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Master's Thesis of Graduate School of International Studies

Economic Complexity and Development
of Natural Resource Intensive Economy:
the case of Mongolia

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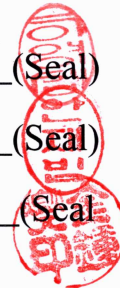
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Abstract

Sustainable economic growth is an essential goal for policymakers around the world, especially in developing countries like Mongolia. For instance, export diversification and economic complexity have been lately discussed as potential drivers of economic growth and prosperity. After transferring from the centrally controlled political system to a vibrant democratic system in 1990, Mongolia started actively participating in international trade. Even though a definite increase in quality of life is shown for the next few decades, the economic performance fluctuates in a greater range while recurring slumps are hindering the country from obtaining further achievements and prospects. Fluctuating economy over the years is affected by the exceptional developmental challenges that hamper Mongolia from operating on its full potential. The volume of export has expanded by itself, however, failed in diversifying the economy, and this ambiguous trend showing no sign of slowdown or reverse. Accordingly, the study has the objective of analyzing the effects of complexity and diversification on economic growth and to examine the economic complexity.

***Key words:* economic development, economic complexity, economic growth, export diversification, product space, export basket**

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I. Introduction

1. Background and Problem Statement

Mongolia transferred from the centrally controlled political system to a vibrant democratic system in 1990. The rapid and hurried transformation led not only to a freer-market, price liberalization, and mass privatization but also to weaker economic growth, hyperinflation, and poverty, which are the most common outcomes of the transition. Mongolian case was recognized considerably better than some other countries' experiences pursuing the same path since the economy got stabilized in the next few years.

Afterward the revolution, the positive trend of the GDP that was sustaining over the long term was interrupted for four years, reaching the lowest in 1992, -9.26%, while the highest in 2011, 17.29% (Figure 1). Once Mongolia was titled as the fastest-growing economy showing a very bright future for the development of the country and captivated foreign investors granting billions of dollars for good. However, the desire of turning Mongolia into the next miracle of Asia ended abruptly when the growth rate slumped to 1.24% after a demi-decade in 2016 as a result of hasty increases in government expenditure and its consequences. A negative increase of inflation along with the dependency on international trade of homogeneous products created a higher level of vulnerability to the global crisis. Furthermore, the Chinese economy showed signs of slowdown from 2007 after maintaining high economic growth nearly for ten years and shrank to a one-digit number. Compared to 2011, the GDP growth rate of China dropped by nearly 3% in 2016, and eventually, the

Mongolian Mining Sector, which is positively correlated to Chinese natural resource demand faced with challenges.

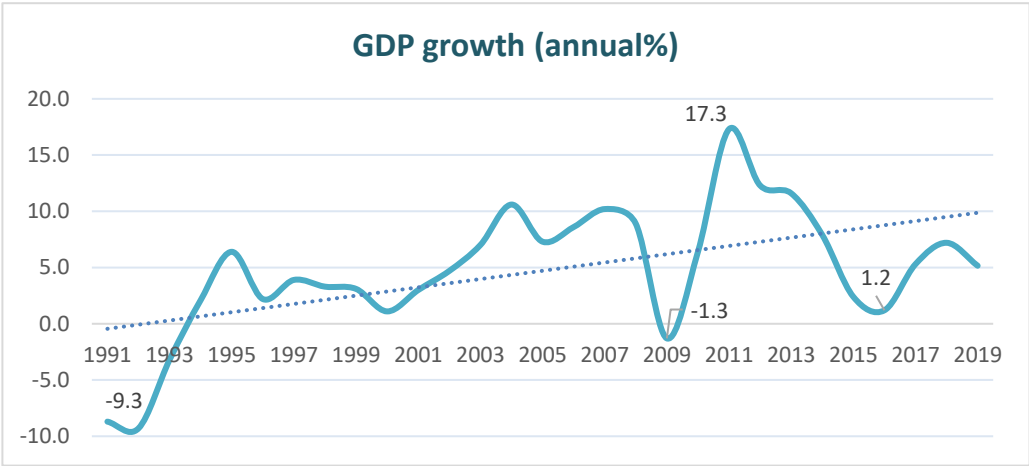


Figure 1-1. GDP growth of Mongolia, 1991-2019 (annual %)

Source: World Bank Database

“Just like many countries, whether industrialized or developing, one of the most fundamental objectives of macroeconomic policies is to sustain high economic growth” (Hanif & Gokal, 2004). However, in the Mongolian case, the economic performance fluctuates in a greater range for the last three decades due to the fluctuations of global commodity prices. A definite increase in quality of life is proven by the achievement of moving from the lower middle-income country to upper middle-income in 2015. However, recurring economic slumps are hindering the country from obtaining further achievements and prospects, which would make the country into an economic miracle.

Democratic revolution over Communism was peaceful, although with the fall of our “big brother”, the Union of Soviet Socialist Republics (USSR), it has lost much of its foreign aid,

and was in a financial crisis. Council for Mutual Economic Assistance (COMECON) was an economic organization with 10 full members under the Soviet Union, which existed from 1949 to 1991. Mongolia joined the Council in June 1962 becoming the first Asian Country of the COMECON and by gaining opportunities of being involved in multilateral economic relations, its share of foreign trade significantly increased. However, the Council collapsed along with the Soviet Union dissolution at the end of December 1991 and the sudden disintegration hit the Mongolian economy hard. It resulted drastic decrease in Mongolian export to former Soviet Union member countries, especially to Russian Federation. Even though Russian Federation was still remaining as the main export destination of Mongolia till 1996, the share of the export suddenly decreased from 63% to 18.3% in 1997. Overall, the Mongolian economy became extremely vulnerable that it needed some resources to boost the economy and improve living conditions.

Dissolution of the union acted like a double-edged sword and encouraged the proliferation of the mining sector. Since Mongolia is a natural resource-abundant country, it was the most reasonable industry to amplify the economic growth. Plenty of untapped mineral wealth is considered a key factor for economic development, however, the geographical position between the two great powers and the significant distance from ports and sea hinders form access to international trade. “Landlocked developing countries (LLDCs) face special trade and development challenges, arising from their lack of territorial access to the sea and geographical remoteness from international markets” (UNCTAD). Export and import of Mongolia should transit through one of the neighboring countries, PRC or Russian

Federation, and this prolonged transportation increases the cost of trade substantially and limits effective participation in world trade. Consequently, Mongolia is greatly dependent on Chinese demand for its resource and highly vulnerable to the Chinese economic slowdown.



Figure 1-2. Export revenue and growth rate, by million USD

Source: Mongolian Statistical Information Service

Export revenue has been relatively low till the early 2000s and it started to show an increasing trend over the last decade. The revenue was lowest in 1996 and reached its all-time best record in 2019 (Figure 2).

Recent export growth has been triggered by the demand in neighboring countries. Mongolia is in an urgent need to reduce the current account deficit, expand its export volume in order to create employment, and most importantly sustain the growth it has enjoyed thus far.

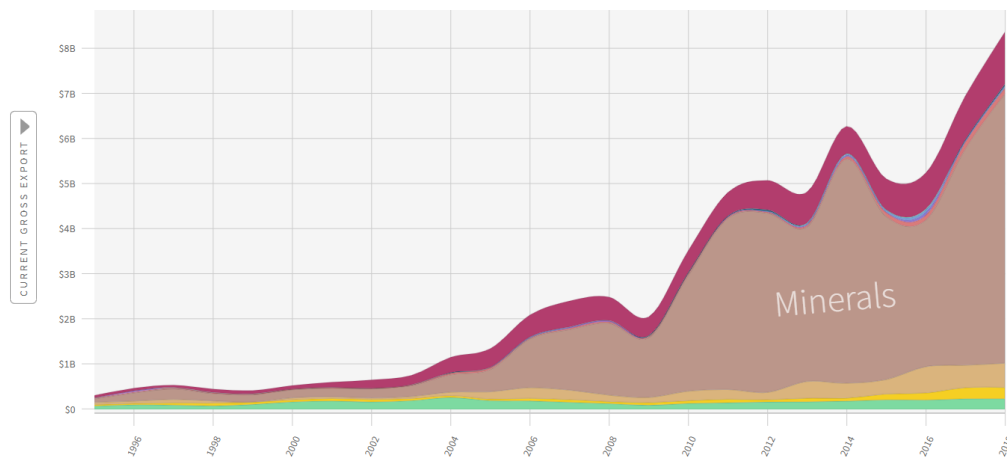


Figure 1-3. Export share by industry

Source: *Atlas of Export Complexity*

Up until 2003, Mongolian export share was evenly proportioned with manufacturing and mining industry commodities. The long-kept balance got disrupted due to the enlarged production of natural resources and increased involvement in global trade. Natural resource export increased over time so that currently it is nearly 20 times higher than in 1995 (Figure 3). To sum up, the volume of export has expanded enormously by itself, however, failed in diversifying and producing complex products, and this ambiguous trend showing no sign of slowdown or reverse in the near future. According to the Foreign Trade Annual Report 2019, 84% of the total export of Mongolia was the sole contribution of the mining sector, while the remaining 16% consisted of animal husbandry, industrial production, and others.

2. Objective of the Study

Fluctuating economy over the years is affected by the exceptional developmental challenges and disturbances that hamper Mongolia from operating on its full potential. Commodity

booms are considered as the key factor to transform the country from the third world to first since the country is endowed with natural resources. However, commodity prices are sensitive to the changes in global macroeconomic, so the fundamental state of the domestic commodity market decides the future of the country. As the volume and composition of mineral resources in export commodities getting larger, the dependency on mining sector increases greatly making the country's economy less diversified and less complex, and highly vulnerable to slowdown and price slumps. Volatility predicted to worsen when the country is in a geographical disadvantage, i.e., landlocked. All these characteristics are the perfect definition of Mongolian trade competitiveness.

For developing countries, exports could be the main driver of economic growth. For instance, export diversification and complexity seem to contribute to the growth success in Emerging Asian countries over the past three decades and the rapid growth in the East African Community countries since the 2000s (Agosin 2008, Giginishvili et al 2014). Diversification and complexity could lead to higher growth by exploring new products and inducing a structural change in the economy. They are considered as a good way to reduce the instability of exports as well.

Therefore, the purpose of this research is to analyze whether export diversification and complexity matter for long-term economic growth. Diversification and complexity of products and partners could contribute to growth by expanding to a larger market and accelerating knowledge spillovers.

Chapter 3 will study the following question: What are the effects of export diversification and complexity on long-term economic growth? Chapter 4 will analyze the export complexity status of Mongolia based on the Economic Complexity and the Product Space concept developed by Hausman. Eventually, the avenues for diversification will be developed. Lastly, issues and policy prescriptions will be suggested.

II. Literature Review

According to Jörg Mayer and Johannes Gareis (2010) the impact of commodity price volatility on low-income, developing countries for which commodities account for a sizeable part of their export earnings have shared the experience of rapid economic growth that characterized the group of developing countries as a whole prior to the outbreak of the crisis. Mongolia bounded in this path with many other developing countries dependent on natural resources, however, the recovery was relatively better and after one year of the deficit in 2009, it got on the track immediately and achieved an all-time high of 21.6 % GDP growth on Sep 2011. Authors also concluded that natural resources affect economic growth negatively only in economies with bad institutions but boost growth once their quality exceeds a critical threshold. Mongolian Corruption Perceptions Index (CPI) score is 35 out of 100 (ranking 106 out of 180) as of 2016, whereas 49 or under perceived as more corrupted. If this measurement has the ability to determine the degree of the institutions, Mongolia with more corrupted authorities should have to cope with certain difficulties to reach the macroeconomics ultimate goal, ensuring long-term economic stabilization.

“The negative growth effects of commodity terms of trade offset the positive impact of commodity booms” (Cavalcanti, Mohaddes, 2014). Therefore, volatility, rather than the abundance per se, drives the “resource curse” paradox and affects the productivity, profitability, and investment decisions of the investors. Hence, countries abundant in natural resources have done less than those intensive in manufacturing. Ian Keay (2014) proposed that “a maturing economy with diversified investment opportunities can become increasingly

immune from the negative effects of commodity price volatility”. Diversification is a complex process achieved over a long period of time, as they require a stable macroeconomic policy environment (UNCTAD Secretariat, 2012). However, its contribution for easing the negative impacts of price volatility is viewed by far the best and recommended to integrate commodity policies into a country’s overall development strategy.

1. The Effects of Export Diversification and Complexity on Economic Development

A. Diversification and Complexity Definition

Researchers have not reached a consensus on the concept of economic growth to date. Some believe that economic growth has a negative impact on society, while others believe that it is the driving force of a country. Since economic growth is defined as the positive change in the capacity of an economy to produce goods and services between two different periods, growth appears as an important ingredient for a country’s wellbeing. It depends on various factors, implementation of new technological advancements, human resources, political stability, natural resources, and many more. Among them, export diversification plays an important role in economic development.

Conceptually, export diversification is the process of changing the composition of the export basket, by improving the standard of the current export products or including completely new products, to broaden the economic activity and eventually generate a higher value-added level. As a consequence, “Countries that export new and complex products tend to develop more rapidly” (Hausman And Rodrik, 2003). “Economic complexity of a country is

calculated based on the diversity of exports a country produces and their ubiquity, or the number of the countries able produce them and those countries' complexity" (Atlas of Economic Complexity). In other words, the complexity measures the know-how in a society based on how diverse and complex are the products being produced and exported by the country. The more complex the products, the larger the income of the country and the less the competition with other trading partners since not many are capable of producing complex products.

B. Diversification and Complexity Indices

Numerous measures or indicators of export diversification have been developed to identify the diversity level of the countries. The most commonly accepted measures of diversification are the Herfindahl-Hirschman Index (HHI) proposed by Orris C. Herfindahl and the Theil Index proposed by Henri Theil. The indices were named by its developers.

The HHI is primarily used for measuring the market concentration and distinguishing competitiveness in the market. Notwithstanding its common use, the HHI is criticized for failing to include the market complexity in the calculation, putting the index at a disadvantage.

Unlike the HHI, the Theil Index is mainly used to measure economic inequality along with other economic circumstances. In some cases, the Theil Index is at a disadvantage due to the different value units, making it unable to compare.

In this paper, I attempted to utilize the Export Diversification (or Concentration) Index (DX) sourced from the World Integrated Trade Solution (WITS), the World Bank as the index has not been used for the econometric analysis of Mongolian export diversification. The index is

calculated by measuring the absolute deviation of the trade composition of a country from the world structure.

Economic Complexity Index (ECI) sourced from the Observatory of Economic Complexity presents the ranking of the countries derived from their export products' complexity. The index measures the knowledge intensity of an economy by taking the productive knowledge extremity of the export basket into account. In addition, the ECI does not focus only on the specialized know-how of countries but also refers to income and growth details.

2. The Product Space

Productivity knowledge has a direct impact on the income of the country. By increasing the know-how of the existing technology, the country will be capable of producing more sophisticated and complex products. Penetrating a new market with new products will require a lot of time, knowledge, and budget, while improving the current technology requires less, as long as the country is familiar with the foundational similarities. Hausman and Klinger (2007) first created the concept of the product space by measuring the data from 2006 to 2008 based on the knowledge differences in international trade and marked their size and distances on the space. "The nodes of the Product Space are colored in terms of product classifications and the size of the nodes reflects the proportion of money moved by that particular industry in world trade" (Atlas of Economic Complexity). The distance between nodes determines the probability of developing new products based on the productivity knowledge of existing products. Moreover, making processed products, rather than the raw ones, increases the production capacity.

Ган-Очир (2017) underlined that the drop in the commodity prices affects the overall economy through three main channels: macroeconomy, budget formulation, and monetary and exchange rate policy. Therefore, to ensure not only a stable but also a high growth rate in the long-term, diversifying the export basket with more sophisticated products is considered necessary. To this end, the author stressed that the natural resource income should be invested in socially efficient infrastructure projects, human capital, as well as to support the internationally competitive sectors tailored to the specifications of the country.

III. The Effects of Export Diversification and Complexity on Economic Development

The chapter is divided into two parts. The first part presents the research methodology and data sources with other related information. The second part presents the findings of the study.

1. Research Methodology

The research would be primarily based on both quantitative and qualitative methods of analysis. In order to analyze the impact of export diversification and economic complexity on the Mongolian economy, multiple tools of econometric analysis would be applied.

A. Data Collection

For proper research, collected data from credible sources both domestic and international resources. International resources are the World Bank, the Atlas of Economic Complexity, the Observatory of Economic Complexity (OEC), and the United Nations Conference on Trade and Development (UNCTAD). Domestic resources are the Mongolian Statistics Information Service, the Ministry of Mining and Heavy Industry, the Mineral Resources and Petroleum Authority, the Mongolian National Mining Association, and the Economic Policy and Competitiveness Research Center.

B. Dependent Variable

Gross Domestic Product (GDP): the annual growth rate percentage of economic output at market prices based on the constant domestic currency.

C. Independent Variables

To choose the independent variables of the paper, extended research is conducted. As a result, the Export Diversification Index sourced from the World Bank and Economic Complexity Index sourced from the Observatory of Economic Complexity are preferred to common indices to avoid the potential similarity to existing papers. The remaining are some of the variables which are widely used in economic growth analysis.

Table 3-1. Determinants of the GDP growth

Variable	Unit	Expected effect on price
Economic Complexity	index	+ / -
Export Diversification	index	+ / -
Exports of Goods and Services	(annual % growth)	+
Foreign Direct Investment	(% of GDP)	+
Gross Capital Formation	(% of GDP)	+
Industry (including construction), value-added	(% of GDP)	+
Inflation, GDP deflator	(annual %)	-
Population Growth	(annual %)	+
Trade	(% of GDP)	+

- a. **Economic Complexity Index (ECOM):** The index measures the knowledge intensity of an economy by taking the knowledge extremity of the export basket into account. The data was sourced from the Observatory of Economic Complexity, the platform focused on the geography and dynamics of economic activities.

- b. **Export Diversification Index (EDIV):** The index is calculated by measuring the absolute deviation of the trade composition of a country from world structure:

$$S_j = \frac{\sum_i |h_{ij} - h_i|}{2}$$

where

h_{ij} = share of the product i in total exports or imports of a country or country group j

h_i = share of the product i in total world exports or imports.

The diversification index ranges from 0 to 1. A value closer to 1 indicates a wider divergence from the world average.

- c. **Export of Goods and Services (EXP):** Annual growth rate of exports of goods and services based on the constant domestic currency. The data was sourced from World Development Indicator by the World Bank.
- d. **Foreign Direct Investment (FDI):** The net inflows of investment in the reporting economy from international investors as a share of GDP. The data was sourced from World Development Indicator by the World Bank.
- e. **Gross Capital Formation (GCF):** Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. The data was sourced from World Development Indicator by the World Bank.

- f. **Level of industrialization (IND):** Industrial share of GDP expressed as a percentage. It comprises value added in mining, manufacturing, construction, electricity, water, and gas. The data was sourced from World Development Indicator by the World Bank.
- g. **Inflation (INF):** Inflation, as measured by the annual growth rate of the GDP, implied deflator shows the rate of price change in the entire economy. The data was sourced from World Development Indicator by the World Bank.
- h. **Population Growth (POP):** the annual increase in the number of individuals in a population expressed as a percentage. The data was sourced from World Development Indicator by the World Bank.

D. Panel Regression

Panel data is a dataset in which the behavior of entities is observed across time, in other words, the logical combination of cross-sectional and time-series data is the main attribute. The other important feature of the panel data is that it considers and explains the individual heterogeneity which allows control over the variables that we are incapable of measuring. To analyze the data, one of the models of the panel data should be run: either Fixed-effect Model or Random-effect Model.

- Fixed-Effect Model (FEM)

Fixed-Effect Model is the pure Panel Data Model and treats unobserved individuals with the explanatory variables.

- Random-Effect Model (REM)

Contrary to FEM, Random-Effect Model assumes the individual heterogeneity independent of regressors.

- Panel Hausman Test (ph test)

Panel Hausman Test is widely used to choose the optimal model between the FEM and REM for specific data. Null hypothesis refers to insignificant differences across cross-sectional units, implying that the REM is an inappropriate model to use.

Panel Regression Application

Both FEM and REM of Panel analysis is used in the analysis. The data type is balanced, each commodity has the exact same amount of data from 1995-2018. Later, run the ph test after saving the panel regression results and interpreted the fittest model for this research.

Cross-sectional Value – The data covers 80 countries

- Sources of the cross-sectional value were limited to the above countries

Time-series Value – Time ranges from 1995-2019 /25 years/

- Time-series values were limited to the above time range. After the transition from closed to open economy in 1990, active involvement in international trade has started. Therefore, statewide historical data of trade is limited to a certain period of time.

2. Findings

Table 3-2 shows summary statistics of the variables used in the growth regressions over the period of 1995-2019.

Table 3-2. Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max
GDP Growth	1997	3.459	3.328	-14.814	25.162
Exports of Goods and Services	1959	5.517	8.684	-31.804	86.043
Foreign Direct Investment	1999	4.000	6.631	-41.063	86.589
Gross Capital Formation	1991	23.954	5.843	1.157	58.150
Industrialization	1975	28.489	8.341	6.496	71.565
Inflation	1997	8.153	31.428	-26.299	914.126
Population Growth	2000	0.995	1.092	-3.847	7.349
Economic Complexity	1910	0.356	0.906	-2.307	2.463
Export Diversification	2000	0.576	0.160	0.227	0.894

A. Fixed-Effect Model

Table 3-3. Growth and Export Diversification & Economic Complexity, Fixed Effects

Variable	Economic Complexity			Export Diversification		
	Coef.	t-stat	p-value	Coef.	t-stat	p-value
EXP	0.143	19.80	0.000	0.142	19.97	0.000
FDI	0.046	3.91	0.000	0.049	4.27	0.000
GCI	0.196	11.94	0.000	0.186	11.70	0.000
IND	0.143	6.21	0.000	0.139	6.24	0.000
INF	-0.019	-9.50	0.000	-0.020	-9.76	0.000
POP	-0.349	-2.49	0.013	-0.347	-2.58	0.010
ECOM	0.291	1.01	0.031			
EDIV				0.643	0.38	0.703
Constant	-5.874	-8.37	0.000	-5.786	-4.92	0.000
Observations	1869			1937		
R-squared	0.318			0.312		
Number of country code	80			80		

The Table 3-3. presents the findings of export diversification and complexity on economic growth in fixed effects. The Economic Complexity and Export Diversification indices both have positive signs as expected since bigger indices

indicate higher diversification and more complex products, suggesting their positive effect on growth. The coefficient of the economic complexity index is 0.291, implying that a one percent increase in the complexity index would increase the average annual growth rate of GDP by ~ 0.3%. The coefficient of the economic diversification index is 0.643, implying that a one percent increase in the diversification index would increase the average annual growth rate of GDP by 0.6%. However, only the economic complexity index is statistically significant, while the diversification index is insignificant since the p-value larger than 5% (0.703).

B. Random-Effect Model

Table 3-4. Growth and Export Diversification & Economic Complexity, Random Effects

Variable	Economic Complexity			Export Diversification		
	Coef.	t-stat	p-value	Coef.	t-stat	p-value
EXP	0.149	20.65	0.000	0.151	21.34	0.000
GCI	0.162	11.94	0.000	0.160	12.15	0.000
IND	0.020	1.77	0.077	0.017	1.56	0.118
INF	-0.018	-8.96	0.000	-0.018	-9.07	0.000
POP	0.071	0.80	0.422	0.080	0.94	0.350
ECOM	-0.586	-5.16	0.000			
EDIV				3.428	5.46	0.000
Constant	-1.730	-4.25	0.000	-3.815	-7.91	0.000
Observations	1869			1937		
R-squared	0.029			0.295		
Number of country code	80			80		

The Table 3-4. presents the findings of export diversification and complexity on economic growth in random effects. The P-values of both indices suggest strong statistical significance to the GDP growth rate. Regardless of the significance, the

coefficient of the economic complexity indicates a negative correlation to growth contrary to expectation. Hence, in the random effect model, regression with export diversification index is statistically significant. The coefficient of the export diversification index is 3.428, implying that a one percent increase in the diversification index would increase the average annual growth rate of GDP by 3.4%.

C. Panel Hausman Test

Panel Hausman Test is run to choose the optimal between the FEM and REM to explain the annual growth rate of GDP.

The result of the Hausman test indicated that the P-value is less than 0.05. It expresses that the Fixed-effect model is in favor of the Random-effect model. Therefore, further discussion would be based on the results of the FEM analysis.

D. Overall Findings

- a. **Economic Complexity Index (ECOM):** The coefficient of the economic complexity index is 0.291, implying that a one percent increase in the complexity index would increase the average annual growth rate of GDP by ~0.3%, and the coefficient is statistically significant.
- b. **Export of Goods and Services (EXP):** The coefficient of the export is 0.143, implying that a one percent increase in the export would increase the average annual growth rate of GDP by 0.1%, and the coefficient is statistically significant.

- c. **Foreign Direct Investment (FDI):** The coefficient of the FDI is 0.046, implying that a one percent increase in the investment would increase the average annual growth rate of GDP by 0.04%, and the coefficient is statistically significant.
- d. **Gross Capital Formation (GCF):** The coefficient of the GCF is 0.196, implying that a one percent increase in the capital would increase the average annual growth rate of GDP by ~ 0.2%, and the coefficient is statistically significant.
- e. **Level of industrialization (IND):** The coefficient of industrialization is 0.143, implying that a one percent increase in the industry would increase the average annual growth rate of GDP by 0.1%, and the coefficient is statistically significant.
- f. **Inflation (INF):** The coefficient of inflation is negative 0.019, implying that a one percent increase in inflation would decrease the average annual growth rate of GDP by 0.01%, and the coefficient is statistically significant.
- g. **Population Growth (POP):** The coefficient of the population is negative 0.349, implying that a one percent increase in the population would decrease the average annual growth rate of GDP by 0.3%, and the coefficient is statistically significant.

To sum up, all the variables are statistically significant and explain the annual growth of the GDP well.

Among the diversification and complexity variables, Economic Complexity Index has the explanatory power to interpret the economic growth of the 80 countries from 1995-2019.

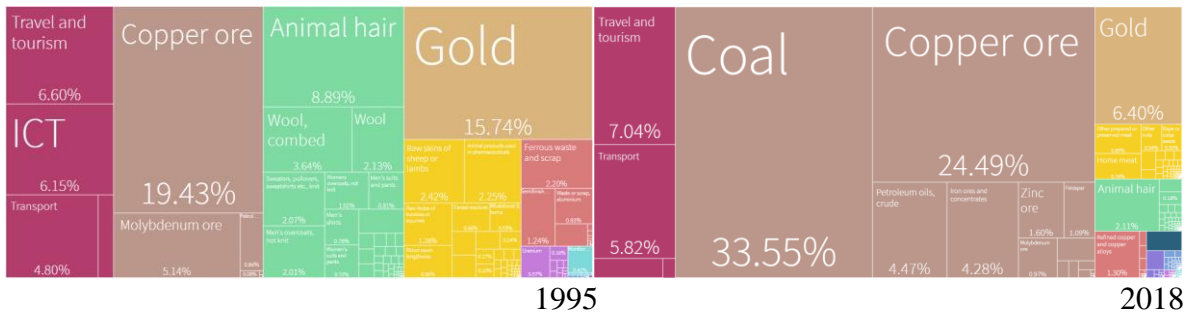
IV. Economic Complexity and Diversification: the Case of Mongolia

In Chapter 3, the statistical significance of the Economic Complexity was proven through the Panel data FEM. Therefore, in Chapter 4, economic complexity of Mongolia will be examined in detail.

1. Economic Complexity and the Product Space

Mongolia's exports are heavily concentrated in minerals and metals commodities such as coal, copper ore, and gold as of 2018 (Figure 4-1). Although exports of countries are expected to become more diverse and complex over time, Mongolian export is failed not only to diversify but also became heavily dependent on a single market. On the other hand, traditional sectors, textile, and agriculture industry shrank enormously.

Figure 4-1. The Evolution of Mongolia's export overtime

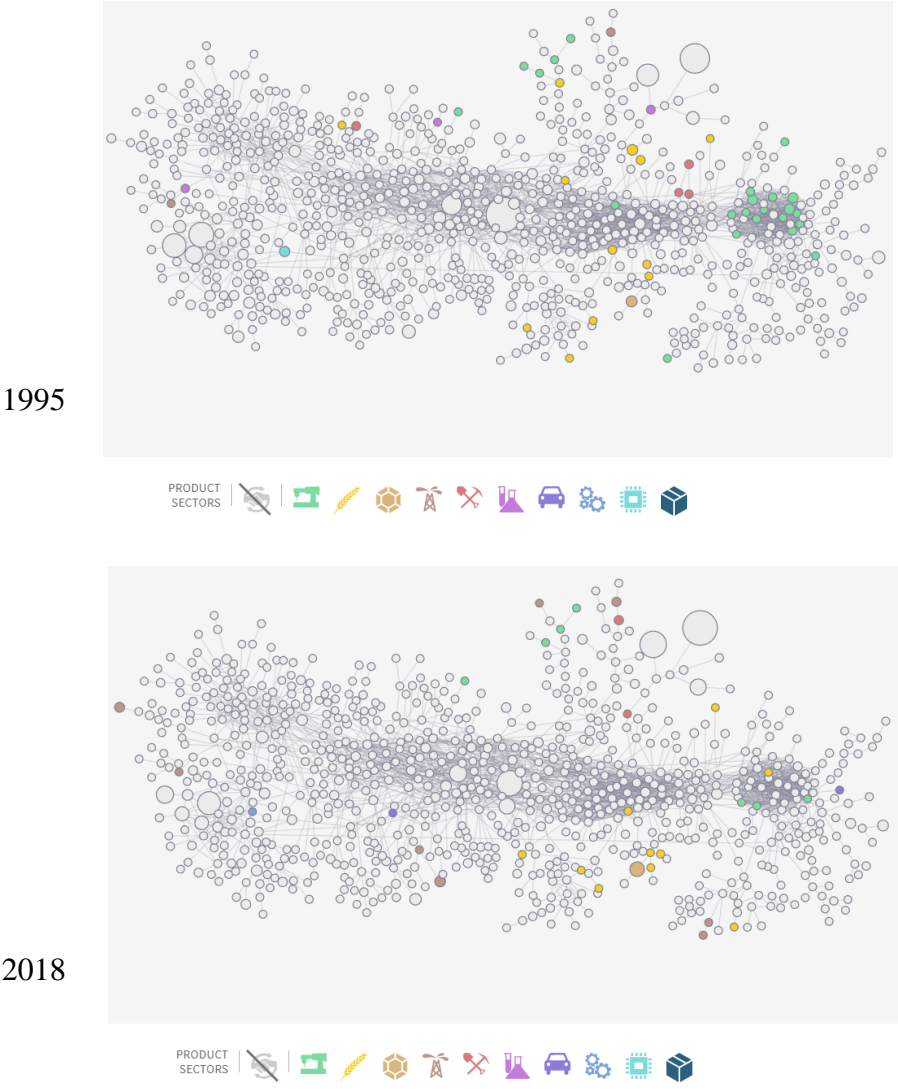


Source: Atlas of Economic Complexity

Mongolia's position in the product space is shown in Figure 4-2. As above, Mongolia has a notable presence in only a few communities, particularly, minerals and metals.

“The nodes of the Product Space are colored in terms of product classifications and the size of the nodes reflects the proportion of money moved by that particular industry in world trade”
(Atlas of Economic Complexity).

Figure 4-2. Mongolia’s Location in the Product Space



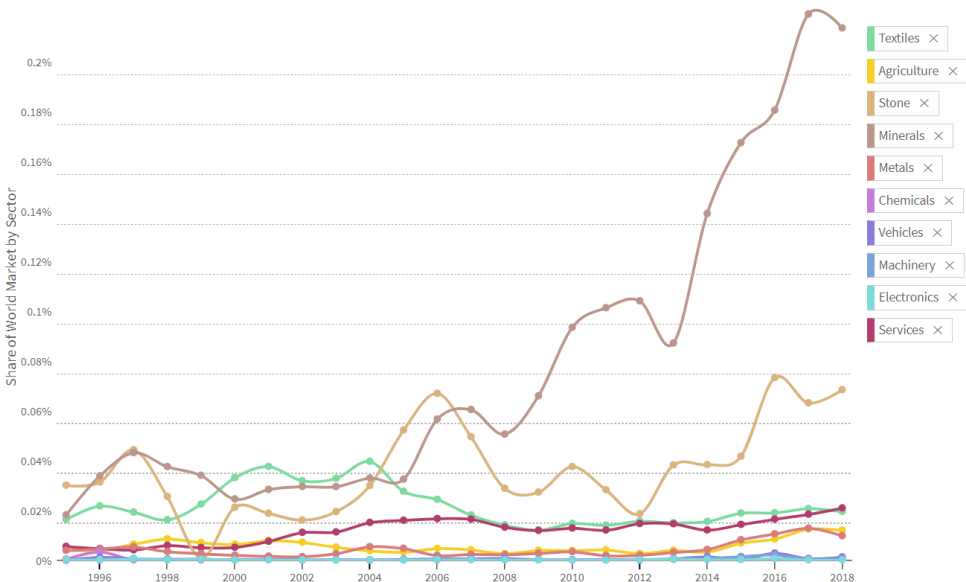
Source: Atlas of Economic Complexity

The Product Space of Mongolia is lacking to a larger extent compared to developed and developing countries. The country manufactures and trades only a few products and on top of that, the vast majority of the export products are raw (not processed) since the nodes are located closer to the space edges and far from the center.

The color of the links indicates the robustness of the proximity measurement between the two products: the darker the link indicates high proximity whereas the lighter the link reflects weaker relatedness.

“The more capabilities a country has, the more complex and diverse products it can generate” (Hausman, 2015). However, the problem is that in order to implement new technology, various elements will be needed and among them, “know-how” is one of the essential factors required to produce more complex products. “It's the diffusion of that know-how in society that underpins the capacity to know how to do more things and more complicated things” (Hausman, 2015). Figure 4-2 shows that Mongolia’s export products are weakly associated with each other indicating the need for more complex products.

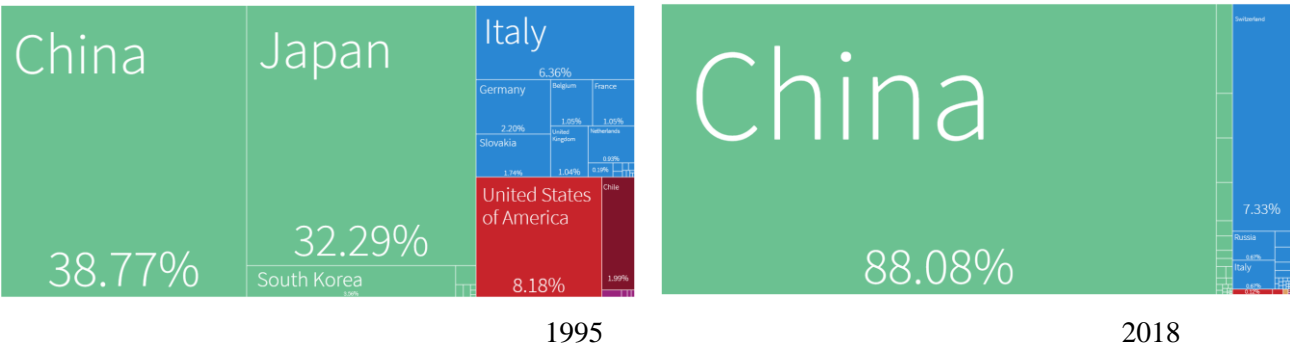
Figure 4-3. Share of World Market by Sector



Source: Atlas of Economic Complexity

The traditional process of structural transformation in Mongolia has not yet started. The structural transformation is viewed as an important procedure to move from the traditional industries to high productivity sectors, encouraging enhanced economic growth. The countries which were specialized in producing agricultural products should move to the textiles industry and eventually to more complicated production, such as machinery, vehicles, and electronics manufacturing. In fact, the Mongolian share of the textile exports has shrunk greatly over the past two decades (Figure 4-2), while the resources needed to produce electronics or vehicles are not accumulated yet.

Figure 4-4. Mongolia’s Export Destination



Source: Atlas of Economic Complexity

Having examined Mongolia’s export by sector, the export destination is also examined. Due to the geographical position and deficient infrastructure, exports in the post-revolution period went primarily to China, Japan, South Korea, the USA, and some European and Latin American countries. However, Mongolia’s export market has failed to diversify over time and became heavily dependent solely on Chinese demand for its mineral and metal commodities.

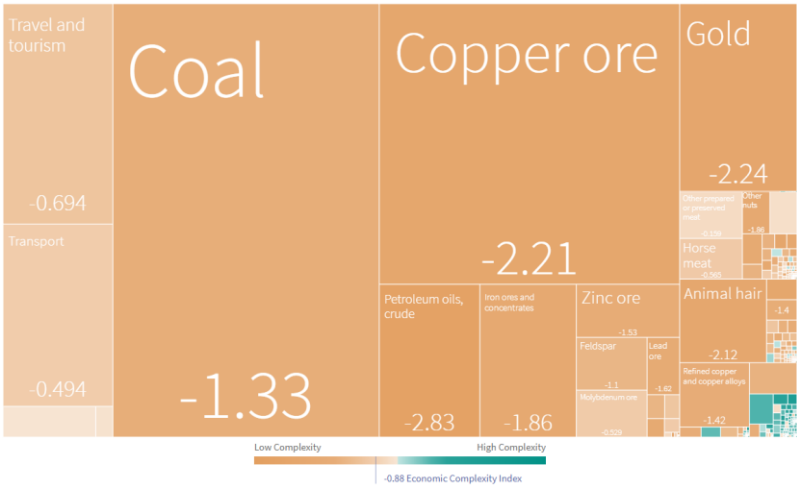
Export has grown by an annual average of 11.7% over the past few years, which had surpassed the total economic growth, as exports represent an expanding part of the economy. Furthermore, non-oil exports have grown by 13.0%, outpacing the global average growth and Mongolia has been experiencing a trade surplus in the goods and services sector. Even so, nearly 90% of the export goes to China, 7.33% to Switzerland, and 0.79% to Thailand while remaining goes to the rest of the world (Figure 4-4).

The global trade trends are considered as a driving force behind the country’s success as exports are growing as a percentage of GDP in Mongolia. According to the World Economic

Forum, two main trends of trade have taken place over the past decade. “First, global trade volumes have continued their exponential growth, and second, developed countries have lost market share, both as importers and as exporters of traded goods, to developing countries” (World Economic Forum). Above all, both of these trends are expected to continue for the time being.

These trends are particularly important as the developed countries demand Mongolia’s products. However, the fact that it lost historic partners, which were important to avoid the dependency on fewer markets and the inability to produce more complex and processed products to gain immunity from commodities volatility, are hindering Mongolia to be the active player in the global trade.

Figure 4-5. Mongolia’s Export Complexity



Source: Atlas of Economic Complexity

Mongolia is experiencing a distressing pattern of export growth, with the majority of the export income coming from low and moderate complexity products, particularly minerals and metals. However, economic expansion is driven by the diversification of the products, which are increasingly complex. The more complex the products, the larger the income of the country and the less the competition with other trading partners since not many are capable of handling the complexity. In the Mongolian case, it managed to produce 6 new products since 2003 (Table 4-1). While few in number, new products have been exported at a large enough volume to contribute to significant income growth. As of 2018, the products newly added to the export basket contributed \$178 in income per capita.

Table 4-1. New Export Products, 2003-2018

New Products	Share	Gross Export /2018/
Iron Ores and Concentrates	63.37 %	\$358 M
Zinc Ore	23.62 %	\$134 M
Lead Ore	7.99 %	\$34.2 M
Rape or Colza Seeds	4.91 %	\$27.7 M
Animal Products used in Pharmaceuticals	0.07 %	\$372 K
Other Animal Fats and Oils	0.05 %	\$267 K

Source: Atlas of Economic Complexity

2. Avenues for Diversification

Mongolia has managed to diversify the export basket with 6 products only for the past two decades, and moreover, half of them are mining products when its urgent need is to enter non-mining sectors to lessen the burdens of heavy dependency on metals and minerals. The largest part of the export income is coming from low to moderately sophisticated products including ores, mineral fuels, and oils.

Hausman developed two types of approaches, which are the Parsimonious Transformation Index (PTI) and the Strategic Bets Index (SBI,) to define the products showing the most growth opportunities to the country. While the PTI approach makes a decision based on the current circumstances and opportunities, the SBI-based approach makes the decision for future gains. Moreover, the products selected based on the PTI approach can be developed in a comparatively shorter period of time with less risk. On the other hand, the products selected based on the SBI approach have more competency to sustain the economic growth, to diversify the export basket, and eventually create jobs. Since Mongolia is not at the technological frontier and has not many nearby jumps to produce diversified products and enough existing know-how, the SBI approach is in favor of the PTI approach. Penetrating into Industrial Machinery and Vehicles market will highly likely bring the opportunity to expand the Mongolian export share in global trade and ultimately encourage the high growth rate (Table 4-2).

Table 4-2. Products with the most opportunity gain

Product Name	Nearby Distance	Opportunity Gain	Product Complexity	Global Size (USD)	Global Growth 5Y
Motor vehicles for transporting goods	3.0 / 5.0	3.5 / 5.0	4.0 / 5.0	\$135 B	↑ 11.4 %
Water gas generators	3.5 / 5.0	3.5 / 5.0	3.5 / 5.0	\$704 M	↓ 30.0 %
Railway track fixtures	3.0 / 5.0	4.0 / 5.0	3.5 / 5.0	\$1.01 B	↑ 2.00 %
Breathing appliances and gas masks	2.5 / 5.0	4.5 / 5.0	3.5 / 5.0	\$1.72 B	↑ 25.7 %
Dairy machinery	2.5 / 5.0	4.0 / 5.0	3.5 / 5.0	\$2.09 B	↓ 2.70 %
Aluminum containers	1.5 / 5.0	5.0 / 5.0	4.0 / 5.0	\$238 M	↑ 2.20 %

Source: Atlas of Economic Complexity

Even though the opportunity gains and product complexity of the given products are high, the products are quite distant from the existing productive knowledge of Mongolia, offering a smaller likelihood of success. Yet with few nearby jumps, substantial growth can be reached by creating longer jumps into vital areas with the expectation of potential diversification in the future. First, the opportunity gain, and product complexity of aluminum containers are the highest by far but requires the longest jump. Still, the biggest buyer of aluminum containers is China, the neighboring country of Mongolia, importing nearly 16% of the world's aluminum production. Above all, the global demand is expected to grow by 2.2% for the next 5 years or more. In contrast, the European Union (EU) and the United States of America (USA), countries which are located far from China geographically, export nearly 80% of the containers. If Mongolia gets specialized in manufacturing certain

containers and import them to China at a more reasonable price by saving the cost of extended shipping, 16% of the global size could belong to Mongolia.

Contrary to aluminum containers, motor vehicles for transporting goods are the closest to move from the current setting and offer sufficient opportunity gain and product complexity. Most importantly, the size of the global trade is the largest by far in the vehicles industry, which means the small portion of the overall trade volume has the ability to uplift the Mongolian economy. On top of that, the global production of motor vehicles for transporting goods has to increase by 11.5% at least, to outpace the world demand within the next half-decade. Although China and Russia are not the major players, access to the industry has the remarkable potency to revamp the economy and diversify the export basket.

The jump requires an extended period, a higher level of know-how, prolonged financial assistance, professional performance and, etc., hence Mongolia needs to produce processed products instead of the raw ones to improve the drawbacks of the economy and to support the diversification process in the meantime.

V. Conclusion

Development in Mongolia faces constraints from the limited availability of export products and partner countries, and the barrier is predicted to worsen when the country is at a geographical disadvantage, i.e., landlocked. Consequently, Mongolia is greatly dependent on Chinese demand for its resources and highly vulnerable to the economic slowdown. Considering the structure of the products that make up the export income, raw metals and minerals extracted by the mining sector are filling the export basket, showing the over-dependency on a single sector. Due to the loss of the appropriate ratio of products, export income is in a risk, unless diversifying the basket with some non-mining products.

Although, Mongolia does not have a basic environment for export diversification and economic complexity, trade promotional organizations and export promotion policies should be properly implemented. Unless the unstable strategies and unclear tools are overshadowing the sustainability of the Export Promotion Policies. To date, there are no state-funded, export-oriented, permanent organizations with sufficient financial and human capacities. The countries that have been able to diversify their exports and enhance the income volume, showed the same pattern of stable export policies, clear implementation mechanisms, and significant government support. In 1998, the Mongolian government is issued to implement the “Export Production Support Program” between 1998-2010. However, the program has not been fully implemented due to the lack of systematical mechanisms and program funding. As well as the implementation of the “Export Support Program” issued in 2013 by the government has also failed, with 18% achievement only. Most recently, the “National Export

Support Program” was reissued in April 2016. The goals and objectives of the program might not meet again if specific actions are not taken place.

Trade Promotion Organizations (TPOs) have tripled just in two decades (D. Lederman, 2008). The main activity of these organizations is to promote the products manufactured by the domestic producers in the global stage. For example, Apex is the TPO based in Brazil, which is fully funded by the state budget and has a high financial capacity. Currently, two projects are going on in Mongolia, the “Export Support Project” financed by the World Bank and the “TRAM Project” supported by the European Union. As both projects are supported by international institutions, no management function exists to achieve the expectations of the projects and budgets are on a small scale.

On top of that, Mongolia’s nominal interest rate is considered relatively high compared to other countries and consequently, it hinders competitiveness and active participation of Small and medium-sized enterprises (SMEs) in global trade. According to the survey, high interest rate is the top concern among SMEs. Export financing programs and services are also in a shortage.

As per outcome of the econometric analysis, economic complexity is proven to be statistically significant to explain the GDP growth per capita. Consequently, Economic Complexity Index (ECI) and product space analysis are utilized to determine the products effective in diversifying Mongolian export. The ECI is not only a determinant of the economy but also its driving force. Accordingly, it is necessary to process raw materials of the mining sector before exporting and identify priority non-mining sectors to add in the basket. In the

short-run, diversification can be created by supporting the traditional sectors such as leather and leather products, wool, slag and ash products, and mining products, particularly mineral fuels, oils, and ores. In the medium and long-term, heavy industrial machinery, vehicle and chemical products will highly likely bring the opportunity to expand the Mongolian export share in global trade and ultimately encourage the high growth rate. The likelihood of success is considered small since they are distant from the existing productive knowledge of Mongolia, yet with few nearby jumps, substantial growth can be reached only by creating longer jumps into the vital areas.

VII. Bibliography and Reference List

Б.Хүслэн, Л. Даваажаргал, (2018), *Экспортын төрөлжилт болон эдийн засгийн өсөлт – Монгол Банкны Судалгаа*

Д.Ган-Очир. (2017). *Байгалийн баялгийг эдийн засгийн хөгжилд ашиглах нь: яагаад хүндрэлтэй байдаг вэ?*

Д.Ган-Очир. (2017). *Түүхий эдийн үнийн уналт: Шилжих механизм, бодлогын асуудлууд*

Монголбанк. (2017). *Жижиг дунд үйлдвэрлэлийн хөгжил, санхүүжилтийн байдал*

Н. Баярсайхан. (2017). *Мөнгө, Санхүү, Баялаг – Дэлхийн Банк*

Статистический ежегодник стран - членов совета экономической взаимопомощи (1981)

Үндэсний Статистикийн Хороо, (2018), *Эдийн Засгийн Өсөлт, Ядуурал, Ажилгүйдлийн Хамаарлын Судалгаа*

Ц.Бямбацогт. (2012). *Гадаад худалдааг дэмжих механизмыг бий болгох нь*

Annual reports from the Ministry of Mining and Heavy Industry/the Bank of Mongolia

Bilal Lofti, (2017), *Export Diversification and Economic Growth in Morocco: An Econometric Analysis*

Corruption Perceptions Index (CPI). (2019). *CPI Full Data Set 2019*

Frida Johannessen & Karina Skjelvik, (2017), *The Impact of Oil Price Volatility on Statoil*

Hidalgo and R. Hausmann. (2009). *The Building Blocks of Economic Complexity*

Hidalgo, B. Klinger, A. Barabasi and R. Hausmann. (2007). *The Product Space Conditions the Development of Nations*

Ian Keay, (2014), *Immunity from the resource curse? The long run impact of commodity price volatility: evidence from Canada, 1900-2005*

International Monetary Fund (IMF), (2019), *Understanding Export Diversification: Key Drivers and Policy Implications*

Jörg Mayer (UNCTAD) and Johannes Gareis, (2010), *Commodity price volatility: causes and impact on low-income countries - (Würzburg University)*

Ministry of Mining and Heavy Industry. (2019). *Annual report*

Mongolian Statistical Information Center, Administrative Units and Territory

Mongolian Statistical Information Center, Mongolian Foreign Trade

R. Hausmann and C. Hidalgo. (2011). *The Atlas of Economic Complexity*

R. Hausmann, J. Hwang and D. Rodrik. (2007.) *What you export matters*

Raja Vinesh Sannasse, Boopendra Seetanah and Matthew John Lamport. (2014). *World Trade Organization (WTO) - Export Diversification and Economic Growth: the case of Mauritius*

Ricardo Hausman, Brad Cunningham, Jihn Matovu, Rosie Osire and Kelly Wyatt, (2014), *How Should Uganda Grow? Faculty Research Working Paper Series*

Tiago V.De V. Cavalcanti, Kamiar Mohaddes and Mehdi Raissi, (2014), *Commodity price volatility and the sources of the growth*

Tsolmon Baatarzorig, Ragchaasuren Galindev, ..., (2018), *Effects of ups and downs of the Mongolian mining sector. Environmental and developmental Economics*

United Nations – Economic and Social Commission for Asia and the Pacific (ESCAP). (2014). *Economic Diversification in Asian Landlocked Developing Countries: Prospects and Challenges*

United Nations, *The Concept of Economic Diversification in the Context of Response Measures*

Vikesh Hanif, Subrina Gokal, (2004), *Relationship between inflation and economic growth - Economics Department, Reserve Bank of Fiji*

World Bank Database, (2015), *Country classification by income level*

World Economic Forum, (2019), *Global Competitiveness Report (GCR)*

World Trade Organization (WTO), Organization for Economic Cooperation and Development (OECD), (2019), *Aid for Trade at a Glance 2019: Economic Diversification and Empowerment*

국문초록

천연자원 집중적 경제의 복합성 다각화와 발전: 몽골의 사례

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지속 가능한 경제 성장은 전 세계 정책 입안자들, 특히 몽골과 같은 개발도상국의 필수 목표입니다. 예를 들어, 수출 다각화와 경제 복합성은 최근 경제 성장과 번영의 잠재적 동력으로 논의되고 있습니다. 1990 년 중앙통제정치체제에서 활기찬 민주주의 체제로 이전한 후 몽골은 국제 무역에 적극적으로 참여하기 시작했다. 향후 수십 년 동안 삶의 질이 뚜렷하게 증가했지만 경제 성과는 더 큰 범위에서 변동하는 반면, 반복되는 슬럼프는 국가가 더 많은 성과와 전망을 얻는 것을 방해하고 있습니다. 수년에 걸쳐 변동하는 경제는 몽골이 잠재력을 최대한 발휘하는 것을 방해하는 예외적인 개발 과제에 의해 영향을 받습니다. 그러나 수출량은 그 자체로 확대되어 경제 다각화에 실패했고, 이러한 모호한 추세는 둔화나 역전의 조짐을 보이지 않고 있다. 이에 따라 경제성장에 대한 복잡성과 다각화의 영향을 분석하고 경제복합성을 검토하는 것이 목표이다.

키워드: 경제 발전, 경제 복합성, 경제 성장, 수출 다각화, 제품 공간, 수출 바스켓

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