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| Dutch Disease in Armenia: by Sector Study |
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*Table of Content*

Abstract……………………………………………………………………………………..…4

*Chapter 1: Introduction*

Motivation……………………………………………………………………………………..5

Mining Sector………………………………………………………………………………….5

Literature Review……………………………………………………………………………...7

Data and Methodology……………………………………………………………………….11

*Chapter 2: Diagnostic Analysis*

Step 1. RER Trends…………………………………………………………………………..12

Step 2. Inflation………………………………………………………………………………15

Step 3. Manufacturing Sector………………………………………………………………...17

Step 4. Labour Shifts…………………………………………………………………………20

Step 5. Mining Contribution………………………………………………………………….22

*Chapter 3: Empirical Analysis*

VEC Model…...………………………………………………………………………………28

Discussions and Limitations…………………………………………………………….……34

Concluding Remarks…………………………………………………………………………37

References……………………………………………………………………………...…….38

Appendix……………………………………………………………………………………..40

*Tables and Figures*

Table 1: Core Inflation……………………………………………………………………….15

Table 2: Products as Percentage of Export…………………………………………………...19

Table 3: Variable Statistics for Empirical Analysis …………………………..……………..29

Table 4: Empirical Analysis. Models 1-3……………………………………………..……...30

Table 5: Empirical Analysis. Models 4-5………………………………………………..…...32

Figure 1: Rybczynski Theorem Illustration……………………………………………………9

Figure 2: Real Effective Exchange Rate in RA………………………..……………………..13

Figure 3: FDI into RA USD………………………………………………………………….14

Figure 4: FDI & Inflation Trends…………………………………………………………….15

Figure 5: Monthly Core Inflation…………………………………………………………….16

Figure 6: Manufacturing, Value Added……………………………………………………...17

Figure 7: Density of Employees on a Given Salary………………………………………….21

Figure 8: Mining Production and Shares of GDP……………………………………………22

Figure 9: Sector’s Contribution to Industry …………………………………………………23

Figure 10: Employment by Sector…………………………………………………………....24

Figure 11: FDI into Sectors in 2012....……………………………………………...…….….25

Figure 12: Remittances and GDP growth……………………………………………….……26

Figure 13: Mining Production and GDP growth……………………………………………..26

*Abbreviation*

DD Dutch Disease

RER Real Exchange rate

REER Real Effective Exchange rate

NEER Nominal Effective Exchange rate

NSSRA National Statistics Service of Republic of Armenia

CBA Central Bank of Armenia

VECM Vector Error Correction Model

OLS Ordinary Least Squares

GIA Governmental Investment in Assets

NFA Net Foreign Assets

DL (∆L) Lagged Difference

HO Heckscher–Ohlin model

*Abstract*

Armenia is a country rich with mineral resources, making mining a significant sector for the country’s economy. The natural resources produce an average annual value of 15370 million AMD of mining contribution to the GDP, supplying 80% of the production to exports. Mining companies create job opportunities and improve infrastructure in provinces of Armenia. The sector’s contribution, combined with a tendency of decline in the manufacturing sector and REER appreciation trends, puts Armenia under the threat of the Dutch Disease.

The aim of the paper is to diagnose whether the country suffers from this condition using data analysis and empirical analysis conducted on recent data from 2000 to 2014. An overall analysis of the economic activity, a VEC regression model on REER, mining production, copper prices, remittances inflow, money supply, net exports, net foreign assets, government investments into assets and other variables was undertaken. As a result of the analysis of the economy the paper concludes that Dutch Disease is a real threat for the Armenian economy.

**Chapter 1: Introduction**

*Motivation*

The mining sector is significant for economic growth, foreign direct investment, economic activity in the provinces and as a major source of employment. Combine this is the continuous degradation of the manufacturing sector in the country and suspicions of Dutch Disease in Armenia arose.

In 1977 the “Economics” Journal first issued the term Dutch Disease referring to the poor management of the natural gas sector in Netherlands. The country’s sector began to dominate the rest of the economy, leaving it dependent on the natural resources’ quantity and price. Later, this term was used to describe cases similar to the Netherlands, describing a boom in natural resource sector and the decline of manufacturing sector.

If left untreated the Disease may potentially cause non-tradable sectors to deteriorate, labour shifts, high inflation, income inequality between tradable and non-tradable sectors of the industry, etc. Not to mention that the collapse of the dependable sector will bring a major crisis in the economy itself. A combination of the booming mining industry and inflow of remittances into the country are a potential threat that this paper examines.

*Mining Sector*

Due to volcanic activity and the country’s position between the converging continents of Europe and Asia, Armenia has rich and diverse mineral resources. Some of the resources are gold, silver, copper lead, zinc, molybdenum and iron-ore, as well as industrial minerals including salt, diatomaceous earth, gypsum, zeolite, limestone, granite and basalt. Some copper-molybdenum and polymetallic ore deposits are also rich in rare earths and elements including germanium, bismuth, tellurium, gallium, indium, selenium, thallium and rhenium.

The mining and metallurgical sector is a major driver in development and stability. A sector that contributed to 10% of the GDP nominal growth in 2011 is a source of income, export and employment. This sector alone brought 26.6% of the total FDI in the year 2012.

Increase in the global demand for copper, gold and other metals have increased the investment into mining sector. Armenia has 33 mining and metallurgical enterprises, with 400 open mines. Two provinces, Syunik and Gegharkunik, are mainly active, hosting seventeen of the mining enterprises. The largest companies are Ararat Gold Recovery Co. (AGRC) and Zangezur Copper-Molybdenum Combine. The country ranks seventeenth in the world in mine output.

Most of the mining output is exported to Russia (composing 16.7% of export revenue in 2011), Germany (11.8%), Bulgaria (11.4%), the Netherlands (8.8%), Iran (8%), the United States (7.5%), etc. Exports of ash, ores and slag accumulate to US$287 million, which is 21.5% of export revenue for the year 2011. Ferrous metal accumulate to US$134 million, precious metals and stones to US$196 million. [[1]](#footnote-1)

In 2002 Armenia's mining and metallurgical sector reported a 21.8% growth and the sector exported more than 80% of its production. In 2011 copper production grew by 19% compared to the previous year and mining contributed to 21.5% of the country’s export revenue. A heavy flow of foreign direct investment, a new mining code (RA and World Bank 2011) that is up to international standards, contribution to the enhancement of technology and innovations in environmental assessment and risk reduction at mining sites have had its impact.

*Literature Review*

Corden and Neary, in 1982, were the first who put the Dutch Disease theory in economic model. In the original paper, the disease was described as the impact of a booming industry on other industries of the country. According to the paper, in a small open economy domestic exchange rate appreciation means that goods produced domestically cost more in the world market compared to other countries’ goods, thus decreasing the country’s competitiveness in the world market.

In most countries where DD was detected (i.e. Russia, Australia, Canada) this mainly hurts the manufacturing sector, since the cost of manufacturing the good is the same, but the demand in the world market declines. By a chain reaction the companies cut down supply, thus need less employees, leading to unemployment rise. Consequently, decrease in production within a country potentially causes decrease in GDP.

If DD is caused by foreign investment, income from natural resource sector continues to inflow, increasing the salary for that sector. In addition to labour shift from the weakened sectors to the high-salary sector, high salary brings to higher taxes. In most cases high taxes give rise to governmental spending, which leads to inflation. The inflation is more commonly observed in non-tradable sector in this scenario. (Corden, 1982)

Initially it was assumed that the cause for Dutch Disease was only in the boom of the natural resource sector. However, a study by Brunnschweiler, C. N. and Bulte, E. H. (2008) argued that it is not the abundance of natural resources that has this effect, but the management of the resource. That is, poor institutions are what cause Dutch Disease.

Hence, a possible explanation for the resource curse is that the resource wealth creates a rivalry over the resources, which leads to poor institutional quality, thus lowering economic growth. Hausmann and Rigobon (2003) argue that due to uncertainty related to property rights over the resource income incompetence in the use of existing resources occur. Sala-i-Martin and Subramanian (2003) name it “institutional impact of natural resources,” and conduct empirical research that shows how some natural resources put forth a robust negative and nonlinear impact on growth due to their harmful impact on institutional quality.

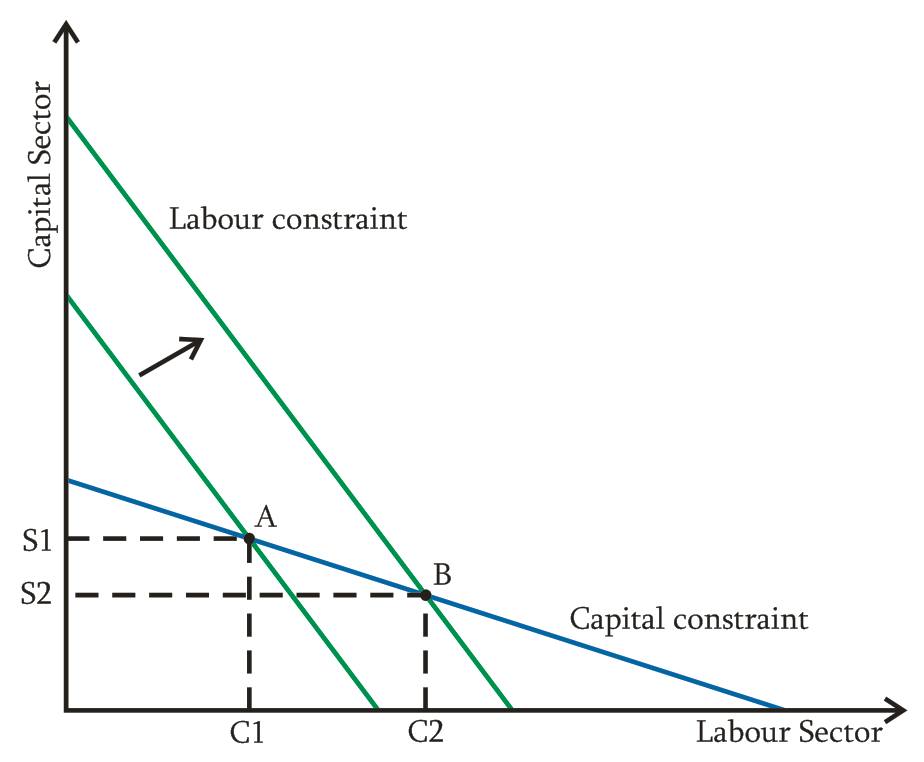
A second explanation lies in the volatility of the resource rents. This volatility is partly caused by low price elasticity of supply. Volatility presents risk and has negatively correlated with growth (Ramey, 1995) and investment (Aizenman and Marion (1999)). Hausmann and Rigobon (2003) argue that the reason for the negative effect is because of financial market imperfections, which gives higher cost of capital, less investment, and lower welfare caused by volatility.

A third explanation of the resource curse goes back to Corden (1982) and Corden and Neary(1984). That is the notion that an exogenous rise in resource prices or in resource output gives real exchange rate appreciation and a decline in the manufacturing sector. A recent finding shows that besides natural resources, other factors, such as international aid from developed countries to less developed countries, may cause Dutch Disease. Consequently, the theory suggests that a flood of foreign currency from any sources is likely to cause Dutch Disease (Rajan and Subramanian, 2008).

The predictions of the Dutch Disease model following Corden and Neary (1984) consider two effects of the disease: movement effect and spending effect. The rise in disposable income that follows from foreign direct investment into particular sector or financial aid is described as the spending effect. Disposable income leads to increase in spending. Rise in the demand for tradable and non-tradable goods though bring price asymmetry, since the price of the tradable good doesn’t change in the world market (Law of Once Price). The raised prices for the non-tradable goods may bring rise in wages, thus labour shift to that sector.

The movement effect entails increase in marginal productivity of the tradable good sector, thus higher wages, leading to labour shift towards the tradable good sector. This effect is mostly what causes a decline in the manufacturing sector. Corden and Neary (1984) denote the fall in manufacturing output as “direct de-industrialization.” Both effects cause decline in the output of the non-resource tradable goods relative to non-tradable goods, and a real exchange rate appreciation (Spatafora and Warner, 1995). Authors A. Richards and J. Waterbury described DD in the Middle East in 2008 saying that DD causes decline in manufacturing and agriculture, while movement effects takes place from declining industries into the natural resource and construction sectors. According to the book, rural workers move to the city, seeking construction jobs, because of wage inequality caused by DD.

The Dutch Disease can be explained by the Rybczynski theorem. Assuming a Heckscher-Ohlin model, consider an economy with labour and capital intensive sectors with appropriate endowments.



*Figure 1. Rybczynski theorem in HO model*

The theorem states:  “At constant relative goods prices, a rise in the endowment of one factor will lead to a more than proportional expansion of the output in the sector which uses that factor intensively, and an absolute decline of the output of the other good” (Tadeusz M. Rybczynski, 1955).

Figure 1 illustrates the Rybczynski theorem. A rise in the labour endowment (due to investment or financial aid) gives rise to the labour intensive sector. At the same time, it shifts equilibrium point from A to B, thus declining the capital intensive sector from point S1 to S2. If so, than DD affects labor-intensive industries more and increase capital intensity (Ismail, 2010). This could give rise to unemployment as was the case in the Netherlands and the United Kingdom. Loayza et al. (2007) provide a recent survey confirming this.

Studies have been conducted to both diagnose and reject the Dutch Disease in several countries. IMF (2005) papers reported on the absence of Dutch Disease for the following five countries: Ghana, Ethiopia, Mozambique, Tanzania and Uganda, despite foreign exchange inflows due to financial aid into the countries. The study by Rajan and Subramanian (2008) found evidence of a systematic negative effect of foreign aid on the competitiveness of exports (33 sampled countries in 1980s and 15 countries in 1990s). A one percentage point increase in the ratio of aid to GDP gives four percentage point overvaluation of the exchange rate. This finding was preceded by Collier and Goderis (2007) with a study that checked for causality. The panel data study found no statistically significant evidence that natural resources impact negatively on governance or institutional quality, but the opposite was confirmed.

*Data and Methodology*

The research is based on literature review, data analysis and statistical analysis for relationships between variables. The theory states that RER appreciates, inflation rate rise, manufacturing sector declines, labour shifts between tradable and non-tradable sectors and the country’s economic dependence on natural resources or financial aid are all potential consequences of Dutch Disease for a small open economy. Firstly, the paper analyses the economy for signs of DD, taking a closer look at the above mentioned statistics.

The second inquiry of the paper is an empirical analysis: a VECM regression on REER. The VECM regressions shows the causality between real effective exchange rate (REER), remittances inflow into RA, government investment, mining production, copper prices, governmental investment in assets (GIA), broad money, net foreign assets (NFA) and other variables. The models will also show the short term and long term relationships of the variables. The data collected for the first analysis is annual data from the years 1995 to 2013, for the empirical analyses - quarterly data from the years 2000 to 2014. Data sources are Central Bank of Armenia, the National Statistical Service Republic of Armenia (NSSRA), World Bank Database, Asian Development Bank and IMF sources.

**Chapter 2: Diagnostic Analysis**

The literature review revealed theory behind Dutch Disease, such that a small open economy would most likely exhibit spending or movement effect behavior (Corden and Neary, 1982). Taking into consideration the evidence from countries presenting with DD (IMF, 2005) a 5 step diagnosis is conducted in the paper to consider Armenia a candidate of the Dutch Disease. The 5 steps are REER appreciation analysis, inflation rate, manufacturing sector decline, labour shifts analysis and the country’s dependence on natural resources or foreign aid.

Step 1. Real Exchange Rate Trends

Real exchange rate is the ratio of prices for tradable and non-tradable goods, where tradable goods are those that can be sold at another location other than the domestic country and non-tradable good is sold in the domestic country only either due to high transportation costs or psychical inability to move a product. Examples of non-tradable goods are construction and public transportation. If unavailable, real exchange rate can be substituted by the real effective exchange rate. The rates are calculated using the following equations:

RER = NER\* Domestic Prices

Foreign Prices

*Equation 1*

REER = NEER\* CPId

CPIf

*Equation 2*

,where CPIf is the consumer price index for the foreign country, CPId is the consumer price index for the domestic country, NER is the nominal exchange rate, NEER is the nominal effective exchange rate. NEER shows how much of foreign currency one can buy using the domestic currency.

Figure 2 illustrates the real effective exchange rate trends in Armenia starting 1995 to 2011.

*Figure 2*

*Data Source CBA Statistics, Authors calculations*

Starting from the year 1995 the real effective exchange rate in Armenia has had an upwards trend. Fluctuations can be seen depending on the economic activity of the country. The rapid escalation of REER from 2003 to 2007 was accompanied by increase in dollar supply in the country, growth in remittances, increase in FDI (mostly into real estate), and high export prices in copper and molybdenum.

*Figure 3*

*Source RA National Statistics Service, Authors calculations*

Figure 3 illustrate net inflow of FDI in US currency. The graph shows that FDI increases continuously until 2008 and rather rapidly between 2003 and 2007. During the crisis a sharp drop follows for two years. The economic crisis of 2007-2008 had brought a 28% drop in the rate of remittances which caught up with the GDP of Armenia in 2009. During the crisis the fall of REER is most likely due to decrease in FDI, drop in export prices in copper and molybdenum, thus depreciation in dram demand and a halt in remittances. The country’s exports also dropped during this period. All these chain reactions are in accordance with the DD theory. The later years bring rate appreciation once again. Understandably, the first step of the diagnoses confirms the paper’s theory of the Dutch Disease existence in Armenia.

Step 2. High Inflation Rate

In the theory a country with the Dutch Disease would have high inflation due to capital inflow from foreign direct investment. Table 1 shows the core inflation in Armenia to be relatively low. The core inflation is based on the CPI and excludes certain goods to prevent volatility.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2014** | **2013** | **Highest** | **Lowest** |
| [Core Inflation](http://www.tradingeconomics.com/armenia/core-inflation-rate) | 0.81 | 0.63 | 7.60 | 0.43 | |

*Table 1*

*Source: Trading Economics[[2]](#footnote-2)*

*Figure 4*

*Source World Bank Database, Authors calculations*

Figure 4 illustrates a combined trend of annual inflation by consumer prices and net inflows foreign direct investment as a percentage of GDP. With a negative correlation of -2.89, the trends confirm that FDI doesn’t affect inflation as expected by the DD theory.

*Figure 5*

*Source CBA Statistics, Authors calculations*

Figure 5 shows that monthly core inflation is trend stationary and the upwards trend is slight. Carefully controlled by the Central Bank, the inflation is not significantly affected by exchange rate or mining production. Since in the theory RER is appreciated by domestic inflation and nominal exchange rate (NER), and depreciated by global inflation (Neinke Oomes, 2009), excluding inflation as the source of REER appreciation, leads to the result that the exchange rate appreciates due to NEER appreciation. The devaluation of the US dollar starting 2005 confirms this theory in practice. In order to find the intensity of DD, the impact of USD exchange rate volatility on REER must be separated from the impact of natural resources production and export.

Step 3. Manufacturing Sector Decline

The theory states that the manufacturing sector is to decline, since high RER has made manufacturing in foreign countries comparatively cheaper than the domestic country’s products. If the condition is found in the economy, it is considered the most significant indicator of Dutch Disease. A stable manufacturing sector is often taken as an indicator of a developed country.

*Figure 6*

*Source World Bank Database, Authors calculations*

Figure 6 shows a steady decline of the manufacturing sector as a value added percentage of GDP from the years 1990 to 2013. According to the theory, this is a clear sign of a resource driven economy. Several sectors in the industry seem to have the same issues for degradation, since the demand for imported goods exceeding the demand for domestic goods due to worsened quality of the products.

**Light manufacturing** would be a contribution to the economy, being mostly a labor-intensive sector. If developed it could be a source of diversification for exports. A number of large firms provide sewing outsourcing for foreign companies. The main challenges of the sector are gaps in customs and tax administration, insufficient knowledge about foreign markets and lack of education. Average annual exports rate though 2003-2010 is -16%.

**Textile sector** was flourishing during the Soviet era, making Armenia one of the biggest suppliers of textile and knitwear products for the USSR. The sector collapsed alongside USSR with a 70% a decline. Since, growth in the sector was due to foreign orders and demand in knitwear in domestic market. 85% of exports of the textile and knitwear sector have been accounted by outsourcing from 2003 to 2013. This is yet another labour intensive sector that used to contribute to 25 to 30% of the employment in the country.

**Machine-building, instrument-making and electrical and technical production** declines as the world continues to modernize. Unable to keep up, the sector has immense challenges**:** weakened infrastructure of engineering education, unavailable new technologies, inadequate knowledge of global markets, on average older researchers and technical staff and certification disputes. Average annual exports rate though 2003-2010 is -4%.

**Gems and jewelry** were traditionally a significant sector for exports in Armenia, yet the sector has declined in recent years. The decline in diamond cutting is due to issues with the raw materials supply from Russia. Average annual export rate though 2003-2010 is -15%.

F**ood processing** industry composes over 40% of the manufacturing sector. It is a manufacturing sector that has maintained its contribution to the economy and export through the years. Russia is the main importer taking about 75% of the total exports of food products. Yet, the sector is not perfect and need major improvement in processing and packaging capacity to meet international standards.

The decline in the manufacturing sector is a combination of decrease in competitiveness in the world market due to REER appreciation and lack of investment into specific brunches of the sector for innovation, education and renovation. The lack of competitiveness is visible in the decline in exports for manufacturing products.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Products as % of Export** | **2000** | **2005** | **2007** | **2009** |
| Semi/Precious stones & metals | 40.80% | 34.50% | 18.10% | 15.10% |
| Non precious metals | 14.90% | 33.10% | 33.90% | 33.10% |
| Minerals | 11.50% | 9.60% | 15.10% | 18.90% |
| Machine/equipment/devices | 10.40% | 2.90% | 3.40% | 3.00% |
| Ready food products | 9.20% | 99% | 12.50% | 14.30% |
| Plastics/natural/artificial rubber | 3.00% | 0.90% | 2.70% | 1.50% |

*Table 2*

*Source RA National Statistics Service*

Table 2 shows exports by products between 2000 and 2009. It shows mining products in the first 3 rows, (non)precious metals, (semi)precious stones and minerals, which create more than 65% of exports. The alteration from precious stones and metals to non-precious metals and minerals is due to diamond processing decline. The drop in the share of machines, equipment and devices, textile products, plastic items and natural and artificial rubber items is a sign of a loss of competitiveness in the world market.

Furthermore, trade lacks diversification not only in the products exported, but also in trading partners making Armenia vulnerable. The main trading partners are Russia (19% of total exports), Germany (10%), Georgia (10%), Canada (9.6%) and the USA (5.6%). [[3]](#footnote-3)

Step 4. Labour Shifts

The theory suggests that there will be some labour shifts between industries. The reason for labour movement is explained by two effects, spending and movement, and their sub-effects. In a small open economy with abundant resources the spending effect describes the rise in disposable income that follows from FDI into a particular sector gives rise in the demand for tradable and non-tradable goods though bring price asymmetry. The raised prices for the non-tradable goods may bring rise in wages, thus labour shift to that sector.

The movement effect entails increase in marginal productivity of the tradable good sector, thus higher wages, which labour shift towards the tradable good sector. More often than not, the effect causes a decline in the manufacturing sector. The high employment rate in the mining sector in provinces reflects the movement effect. Increase in average wages would correspond to the movement effect.

In Armenia’s case evidence shows that the shifts in labour correspond to the movement effect. Particularly in the rural areas employee were encouraged to shift to the resource abundant tradable sector to reduce unemployment and increase productivity and wages (World Bank, 2012). The effect is seen though higher wages for the resource-intensive sector.

Table 2 in appendix depicts the percentage of employees receiving a certain salary range by industry. It is clearly visible that in mining sector a higher percentage of employees receive a salary in the range from 121,000 to 240,000 in AMD than any other sector. Figure 2 compares these statistics for the total economy, illustrating that the mining sector has higher average salary for more percentage of employees. [[4]](#footnote-4) The combination of higher wages and high employment makes mining a booming sector in the Dutch Disease theory.

*Figure 7*

*Source RA National Statistics Service, A. Grigoryan Calculation*

Figure 7 illustrates the findings in Table 2 in appendix graphically, comparing the employee density receiving a given salary range to the situation in the industry on average. The highest frequency in a salary range for the average industry is between 30,000 and 90,000, mostly due to salaries in agriculture and transportation sectors. The sectors are labour intensive and have a very large percentage of employee from the total labour force of Armenia, thus the average industry density is a good indicator of the salary range in the current state. Meanwhile, the mining sector has an average salary that is more than twice higher than the two most labour intensive sectors in the economy. Thus, step 4 corresponds to the DD theory in the way that the economy moves according to the movement effect. The labour force is moving towards the resource intensive sector, since investment in the sector generates employment opportunity and higher wages.

Step 5. Dependence on Natural Resources and/or Financial Aid

The mining sector is significant for economic growth, foreign direct investment, economic activity in the provinces and is a major source of employment. Armenia has rich and diverse mineral resources such as: gold, silver, copper, lead, zinc, iron-ore and other metals and minerals

*Figure 8*

*Source RA National Statistics Service, Authors calculations*

Figure 8 shows time trends for the mining production and it contribution to the structure of GDP. A rapid growth through 2003 to 2007 was followed by a drop during the crisis years. Parallel to the trends of REER, the production was reacting to copper price and world market demand volatility.[[5]](#footnote-5) Mining contributes to the GDP through industry output, exports, FDI inflow, employment opportunity and development of infrastructure in provinces. Main branches of GDP structure show that Services contributed to 42.1%, Agriculture 20.6% and Industry 37.3% in 2013. Industry is quite a significant brunch of the GDP.

*Figure 9*

*Source RA National Statistics Service, Authors calculations*

Figure 9 shows the breakdown of the industry sector. These are not all but the most contributing brunches of the sector. After the food product manufacturing mining comes next in terms of contribution to the industry sector. The sector is export oriented and the three leading productions are the ones most exported. Food product, mining product and beverages contribute to more than 75% of the total export. Consisting mostly of resource-intensive products, exports account for more than 11% of the GDP. The average annual export growth for metal mining between 2003 and 2010 was a staggering 29%, average growth for metallurgical production during the same time period was 21%. Aside from the productivity and export growth, mining sector also contributes in tax revenue, FDI and employment opportunity.

*Figure 10*

*Source RA National Statistics Service, Authors calculations*

Figure 10 shows percent of employee into a specific sector as a percentage of the total labor in the province. Mining sector is labor-intensive and generates large employment opportunities, thus contributing to the economic growth. Syunik and Gegharkunik provinces owe most of their employment to the mining sector. Mining contributes greatly to the Lori and Tavush provinces. Since the sector generates employment in provinces, rather than the capital, there is indisputable evidence that the urban area owes most of its employment, economic activity and infrastructure development to this sector. This is mostly due to foreign direct investment and foreign ownership of mining companies, not to mention high tax revenue (new mining code requirement, RA and World Bank 2011). The following Figure 11 shows FDI inflow into sectors of the economy. [[6]](#footnote-6)

*Figure 11*

*Source RA National Statistics Service, Authors calculations*

The main sectors for the FDI are mining, telecommunications and transport. The IT and Scientific research investment inflow is so inadequately small for a developing country. Mining sector brought 26.6% of the total FDI in the year 2012. This large inflow of foreign currency into the country is a potential cause of Dutch Disease.

The following two figures, Figure 12 and Figure 13, show a comparison of trends in remittances and trend in mining production, both combined with GDP annual growth. The structure of remittances changed over the years. In 2001 and 2002 100% of remittances were short-term migrants’ cash flows, yet by 2010 4% of remittances were from long-term migrants.

*Figure 12*

*Source CBA Statistics, Authors calculations*

*Figure 13*

*Source CBA Statistics, Authors calculations*

The graphs show that mining production would fluctuate with economic fluctuations (correlated more with copper and molybdenum prices, than GDP trend). The production started to increase starting 2000, with an escalation in 2004, mostly due to copper price increase. The 2008 crisis slowed down the production until 2009, at which point a gradual increase started again. The drop in the mining production in 2008 contributed to the big drop in the GDP. Meanwhile, remittances had a continuous and monotonous increase during the years 2000 to 2008. In the third quarter of 2008 the effect of the crisis caught up with the remittance inflow into the country and the rate dropped drastically, hitting its lowest rate, a decline by 28%, in 2009 alongside GDP growth and mining production.

*Conclusion*

The 5 step diagnosis revealed that Armenia is a candidate for Dutch Disease. Four out of five symptoms indicate the condition. The REER has an appreciating trend and is sensitive to copper price and USD supply change, which affect FDI and mining export. The manufacturing sector has been declining due to lack of investment and insufficient invest into the lagging sectors. Movement effect has identified labour shifts to the resource abundant sector and higher wages in the tradable sector. The contribution of the mining sector to the economy and the country’s development in general is evident though FDI, exports structure, large mining production, employment opportunity, etc. Lack of competitiveness is evident from degrading manufacturing sector, lack of diversification in exported good and trading partners.

Further, the quality of institutional guidance is relevant for avoiding DD. Since it was left untreated, the boom in the natural resource sector in the Netherlands created a resource curse in the country, yet the situation is different for petroleum-rich Norway. Despite rich natural resources, Norway never developed DD, because of the awareness of the condition. The government of Norway developed several policies to avoid DD, including funding of the manufacturing sector to sustain it, creating of the Government Pension Fund designed to hedge against petroleum revenue and investment in technological advancement and research.

**Chapter 3: Empirical Analysis**

As stated in the 5 stage diagnosis, the appreciation of REER in Armenia is partly due to natural resource industry activity, which can be seen in copper price trends and mining production trends. Keeping in mind the natural resource industry is not the sole driver of the REER the first stage analysis will include remittances that flow to Armenia from abroad in the models. Studies show that cash inflow in the country can be a cause of DD.

Table 3 illustrates all the variables used in the VECM regression. As indicated in Weight, variables are weighted by the GDP and seasonally adjusted. Broad money is the M2 AMD, which includes M1 and time deposits and borrowings in AMD. Net Foreign Assets is the net international investment position of a country. In Armenia’s case the position is negative, since there are no major investments abroad.

The models have been tested for normality and residual autocorrelation. No residual autocorrelation was found. The Jarque-Bera test indicated that residuals are normally distributed.[[7]](#footnote-7)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Observ. | Mean | Std. Dev. | Function | Mean weighted by GDP |
|  |  |  |  |  |  |
| Real Effective Exchange Rate | 56 | 118.005 | 13.45 | base 2004 = 100 |  |
| Mining and Quarrying Production | 56 | 15370.57 | 8965.2 | in million AMD | 0.022 |
| Remittances | 56 | 265.8537 | 185.8 | in million USD |  |
| Copper Prices | 56 | 5157.589 | 2689 | Market prices, nominal $ |  |
| Net Foreign Assets | 52 | 158743.7 | 193242 | in million AMD | 0.31 |
| Broad Money | 56 | 358020.7 | 251053 | in million AMD | 0.475 |
| Net Exports of Goods and Services | 56 | -145084 | 80328.45 | in million AMD | -0.217 |
| Governmental Investment into Assets | 56 | 812021 | 501257 | in million AMD | 1.22 |

*Table 3.Variable Statistics*

In the long run Government investment may capture technological progress. Net foreign assets of the country show the assets value of assets a country hold abroad deducting domestic assets held by foreign investors. In DD theory, investment in foreign assets acts as economy’s diversification for a country. M2 is short term policy indicator, since the government can artificially increase or decrease the REER in the market by generating cash flow. The variables indicate the Government’s policies, involvement in the market production and economic activity.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1 | Model 2 | Model 3 |
| Number of Observation | 48 | 52 | 48 |
| SBIC | 21.4 | 4.8 | 17 |
| AIC | 19.2 | 2.6 | 16.6 |
| Error Correction | 0.22 | 0.11 | 0.64 |
| Longer Term Relation: REER | | | |
| Mining share |  | 4.28\*\* (1.92) | 4.8\*\*\* (0.16) |
| Remit. |  |  | 0.50\*\*\* (0.024) |
| Copper | 0.0087\*\*\*[[8]](#footnote-8) (0.01) |  |  |
| NFA share | 32\*\*\* (7.4) |  | 20.4\*\*\*  (6.6) |
| Net Exports share |  | 129.5\*\*\* (45.3) |  |
| GIA share |  | -25.3\*\*\* (7.2) |  |
| Constant | -106 | -41.9 | 35 |
| Short Term Relation | | | |
| ∆REER | 0.26\*\* (0.15) |  | 0.49\*\* (0.13) |
| ∆REER Lag(2) |  | -0.27\*\* (0.14) |  |
| ∆Mining share |  | 4.35 \*\*\* (1.1) | 3.76\*\*\* (0.75) |
| ∆Mining share Lag(2) |  |  | 2.56\*\*\* (0.81) |
| ∆Remit. Lag(3) |  |  | -0.04\*\*\* (0.02) |
| ∆Copper Lag(2) | 0.001\*\*\* (0.0006) |  |  |
| ∆NFA share |  |  | -14.2\*\*\* (5.5) |
| ∆M2 share | -10.5\*\*\* (4.7) |  |  |
| ∆GIA share Lag(3) |  | -6.59\*\* (2.4) |  |
| Constant | 1.11 | -0.003 | -0.015 |

*Table 4. Empirical Analysis. Model 1-3*

The relationship shows REER to be significantly dependent on copper prices in the world market. A unit increase in copper prices increases REER both in short term and long term by 0.001 and 0.002 units respectively. Net foreign assets appreciate the REER in the long run by 7 units. M2, on the other hand, is an indicator of negative governmental policy, since increasing cash flow into the market is a method of manipulating the REER the decrease. The artificial reduction of REER is only short term by 10.5. This is verified by the model, since M2 is not statistically significant in the long term.

The next model substitutes copper prices with mining production as a share of GDP structure. The variables are not included in the model simultaneously, since their correlation created multicollinearity in the model. Mining production shows a higher intensity and effect on the REER, with 0.47 unit increase in the long run and 4.35 unit increase in the short run, thus verifying the theory that mining production appreciates REER. As predicted in the theory a unit increase in the share of governmental investment into assets in the GDP decreases the REER by 25.3 as it is an indicator of positive governmental policy to avoid spending effects, may be an indicator of technological progress and diversification of the economy. The negative sign of the relationship speaks of investment with high import contents, which have a negative effect on the trade of balance.

The third model checks for the theory of international cash flow into the country having an impact of developing DD. The model had two co-integrated relations, since there is causality between REER and NFA variables.[[9]](#footnote-9) The causality lies in the foreign investments: a low RER makes domestic assets less attractive for both domestic and foreign investment, because the assets offer lower real rates of return. On the other hand, a reduction in foreign investment into assets decreases the demand for the domestic currency, thus increasing REER. As expected, the increase in remittances increases the real effecting exchange rate both in long and short term. Although the effect of remittances is not as intense as the effect of mining production, it contributed to developing DD. This implies that remittances are not used wisely in the economy and instead of investing the acquired resource to increase economic activity; the remittances have made the economy dependent.

|  |  |  |
| --- | --- | --- |
|  | Model 4 | Model 5 |
| Observations | 53 | 49 |
| AIC | -6.472325 | -5.228409 |
| HQIC | -5.97197 | -4.715728 |
| SBIC | -5.171188 | -3.877109 |
| Long Term Relationship | | |
| Speed of Convergence | 0.176 | 0.064 |
| Log REER | 1 | 1 |
| Log Mining Production | 0.239\*\*\*[[10]](#footnote-10) (0.05) |  |
| Log Remittances |  | 0.197\*\*\* (0.04) |
| Log GIA | -0.32\*\*\* (0.07) | -0.402\*\*\* (0.07) |
| Constant | -2.6 | -0.16 |

*Table 5. Empirical Analysis, Models 4-5*

The models 4 and 5 show the relationship between REER, governmental investment into assets, remittances and mining production in the long run. The model illustrates that a percent increase in mining production and remittances inflow appreciate REER in Armenia by 0.04% and 0.012% respectively.

*Discussions and Limitations*

**Findings:** The economic state of the country shows signs of DD, but not the intensity of the condition. As revealed in the five step diagnosis the signs of DD are as follows: REER appreciates over time, with a close correlation to copper price trends; wage inequality causes labour shifts, since the mining sector is the primary job supplier for the provinces and the distribution for salaries is more favorable in this sector; manufacturing sector deteriorates, with lack of investment, technological advancement and skilled labour as only a part of the issue; and loss of competitiveness in the world market, shown in the poor export sophistication.

The empirical analysis confirms that REER is appreciated by mining production and remittances increase, depreciated with money supply and governmental investment into assets. Mining production appreciates REER both in short and long terms, yet the increase seem slight. Partly due to a small database limitation, the intensity of the appreciation is expected to be bigger in a country with DD. Financial aid and remittance inflow also contributes to developing of DD, yet once again not with the intensity expected. Dutch Disease is a threat in Armenia, yet the country isn’t so far along that path to formally establish the country suffers from DD. Furthermore, institutions have no clear policies and don’t aid against DD. A unit increase in the share of governmental investment into assets in the GDP decreases the REER. It is an indicator of positive governmental policy to avoid spending effects. The negative sign of the relationship speaks of investment with high import contents, which have a negative effect on the trade of balance, meaning that a policy to avoid spending effects hasn’t been established. M2, on the other hand, is an indicator of negative governmental policy, since increasing cash flow into the market is a method of manipulating the REER the decrease. The empirical model found two co-integrated relations, since there is causality between REER and NFA variables. The causality lies in the foreign investments: a low RER makes domestic assets less attractive for both domestic and foreign investment, because the assets offer lower real rates of return. On the other hand, a reduction in foreign investment into assets decreases the demand for the domestic currency, thus increasing REER.

**Policies:** Achieving a mere decline in REER are not sufficient measures to eliminate DD. DD lies in the manufacturing sector decline. The investment into developing this sector is the structural change needed to achieve a more stable economy. Countries with DD have had different approaches in fighting DD. Netherlands, alongside with investment into manufacturing sector, made investments in international assets, thus diversifying the economy. Australia dealt with the condition by eliminating tariffs and subsidizing a certain sectors of the manufacturing industry. The government of Norway developed several policies to avoid DD, including funding of the manufacturing sector to sustain it, creating of the Government Pension Fund designed to hedge against petroleum revenue and investment in technological advancement and research.

For Armenia’s case several steps are necessary. Governmental spending affects the resource revenue greatly (Katz et al, 2004), thus a fiscal policy must be established to control the spending effect of DD. An example is controlling the amount of resource revenue spend and the amount saved in a stabilization and/or investment funds. Further steps to diversify the economy must be implemented, such as investment into research, which has been reported as lacking in nearly all sectors of the economy. Reducing import barriers can make advanced technology and other materials needed in the manufacturing sector more available, thus increase the competitiveness of the country’s products in the international market. Special attention is needed for the rural parts of Armenia. Basic investments, such as infrastructure development and educational advancement, can potentially be a major transformation for the economic activity in the provinces.

**Limitations:** The paper has limitations in data availability and microeconomic foundation. VEC analysis requires a large number of observations, yet collecting time series data on Armenia is a challenge. The VEC models on REER didn’t include data on institutional policy stability, since such data cannot be vary quarterly, yet the paper included substituting variables for governmental policy in the models.

Data on FDI into mining, technological advancement of the mining sites would have benefited the model, yet were unavailable in a quarterly interval. More robust models with a larger number of independent variable weren’t designed for the REER analysis, due to instability caused by small number of observations available. Instead several models were run with various combinations of explanatory variables, in order to find the relationship in the analysis. The OLS model lacked data on labour costs, technological advancement and research for the manufacturing sector.

Further research can be conducted to find the intensity of Dutch Disease in Armenia. For this research the variables mentioned above are crucial. The paper discussed the finding that REER appreciation was due to nominal exchange rate appreciation rather than inflation. Starting 2005 the value of the US dollar has been declining, which would appreciate the REER. In order to find the intensity of DD, the impact of USD exchange rate volatility on REER must be separated from the impact of natural resources production and export.

*Concluding Remarks*

The paper examined the possibility of Dutch Disease in Armenia. Dutch Disease is a condition of the economy, where a boom in a tradable, natural resource driven sector causes a degradation of the rest of tradable sectors of the economy, mainly the manufacturing sector. The condition usually presents with real exchange rate appreciation. The main consequences of the condition are loss of competitiveness in the world market, wage inequality and inflation.

Armenia is a resource rich country, in a way that mining production contributes to the GDP and exports 80% of the products. The industry creates job opportunities, mainly in provinces, and offers wage distribution towards higher wages. The industry draws large foreign direct investment into the country. In addition to a growing mining sector, continuous and increasing inflow of remittances is also a threat of developing DD in Armenia.

A closer analysis of the economy revealed signs of DD, with REER appreciation, wage inequality that cause labour shifts, deteriorating manufacturing sector, which lacks investment and skilled labour, and loss of competitiveness in the world market, shown in the poor export sophistication. The empirical analysis confirms that REER is appreciated by mining production and remittances increase, depreciated with money supply and governmental investment into assets.

The economic state of the country shows all the signs of DD, but not the intensity of the condition. The paper concludes that Dutch Disease is a real threat in Armenia, yet the country isn’t so far along that path to formally establish the country suffers from DD. Awareness and clear policy against developing DD are necessary.

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*Appendix*

|  |  |  |
| --- | --- | --- |
| Sector | FDI USD | FDI % |
| Communication | 113083.4 | 36.7% |
| Power and Gas  Supply | 7312.6 | 2.7% |
| Mining Industry | 30272.6 | 16.16% |
| Agriculture and Hunting | 7171 | 2.64% |
| Air Transport Activities | 4869.4 | 1.8% |
| Food and Beverage | 29369.4 | 10.83% |
| Real Estate Deals | 45981.2 | 16.96% |
| Hotel Services | 1475.2 | 0.54% |
| Construction, buildings | 2547.4 | 0.94% |
| Land transport | 10801 | 3.98% |
| Research | 1333 | 0.49% |
| Other | 16944.2 | 6.25% |
| TOTAL | 271160.4 | 100% |

*Table 1: FDI into branches of Industry Sector*

*Source RA National Statistics Service, 2013*

*Figure 1: Monthly Copper Prices*

*Source Nasdaq Statistics*

*Figure 2: Employment in Mining vs Total Economy*

*Source RA National Statistics Service 2011*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Salary by Industry | <30000 AMD | 30000-60000  AMD | 61000-90000  AMD | 91000-120000  AMD | 121000-180000  AMD | 181000-240000  AMD | 241000-300000  AMD | 301000-450000  AMD | >900000  AMD |
| **Agriculture** | 0.3 | 53.5 | 22.6 | 10.3 | 10.5 | 1.6 | 0.3 | 0.6 | 0 |
| **Mining** | 0 | 3.9 | 10.6 | 12.2 | 32.5 | 17.2 | 9.6 | 6.9 | 1.5 |
| **Manufacture** | 0.9 | 34.2 | 24.7 | 14.7 | 13.6 | 4.9 | 2.7 | 2.6 | 0.4 |
| **Construct.** | 0.5 | 11.5 | 18.9 | 23.2 | 18.7 | 15.8 | 3.9 | 5.3 | 0.3 |
| **Wholesale/**  **retail** | 2.5 | 38.8 | 33.3 | 11.9 | 6.8 | 2.4 | 1.7 | 1.6 | 0.2 |
| **Transport** | 0.4 | 49.1 | 14.1 | 15 | 8.1 | 8.5 | 2.1 | 1.1 | 0.5 |

*Table 2: Salaries by Industry*

*Source RA National Statistics Service, 2013*

|  |  |  |
| --- | --- | --- |
|  | **Model 3** | |
| Number of Observation | 48 | |
| SBIC | 19.6 | |
| AIC | 17.1 | |
| **Long Term Relationship** | **CE 1** | **CE 2** |
| Error Correction | 0.64 | 0.004 |
| REER | **1** | 0 |
| Mining share | 4.8\*\*\* (0.16) | 2.28\*\*\* (0.04) |
| Remit. | -0.50\*\*\* (0.024) | 0.01 (0.0006) |
| NFA share |  | **1** |
| Constant | 35 | 5.5 |
| **Short Term Relationship** | | |
| ∆REER | 0.49\*\* (0.13) | 0.39\*\*\* (0.13) |
| ∆Mining share | 3.76\*\*\* (0.75) |  |
| ∆Mining share Lag(2) | 2.56\*\*\* (0.81) |  |
| ∆Remit. Lag(3) | -0.04\*\*\* (0.02) | -0.00038 (0.0008) |
| ∆NFA share | -14.2\*\*\* (5.5) | -0.8\*\*\* (.28) |
| Constant | -0.015 |  |

*Table 3. Empirical Analysis Part 1*

*Cointegrated Relation*

*Figure 3 Exports & Mining Production*

*Source CBA, RA National Statistics Service*



*Figure 4. VEC Model 1 Stability Graph*



*Figure 5. VEC Model 2 Stability Graph*

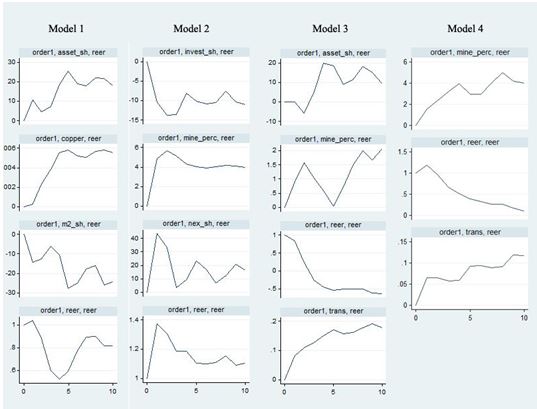


*Figure 6. VEC Model 3 Stability Graph*



*Figure 7. VEC Model 4 Stability Graph*

IRF graphs for the 4 VECM regressions.



*Figure 8. IRF graphs*

1. Source: 2011 Minerals Yearbook Armenia, USGS [↑](#footnote-ref-1)
2. http://www.tradingeconomics.com/armenia/inflation-cpi [↑](#footnote-ref-2)
3. Source: CIA, World Factbook [↑](#footnote-ref-3)
4. See appendix, Table 2 and Figure 2 [↑](#footnote-ref-4)
5. See copper prices in appendix, Figure 1 [↑](#footnote-ref-5)
6. See appendix Table 1 [↑](#footnote-ref-6)
7. See Appendix for Stability Graphs in VECM regression [↑](#footnote-ref-7)
8. Standard Deviation is in brackets

   \*\*\* significance at 1%, \*\* significance at 5%, \* significance at 10% [↑](#footnote-ref-8)
9. For full cointegrated model see Appendix, Table 3. [↑](#footnote-ref-9)
10. Standard Deviation is in brackets

    \*\*\* significance at 1%, \*\* significance at 5%, \* significance at 10% [↑](#footnote-ref-10)