$H_i = \sum_{j=1}^{m} \left(\frac{x_j}{\sum_{j=1}^{m} x_j}\right)^2$, x_{ij} is the size of the output of region j in the total output of industry i. In case of maximum absolute concentration $H = 1$, and the less concentrated is industry and the more regions we consider the closer it will be to zero. Due to its simplicity the HH-index became one of most frequently used indices of concentration and specialization among scholars. HH index also can easily be transformed and used for other measurements depending on the purpose the study. This was demonstrated by Bikker and Haff (2002) in their research on concentration in banking industry. HH index is also used in more complex indices like, for example, Ellison and Glaeser Index (Ellison and Glaeser 1994) and in Maurel and Sedillot Index (Maurell and Sedillot 1999).

In order to detect the relative concentration of industries we use the Gini Index which in some literature is also called locational Gini Index. $G^i = 1 - \sum_{\bar{j}}^{R} \lambda_j \left[\lambda^i_{j(n)} + \lambda^i_{j(n-1)}\right]$, where λ_j is the share of the industry of region $\bar{j}$ in the total national industrial out. $\lambda^i_{j(n)}$ is the accumulated share of industry of region j which is on the n^{th} position by its share in the industry i. $\lambda^i_{j(n-1)}$ is the accumulated share of region j which is on the n^{th} position among all the regions by its share of output in the industry i. It oscillates between 0, which implies absolute dispersion, and 1, which represents the maximum concentration. The Gini index is well known for its applicability in other fields as well. Originally developed by Gini (1912) it has been widely used in a broad range of human and natural sciences for different purposes. One of the economists who demonstrated the usefulness of this index in special economics was Krugman (1991). Graphically the Gini index measures the area between the 45 degrees line of equality and the Lorenz (1905) curve. In our case the greater this area the more concentrated is an industry. There are also other forms of Gini index that are based on the same technique but imply slightly different approach that can be found in Guillain and LeGallo (2005), Hong (2011), Ceapraz (2008), Campos (2012) and others.

There are of course many other techniques of measurement which are more complex and require more complex data. However, our choice is limited to HH and Gini indices due to the characteristics and availability of the data at hand.

There are also certain drawbacks that emerge depending on data characteristics and measurement techniques applied. Particularly, industries tend to become more concentrated as the level of industrial disaggregation increases (Goschin et al. 2009). It is also worth mentioning that there is no perfect measurement of concentration. Each approach bears in itself some advantages and shortcomings. Moreover, there are also different linkages between industries themselves which inevitably affects the degree of concentration. Thus the more related the industries are, there more correlated they become in terms of concentration.

In terms of geographic areas the data are not as detailed as we would like them to be. The amounts of production of each disaggregated industry are given at regional level. Hence, our empirical analysis will be done on 14 regions and 2 cities of republican status. There are 16 territorial units. This can cause certain imprecisions in detecting concentration. Moreover,

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many regions of Kazakhstan are very big in terms of geographic space. This certainly limits the power of our research even further if to take into account that concentration usually takes place at smaller geographic levels (Ruiz-Valenzuela et al. 2006).

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Absolute Concentration

Kazakhstan is one of the Post-Soviet states with large extractive sector and poor manufacturing. The share of its extractive sector in the total industrial output is roughly 60%. Its extractive industry is mainly based on oil and gas industry, which in our analysis corresponds to *06 - Petroleum and natural gas*. The share of this particular sector is about 51%. Given that other 5.8% of the industrial sector is attributed to utility industry, the remaining manufacturing sector only account approximately for about one third of all industries and it is split into numerous small industries.

In Table 2, you can see the ranking of all the industries in absolute and relative terms at 2-digit disaggregation level in 2013.

Table 2. *Absolute and Relative Concentration Rankings of 2-digit Level Industries in 2013.*

Absolute concentration index ranking of industries (HH index)		**Relative concentration index ranking of industries (Gini index)**	
Industry	HH index	Industry	Gini index
10 - Food products	0.090	38 - Waste collection and treatment	0.402
36 - Water collection, treatment and supply	0.091	06 - Petroleum and natural gas	0.424
23 - Other non-metallic mineral products	0.092	36 - Water collection, treatment and supply	0.441
38 - Waste collection and treatment	0.095	08 - Other mining and quarrying	0.461
37 - Sewerage	0.096	35 - Electricity, gas, steam and air conditioning	0.570
25 - Fabricated metal products	0.104	37 - Sewerage	0.580
22 - Rubber and plastics products	0.106	09 - Mining support service activities	0.583
08 - Other mining	0.117	25 - Fabricated metal products	0.587
28 - Machinery and equipment n.e.c.	0.119	33 - Repair and installation of equipment	0.602
33 - Repair and installation of equipment	0.127	23 - Other non-metallic mineral products	0.631
35 - Electricity, gas, steam and air conditioning	0.129	19 - Coke and refined petroleum products	0.642
14 - Wearing apparel	0.130	22 - Rubber and plastics products	0,655
20 - Chemical products	0.143	10 - Food products	0.667
16 - Wood and cork products	0.148	20 - Chemical products	0.667
27 - Electrical equipment	0.179	14 - Wearing apparel	0.679
31 - Furniture	0.191	31 - Furniture	0.689
17 - Paper products	0.194	16 - Wood and cork products	0.725
15 - Leather products	0.203	24 - Basic metals	0.751

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07 - Metal ores	0.213	17 - Paper products	0.778
24 - Basic metals	0.260	27 - Electrical equipment	0.800
09 - Mining service activities	0.267	07 - Metal ores	0.811
06 - Petroleum and natural gas	0.292	05 - Coal and lignite	0.833
11 - Beverages	0.293	28 - Machinery and equipment n.e.c.	0.840
19 - Coke and refined petroleum products	0.339	13 - Textiles	0.855
21 - Pharmaceuticals	0.385	11 - Beverages	0.855
26 - Electronic and optical products	0.396	15 - Leather products	0.869
13 - Textiles	0.397	29 - Motor vehicles	0.873
05 - Coal and lignite	0.420	21 - Pharmaceuticals	0.896
29 - Motor vehicles	0.475	26 - Electronic and optical products	0.916
12 - Tobacco products	1.000	12 - Tobacco products	0.967

Source: Author's calculations based on the data from ASRK.

As we can see, in absolute terms all the industries at 2-digit level are rather dispersed. *12 – Tobacco industry*, *(1.000)* which is almost totally based in Almaty region, is the only industry that exceeds *HH=0.500*. The least concentrated industries are *10 – Food products (0.090), 36 – Water management (0.091), 23 – Other non-metallic mineral products (0.092), 38 - Waste collection and treatment (0.095), 37 – Sewerage (0.096).* The most concentrated industries in absolute terms other than *12 – Tobacco industry* are *26 – Electronic and optical products (0.396), 13 – Textiles (0.397), 05 - Coal and lignite (0.420)* and *29 – Motor vehicles (0.475)*

In relative terms the indices don't vary as greatly as in absolute terms. *38 – Waste collection and treatment (0.402), 06 – Petroleum and natural gas (0.424), 36 – Water collection, treatment and supply (0.441)* and *08 - Other mining and quarrying (0.461)*. It's remarkable that the two rankings industries in two columns don't match except for *12 – Tobacco industry* and *31 – Furniture industry*. However, there is some tenuous order. Particularly, most utility industries are very dispersed both in absolute and relative terms, as it is reasonable to expect. It is also noteworthy, that the industries that require more advanced scientific base are very concentrated in both terms. On the other hand, these industries are extremely small in terms of output.

Table 3 presents our conventional classification of industries by their change of indices of concentration at 2-digit disaggregation level during the time period from 1990 to 2013.

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Table 3. *Absolute Change of HH and Gini Indices between 1990 and 2013.*

Industry Description	Industry	ΔHH Index	ΔGini Index
Extractive industries	05 – Coal and lignite	-0.232	-0.013
	06 – Petroleum and natural gas	-0.210	-0.311
	07 – Metal ores	-0.020	0.036
	08 – Other mining	-0.072	-0.284
	09 – Mining service activities	-0.081	-0.064
Industries with Low Knowledge Intensity	10 – Food products	0.008	0.061
	11 – Manufacture of beverages	0.174	0.179
	12 – Tobacco products	0.000	0.014
	13 – Textiles	0.233	0.124
	14 – Wearing apparel	0.021	0.080
	15 – Leather products	0.048	0.061
	16 – Wood and cork products	0.053	0.076
	17 – Paper products	-0.087	-0.024
	31 – Furniture	0.082	0.080
Industries with Medium Knowledge Intensity	19 – Coke and refined petroleum products	0.015	-0.159
	20 – Chemical products	-0.047	-0.104
	21 – Pharmaceuticals	-0.464	-0.053
	22 – Rubber and plastics products	-0.165	-0.057
	23 – Other non-metallic mineral products	0.005	0.061
	24 – Basic metals	-0.081	-0.033
	25 – Fabricated metal products	-0.060	-0.123
Industries with High Knowledge Intensity	26 – Electronic and optical products	-0.012	0.088
	27 – Electrical equipment	-0.057	-0.045
	28 – Machinery and equipment n.e.c.	-0.004	-0.132
	29 – Motor vehicles	0.222	-0.010
	30 – Other transport equipment	-	-
Non-Tradable and Utility Industries	18 – Printing	-	-
	32 – Other manufacturing	-	-
	33 – Repair and installation of equipment	0.040	0.031
	35 – Electricity, gas, steam and air conditioning	-0.025	-0.047
	36 – Water collection, treatment and supply	-0.018	-0.092
	37 – Sewerage	-0.080	-0.117
	38 – Waste collection and treatment	-0.049	-0.296
	39 – Remediation and waste management	-	-

Source: Author's calculations based on the data from ASRK.

Note that like in the previous Table *2 12 – Tobacco products* and *31 – Furniture industry* demonstrate outstanding results. Both industries had minimum change in absolute and relative terms during the whole period. All the Utility industries that include *35 – Electricity, gas, steam and air conditioning, 36 – Water collection, treatment and supply, 37 – Sewerage* and *38 – Waste collection and treatment* show negative changes in absolute and relative throughout the given time period. Taking into account the specificities of this industries, we can attribute their dispersion

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to infrastructural developments of remote areas and small towns. This is illustrated in Figures 16 and 23.

There are also negative changes among extractive industries in both terms. Particularly, *05 – Coal and lignite (ΔHH=-0.232)* and *06 – Petroleum and natural gas (ΔHH=-0.210)* have become considerably dispersed in absolute terms. In relative terms *06 – Petroleum and natural gas (ΔGini=-0.311)* and *08 – Other mining (ΔGini=-0.284)* have been dispersed in spatial terms during the sample period. Any shifts in terms of location in extractive industries should be considered with certain level of skepticism. The dispersion of extractive industries can be done in two ways. First – construction of new mine and development of new oil fields, second – establishment of new offices in other regions. Since 1990, both effects took place in Kazakhstan. The graphs of these changes are illustrated in Figures 10 and 17.

We can observe a very different situation with Industries with Low Knowledge Intensity. Here all the industries except for *17 – Paper products (ΔHH=-0.087, ΔGini=-0.024)*, have positive changes in their indices. However, many of these changes are small. Despite, *11 – Manufacture of beverages (ΔHH=0.174, Δ Gini 0.179)* and *13 – Textiles (ΔHH=0.233, Δ Gini=0.124)* have the largest positive changes in concentration levels. This is largely due to spatial expansion and growth of production of wine and soft drinks which correspond to *1102 - Manufacture of wines* and *1104 - Manufacture of soft drinks* in Table 17.

Table 4 shows the ranking of the 10 least concentrated industries in absolute terms in 1990 and 2013.

Table 4. *10 Least Concentrated 2-digit Industries*.

1990			**2013**		
Rank	Industry	HH index	Rank	Industry	HH index
1	10 - Food products	0.082	1	10 - Food products	0.090
2	33 - Repair and installation of equipment	0.087	2	36 - Water collection, treatment and supply	0.091
3	23 - Other non-metallic mineral products	0.087	3	23 - Other non-metallic mineral products	0.092
4	16 - Wood and cork products	0.095	4	38 - Waste collection and treatment	0.095
5	36 - Water collection, treatment and supply	0.109	5	37 - Sewerage	0.096
6	31 - Furniture	0.109	6	25 - Fabricated metal products	0.104
7	14 - Wearing apparel	0.109	7	22 - Rubber and plastics products	0.106
8	11 - Manufacture of beverages	0.118	8	08 - Other mining	0.117
9	28 - Machinery and equipment n.e.c.	0.123	9	28 - Machinery and equipment n.e.c.	0.119
10	38 - Waste collection and treatment	0.143	10	33 - Repair and installation of equipment	0.127

Source: Author's calculations based on the data from ASRK.

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In absolute terms *10 – Food* industry has the lowest degree of regional concentration in both years. From Figure 11 we can see that it has been the most dispersed industry throughout the whole sample period. The list is not quite surprising if to focus on the specificity of the industries. These are mainly industries for which proximity to consumer markets is vital. Apart from *10 – Food* industry these include *11 – Beverage* and *31 – Furniture* industries.

The main utility industries are also very dispersed among regions. These are *36 - Water collection, treatment and supply, 38 - Waste collection and treatment, 37 - Sewerage* and *38 - Waste collection and treatment*. All these industries together with *35 - Electricity, gas, steam and air conditioning* have been very dispersed on the regional level. These industries have experienced minor changes which can be seen in the previous Table 3. *14 - Wearing apparel* industry is also one of the least concentrated industries and it has been so during the whole observation period. *23 - Other non-metallic mineral products* is another industry with high stability in terms of concentration. In both years it is the 3rd most dispersed industry.

Table shows us the 10 industries with the highest HH index in 1990 and 2013.

Table 5. *10 Most Concentrated 2-digit Industries*.

1990			2013		
Rank	Industry	HH index	Rank	Industry	HH index
20	22 - Rubber and plastics products	0.271	21	09 - Mining service activities	0.267
21	17 - Paper products	0.282	22	06 - Petroleum and natural gas	0.292
22	19 - Coke and refined petroleum products	0.324	23	11 - Beverages	0.293
23	24 - Basic metals	0.341	24	19 - Coke and refined petroleum products	0.339
24	09 - Mining service activities	0.347	25	21 - Pharmaceuticals	0.385
25	26 - Electronic and optical products	0.408	26	26 - Manufacture of computer, electronic and optical products	0.396
26	06 - Petroleum and natural gas	0.502	27	13 - Textiles	0.397
27	05 - Coal and lignite	0.652	28	05 - Coal and lignite	0.420
28	21 - Pharmaceuticals	0.849	29	29 - Motor vehicles	0.475
29	12 - Tobacco products	1.000	30	12 - Tobacco products	1.000

Source: Author's calculations based on the data from ASRK.

An extraordinary performance is presented to us by *12 - Tobacco* industry, which has an HH=1.000 in 1990 and 2013. However, the *12-Tobacco* industry should be treated as an outlier due to its small size. As one might expect, many industries with high knowledge intensity, for which spillover effect is important, and extractive industries, for which physical proximity to natural resource deposits is the main requirement, are among the most concentrated industries. Among the knowledge intensive industries we can find *26 - Electronic and optical products* and *29 - Motor vehicles*. *26 - Electronic and optical products* had an interesting trajectory in terms

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of absolute concentration during the sample period (see Figure 15). It increased incredibly from 1990 to 2000 and then started to decrease gradually. This is mainly due to the increase of the share of Almaty in this industry. Consequently, the output put of this industry started to increase in other regions like Aktobe, North Kazakhstan Karaganda and Astana. *29 - Motor vehicles* industry also has an irregular fluctuating pattern. This probably due to the expansion of this industry in East Kazakhstan Region. The most concentrated extractive industry in 1990 as well as in 2013 in absolute terms is *05 - Coal and lignite*, which holds its 3rd ranking position throughout the whole period. The second most concentrated industry that appears in the table is *06 - Petroleum and natural gas*, which is the most important industry in terms of its output. However, this industry is not as concentrated as it was in the very beginning of the sample period. Obviously, this is almost totally attributed to the discovery of new oilfields in Kyzylorda, West Kazakhstan and Aktobe regions which began to produce oil recently. Unlike *05 - Coal and lignite* industry, which is geographically tied to Karaganda and Pavlodar regions, 06 - Petroleum and natural gas expanded in spatial terms during our observation period. Correspondingly, *09 - Mining service activities* also present high degrees of absolute spatial concentration. In the table above we can also observe some of the industries with medium knowledge intensity. These include *22 - Rubber and plastics products, 19 - Coke and refined petroleum products, 24 - Basic metals* and *21 - Pharmaceuticals*. All of these industries have experienced a substantial movement towards spatial dispersion. This can be seen in Figures 13 and 20. Especially, this refers to *21 - Pharmaceuticals* industry which lost absolute concentration degrees dramatically during the first half of the 1990s.

In order to see a more detailed picture we look the industries at 4 and 5 digit disaggregation levels. The complete set industries and their corresponding HH and Gini indices at 4 and 5-digit level are shown in Tables 15-23 and 26-30.

Table 6 contains 10 least concentrated industries in 1998 and 2013.

Table 6. *10 Least Concentrated 4 and 5-digit Industries.*

1998			2013		
Rank	Industry	HH index	Rank	Industry	HH index
1	3100-1 - manufacture of chairs and seats	0.003	1	3530 - Steam and air conditioning supply	0.091
2	1061-3 - flour or meal of dried vegetables	0.088	2	2220-1 - manufacture of finished plastic products	0.105
3	1392 - made-up textile, except apparel	0.097	3	1071 - bakery products	0.107
4	1071 - manufacture of bakery products	0.107	4	3100-4 - manufacture of furniture for bedrooms, living rooms, gardens etc.	0.108
5	1050-4 - manufacture of cheese and curd	0.111	5	0810-5 - breaking and crushing of stone and gravel	0.109
6	3530 - steam and air conditioning supply	0.119	6	1010-5 - production of sausages and salamis	0.110
7	0810-7 - quarrying of sand	0.127	7	2395-2 - structural components of cement, concrete or artificial stone	0.113

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8	1010-5 - production of sausages and salamis	0.129	8	0810-4 - extraction and dredging of industrial sand	0.120
9	1050-3 - manufacture of butter	0.136	9	2392 – manufacture of clay building materials	0.125
10	0810-5 – breaking and crushing of stone and gravel	0.138	10	2220-6 – manufacture of plastic doors, windows, frames, etc.	0.126

Source: Author's calculations based on the data from ASRK.

As it is reasonable to expect, the industries in Table 6 are a more detailed reflection of the industries from Table 4. However this provides us a deeper insight into the issue. The degree of concentration of *3100-1 - manufacture of chairs* and seats is really incredible. It turns out that among the furniture industries, *3100-1 - manufacture of chairs and seats* was the only dispersed industry in 1998. However, among the food industries many were dispersed across regions in absolute terms. For 1998 there are other food industries that are close to the most dispersed industries but are not in the list of Table 6. These industries with their corresponding HH indices can be verified in Table 16. On the other hand, if we look at the right side of Table 6 we can notice a slight change represented by the presence of several industries with medium knowledge intensity among the most dispersed industries. These are *2220-1 - manufacture of finished plastic products, 2395-2 - structural components of cement, concrete or artificial stone, 2392 - manufacture of clay building materials* and *2220-6 - manufacture of plastic doors, windows, frames, etc.* This decline in concentration of the above mentioned industries can be also seen in plots of their 2 digit aggregation in Figures 12 and 13. As for the utility industries, there is also a slight movement towards dispersion in absolute terms. This can be seen from *3530 - Steam and air conditioning supply*, which by 2013 became the most dispersed industry with a very low *HH=0.091*.

The most concentrated industries at 4 and 5-digit levels in 1998 and 2013 are listed in Table 7.

Table 7. *10 Most Concentrated 4 and 5-digit Industries.*

1998			2013		
Rank	Industry	HH index	Rank	Industry	HH index
119	2420-3 - crude aluminum and aluminum oxide	1.000	214	2814 - bearings, gears, gearing and driving elements	1.000
120	2420-5 - crude zinc	1.000	215	2821-6 - caterpillar tractors	1.000
121	2420-11 - tin and coating with tin	1.000	216	2822-2 - machine tools for turning, drilling, milling, shaping, planing, boring, grinding etc	1.000
122	2431-2 - casting of steel castings	1.000	217	2823 - machinery for metallurgy	1.000
123	2640-1 – manufacture of televisions	1.000	218	2826-1 - machinery for washing	1.000

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124	2710-1 - electric distribution transformers	1.000	219	2826-2 - manufacture of wringing	1.000
125	2821-1 - tractors for agriculture and forestry	1.000	220	3020-1 - rail locomotives	1.000
126	2824 - machinery for mining and construction	1.000	221	3030 - air and spacecraft and related machinery	1.000
127	2826 - machinery for textile	1.000	222	3211-1 - manufacture of coins	1.000
128	2910 - motor vehicles	1.000	223	3240 - games and toys	1.000

Source: Author's calculations based on the data from ASRK.

As it is reasonable to expect based on the ranking from Table 5, the most concentrated industries at 4 and 5-digit level disaggregation are mainly extractive industries and industries with high knowledge intensity and more valued added capacity. Also note that all the industries listed in Table 7 have *HH=1.000* which is the maximum concentration that can be. Since we consider industries at regional level, this means that all the industries listed in Table 7 are based only in one or few of the 16 regions of Kazakhstan. Namely, in 1998 *2640 - 1 - manufacture of televisions* was totally concentrated in the city of Almaty, *2710-1 - electric distribution transformers* and *2824 - machinery for mining and construction* in South Kazakhstan region, *2821-1 - tractors for agriculture and forestry* in East Kazakhstan region, *2826 - machinery for textile* in Zhambyl region, *2910 - motor vehicles* was mainly based in Akmola and East Kazakhstan regions. By 2013 many some industries had disappeared but other had emerged. These are *2826-1 - machinery for washing* and *2826-2 - manufacture of wringing*, both based in Zhambyl region, *3020-1 - rail locomotives* which is a brand new industry based totally based in Astana, 3240 - games and toys based in Karaganda and *2821-6 - caterpillar tractors* in East Kazakhstan region. Since the development of the advance industries based on high level of knowledge is declared to be the top economic priority by the government of Kazakhstan, there should be deep policy implications behind exploring the spatial behavior of these industries from the point of normative economic analysis. At first glance, it might seem that the high level of absolute concentration of these high knowledge intensive industries fits well into the framework concerning spillover effects. But there are factors that make this unsuitable for our case. Firstly, these industries are mainly single plant industries with extremely small output. Secondly, in most cases these newly based industries receive government interventions in different forms which means that they are highly uncompetitive.

As for the extractive industries, the reason of their high absolute concentration is obvious. As it was mentioned before, these industries are tied to the location of natural resource deposits.

Figures 2-5 reflect the numbers of industries that are dispersed with HH $0<400$, industries with low concentration level with HH $0.400<0.600$, industries with medium concentration level with HH $0.600<0.800$ and industries with high concentration level with HH $0.800<1.000$. Such classification is purely conventional. In order to avoid the effect of merging and disappearing industries we take the percentage of

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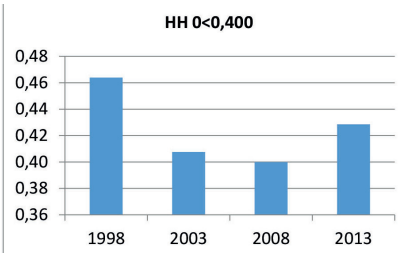
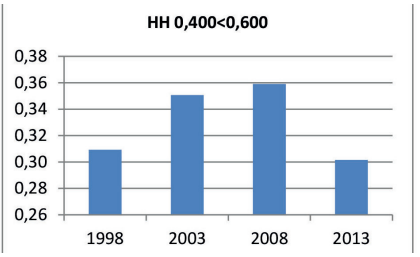
industries for each figure. As we can see the histogram of the numbers of dispersed industries follows a U-shaped figure. On the other hand, in case of industries with low concentration we observe the opposite shape.

Figure 2.
Dispersed Industries (HH Index).



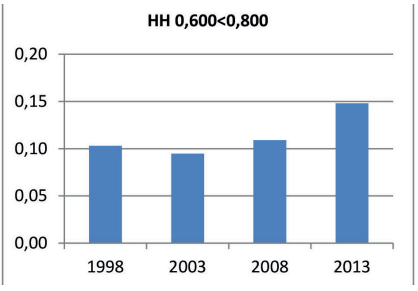
Source: Author's calculations based on the data from ASRK.

Figure 3.
Industries with Low Concentration (HH Index).



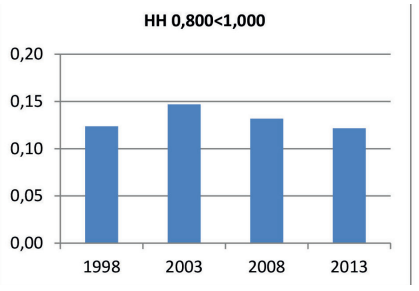
Source: Author's calculations based on the data from ASRK.

Figure 4.
Industries with Medium Concentration (HH Index).



Source: Author's calculations based on the data from ASRK.

Figure 5.
Industries with High Concentration (HH Index).



Source: Author's calculations based on the data from ASRK.

From Figure 2 we see a U-shaped graph of dispersed industries in absolute terms, whereas the industries with low concentration from Figure 3 have the opposite shape. Thus, there is a decline of the number of industries with low concentration since 2008. As for the industries with medium concentration in Figure 4, we can observe a stable increase of their number since 2003. The situation with industries with high absolute concentration is rather ambiguous. Their number grew from 1998 to 2003, but since then they have a moderate declining pattern. The Figures depicted above, however, don't give us a clear understanding concerning the number of industries.

Relative Concentration

While considering concentration it is always useful to apply measurements of relative concentration along with measurements of absolute concentration. As it was already mentioned, we use Gini index as a tool of measurement of relative concentration.

In Table 8, you can see the 10 industries with the lowest Gini indices in 1990 and 2013.

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Table 8. *10 Least Concentrated 2-digit Industries (Gini Index).*

1990			2013		
Rank	Industry	Gini index	Rank	Industry	Gini index
1	36 - Water collection, treatment and supply	0.533	1	38 - Waste collection and treatment	0.402
2	23 - Other non-metallic mineral products	0.570	2	06 - Petroleum and natural gas	0.424
3	33 - Repair and installation of equipment	0.571	3	36 - Water collection, treatment and supply	0.441
4	14 - Wearing apparel	0.599	4	08 - Other mining	0.461
5	10 - Food products	0.607	5	35 - Electricity, gas, steam and air conditioning	0.570
6	31 – Manufacture of furniture	0.609	6	37 - Sewerage	0.580
7	35 - Electricity, gas, steam and air conditioning	0.617	7	09 - Mining service activities	0.583
8	09 - Mining service activities	0.647	8	25 - Fabricated metal products	0.587
9	16 - Wood and cork products	0.649	9	33 - Repair and installation of equipment	0.602
10	11 – Manufacture of beverages	0.676	10	23 - Other non-metallic mineral products	0.631

Source: Author's calculations based on the data from ASRK.

Comparing Tables 7 and 8 we can notice a great similarity. Like in the case of absolute concentration, utility industries and industries that tend to be closer to markets rather than raw materials are the most dispersed industries in relative terms. This sounds as a confirmation of the theory of Weber (1909). *14 - Wearing apparel and 31 - Furniture* also can be examples of that. All utility industries demonstrate very small rate of regional concentration initially and a slight pattern towards dispersion throughout the sample period. This is illustrated in Figure 23. Like in the case with absolute concentration, *10 - Food products* and *11 - Manufacture of beverages* in 1990 are among the most dispersed industries. In Figure 18, we can see that the two industries had a slight but firm pattern towards concentration. In 1990, other industries of low and medium knowledge intensity were among the most dispersed ones. These are *23 - Other non-metallic mineral products, 09 - Mining service activities* and *16 - Wood and cork products*. By 2013, we can see great changes in the ranking of the industries. First of all, it is very surprising to see extractive industries among the least concentrated ones. *06 - Petroleum and natural gas (0.424), 08 - Other mining (0.461)* and *09 - Mining service activities (0.583)* present rather small Gini indices. This can be due to the shortcomings of the index itself and the nature of the data. Particularly, recall that we measure industries by their output and that the Gini index captures relative concentration. In other words, any deviation from the aggregate industrial output is recognized by Gini index as a concentration. Thus if to take into account that *06 - Petroleum and natural gas* industry accounts for more than a half of the total industrial output, this industry itself starts to act as a yardstick and doesn't detect its own

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degree of concentration. However, we don't reject the spatial expansion of the *06 - Petroleum and natural gas* and other extractive industries. In Figure 9 we can see that this refers to *09 - Mining service activities* and *08 - Other mining* too. *23 - Other non-metallic mineral products* is one of the industries that experiences negligibly small growth of Gini index. The distortion that corresponds to 1998 is largely a matter of data quality.

Industries with the highest Gini concentration index are listed in Table 9:

Table 9. *10 Most Concentrated 2-digit Industries (Gini Index)*.

1990			2013		
Rank	Industry	Gini index	Rank	Industry	Gini index
20	19 - Coke and refined petroleum products	0.801	21	07 - Metal ores	0.811
21	17 - Paper products	0.801	22	05 - Coal and lignite	0.833
22	15 - Leather products	0.808	23	28 - Machinery and equipment	0.840
23	26 - Electronic and optical products	0.828	24	13 - Textiles	0.855
24	27 - Electrical equipment	0.845	25	11 - Manufacture of beverages	0.855
25	05 - Coal and lignite	0.846	26	15 - Leather products	0.869
26	29 - Motor vehicles	0.883	27	29 - Motor vehicles	0.873
27	21 - Pharmaceuticals	0.949	28	21 - Pharmaceuticals	0.896
28	12 - Tobacco products	0.953	29	26 - Electronic and optical products	0.916
29	28 - Machinery and equipment	0.972	30	12 - Tobacco products	0.967

Source: Author's calculations based on the data from ASRK.

12 - Tobacco industry holds a stationary position of very high regional concentration. Another particularity that is clear is the fact that all the higher technology industries are very concentrated both in 1990 and 2013. These include *26 - Electronic and optical products, 27 - Electrical equipment, 28 - Machinery and equipment* and *29 - Motor vehicles*. Apart from having high relative concentration these are the most stable industries in terms of regional concentration. This can be observed in Figure 23. In this sense there are no major contradictions between HH absolute and relative Gini indices. *21 - Pharmaceuticals* is another industry that has been highly concentrated throughout the observation period. In 2013 two extractive industries appear to be highly concentrated which is due to the location of deposits of natural resources. If to look at Figure 17 we can see that these two industries have very stable relative concentration trajectory during the sample period. The same can be stated about *17 - Paper products. 15 - Leather products* industry follows a trend towards concentration since 2000. Prior to this it had the opposite trend. *19 - Coke and refined petroleum products,* on the other hand, has a clear pattern of dispersion.

In Table 10 we can see the 10 most dispersed 4 and 5-digit level industries. The industries in Table 10 mainly coincide with their 2-digit counterparts from Table 8.

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Table 10. *10 Least Concentrated 4 and 5-digit Industries (Gini Index).*

1998			2013		
Rank	Industry	Gini index	Rank	Industry	Gini index
1	3530 - steam and air conditioning supply	0.234	1	1410-2 - outerwear for women and children	0.249
2	1071 - bakery products	0.399	2	1020 - processing and preserving of fish	0.481
3	1392 - made-up textile articles	0.455	3	1920-2 - propane, butane and other gases	0.508
4	3510 - electric power generation	0.464	4	0610 - extraction of petroleum	0.510
5	3600 - water collection, treatment and supply	0.526	5	3530 - steam and air conditioning supply	0.517
6	1061-3 - flour or meal of dried vegetables	0.546	6	3600 - water collection, treatment and supply	0.579
7	2511 - structural metal products	0.556	7	1071 - bakery products	0.607
8	1050-4 - cheese and curd	0.571	8	1050-5 - manufacture of yoghurt	0.609
9	1010-1 - dressing or packing meat	0.572	9	2220-1 - finished plastic products	0.611
10	1104-1 - natural mineral waters	0.574	10	0620-1 - extraction of natural gas	0.623

Source: Author's calculations based on the data from ASRK.

As it was mentioned earlier, the most dispersed industries are mainly the sub industries of food and beverage industries and utility industries. As in case with absolute concentration, food industries and utilities are very dispersed. In 2013 *1410-2 - outerwear for women and children* became the most dispersed industry. However, it is quite surprising to see *1920-2 - propane, butane and other gases* and *0610 - extraction of petroleum* among the most dispersed industries. This is probably attributed to the reason mentioned above.

In Table 11, the most concentrated industries are shown.

Table 11. *10 Most Concentrated 4 and 5-digit Industries.*

1998			2013		
Rank	Industry	Gini index	Rank	Industry	Gini index
119	0810-3 - mining of chalk and dolomite	0.966	214	2811 - engines and turbines	0.970
120	1520-5 - polymeric footwear	0.971	215	1072 - manufacture of sugar	0.975
121	2821-3 - manufacture of mowers	0.972	216	0891-2 - grinding of phosphates	0.979
122	2640-4 - radio receivers	0.974	217	2814 - bearings, gears, gearing and driving elements	0.984
123	0620-2 - extraction of condensates	0.974	218	3030 - air and spacecraft machinery	0.985

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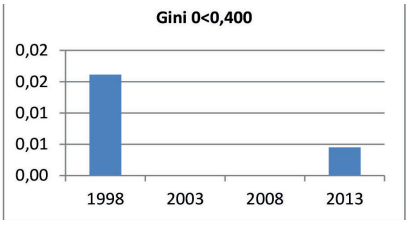
124	0891-1 - mining of phosphates and potassium salts	0.974	219	2011-3 - manufacture of phosphorus	0.987
125	0891-2 - grinding of phosphates	0.974	220	0891-1 - mining of phosphates and potassium salts	0.987
126	2011-3 - manufacture of phosphorus	0.974	221	1512-1 - saddlery and harness	0.987
127	2826 - machinery for textile	0.974	222	2826-1 - machinery for washing	0.987
128	2910 - motor vehicles	0.975	223	2826-2 - manufacture of wringing	0.987

Source: Author's calculations based on the data from ASRK.

As in case with absolute HH indices, the most relatively concentrated industries are mainly industries with high knowledge intensity and extractive industries. There are also some intermediate industries like *1520-5 - polymeric footwear, 2011-3 - manufacture of phosphorus* and *1512-1 - saddlery and harness*. The high concentration of the industries with high knowledge intensity can be explained by their small size rather than spillover effect.

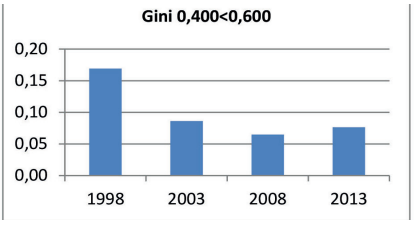
Figures 6-9 summarize the Gini indices of industries at 4 and 5-digit level shown in Tables 17-23.

Figure 6.
Dispersed Industries (Gini Index).



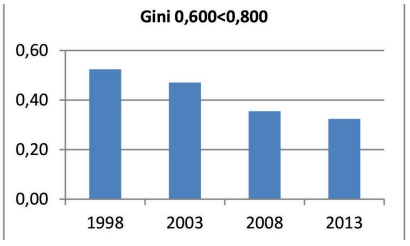
Source: Author's calculations based on the data from ASRK.

Figure 7.
Industries with Low Concentration (Gini Index).



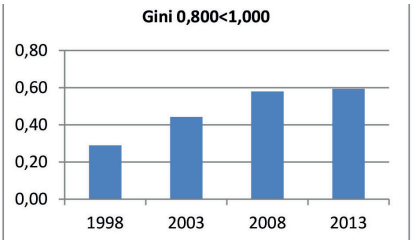
Source: Author's calculations based on the data from ASRK.

Figure 8.
Industries with Medium Concentration (Gini Index).



Source: Author's calculations based on the data from ASRK.

Figure 9.
Industries with High Concentration (Gini Index).



Source: Author's calculations based on the data from ASRK.

Like in Figures 2-5 Dispersed industries: Gini 0<0.400; Industries with low concentration level: Gini 0.400<0.600; Industries with medium concentration level: Gini 0.600<0.800; Industries with high concentration

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level: Gini 0.800<1.000. In case with dispersed industries we see that very few industries were dispersed throughout the sample period. In 2003 and 2008 there not even single industry with Gini 0<0.400. This can be mainly attributed to "strictness" of the Gini index itself or to our conventional rule of definition of dispersed industries. Thus, the percentage of industries with low concentration has from 17% to 8% in 2013. The proportion of industries with medium relative concentration fell from 52% to 32% during the same sample period and the proportion of industries with high relative concentration has grown from 29% to 59%. The depiction above gives us a clear pattern towards high concentration of industries. The same trend is described in Figures 7 and 8, which corresponds to industries with low and medium concentration.

Summarizing the analysis presented above, we must admit the absence of a definite and unambiguous pattern of the concentration of industries at regional level that could be attributed to all the industries under consideration. However, some industries present clear signs of concentration, dispersion or both during the time period under consideration.

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CONCLUSION

Our analysis has focused on geographical concentration patterns in industries, including extractive and utility industries at 2, 4 and 5-digit level industries, across 16 regions of Kazakhstan encompassing the time period from 1990 to 2013. The objective of this study was to identify the change in regional concentration of industries during the sample period. The theories of trade and spatial relocation of industries in conditions of transition in general terms predict prevalence of concentration patterns over forces of dispersion. In order to detect spatial relocations of industries we applied well known Herfindahl-Hirschman index for absolute concentration and Gini index for identification of relative concentration.

Our findings appear to be rather ambiguous. There are certainly considerable differences in levels of concentration between industries and their changes during the sample period. Particularly, utilities, food and beverage industries appear to be the least concentrated industries of all, whereas industries with high knowledge intensity present very high levels of spatial concentration during the whole sample period. Also there was a considerable decline in concentration of oil and gas and related extractive industries during the period of under consideration in absolute as well as relative terms, which might be explained by discovery of new deposits of natural resources. Our findings also suggest that many new industries with high knowledge intensity have emerged since 1990 and that there are many sectors that are negligibly small. In relative terms majority of the 4 and 5-digit industries have become more concentrated. Our study also suggests that it is also worthwhile to take into account that there is a huge asymmetry of sizes of different industries. This creates certain distortions of measurement.

The results show that in case of huge dominance of certain industries, it is better to rely on absolute measurement techniques. In order to achieve deeper levels of understanding of the spatial patterns of economic activity in Kazakhstan, further research is needed in this and other related fields. It would be useful to consider the issue in contexts of knowledge spillover, economies of scale and market structure. Particularly, there should be more research on spatial distribution of industries with more precise data on plant number and size, considering smaller spatial units and application of more sophisticated measurement techniques.

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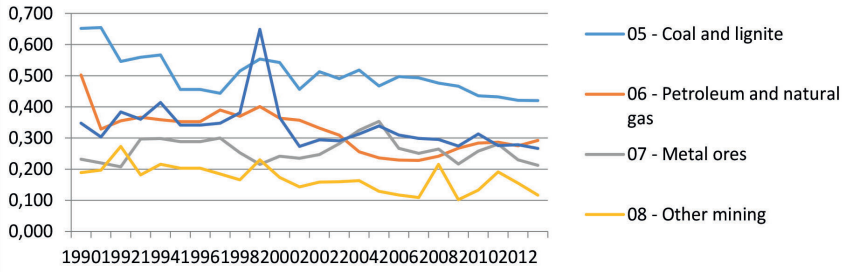
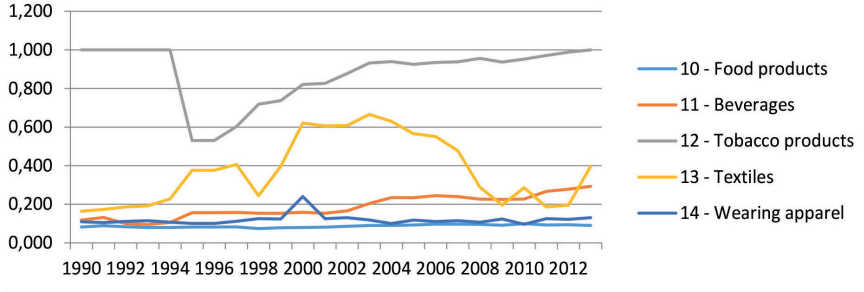
APPENDIX

Figure 10.
HH Index for Extractive Industries.



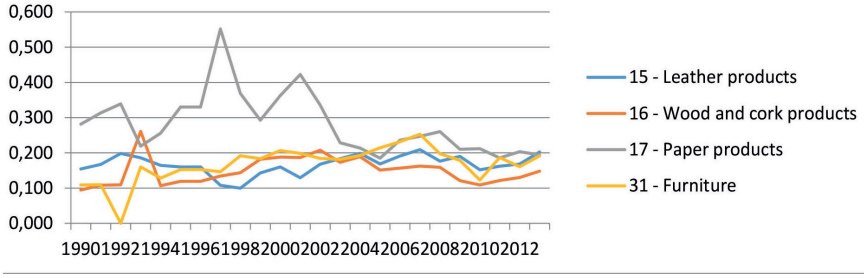
Source: Author's calculations based on the data from ASRK.

Figure 11.
HH Index for Industries with Low Knowledge Intensity - 1.



Source: Author's calculations based on the data from ASRK.

Figure 12.
HH index for Industries with Low Knowledge Intensity - 2.



Source: Author's calculations based on the data from ASRK.

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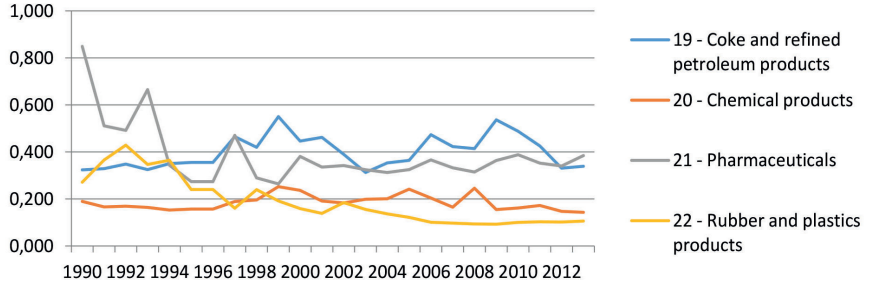
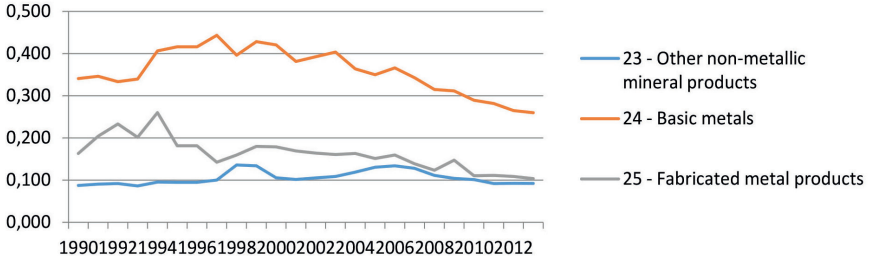
Figure 13.
HH index for Industries with Medium Knowledge Intensity - 1.



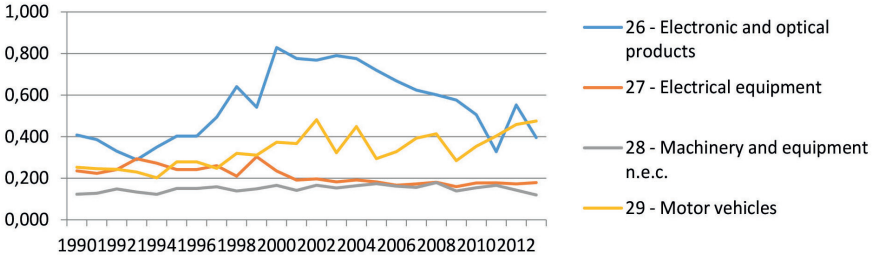
Source: Author's calculations based on the data from ASRK.

Figure 14.
HH Index for Industries with Medium Knowledge Intensity - 2.



Source: Author's calculations based on the data from ASRK.

Figure 15.
HH Index for Industries with High Knowledge Intensity.



Source: Author's calculations based on the data from ASRK.

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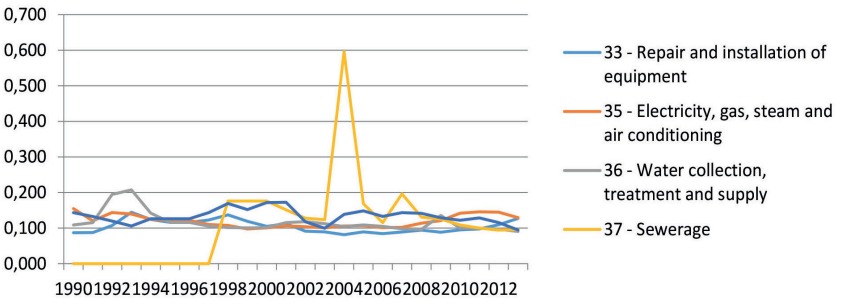
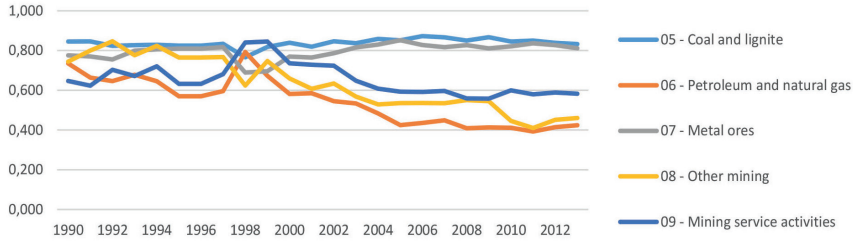
Figure 16.
HH Index for Utility and Non-Tradable Industries.



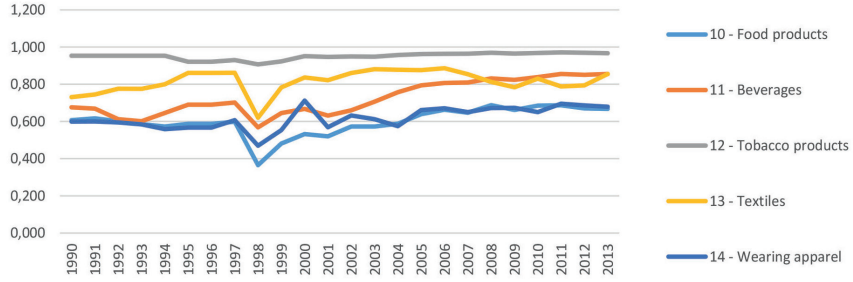
Source: Author's calculations based on the data from ASRK.

Figure 17.
Gini Index for Extractive Industries.



Source: Author's calculations based on the data from ASRK.

Figure 18.
Gini Index for Industries with Low Knowledge Intensity - 1.



Source: Author's calculations based on the data from ASRK.

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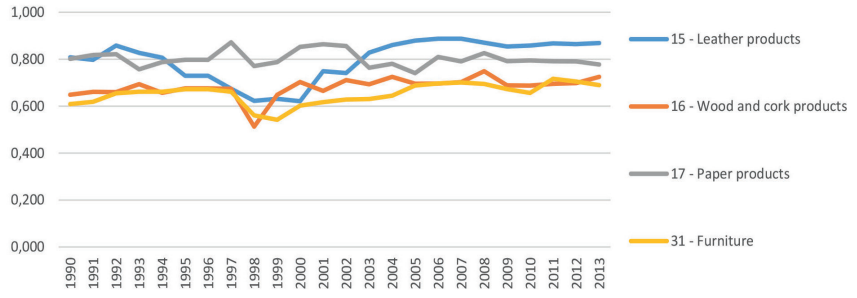
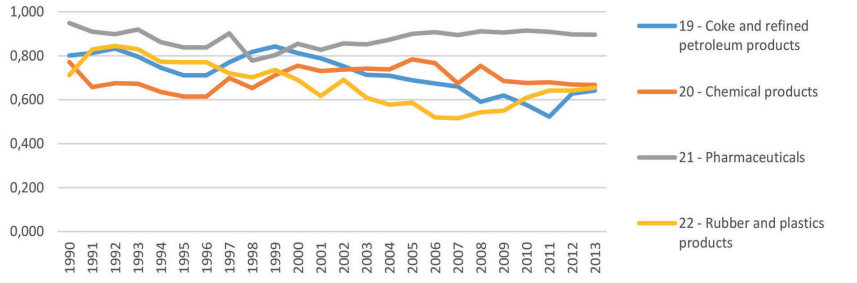
Figure 19.
Gini Index for Industries with Low Knowledge Intensity - 2.



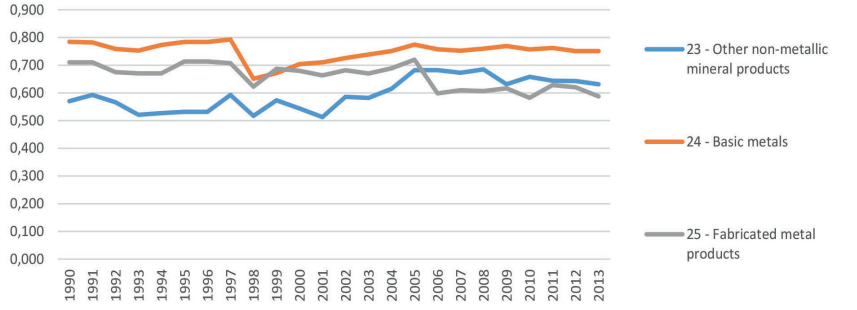
Source: Author's calculations based on the data from ASRK.

Figure 20.
Gini Index for Industries with Medium Knowledge Intensity - 1.



Source: Author's calculations based on the data from ASRK.

Figure 21.
Gini Index for Industries with Medium Knowledge Intensity - 2.



Source: Author's calculations based on the data from ASRK.

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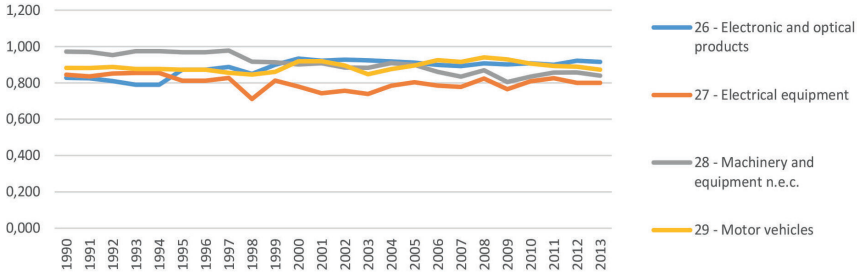
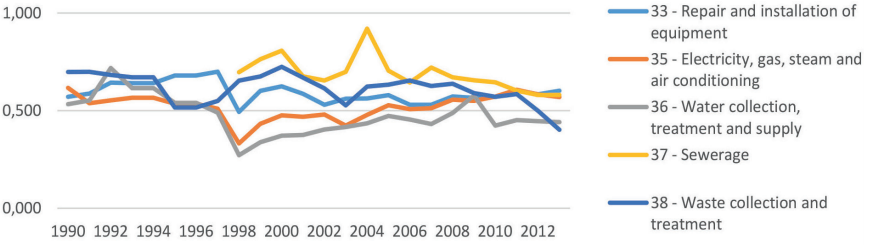
Figure 22.
Gini Index for Industries with High Knowledge Intensity.



Source: Author's calculations based on the data from ASRK.

Figure 23.
Gini Index for Utility and Non-Tradable Industries.



Source: Author's calculations based on the data from ASRK.