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Natural Resource Curse: Can a Dutch Disease Become a Dutch Miracle?

(A Case Study of The Netherlands)

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List of Acronyms

ADF	Augmented Dickey Fuller
BOPS	Balance of Payment Statistics
CBS	Central Bureau of Statistics
DF	Dickey Fuller
DSM	Dutch State Mines
ECM	Error Correction Model
FES	Fund for Enhancement of Economic Structure
GCF	Gross Capital Formation
GDP	Gross Domestic Product
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
RC	Resource Curse
SC	Social Contribution
WDI	World Development Indicators

Abstract

After the evaluation of various channels of 'natural resource curse' literature, such as Dutch Disease; reduction in the productive activities; low investment in human capital development; rent seeking behaviour; corruption and the institutional structure of world markets, which have been important over the last four decades, now, we suggest that the management of resource revenues and sustainability are important determinants for the conversion of 'natural resource curse' into 'natural resource blessing'. For example, when we have analyzed the natural resource curse literature through case study of the Netherlands, we found mixed results in the previous studies, as well as, in our own analysis. We used different time series research techniques, for instance, graphical; tabular; comparative and econometric methods, for the detailed analysis of the Netherlands. Furthermore, we used bivariate cointegrating and Error Correction Mechanism (ECM) regressions for the periodical analysis of the Netherlands, such as, 1970-79; 1980-89; 1990-99 and 2000-06.

Our empirical analysis indicates the symptoms of Dutch Disease and confirms our rentier hypothesis, during the time period between mid-1970s and mid-1980s. Our results are in favour of the resource curse literature during the time period 1970-87. First, we find negative and statistically significant relationship between manufacturing value added and total natural resource rents, during 2000-06. These findings also support our rentier hypothesis. Second, we find negative and statistically significant relationship between social welfare benefits and total natural resource rents, during 2000-06. Moreover, we confirmed our results by periodical analysis of time period 1995-2006. These findings support our investment hypothesis. Third, our empirical analysis also indicates the positive relationship between growths rate of GDP per capita and total natural resource rents during the time period 2000-06. These findings also support our investment hypothesis. Final, we did not find any cointegrating relationship between tertiary school enrolment and total natural resource rents during the time periods, such as, 1970-79 and 1980-89. On the contrary, we find statistically significant and positive cointegrating relationship between tertiary school enrolment and total natural resource rents in long term during the time period, such as, 1990-99 and 2000-06. As a result, these econometric analyses support our investment hypothesis during the time period 1995-2006 and 2000-06, except the changes in the direction of manufacturing value added. However, these findings indicate the structural and policies changes in the Netherlands, during 1990s. In 1994, the establishment of 'Fund for Enhancement of the Economic Structure' (FES) is the initiative of the Dutch government towards the management of natural resource revenues. This fund finances investment in 'hard' and 'Knowledge' infrastructure. Therefore, these findings support our investment and institutional hypotheses, after 1995 onwards. If these development steps continue in the future, then it may commute 'Dutch Disease' into 'Dutch Miracle".

Relevance to Development Studies

Over the last years, the policies suggest that the debate should now get away from the effect of Dutch Disease and counter-claims and move towards the issues of management of resource revenues and sustainability. Overall, the debate proposes an individual (country-level or state-level) initiative to strengthen the capacity to manage the natural resource revenues. Therefore, our case study of Netherlands will give new dimensions to researchers, for the analysis of the resource curse literature, in order to identify the appropriate policy options. We propose sustainability in the extraction of natural resources through the actions of state such as good governance and non-corrupted bureaucracy and the establishment of fund for the management of natural resource revenues through investment of these revenues in human and physical capital development. Due to the development in educational; technological and institutional structure, there would be proper distribution of natural resource revenues, in turn; there would be reduction in income inequality and higher economic growth.

Keywords

Natural Resource Curse, Natural Gas, Natural Resource Revenues, Human Capital Development, Dutch Disease, Dutch Miracle, Natural Resource Blessing, The Netherlands, OECD Members, ECM, Cointegration, Time Series Analysis (1960-2006), Rentier, Institutional Structure, Political Economy

Chapter 1
Introduction

1.1 Natural Resources: Blessing or Curse?

Through examining the literature of past two centuries, the economic history of natural resources showed mixed results. According to Van der Ploeg (2011), the empirical evidence suggests that, 'analysing natural resources: curse or blessing', one should expect any possibility. During the 19th century and the first half of the 20th century, countries with relatively abundant natural resources grew rapidly, such as, Australia, Scandinavia[1] and United States (Wright, 1990 and Meller, 1990 as quoted in Bravo, et. al. 2005). In the second half of the 20th century, many natural resource abundant countries, however, experienced slow growth. There is a huge debate on the 'natural resource curse', which is, a negative impact on long-term growth due to excessive reliance on exporting an abundance of primary commodities. Therefore, reductions in natural resource revenues, due to lower export prices, are confirmations of the warnings of analysts regarding the natural resource curse predictions. In 2008, McKinley mentioned the case study of different countries, such as, Angola and Zambia in Sub-Saharan Africa; Brazil, Chile, Trinidad and Tobago, and Venezuela in Latin America and the Caribbean; Yemen in the Middle East and Uzbekistan in Central Asia. Initially, each of these countries enjoyed the benefits of an increase in revenue from the export of primary commodities, such as oil, gold and copper. However, they experienced a long term decline in revenues due to reduction in the export demand of primary commodities. Moreover, the large flow of export revenues in these countries have distorted their macroeconomic stability and slowed growth in their other economic sectors, especially manufacturing. On the basis of these analysis, a large number of researchers claimed that having an abundance of resources can often be a curse, rather than a blessing.

The term 'natural resource curse' was coined by British economist Richard M. Auty in 1993. Auty (2001a, 2001b) explored the phenomenon of resource abundance in various countries, for example, oil in Nigeria; diamonds in Sierra Leone and Angola; tin in Bolivia, often develop more slowly as compared with resource poor countries, for example, Hong Kong; Singapore; South Korea and Taiwan. Auty (2007a, 2007b) explained that boost in resource curse thesis happened, when Sachs and Warner in 1995 used regression analysis for the comparison among the countries economic performance during the time

[1] It includes Denmark, Norway and Sweden, but some experts also argue for the inclusion of Finland and Iceland.

period 1970-1989. Sachs and Warner (1995a, 1995b) explained a statistical significant and negative relationship between natural resource intensity and growth over those twenty years. Sachs and Warner (1999: 43-76) described an inverted U-shaped relationship between trade policy and natural resource dependence, measured on the horizontal and vertical axis, respectively. Also, these results are consistent with LaI's (1993) study. Sachs and Warner (1999) concluded that most resource rich governments introduced more protective trade policies to counter the employment-diminishing effects of resource abundance. As a result, these protective measures initiated an increase in resource dependence, leading to economic distortion and growth collapse.

Murshed (2008) discussed the three points related to resource curse phenomena. First, the resource curse is a recent (post-1970) debate, historically, abundance of natural resource endowments are blessings rather than curse. Second, there are various macroeconomic mechanisms behind the conversion of resource booms into resource curse, such as, spending effect due to excessive consumption, and a relative price effect due to real exchange rate appreciation. Third, the presence of large resource revenues may be the cause of adverse political economy, for example, rentier state; bad institutional setting and corruption. Murshed (2008, 2011) concluded that all of these problems could be avoided in the presence of good institutional setting and judicious policy design, as in the case of Norway and Malaysia, respectively. Furthermore, if the wise course is followed, then the resource curse may not be a curse at all. Hence, the problem lies not in the existence of natural resources or natural resource revenues (windfall gains), but happens, due to the mismanagement of resource revenues through different channels such as poor governance, bad macroeconomic policies and lack of institutional setting, which in turn, reduces economic growth. This research paper will explore the institutional hypothesis alongside the simpler curse versus blessing hypothesis.

1.2 Case Studies of Natural Resource Abundant Countries

This section describes case studies suggesting differentiation between natural resource more developed and natural resource less developed countries.

The world's second largest oil exporter Norway shows no clear symptoms of a resource abundance curse. But, one of the factors, that separate Norway's experience from other OPEC members, is timing of natural resource discovery relative to wide economic development. Norway was already a developed country at the time of the oil discoveries in the 1970s. Norway has a long-run oriented and tax-based approach to the management of its vast oil resources. According to Petroleum Act (1996) Policy of Norway, all the rent from oil and gas should accrue to the Norwegian people through their government (Gylfason, 2001a; 2001b). Norway's long history of democracy and market economy has also very important considerations in the management of oil resources. Though, some weak signs can be detected such as stagnant exports, absence of large and high-tech manufacturing industry and sluggish foreign direct investment. But, the main challenge is to ensure that the oil revenues do not generate a false sense of security in terms of diminished desire to work. Also, Norway's experience suggests a need to keep political interference separated from the management of resource revenues, just as other key institutions like the courts, media and banks have been depoliticized over the years.

A case study of Uzbekistan shows the importance of diversification and offers some instructive lessons. Due to the increase in natural resource revenues from rising exports of gold and energy, Uzbekistan has been able to achieve huge current account surpluses. McKinley (2008: 3) argues that Uzbekistan could now mobilise such resources to finance investment that could help to diversify its economy and contribute to sustainable growth, even in the event of a global economic slowdown. But, Uzbekistan will face great political challenges in achieving this potential.

A case study of Yemen shows that its development prospects are less than Uzbekistan's because it has neglected to finance the development projects in the agriculture sector, even though Yemen has enjoyed an export boom in oil.[2] Therefore, the recent increase in its inflation rate has not been due to appreciation of its exchange rate, but, due to the rising costs of its food imports and persistently low productivity activity in its agricultural sector. In the long term, the countries which are able to use resource revenues for diversifying their economies will have the best chance of achieving a sustainable rate of economic growth and employment generation. On the basis of these three case studies, we analysed that natural resource revenues or windfall gains from natural resources do not themselves explain poor macroeconomic performance and low economic growth, but contextually appropriate policies towards the management of natural resource revenues are important.

1.3 Policies Analysis in the Management of Natural Resource Revenues

In the vast literature on natural resource curse, the two policies either 'top-down' or 'bottom-up' can be used as an alternatives for the removal of the conversion of 'blessings' into 'curse'. As exemplified by Gaille (2011), the 'top-down' approach is the petroleum revenue management trust in Chad, which requires the government to spend petroleum revenues on specific programs such as public health or infrastructure. As an alternative, the example of 'bottom-up' approach is the way the state of Alaska pays each resident a dividend from petroleum production of between $331.20 and $ 1,986.86 per year (Annual Report, 2009).

One side of the policy debate proposes the 'bottom-up' approach that diverts a small percentage of resource wealth to microfinance and educational lending programs. Other side of the policy debate proposes the 'top-down' solutions seek to establish new institutions for the management of the resource funds. Duruigbo[3] examined that various development commissions in Nigeria

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[2] ibid

[3] Internal citation omitted, as explained by Gaille (2011).

have been created that were designed to better control the use of oil revenues, but these have done little for the benefit of specific individuals (Gaille, 2011). In the case of Chad, the World Bank had withdrawn from the project of 'Chad-Cameroon pipeline', which is designed for poverty reduction. Because, as analyzed by Lesley (2008), Chad had failed to comply with agreements, in which the government agreed to distribute the share of its oil revenues for local communities, health and education (Gaille, 2011).

Thus, it is important to consider another alternative approach for the management of resource revenues, after the failure of the World Bank's 'top-down' approach in Chad. Whereas, the success of microfinance in the developing world provides an alternative of 'bottom-up' approach. So, direct payments is a pure form of 'bottom-up' approach because it distributes the direct payment of resource revenues to individual citizens and also reduce to risk of government corruption. Another approach of 'bottom-up' is Microfinance lending, which has a well-established record of success in the developing countries, due to, its aim to reduce poverty and diversify the economic activities in developing countries through cheap access to credit or financial markets.

In past, the focus of policy would have been on only economic reforms to make markets competitive and rent-free, but now, it is argued that the these polices will not be sustained without simultaneous political reforms and institutional reforms. Whereas, the experience of high growth economies also suggests that if growth and sustained poverty reduction are the objectives, than there is a need to become more focus on institutional and political reform. As Murshed (2008) described that economic growth reduces poverty by not only through raising incomes, but also, through the distribution of income. It implies there is also a need for the proper distribution of natural resource revenues through the channel of institutions and good governance.

1.4 Research Question and Hypothesis

1.4.1 Research Question

Must natural resources create a rentier economy and dampen sustainable economic development?

1.4.2 Research Hypothesis

This research paper will explore three hypotheses of natural resource curse.

1.4.2.1 The Rentier Hypothesis

Abundant natural resources tend to damage national economic performance today as market forces tend to reduce productive economic activity, especially in manufacturing, and the wind-fall revenues that go to the state tend to be used unproductively.

1.4.2.2 The Investment Hypothesis

Abundant natural resources offer a potential to improve national economic performance as the wind-fall revenues that go to the state can be used productively if there is sufficient 'political will'.

1.4.2.3 The Institutional Hypothesis

Abundant natural resources will be used more or less productively depending on the contextual path dependent history of the structure of the national political economy, including the capacity to learn and adjust.

1.5 Research Objectives

This research paper investigates the Resource Curse Literature through an attempt to compare less and more productive uses of natural resources in the development process. Despite the vast literature on natural resources, there are very limited case studies available on various forms of capital as transmission mechanisms of resource curse into resource blessing. The research paper is based on case study analysis, rather than cross-country analysis. Thus, the research paper is based on the analysis of one developed country (Netherlands) due to its prominent place in the resource curse literature through the concept of 'Dutch Disease'.

'Can a Dutch Disease become a Dutch Miracle'? We can also apply this notion as 'Can a Resource Curse becomes a Resource Miracle'? Already, a well defined statement is also available in the literature: 'Can a Curse become a Blessing?' The logic of this RP statement: 'Can a Dutch Disease become a Dutch Miracle?' especially "Miracle" (as mentioned in Becker, 2000: 230) is based on the idea that Dutch economy is moving from "welfare to work" (Keman, 2003) since 1980s. So, what are the policy implications for these development steps and the process of challenging the Dutch Disease effect?

1.6 Limitations of the Research Paper

This research study does not include the history (prior to the exploitation of natural resources, before 1960s) of the Netherlands, due to time constraints. Furthermore, this study does not make an individual comparison between the Netherlands and other natural resource countries; however, this comparison is made between OECD member countries.

1.7 Outline of the Research Paper

The outline of the RP is as follows:

Chapter II examines the literature review on Resource Curse and Dutch Disease.

Chapter III explains the macroeconomic analysis of the Netherlands and comparison between the Netherlands and OECD Members.

Chapter IV describes the econometric methodology and regression results of the Netherlands.

Chapter V presents the conclusions and recommendations.

Chapter 2
Literature Review on Natural Resource Curse and Dutch Disease

The phenomenon of negative relationship between economic growth and natural resources is known as 'natural resource curse'. For this reason, the vast exploitation of natural resources effect the economic growth through different channels, such as, reduction in the level of total exports or shift away from the manufacturing exports, low investment in the productive activities (e.g. human capital) and higher welfare benefits. Furthermore, the natural resource curse is based on the argument that natural abundance leads to poor economic performance, high levels of corruption and poor governance, which in turn, increases poverty and inequality within and across the countries. Previous studies contribute in the resource curse literature with mixed explanations, including long-term decline in terms of trade, primary export revenue volatility, Dutch Disease, crowding out effects, government mismanagement, corruption and low levels of human capital. In 1999, Ross explained that the underlying causes or transmission mechanisms remain controversial, whereas, the empirical evidence strongly supports the existence of the resource curse. Similarly, time series analysis of empirical studies established that natural resources have promoted economic growth from the late nineteenth century till the 1960s in developing countries. The concept of "resource curse" initiated to appear in the developing countries in 1960s and remained need careful analysis (Auty, 2001a; 200b; 2000c). In line with these literature studies, Costantini and Monni (2006) suggested five different explanations of natural resource curse namely, the Dutch Disease effect; the misallocation of revenues from resource exploitation; the rent seeking behaviour; the quality of institutions and the role of human capital development.

2.1 Natural Resource Curse

Ranis (2000) explained the six factors that may harm the achievement of sustained economic development due to the presence of abundant natural resources. First, resource abundant countries ignore the importance of human development due to excessive resource rents. Second, resource rents create rent-seeking activity instead of productive activity. Third, resource abundant countries adopt the policy of import substitution industrialization, even its contribution to development has diminished. Fourth, there is unequal distribution in resource rents due to specific interests of elite class or monopoly groups. Fifth, there is less economic growth in the absence of export diversification because the prices of natural resource exports are more volatile as compared with the prices of manufactured goods. Final, Dutch

Disease effects may seriously weaken the competitiveness of the non-mining tradable sectors (Krause, 1995)[4].

Auty (2001a) criticised that the Ranis (2000) only explained the six factors that may harm the achievement of sustained economic development due to the presence of abundant natural resources. But, Ranis (2000) does not give any explanation related to the underperformance of resource rich countries. Therefore, Auty (2001a, 2001b, 2001c, 2001d) discussed the importance of three linking factors (such as the dominant system of landholding, the type of political state and the choice of the developmental strategy) between natural resource endowment and economic performance.

On the basis of these debates, we explained the natural resource curse literature through the division into two categories. First, the Dutch Disease (DD) literature consists of natural resource based exports boom with adverse effects on manufacturing (Corden, 1984; Sachs and Warner, 1995a; 1995b; 1999; 2001), appreciation of exchange rate (Corden, 1984; Stevens, 2003), consumption of resource revenues through higher social contributions or increase in spending effect (Wierts and Schotten, 2008; Van der Ploeg, 2006; 2011; Gylfason, 2001a; 2001b) and reduction of investment in human capital development (Gylfason, 2001c), but the Dutch Disease Literature did not mention the importance of political and institutional structure. Second, the Political Economy (PE) literature consists of the level of resource abundance and reserve base, the maturity of the resource based industry (Auty, 2001a; Auty & Gelb, 2001d; Murshed, 2004; 2007; 2011), the ownership structure; control and taxation, the political structure and governance (Jerome, et. al. 2005), role of institutional quality (Murshed, 2008), lack of transparency and absence of rules (Wantchekon, 1999), corruption and rent seeking (Stevens, 2003).

2.2 Dutch Disease Literature

As Corden (1984) and Stevens (2003) defined that Dutch Disease refers to the adverse effects on Dutch manufacturing after the natural gas discoveries of the nineteen 'sixties', essentially through the subsequent appreciation of the Dutch real exchange rate. Corden (1984: 359) explained that it might be argued that the true Dutch Disease in the Netherlands was not the adverse effect on manufacturing or real appreciation. But rather, the use of Booming Sector revenues for social welfare payments, which are not sustainable, most importantly, it has been difficult to reduce them, politically.

As described by Wierts and Schotten (2008), consumption of the gas revenues (e.g., higher social welfare payments), in the 1970s, led to 'Dutch Disease', a term that not only referred to the pressure exerted by the higher gas revenues on the real exchange rate, but also to the derailment of the real economy and public finance. Wierts and Schotten (2008) explained that the literature on the symptoms of the 'Dutch Disease' often warns for the risk that

[4] As described by Auty (2001a)

a sharp rise in revenues from natural resources may encourage politicians to use the temporal income to raise the welfare state to a level that is unsustainable once the natural sources dry up (Gylfason and Zoega, 2002; Van der Ploeg and Pelhekke, 2009). Overall, this condition exactly happened in the Netherlands in the 1970s. Wierts and Schotten (2008) description of 'Dutch Disease' supports our rentier hypothesis.

The brief explanation of the Dutch Disease can also be found in Corden and Neary (1982) and Sachs and Warner (1995a, 2001). For example: Sachs and Warner (2001)[5] provide a theoretical explanation of the Dutch Disease through elaborating the endogenous growth model developed by Matsuyama (1992). There are three sectors in the model, such as, a traded manufacturing sector, a non-traded service sector and a traded resource sector. Endogenous growth arises because employment in the manufacturing sector generates improvements in human capital, as a by-product. When resources are discovered, it raises the level of income for a number of periods. Now, a part of this income is spent on the non-traded service sector, drawing resources away from manufacturing, in turn, increased demand for manufactures is satisfied through imports. Further, the reduction in manufacturing employment reduces the rate of growth, due to the decrease in the accumulation of human capital. Moreover, Corden and Neary (1982) and Sachs and Warner (1995, 2001) also supports our rentier hypothesis.

After the discovery of the vast Slochteren natural gas field in Groningen province in the Netherlands in 1959, and oil a decade later in the British and Norwegian sectors of the North Sea, not only represented large increases in the national wealth of these countries but also stimulated rapid growth in their energy sectors (Hutchison, 1994; Di John, 2007). In addition, a huge increase in energy prices during the 1970s, the development of oil and gas resources allowed these nations to move from positions of net energy importers to net exporters. On the one side, these views support our investment hypothesis. Although the boom increased overall national wealth and improved the balance of payments, it was feared that some sectors, including manufacturing sector would decline due to international competitiveness and adversely affect whole regions and major segments of the work force[6]. On the other side, these views contradict our investment hypothesis and supports rentier hypothesis. Therefore, a natural resource based export boom with these adverse effects has been characterised as the 'Dutch Disease', as mentioned by Hutchison (1994).

2.2.1 "Neither Dutch nor a Disease"

Gylfason (2001a) explained that, being neither Dutch nor a disease, the Dutch disease is a double misnomer.

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[5] Jerome, et.al.(2005)

[6] Hutchison (1994) and Di John (2007)

> 'But when, as in this case, a disease bears the name of the first patient diagnosed with it, it would seem a bit harsh to require the patient to remain sick for the name to stick. The fact that the Dutch recovered fairly quickly from the disease that bears their name, while some other countries have suffered much longer and continue to do so, does not by itself call for a name change'.

Gylfason (2001a) mentioned that the late 1960s onwards, exports of goods and services have increased from less than 40 per cent of GDP to nearly 60 per cent, a high ratio by international standards for a country with 16 million inhabitants. So, the fears of de-industrialization did not happen, but the name stuck. On the contrary, Gylfason (2001c) analyzed that natural resource abundance may reduce private and public incentives to accumulate human capital due to a high level of non-wage income such as, dividends, social welfare payments, low taxes. For example, Arezki and Van der Ploeg (2008) explained that countries rich in natural resources may also make the mistake of building a generous welfare state, which is not suitable when natural resources run out. In case of the Netherlands, it is often argued that government used the gas resource revenues from the Slochteren gas source to build up an unsustainable welfare state during the 1970s and 1980s, which has taken many administrations to turn back.

In line with Gylfason, Davis and Tilton (2005) also criticized the structural adjustments that occur within a country during a mineral boom, such as in the Netherlands in the 1960s, are by themselves not a problem. Many other countries (such as Norway and United Kingdom) have gone through similar experiences. Indeed, the Dutch disease actually allows a country to benefit from its new found mineral wealth by encouraging resources to flow from other sectors of the economy to the booming sector[7]. If natural (capital) assets are converted into human or physical capital; then they can promote economic growth, but, if natural (capital) assets are consumed; then they can lower current levels of poverty. So, in either case, natural resources can enhance economic development because these natural resources provide opportunities to developing countries, as analyzed by Davis and Tilton (2005). Therefore, Gylfason (2001a) estimates and Davis and Tilton (2005) findings also supports our rentier, as well as, investment hypotheses.

2.2.2 Importance of Productive Investment in Economic Development

In 2007, Gylfason explained the key factors of recent economic growth theory. First, the saving and investment used for the building of real capital, such as, physical infrastructure; factories; machinery; equipment and road and bridges. Second, the education, training, health care and social security played an important role for the development of Human Capital[8]. Third, exports and

[7] Gylfason (2001c)

[8] It means better and more productive work force, as defined by Gylfason (2007).

imports of goods and services are used for the building of foreign capital. Fourth, the presence of democracy, freedom and honesty create social capital and also absence of corruption strengthens the social fabric of the society. Fifth, financial capital depends upon the economic stability with low inflation. Last, manufacturing and services sector leads to diversification of the national economy because excessive reliance on low-skill intensive primary production, such as, natural capital are the reason behind low economic growth.

These studies explain the importance of human capital in the 'RC' literature and show mixed effects. Stijns (2001; 2005) results explained that performances of resource-rich developing countries are better in terms of social performances than resource-poor countries, which are also in line with the results of Davis and Tilton (1995). In 2010, Pineda and Francisco find the evidence that changes of human development from 1970 to 2005 (proxies by changes in the Human Development Index, HDI) are positively and significantly correlated with natural resource abundance. Manning (2004) and Phillipott (2010) results are also similar with Gylfason's results becasue they find a negative relationship between resource revenues and public spending on education and school enrolment rates at every level, but coefficients are not always significant. Murshed (2004) illustrate the importance of human capital accumulation because the highly educated population eventually demands superior institutions and more accountable government. Murshed (2008, 2011) analyzed that the most important channels of natural resource curse are political economy mechanisms because there are negative relationship between natural resource rents and institutional development. .

2.3 The Political Economy Literature

The 'Politics of Privilege' written by Hutchcroft (1997) explained the various phenomena of politics such as rent-seeking, corruption and clientelism. As analyzed by Hutchcroft (1997: 646), the rent literature explains that state actions distort markets, corruption literature examines the public roles and private influences that create conflict within state agencies, and clientelism literature encourages the appropriate analysis on the power relationships that penetrate states, societies and markets. Overall, the analysis of the performance criteria depends upon the basic issues such as the distribution of political power, the character of bureaucratic agencies, institutionalization and differentiation of business interests. As mentioned by Khan (2002), economists, such as Bates (2001); Bardhan (2000); Olson (2000); Stiglitz (1998); Shleifer and Vishny (1998); Khan (1995) and North (1990), agree that state failure can have significant effect on growth.

2.3.1 Rent Seeking Literature

Wantchekon (1999), Auty (2001a), Auty and Gelb (2001d), Stevens (2003) and Murshed (2004, 2007, 2008, 2011), Haber and Menaldo (2011) and Bjorvatn, et al. (2012) mentioned political economy explanations, such as rent seeking activities, authoritarian regime and corruption, due to natural resource dependence, which in turn, hampers the economic growth. Wantchekon (1999) and Bjorvatn, et al. (2012) summarized the key factors, such as lack of transparency and absence of rules, which generate authoritarian governments in rentier economies. For example, when the rule of law is strong and the internal organization of the government is relatively decentralized, as was the case in Norway before the oil boom, than the process of rent distribution will be more transparent and less discretionary. In comparison, when the rule of law is weak and the government is centralized as was the case in Nigeria after the oil boom, resource abundance will tend to generate monopoly and the breakdown of democracy. On the contrary, Haber and Menaldo (2011) concluded that there is positive and statistically significant relationship between natural resource income and democracy. They suggested that there is a need for reconsideration of 'natural resource curse' literature.

2.3.2 Role of Economic Institutions in the Political Economy

Economic development is based on the economic institutions of the country, including the structure of the property rights and the presence of perfect markets. Individuals have no incentive to invest in physical or human capital and adopt more efficient technologies in the absence of property rights. Economic institutions are also important for the efficient allocation and distribution of resources. Economic institutions are endogenous and they are determined by collective choices of the society, as analyzed by Acemoglu, et.al. (2005a).

> 'Economic Institutions influence not only the size of the aggregate pie, but how this pie is divided among different groups and individuals in society'.[9]

Although, there is no guarantee that all individuals and groups will prefer the same set of economic institutions because of their '*conflict of interest*' among various groups and individuals over the choice of economic institutions. The equilibrium between these two groups depends upon the political power. Therefore, *"shocks"*, such as, changes in technologies and the international environment, can play an important role for the balanced political power in society, in turn, lead to major changes in political and economic institutions and economic growth.[10]

Murshed (2004) evaluated that developing countries which export mineral/fuel type natural resources have lower growth rates as compared with resource deficient countries in the post-1970 period, except the case of Botswana. Findlay and Lundahi (1994) and Murshed (2001) explained that resource boom effects do not always lead to macroeconomic problem and growth reduction, as pointed by Murshed (2004). Even though, the adverse effects of resource booms can be avoided, as mentioned by Murshed (2004), through judicious policy design via intersectoral linkages[11]. Murshed (2004)

[9] As quoted by Acemoglu, et.al. (2005a)

[10] ibid

[11] Suggested by Clarida and Findlay (1992) and Sachs and Warner (1999, 2001)

concluded that growth failure happens due to institutional malfunctioning. Weak institutional setting, corruption, and the presence of monopoly are the main reasons behind the low economic growth.

2.3.3 Geographical Literature

Acemoglu et al. (2001) stressed that the quality of institutions to be a more important determinant of economic growth. They associated the quality of institutions to the nature of the colonial experience. Because the institutional structure increase the wealth creation, if colonial settlers worked in the overseas territory. Whereas, the institutions facilitated the extraction of wealth to the detriment of local people, if climatic conditions discouraged permanent colonial settlement. But, this conclusion was swiftly challenged, as mentioned by Auty (2007a). For instance, Glaeser et al. (2004) criticised the usefulness of the institutional indices selected by Acemoglu et.al. Because they found that human capital accumulation and policy choice determine institutional quality, which improves as a consequence of rising incomes, but, is not the cause of that rise. Sachs and Warner (2001) explained the little direct evidence that omitted geographical or climate variables explain the curse.

Although, the historical evidence shows that there has been a notably Reversal of Fortune[12] in economic prosperity within former European colonies, for example, societies like the Mughals in India, and the Aztecs and the Incas in the Americas were among the richest civilizations in 1500, now the nations coincide with the boundaries of these empires are among the poorer societies of today. Whereas, countries occupying the territories of the less-developed civilizations in North America, New Zealand and Australia are now much richer than those in the lands of the Mughals, Aztecs and Incas. Therefore, the geographical argument is inconsistent with historical evidence (Acemoglu, et.al. 2005a; 2005b; 2005c), as Sachs analyzed on the intrinsic poverty of the tropics. In 1500, there were the countries in the tropics which were relatively prosperous, but in 2003 it is the reverse. Although, it is also possible that the Europeans did not introduce bad institutions but these are inherited from previous Civilizations. Because the structure of the Mughal, Aztec and Inca empires were already very hierarchical with power concentrated in the hands of few ruling.

[12] The institutional reversal along with the institutions hypothesis is known as the Reversal of Fortune, which explains that relatively rich places got relatively worse economic institutions and vice versa. Also, the institutions hypothesis is consistent with the timing of the reversal. The industrialization was the major investment opportunity of the nineteenth century. Countries that are rich today, both among the former European colonies and other countries are those that industrialized successfully during this critical period.

2.3.4 Resource Abundance or Dependence

According to Frankel (2010), the endowments of "point source" commodities (oil and minerals and some crops) can lead to poor institutions, such as corruption, inequality, class structure, power struggles, and absence of rule of law and property rights.

Auty (1997) and Philippot (2010) divided the natural resource abundant countries into two categories, that is, point-sourced and diffused economies. Point-sourced economies are based on natural resources such as oil, gas and minerals whereas diffused economies are based on natural resources such as agriculture. Many authors (Engerman and Sokoloff, 2002 and Isham, et.al. 2003) argue that point resources are more detrimental to economic development than diffuse resources.

Sachs and Warner (2001) explained that the variation in mineral exports across countries is responsible for a large fraction of the overall variation in the natural resource variable, so inclusion and exclusion of agriculture does not much alter the basic empirical findings. Gylfason, et. al. (1999) argued that resource abundance per se need not do any harm because many countries have abundant natural resources and have managed to outgrow their dependence on them by diversifying their economic activity. Murshed (2007) indicates that the problem does not lie in the natural resource endowments per se but it is based on the dependence of the primary commodities exports and undiversified economy. Basically, the problem of natural resource curse is not associated with a steady reliance on agriculture or resource-based exports, but, it exists due to mismanagement of resource revenues or sudden windfall gains.

2.4 Conclusions

We conclude on the basis of Frankel's analysis (2010), that the abundance of natural resource abundance may be considered as a double-edged sword, with all pros and cons. Moreover, the outcome could be expected, either good or bad[13]. We analyse that the literature findings are consistent with our hypotheses, for instance, rentier; investment and institutional hypothesis. These findings further suggest the diversity in the literature of natural resource curse and explain that the results are highly dependent on the adoption of research methodologies, techniques, variables, countries and time period.

We already described the different explanations for the case of the Netherlands in the aforesaid sections. We do not find any appropriate research in the case study of the Netherlands. Except, Maria- Dolores and Morales (2012) used the data from different geographical areas of the Netherlands for the period of two years, such as, 1997 for dynamic economies and 2007 for the rest of the data. They analyzed the natural resource curse literature through the

[13]According to Mikesell (1997), Stevens (2003); Lederman and Maloney (2008), Wright and Czelusta (2003, 2004, 2006), as cited in Frankel (2010)

estimation of production functions in different sectors of the economy for the determination of economies of scale. Their results explain that the deindustrialization process may be suffered due to the higher development in the sector of natural resource sector. However, their results only depend upon the statistics for the years 1995, 2006 and 2007. Therefore, we can fill the gap in the literature by considering time analysis between 1960 and 2006 by the use of macroeconomic variables through different research methodology techniques, for instance, graphical methods, tabular methods, comparative methods and econometric methods. In the subsequent chapters, we will examine the literature through different time series technique for the case study of the Netherlands.

The research paper explores the adverse effects of Dutch Disease and validates our research hypothesis in the case of the Netherlands. It may be prominent to highlight that the Netherlands is the origin of Dutch Disease. This research study needs to further get answer of the following two sub-questions:

- The Netherlands gave the concept of resource curse as Dutch Disease and yet there appear to be signs of sustainable macro-economic success- is that the case?
- Recent literature suggests that there has been a shift in government strategy from rentier 'welfare' to productive 'work'- can such a shift found in the Dutch Data?

Chapter 3
The Netherland's as a Case Study and Comparative Analysis of the Netherland's with OECD Members

As Van Wijnbergen, S. (1984) quoted from The Economist (1977) on the Netherlands:

> 'To refer to a vast, valuable energy resource as the source of a *"disease"* sounds rather ungrateful.'

3.1 Background

3.1.1 The State of the Netherland's Economy in 1960

Netherlands is located in North-West Europe and it borders the North Sea to the north and west, Belgium to the South, and Germany to the east, and also shares maritime borders with Belgium, Germany and the United Kingdom. Therefore, the Netherlands location gives it prime access to markets in the UK and Germany, with the port of Rotterdam being the largest port in Europe. The country capital is Amsterdam and the seat of government is The Hague. The Netherlands is a founding member of the European Union, the OECD and the World Trade Organization.

Relatively, the industrialization process in the Netherlands as compared with other Western Europe countries occurred late. Therefore, the 1850-1870 considered as a run-up period of technical progress and the decade 1880-1890 was a transitional phase towards technical and technological progress. Whereas, the development of the decade was based on industries of capital goods such as engineering, ship building and vehicle and engine manufacturing and also consumer goods industries such as those producing quinine, ready-made clothing, margarine, biscuits and electric light bulbs. After World War II, all products which had previously been imported were now being manufactured at home especially chemical industry (De Vries, 1978: 17) and exploratory borings for oil and gas, suspended during the war, were revived (Lubbers and Lemckert, 1980). Initially, technical progress in the Netherlands was based on derived nature, having been modelled on examples from abroad. But, during the twentieth century, a national contribution was added. In this context, technological explosion was essential characteristic of the 'Sixties'.

3.1.2 Historical Development of Natural Gas Revenues

According to Percebois (1999), the European countries can be classified into three categories. First, countries in which the gas industry is still relatively integrated and not highly deregulated. Its capital ownership may be predominantly public (France, Italy, Greece, Ireland) or predominantly private (Belgium). Second, countries in which the deregulation process has started and where integration is often less marked than in the previous category of countries (Spain, Netherlands, Germany, and Austria). Additionally, a good proportion of the industry has already been privatised (Spain, Germany). Third, countries in which the deregulation, disintegration and privatisation process is at an advanced stage (United Kingdom).

In 1904, a systematic search for useful natural resources started with the establishment of the National Institute for the Prospecting of Minerals. On the other side, the exploitation of coal mines in Zuid-Limburg stimulates with the establishment of the Dutch State Mines (DSM). Since 1930, the Dutch States Mines (DSM) has also been active in the chemical sector, as well as, with the replacement of coal by natural gas in the *"sixties";* DSM faced the necessity to concentrate on chemistry in the future[14].

On the basis of the discovery of natural gas reserves in the Northern province of Groningen in 1960, it was estimated that 50 billion meter cubic (m3) of natural gas was present. In 1965, the official estimates of natural gas reserves were around 1,500 billion m3 and two years later they stood at 2,200 billion m3.[15] After 1967, the share of natural gas could be considered as proven reserves continued to increase. Throughout the *"Sixties"*, the Dutch authorities realized the importance of energy supply and development of economic policy both at national and international level.[16] Over the years, the Netherlands has developed a significant and high-quality oil and gas industry. Overall, total gas revenues nominally amount to 150 billion Euros.[17] At present, Dutch gas production is generating five billion Euros annually in state revenues. Thirty percent of these revenues are paid into the Fund for Enhancement of the Economic Structure. This fund finances investments in 'hard' and knowledge infrastructure, whereas, the remainder goes to the Treasury[18].

3.1.3 Descriptive Analysis of the Netherlands Natural Gas (1960-2006)

We calculated[19] the share of natural gas exports as a percentage of total exports because the time series (1960-2006) data is not available. But, we collected the statistical data on total exports and gas exports from Central Bureau of Statistics (CBS), the Netherlands[20] in Million Euro. We examined that the share of natural gas exports was 16.94 % in total exports of Netherlands during the time period 1960-69, but it had increased from 16.94 % to 86.7% during the

[14] De Vries (1978: 17)
[15] Lubbers and Lemckert (1980)
[16] Lubbers and Lemckert (1980: 87-113)
[17] Golombek, et.al (1995)
[18] ibid
[19] Own calculations [By multiplying the gas exports (a) with 100 (b), we get value (c), than divide this value by total exports (d). Therefore, we get the share of gas exports in total exports (e), which is equal to (c/ d)].
[20] In Dutch, it is known as, Centraal Bureau voor de Statistiek (Central Agency for Statistics), CBS

time period from 1960-69 to 1970-79, respectively. These figures indicate the symptoms of Dutch Disease during this time period and confirm our rentier hypothesis, as shown in Table 3.1. Whereas, the share of natural gas exports in total exports was 33.73%, 21.94% and 15.28% during the time period 1980-1989, 1990-99 and 2000-06, respectively. The huge decline in share of gas exports from 86.7 % (1970-79) to 15.28 % (2000-06), might be, due to change in gas prices and policy perspectives towards the stability of total exports. These finding confirms our institutional hypothesis.

As a comparison, when we examined the natural gas rents (% of GDP), which is another measure of natural resources, we also find the similar trends. The statistical data on natural gas rents has been collected from the World Development Indicators (WDI), which is the most reliable source of data. The shortcomings of the data: the values on natural gas rents (% of GDP) from the period 1960-1969 are not available, as shown in Table 3.1.

We obtained data for each year, from the 1960 to 2006, but we calculated the average values for the periodical analysis into five periods, that are, (1960-69), (1970-79), (1980-89), (1990-1999) and (2000-2006). The share of natural gas rents (as a percentage of GDP) were higher, such as, 2.42% and 3.24% during the time period 1960-69 and 1970-79, respectively, as compared with the share of natural gas rents were lower, such as, 1.06% and 1.75% during the time period 1990-99 and 2000-06, respectively.

Table 3.1: Time Period Analysis of the Netherland's Natural Gas Exports and Natural Gas Rents (1960-2006)

Years	Share of natural gas exports in total exports	Natural gas rents (% of GDP)
1960-69	16.94	0[21]
1970-79	86.7	2.47
1980-89	33.75	3.24
1990-99	21.94	1.06
2000-06	15.28	1.75

Source: CBS StatLine (2012) &WDI (2011)

In early 1986, the fall in the oil prices, about half than previous, also led to a sharp decline in the gas rent and most importantly, a fundamental change in the perspective on the European energy market, when the decision made by Saudi Arabia and other Middle East oil producers (Radezki, 1999). For example, the import prices of gas to Western Europe declined from an average of $3.7/mmBTU in 1984-1986 to $2.3 in 1987-1989, or by almost 40% (BP Review of World Gas, 1991), and have remained at the lower level for most of the time during the 1990s (Radezki, 1999 : 19). In addition, liberalization of East Europe gas market (around 1990) and new opportunities for established gas market actors, as well as, for new entrants provided a framework for the

[21] Data values are not available during this time period.

implementation of structural change[22]. In turn, there is also a possibility of decline in the gas prices, in the case of the Netherlands, might be, due to the emergence of these new gas exporters, for example, Russia. Overall, these emergent circumstances highlighted the changes in the gas market during the period of late 1980s and early 1990s.

We described the natural gas supply, indigenous production[23] and consumption patterns (1960-2006) of the Netherlands in Table 3.2. The statistical data on these variables collected from CBS in Million cubic meters. These average values indicate the higher supply and indigenous production of natural gas in Netherlands, up to 1970 onwards. As shown in Table 3.2, the rapid increase in total supply and indigenous production of natural gas, from 3736 (1960-69) to 37623 (1970-79) and 5125 (1960-69) to 76033 (1970-79), respectively, also indicates the presence of Dutch Disease during this time period. After 1980s, the data shown that there is no rapid increase in the values of supply and production of natural gas. But, the data on the consumption of natural gas is not available (1960-89) in CBS statistics. Therefore, we would explore another source for the appropriate analysis.

Table 3.2: Time Period Analysis of the Netherland's Natural Gas Supply, Indigenous Production and Consumption in Million Cubic Metres (1960-2006)

Years	Total Supply	Indigenous Production	Total Consumption
1960-69	3736	5125	0[24]
1970-79	37623	76033	0[25]
1980-89	40887	77078	0[26]
1990-99	45939	80303	47347
2000-06	47115	73380	47115

Source: CBS StatLine (2012)

In line with Gylfason (2001a: 3) results, as we already mentioned in the previous chapter, we also find that the exports of goods and services had increased during the period 1970-2006 (Table 3.3). The numerical analysis of imports and exports indicates the presence of trade surplus during the time period 1970-2006, except the time period of 1960-69, as shown in Table 3.3. Most importantly, the share of gas exports in total exports[27] was very higher during the time period (1970-79), when we made a comparison between exports of goods and services and exports of natural gas. These statistical values have been obtained from CBS, in Million Euro for each year (1960-

[22] Radezki, 1999
[23] It means extraction of natural gas from nature, on-shore and off-shore in the Dutch territorial part of the North Sea. The maps are available in Appendix (A.21).
[24] Data on consumption is not available in CBS StatLine, during this time period
[25] ibid
[26] ibid
[27] Already, we have described in the Table 3.1.

2006). But, we have taken[28] the average values of these time series, by dividing them into five time periods, such as, (1960-69), (1970-79), (1980-89), (1999-2000) and (2000-06), for the periodical analysis.

We obtained the statistical values of natural gas production, domestic consumption, imports and exports in Billion Cubic Meters, from International Energy Agency (IEA) Report, (2000; 2006) which is also most important, reliable and accurate source for natural gas information. We also calculated the average values of these variables, as shown in Table 3.4. The data for the time period 1960-70 is not available, which is the drawback of IEA source. Whereas, we obtained the values of natural gas domestic consumption (1970-89) from this source because these values are not available in CBS (as we mentioned in Table 3.2). The numeric's explains the higher rate of production during the decade 1971-80. The consumption of natural gas is less than production, in every time period, as shown in Table 3.4.

Table 3.3: Time Period Analysis of the Netherland's Imports, Exports and Gas Exports in Million Euros (1960-2006)

Years	Imports of Goods & Services	Exports of Goods & Services	Gas Exports	Gas Exports Share
1960-69	13788	13641	2311	16.94
1970-79	48044	49725	43113	86.7
1980-89	103225	109566	36981	33.75
1990-99	165922	180745	39657	21.94
2000-06	291277	324303	49581	15.28

Source: CBS StatLine (2012)

Table 3.4: Time Period Analysis of the Netherland's Natural Gas Production, Domestic Consumption, Imports and Exports in Billion Cubic Meters (1971-2006)

Years	Production of Natural Gas	Consumption of Natural Gas	Imports of Natural Gas	Exports of Natural Gas
1971-80	96.21	42.27	4	57.72
1981-90	77.92	43.28	2.98	40.73
1991-00	83.68	48.9	6.49	41.84
2000-06	78.25	50.23	23.19	51.22

Source: IEA Report (2006)

These results are slightly different from the previous analysis, due to the variations in data sources and measurement units. The natural gas imports and exports statistical data confirms the analysis of various studies[29]that the exports are very higher than imports of natural gas, may be due to self-sufficiency of the Netherlands in natural gas production. These data findings seem to be

[28] Own calculations

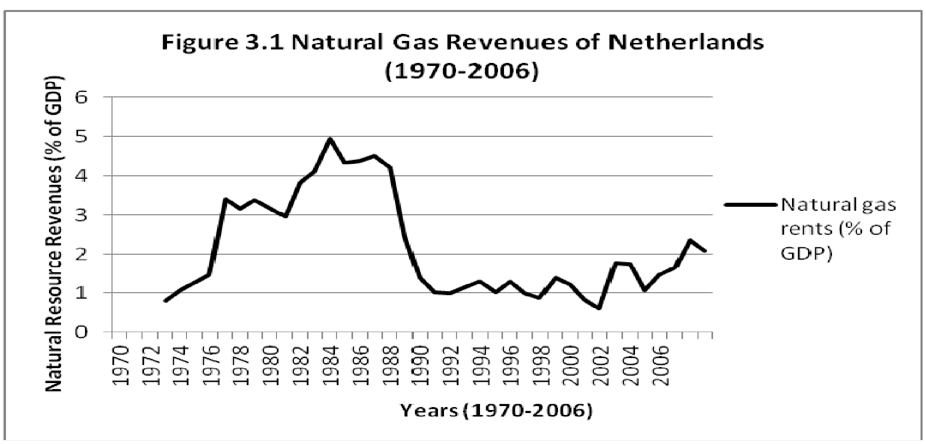
[29] Stern, 2002; Percebois, 2008 and Holz, 2009

claiming that our investment hypothesis is true, in this regard. Because, increase in gas production and exports allowed the Netherlands to move from position of net energy importers to net exporters (Hutchison, 1994; Di John, 2007).[30]

3.2 Impact of Natural Resource Rents on Macroeconomic Variables of the Netherlands (1960-2006)

In this section, we have examined the impact of natural resource rents (windfall gains) on macroeconomic variables[31] for the time period 1960-2006, in the case of the Netherlands. The purpose is to investigate the role of natural gas rents for the development of the economy, whether these resource revenues generate 'Dutch Disease' effect and the phenomena of natural resource curse. We presented a graphical analysis of natural resource rents, current account trends, exchanges rates and manufacturing value added, as shown in Figure 3.1, 3.2, 3.3 and 3.4, respectively. The data on rents (1970-2006) and current account (1969-2006) obtained from WDI (2011) data sources, whereas, the data on exchange rates (1960-2006) and manufacturing value added (1970-2006) obtained from BOPS (2011) and CBS StatLine (2012), respectively. The differences in the time period occurred due to the non availability of data values in these statistical sources.

Figure 3.1: Natural Gas Revenues of the Netherlands (1960-2006)

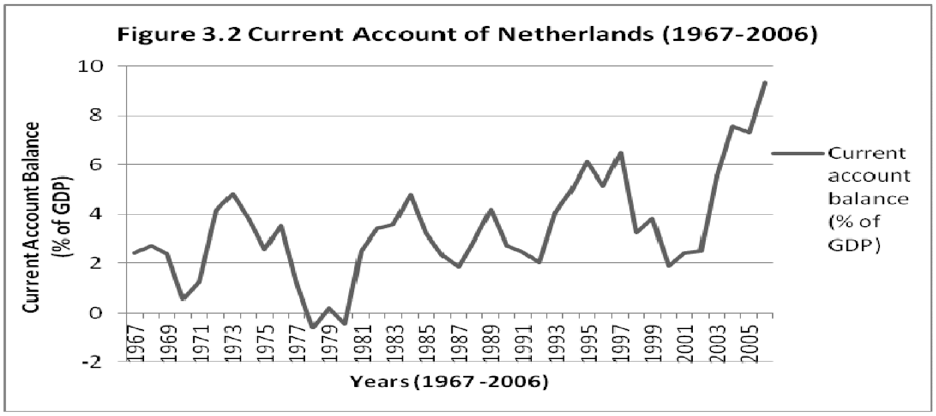


Source: WDI (2011)

The Figure 3.1 explains that the share of natural gas rents was higher, around 5%, during the time period 1980-82. Then, there was decline in these resource rents from 4% to 1% during the time period from 1984 to 1988, as

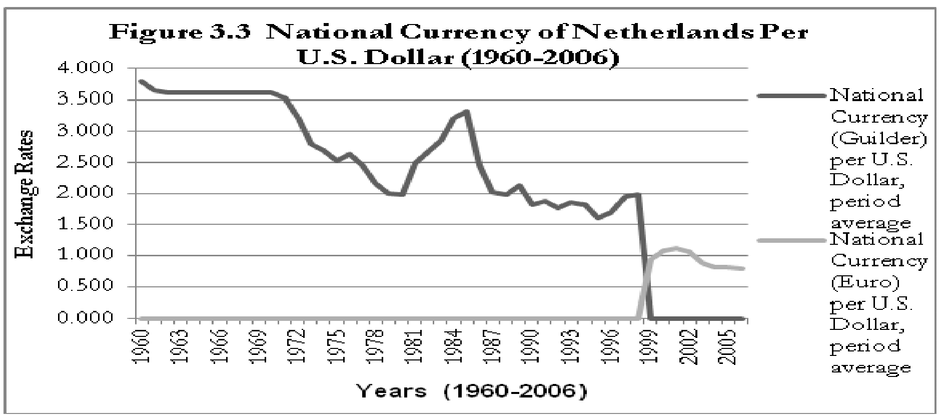
[30] These references mentioned in chapter 2.
[31] Definations are available in appendix (A.19).

Figure 3.2: Current Account Trends of the Netherlands (1960- 2006)



Source: WDI (2011)

Figure 3.3: Exchange Rate Trends of the Netherlands (1960-2006)



Source: BOPS (2011)

Figure 3.4: Manufacturing Value Added Trends of the Netherlands (1970-2006)

Source: CBS StatLine (2012)

shown in Figure 3.1. Since 1990, the share of these resource rents has balanced, average 1.5%, due to decrease in gas prices and emergence of new gas markets through the process of liberalization, as well as, the Dutch policy towards the stabilization of resource rents through the introduction of 'Fund for Enhancement of Economic Structure'. Now, we can seen that the rise of natural resource rents (Figure 3.1), during the time period (1980-82), also explains the current account surplus (Figure 3.2), appreciation of the national currency[32] (Figure 3.3) and decline in the share of manufacturing value added in the similar (1980-82) time period. Therefore, these results favour our rentier hypothesis and confirm the presence of 'Dutch Disease' during this time period.

3.3 Time Period Analysis of Macroeconomic Variables of the Netherland's (1960-2006)

In this section, we examined the variation in macroeconomic variables through time series analysis. We described the average values[33] of macroeconomic variables, such as, domestic product at net and gross market prices; national income at net and gross market prices;[34], as Shown in Table 3.5. The statistical data has been obtained on each year from CBS (2012), from the time period 1960 to 2006, in Million Euros. These macroeconomic variables indicate the rapid increase in the values, after 1970s. Therefore, we connect these rapid increases in macroeconomic variables (1970-2006) of Netherlands with the availability of natural resource rents. It is possible that the increases in macroeconomic variable statistics are associated with the increase in natural resource rents.

Table 3.5: Time Period Analysis of the Netherlands Domestic Product and National Income (1960-2006)

Time Period	Domestic Product (Million Euros)		National Income (Million Euros)	
Years	Net Market Prices	Gross Market Prices	Net Market Prices	Gross Market Prices
1960-69	28972	31936	29349	32313
1970-79	90381	103296	92001	104466
1980-89	167934	195551	168678	196295
1990-99	259856	305130	260839	306112
2000-06	408114	478981	415575	486412

Source: CBS StatLine (2012)

[32] The two different lines (Figure 3.3) indicate the conversion of Guilders (1960-1997) into Euros (1998-2006), after 1998 time period.
1 Dutch Guilder (1 Euro)= 0.45Euro (2.2037 Dutch Guilder)
[33] Own calculations
[34] We defined these variables in Appendix (A.19).

For example, the values of domestic product are 28972 and 31936, both at net and gross market prices, respectively, during the time period 1960-69. As compared with the previous decade, we find that the values of domestic product are higher during the time period 1970-79, such as, 90381 and 103296, both at net and gross market prices, respectively. Similarly, it can be seen that there is continuously increase in domestic product during the time period 1980-2006, as shown in Table 3.5. The values of national income are 29349 and 32313, both at net and gross market prices, respectively, during the time period. As compared with the previous decade, we find that the values of national income are higher during the time period 1970-79, such as, 92001 and 104466, both at net and gross market prices, respectively (Table 3.5). Furthermore, there is continuously increase in national income during the time period 1980-2006. As a result of these findings, we can say that there is positive relationship between measures of economic growth (domestic product, national income) and natural resource revenues.

Table 3.6: Time Period Analysis of the Netherlands Wages, Social Contributions, Operating Surplus and Taxes in Million Euros (1960-2010)

Years	Wages & Salaries	Employer's Social Contributions	Operating Surplus/ Mixed Income	Taxes on production and imports less subsidies
1960-69	13319	2641	8447	2589
1970-79	46019	12946	23124	8742
1980-89	81527	23741	47127	15539
1990-99	133125	24178	72666	29888
2000-06	191267	50774	112469	53604

Source: CBS StatLine (2012)

Besides these results, we also explored the components of GDP, such as, wages and salaries; employer's social contributions; operating surplus and taxes. The data obtained from CBS StatLine (2012) and we calculated the average values of these variables, as shown in Table 3.6. Moreover, we also find the similar increasing trends in the components of GDP.

Table 3.7: Time Period Analysis of the Netherlands Government Spending on Education, Savings, Consumption and Unemployment Rate (1960-2006)

Years	Government Spending on education	Government Spending on education Per Person	Net Savings	Consumption	Unemployment Rate (% of GDP)
1960-69	25	26	32	29	28.8
1970-79	94	93	102	97	80.9
1980-89	160	149	232	184	204.8
1990-99	212	166	375	284	156.7
2000-06	348	281	654	456	116.85

Source: CBS StatLine (2012)

When we examined the other indicators of natural resource literature, generally, we find an overall increase in the government spending on education and education per person, net savings and consumption and supports our investment hypothesis, as shown in Table 3.7. The saving values are also higher than consumption values during all the time periods. These data values are obtained from CBS (2012) in Million Euros. On the contrary, we also find a rapid increase in unemployment rate, which indicates the leisure and consumption use of resource revenues and supports rentier hypothesis. The data of unemployment obtained from WDI (2011) in percentage values.

3.3.1 Time Period Analysis of the Netherland's Social Contributions (1960-2006)

Many studies in the literature[35] indentify the 'Dutch Disease' in the Netherlands with the rapid increase in social contributions. Therefore, we analyzed the data of social contribution through the division into different categories, such as, social benefits; disability benefits; unemployment benefits; old age pensions and income support benefits. Similarly, we also calculated the average values of these benefits, as shown in Table 3.8. The data values are obtained from CBS with base year (1975) and values are available in the form of number of people[36]. Interestingly, our results support the literature studies. Because, the increase in the values of these benefits (as shown in Table 3.8) indicates that the higher number of people are getting these benefits.

Table 3.8: Time Period Analysis of the Netherland's Social Contributions through Social Benefits, Disability Benefits, Unemployment Benefits, Old Age Pensions and Income Support Benefits (1960-2006)

Years	Social Benefits	Disability Benefits	Unemployment Benefits	Old Age Pensions	Income Support Benefits
1960-69	55.5	48.9	38.4	76.5	47.4
1970-79	108.3	110.1	67.7	98.9	80
1980-89	102	186	192.2	138.3	184.7
1990-99	75.6	221.8	413.6	181.5	185.8
2000-06	30.14	229.57	337	209.42	136.42

Source: CBS StatLine (2012)

Moreover, these results indicate that the numbers of people are higher in unemployment benefits, as compared with other benefits. This analysis shows the consumption use of resource revenues instead of production use and also supports our rentier hypothesis.

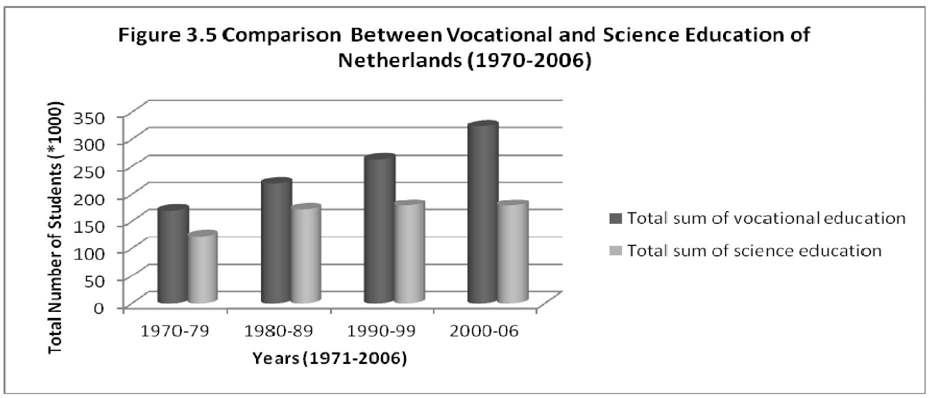
[35] See Chapter 2.

[36] Number of people is equal to 1000.

3.3.2 Time Period Analysis of the Netherland's Educational System (1960-2006)

According to educational results (Table 3.7), we find an increase in government spending on education and government spending on education per person. Generally, these results support our investment hypothesis. To look at this hypothesis in another way, we made a comparison between vocational and science education for the more detailed analysis. The comparative results indicate that the numbers of students are higher in vocational education, as compared with science education, as shown in Figure 3.5.

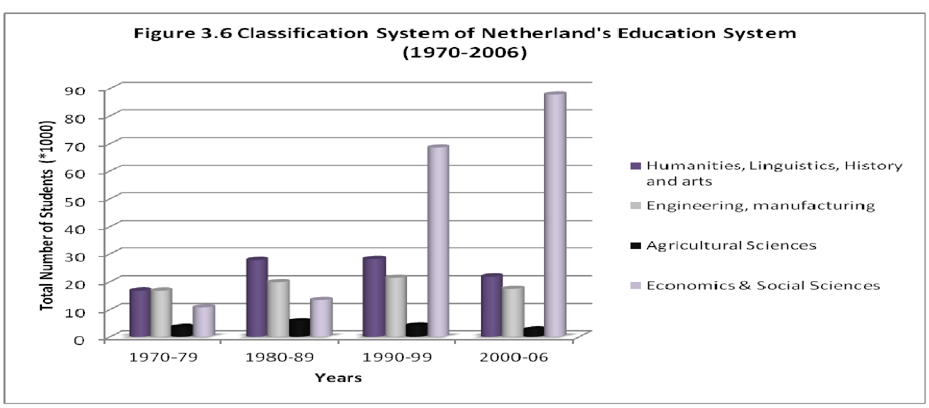
Figure 3.5: Comparison between Vocational and Science Education of the Netherland's (1970-2006)



Source: CBS StatLine (2012)

Furthermore, we divided the Netherland's educations system into different classifications, as shown in Figure 3.6. This classification system justifies our previous results (Figure 3.5), in favour, that total numbers of students are higher in humanities; arts and social sciences, as compared with science education, such as, engineering and manufacturing studies. Therefore, these detailed analyses of the Netherland's educational system support our rentier and institutional hypotheses, instead of investment hypothesis.

Figure 3.6: Classification System of the Netherland's Education System (1970-2006)



Source: CBS StatLine (2012)

3.3.3 Time Period Analysis of the Netherland's Political and Institutional Structure (1996-2006)

In order to explore the Institutional hypothesis, we need to examine the governance indicators, such as, voice and accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law and control of corruption, as shown in Table 3.9. We conclude that the Netherlands has a higher rank among all countries. The data on these variables obtained from 'The Worldwide Governance Indicators' (2012) for the time period 1996-2006. Institutionally, the Netherlands seems well positioned to use abundant natural resource revenues productively, though the higher revenues in the time period (1973-1985) suggest a learning experience with a possible 'rentier' (welfare) element.

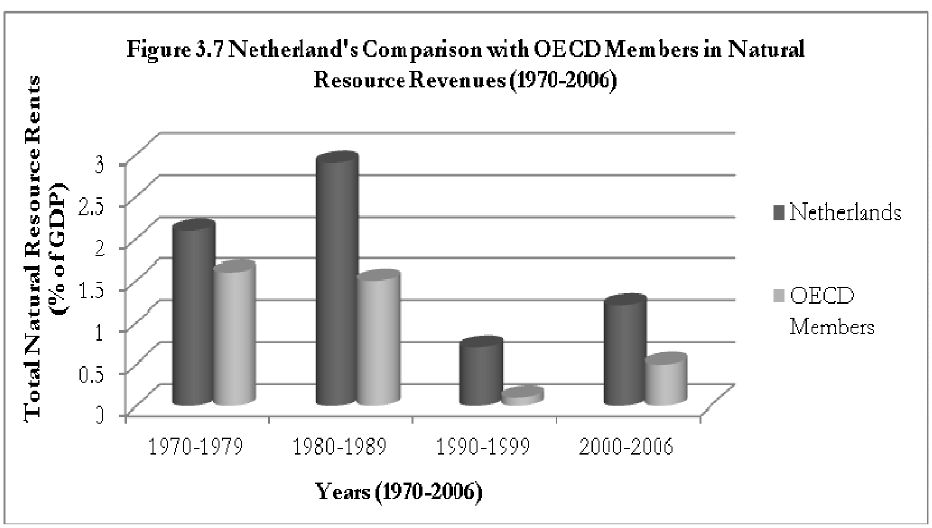
3.4 Time Period Comparison of the Netherlands with OECD Members (1970-2006)

In this section, we consider the comparative analysis of the Netherlands with OECD Members in macroeconomic indicators.

3.4.1 Comparative Analysis of the Netherlands with OECD Members in Natural Resource Revenues (1970-2006)

The Netherlands has higher share of natural resource rents as compared with OECD members during the period 1970-2006, as shown in figure 3.7. The data obtained from World Development Indicators (WDI, 2011) for the time period 1970-2006, because the data is not available, prior to 1970s period. It can be shown that the lower share of resource revenues indicates the emergence of new gas markets (Russia) and structural changes, both Netherlands and OECD Members, during the time period 1990-2006.

Figure 3.7: The Netherland's Comparison with OECD Members in Natural Resource Revenues (1970-2006)



Source: WDI (2011)

Table 3.9: Time Period Analysis of Governance Indicators in the Case of the Netherlands (1995-2006)

Indicators	Legend	1996	1998	2000	2002	2003	2004	2005	2006
Voice and Accountability	*Esti-mate*[37]	1.60	1.63	1.60	1.49	1.51	1.72	1.68	1.59
	StdErr[38]	0.22	0.23	0.22	0.20	0.19	0.19	0.19	0.17
	NumSrc[39]	6.00	6.00	7.00	8.00	8.00	8.00	8.00	9.00
	Rank[40]	99.04	100.00	98.56	96.63	97.12	98.08	99.04	99.52
	Lower[41]	87.08	88.52	88.04	88.04	88.04	90.91	90.43	91.39
	Upper[42]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Political Stability and Absence of Violence	*Estimate*	1.44	1.51	1.66	1.22	1.15	1.00	0.95	0.87
	StdErr	0.36	0.34	0.30	0.28	0.28	0.28	0.27	0.26
	NumSrc	4	4	5	6	6	7	7	7
	Rank	100	100	100	94	88	81	79	75
	Lower	75	79	88	72	69	64	63	61
	Upper	100	100	100	100	100	99	96	95
Government Effectiveness	*Estimate*	2.01	2.07	2.08	2.00	2.03	2.12	1.95	1.78
	StdErr	0.23	0.21	0.21	0.19	0.19	0.21	0.19	0.20
	NumSrc	5	5	5	5	5	5	5	6
	Rank	99	100	99	97	98	98	98	95
	Lower	90	92	91	91	92	91	92	88
	Upper	100	100	100	100	100	100	100	99
Regulartory Quality	*Estimate*	1.81	1.89	2.08	1.86	1.74	1.79	1.67	1.68
	StdErr	0.27	0.27	0.23	0.23	0.20	0.21	0.19	0.21
	NumSrc	6	6	6	6	6	6	6	6
	Rank	98	98	100	99	98	98	98	97
	Lower	90	93	95	92	91	90	90	89
	Upper	100	100	100	100	100	100	100	100
Rule of Law	*Estimate*	1.65	1.74	1.72	1.69	1.71	1.76	1.75	1.77
	StdErr	0.19	0.19	0.16	0.18	0.18	0.17	0.17	0.17
	NumSrc	7	7.00	8.00	8.00	8.00	8.00	8.00	9.00
	Rank	96	95.69	95.69	95.22	95.22	95.22	95.22	95.69
	Lower	90	91.43	91.43	90.00	90.48	91.90	90.95	90.48
	Upper	100	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Control of Corruption	*Estimate*	2.22	2.27	2.32	2.18	2.08	2.02	1.97	2.08
	StdErr	0.23	0.19	0.23	0.18	0.20	0.18	0.18	0.19
	NumSrc	5	5	5	5	5	6	6	7
	Rank	98	98	98	97	96	96	96	96
	Lower	93	93	93	93	92	92	93	92
	Upper	100	100	100	100	99	98	99	99

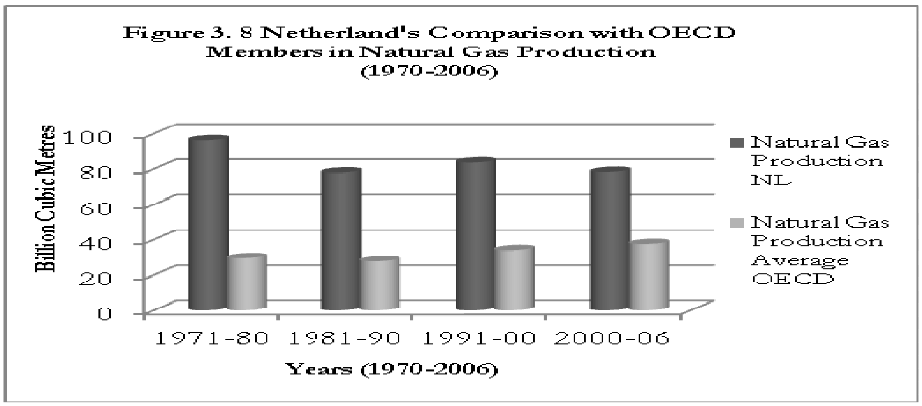
Source: Kaufmann, et. al. (2010)

[37] Governance Estimates [It ranges from -2.5 (weak) to 2.5 (Strong) governance performance]
[38] Standard error (It reflects variability around the point estimate of governance)
[39] It represents number of data sources on which estimate is made.
[40] Percentile rank among all countries [It ranges from 0 (lowest) to 100 (highest) rank]
[41] Lower bound of 90% confidence interval for governance (percentile rank terms)
[42] Upper bound of 90% confidence interval for governance (percentile rank terms)

3.4.2 Comparative Analysis of the Netherlands with OECD Members in Natural Gas Production, Consumption, Imports and Exports (1970-2006)

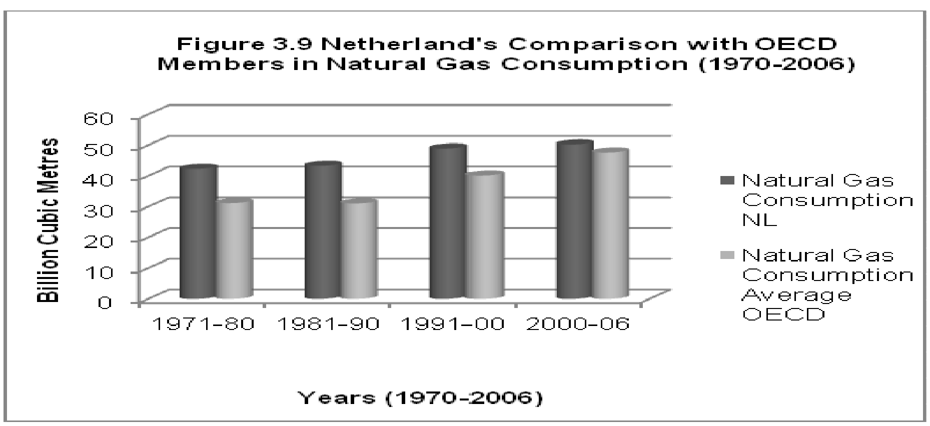
Furthermore, we also compared the Netherlands natural gas production, consumption, imports and exports statistics with OECD Members, as shown in Figure 3.8, Figure 3.9, Figure 3.10 and Figure 3.11, respectively. We obtained the statistics from International Energy Agency (IEA, 2000; 2006), which is the most accurate and reliable source of energy information.

Figure 3.8: The Netherland's Comparison with OECD Members in Natural Gas Production (1970-2006)



Source: IEA (2000, 2006)

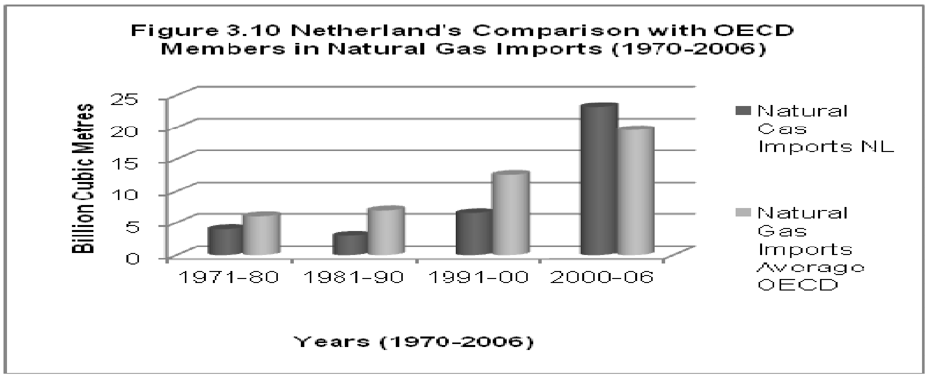
Figure 3.9: The Netherland's Comparison with OECD Members in Natural Gas Consumption (1970-2006)



Source: IEA (2000, 2006)

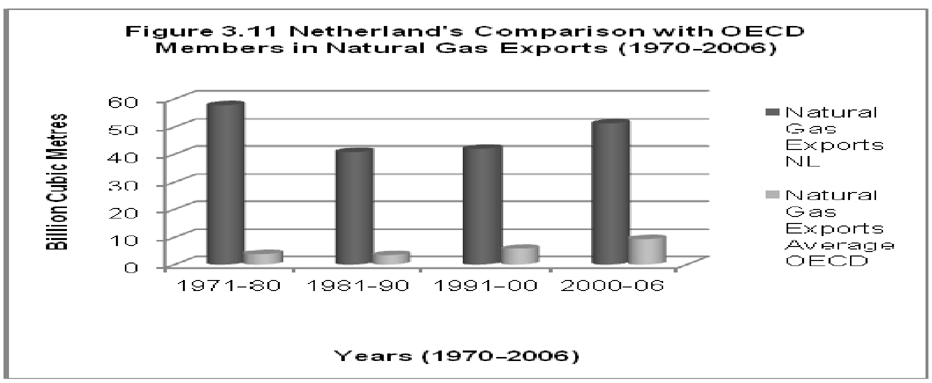
We calculated the average value for each decade period, such as 1971-80, 1981-90, 1991-00 and 2000-06, for the appropriate comparison among the time periods. In short, the statistical analysis explains that the Netherlands has higher level of production and exports of natural gas, as compared with OECD Members. With respect to consumption of natural gas, the Netherlands has slightly higher values as compared with OECD Members. Regarding the imports trends, the Netherlands has lower trends as compared with OECD Members, except the time period (2000-06). These changes in import trends indicate the shift in policy perspectives towards the sustainability of natural gas.

Figure 3.10: The Netherland's Comparison with OECD Members in Natural Gas Imports (1970-2006)



Source: IEA (2000, 2006)

Figure 3.11: The Netherland's Comparison with OECD Members in Natural Gas Exports (1970-2006)

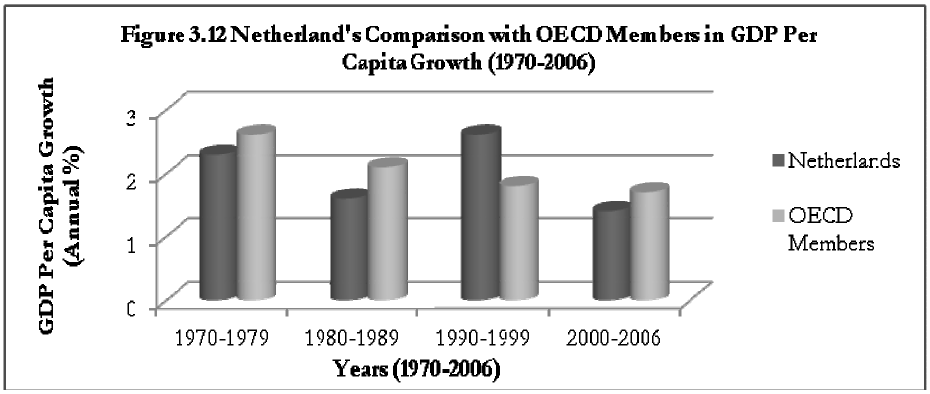


Source: IEA (2000; 2006)

3.4.3 Comparative Analysis of the Netherlands with OECD Members in GDP Per Capita Growth (1970-2006)

In figure 3.12, it is shown that the GDP Per Capita Growth is higher in OECD Members as compared with the Netherlands, during the period 1970-1989. These decade results confirm the 'Dutch Disease' effect on the Netherlands. On the one side, the Netherlands has higher GDP Per Capita as compared with OECD Members, average 2.5 percent, during the time period 1990-1999, possibly, due to a management of resource rents and a shift strategy. These higher values support the investment and institutional hypothesis. On the other side, the growth rate of Netherlands has lower, might be due to the inclusion of new OECD Members, during the period 2000-2006 as compared with the OECD Members.

Figure 3.12: The Netherland's Comparison with OECD Members in GDP Per Capita Growth (1970-2006)

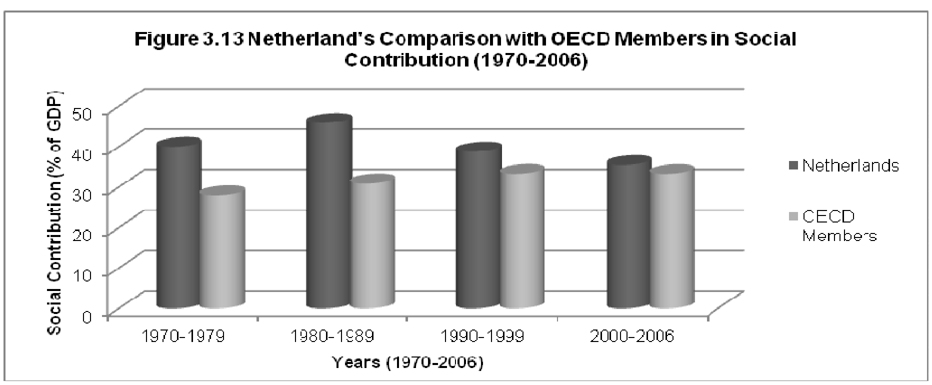


Source: WDI (2011)

3.4.4 Comparative Analysis of the Netherlands with OECD Members in Social Contribution[43] (1970-2006)

The Netherlands has higher level of social contribution as compared with OECD Members (as shown in figure 3.13), during the time period 1970-2006. We already mentioned the different categories of social contribution in Table 3.8. In relation with the figure 3.7, the contribution of natural resource rents was higher during the time period 1980-1989 as compared to other decades.

Figure 3.13: The Netherland's Comparison with OECD Members in Social Contribution (1970-2006)



Source: WDI (2011)

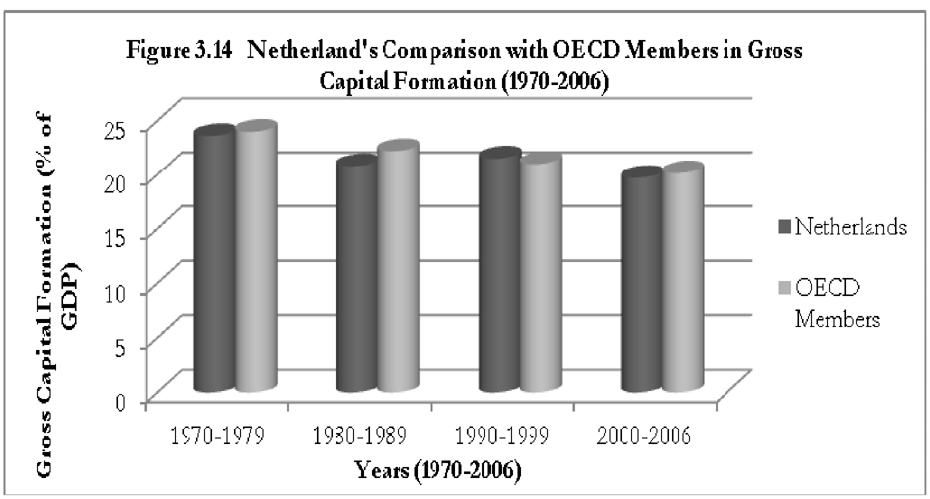
[43] Data on social contribution (1995-2006) is available on WDI (2011). Therefore, we use another source (Bos, 2008) for time period (1970-2006) in the case of Netherlands. But, we assume the similar average values (WDI, 2011) for the previous time period, in the case of OECD Members.

Similarly, the share of social contribution of Netherlands was also very higher during 1980-1989, as compared to other decades. This relation can be seen as that the higher resource rents become the cause of a more generous welfare system in Netherlands. In comparison with GDP Per Capita Growth (Figure 3.12), we also find that share of social contribution is lower in the last two decades (Figure 3.13). These findings justify the diminished rentier effect and also support institutional and investment hypothesis, especially during the decade (1990-99).

3.4.5 Comparative Analysis of the Netherlands with OECD Members in Gross Capital Formation (1970-2006)

In Figure 3.14, the Netherlands have higher trends in the gross capital formation during the time period 1990-1999 as compared with OECD Members. These results also indicate the productive use of natural resources through the implementation of resource management policies, after 1990s. Whereas, in other time periods the Netherlands and OECD Members have similar trends in the gross capital formation, which is also formally known as 'gross domestic investment.' In comparison with GDP Per Capita Growth (Figure 3.12) and social contribution (Figure 3.13), we also find an increase in gross capital formation during the similar decade (1990-99). On the basis of these comparisons, we conclude that these results support rentier hypothesis during the decades (1970-89), along with the investment and institutional hypotheses during the decades (1990-99). We also find mixed results in the time period (2000-06).

Figure 3.14: The Netherland's Comparison with OECD Members in Gross Capital Formation (1970-2006)

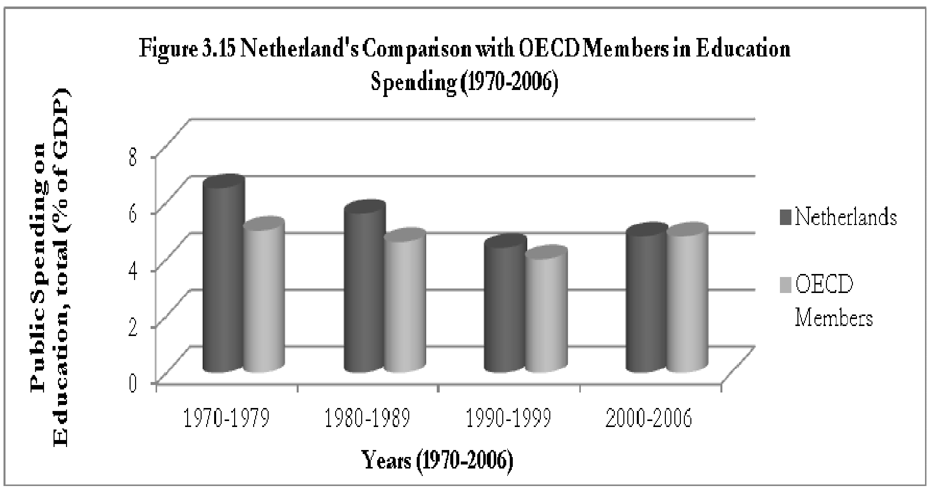


Source: WDI (2012)

3.4.6 Comparative Analysis of the Netherlands with OECD Members in Public Spending on Education (1970-2006)

When we compared the public spending on education as an measurement of human capital between the Netherlands and OECD Members (as shown in figure 3.15), we find that the percentage of public spending on education is higher in Netherlands as compared with OECD Members. For example, the percentage of public spending on education is around 6% during 1970-1979 in case of Netherlands, whereas the percentage of public spending on education is around 4.5 % during the time period 1970-1979 in the case of OECD Members, which is higher in the Netherlands as compared with OECD countries. With the passage of time period, the percentage of public spending has declined in both cases. Overall, the Netherlands have higher percentage in public spending on education as compared with OECD Members. These results indicate that the Netherlands has higher investment rate in the development of human capital, as compared with OECD Members.

Figure 3.15: The Netherland's Comparison with OECD Members in Education Spending (1970-2006)



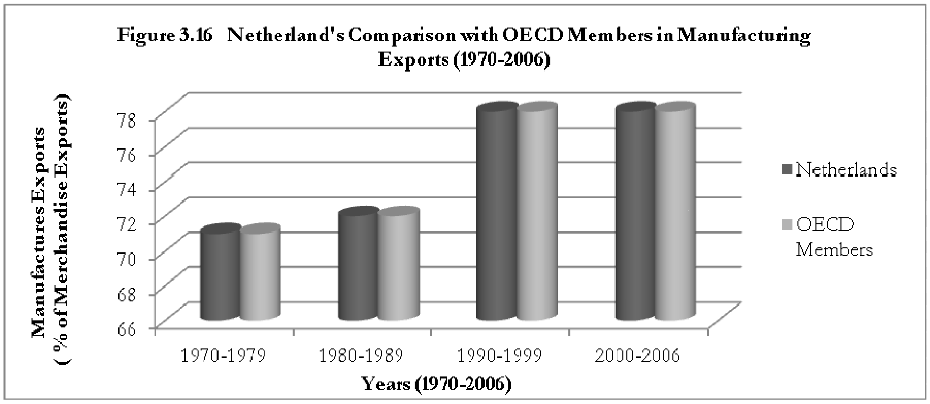
Source: WDI (2011)

3.4.7 Comparative Analysis of the Netherlands with OECD Members in Manufacturing Exports (1970-2006)

One of the main explanations of the Dutch Disease effect is that there is decline in the manufacturing exports and the country shift away from manufacturing exports. When we compared the Netherlands and OECD Members in manufacturing exports, we find the similar trends in both cases. Overall, the share of manufacturing is 72% in merchandise exports during 1970-1979, which is higher share as compared to other exports.

Similarly, the percentage of manufacturing exports has increased with time period, instead of decreased in manufacturing exports. These comparative results (Figure 3.16) also confirm the export analysis of Gylfason. The rapid increase during the time period 1990-99, might be due to liberalization process, emergence of new gas market actors, decline in the gas price due to competition and structural change, as we already examined these factors.

Figure 3.16: The Netherland's Comparison with OECD Members in Manufacturing Exports (1970-2006)

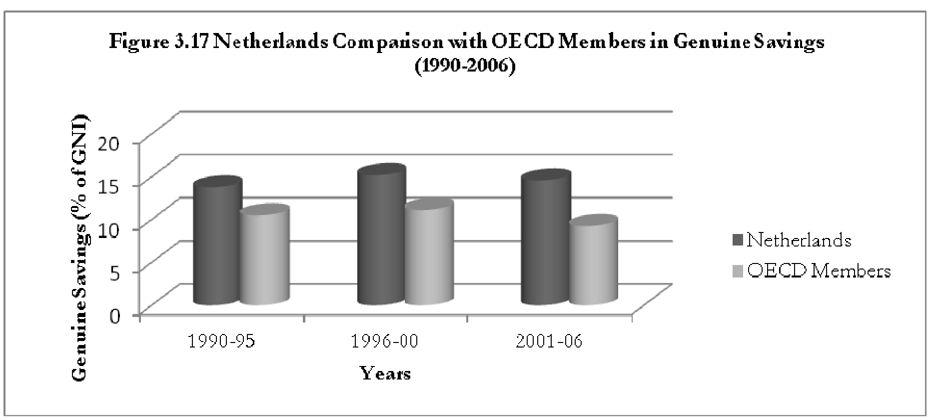


Source: WDI (2011)

3.4.8 Comparative Analysis of the Netherlands with OECD Members in Genuine Savings[44] (1990-2006)

When we compared the genuine savings of the Netherlands and OECD Members (as shown in figure 3.17), we find that the percentage of genuine savings is higher in the Netherlands as compared with OECD Members, but data is not available prior to 1990 in WDI (2011).

Figure 3.17: The Netherland's Comparison with OECD Members in Genuine Savings (1990-2006)



Source: WDI (2011)

[44] Definition is given in appendix (A.19).

3.4.9 Summary of Comparative Findings

Overall, the shares of natural resource rents are higher as compared with the OECD countries. This shows a potential for resource curse. The Netherlands have higher levels of production, consumption and exports of natural gas as compared with OECD countries. The percentage of gross capital formation and manufacturing exports has similar in both cases, but the Netherlands have higher social contribution and public spending on education as compared with OECD countries. Furthermore, when we made a detailed comparison across GDP Per Capita growth; social contribution; gross capital formation; public spending on education; manufacturing exports and genuine savings, the results favour the consumption use of resource revenues, during the decades (1970-1989), in the case of Netherlands. These findings also detect the symptoms of 'Dutch Disease' and support our rentier hypothesis during these decades. Our result not only supports the presence of 'Dutch Disease' and 'rentier hypothesis' during the decades (1970-89), but also, supports learning effects, 'investment' and 'institutional' hypotheses during the decades (1990-2006). Therefore, we consider this period (1990-2006) as a 'benchmark' period in the history of the Netherlands. Hence, different policy decisions had been taken during this period such as polder model[45], the idea 'from welfare to work', liberalization and structural change, both internally and externally.

3.5 Institutional Changes during 1990's

The main European natural gas producers are the UK, the Netherlands, Italy and Denmark. According to Stern (2002), the five European countries are self sufficient and net exporters of natural gas, for example, the UK; the Netherlands; Norway; Denmark and Albania. The European gas oligopoly is composed of Gazprom (Russia), Sonatrach (Algeria), GFU (Norway) and Gasunie (Netherlands). But, the role of the European Commission is to limit monopoly rents and to improve the welfare for each consumer. There is no real common energy policy in Europe but a simple consensus on three priorities: competitiveness, security and sustainability, as analyzed by Percebios (2008). The price of gas is strongly linked to oil price[46] because these two energies are substitutes and there is also some correlation between the two prices. Norway is a producer of natural gas at fairly high costs, but, Algeria and the European producers such as, United Kingdom and the Netherlands can export at relatively low costs to Europe (Holz, 2009).

Recently, the Netherlands has enjoyed sizeable deposits of natural gas resources and the government has received significant revenues from these natural resources. During their peak timings, these natural resource revenues had a great expansionary influence on government expenditure of the

[45] Dutch Policy based on 'Consensus' among government, labour unions and employers.
[46] Percebois, 2008

Netherlands.[47] With the passage of time, the government had adopted the policy of tight fiscal policy (increase in taxes) for the maintenance of additional expenditures, when these resource revenues dropped. Therefore, the increase in social benefits due to these natural resource revenues was referred the condition in the literature known as 'Dutch Disease.'

Now, gas revenues go into a special fund known as 'Economic Structure Enhancing Fund' during the time period in late 1980s and early 1990s. The purpose of the fund is to improve the economic infrastructure of the Netherlands such as high-speed rail links and highways. The fund expenditure is entirely based on the money that receives from gas revenues and other revenues from the sale of government property.[48] Because the objective of the fund is two-fold. The first objective is to remove these gas revenues from the budget debate and also remove their expansionary impact. The second objective is to guarantee that significant money would be spent on improving the country's economic infrastructure. In turn, economic infrastructure projects enhance the efficiency of the economy.

Due to these institutional changes in the Netherlands, our findings indicate the shift in the macroeconomic variables and show the learning effects, after 1990's. In this context, we agree with Stijns (2005) that the ability to turn the curse into a blessing depends on the nature of the learning process. Arguably, the resource revenues have had less effect on investment and manufacturing than might have been expected, but use of revenues for both 'rentier welfare' (especially in early years) and 'human capital development'[49] both seems to have occurred suggesting a tension between rentier and investment hypothesis. In fact, the genuine savings and the reduced level of indigenous production in the 1990s suggest sustainability. Therefore, we used an econometric technique for the significance of these results in the next chapter.

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[47] Blöndal, J.R. and J.K. Kristensen, 2002
[48] Blöndal, J.R. and J.K. Kristensen, 2002 & Bos, 2008
[49] It includes gross capital formation, manufacturing and spending on education.

Chapter 4
Econometric Methodology and Regression Results of the Netherlands (1970-2006)

Cross-sectional regression results may not seem to be appropriate because indices used in multi-country regression analysis are often crude proxies for the factors at work on the ground, as criticised by Auty (2007a; 2007b). In addition, these findings also vary with the data selected. For example, resource dependence may be measured on the basis of rent, exports, employment, or land endowment and the time period chosen for analysis also affects findings, such as, differences in the data availability among countries, the frequency of growth collapses during 1974–1985, and some countries subsequently adopted economic reform measures, whereas, others countries did not adopt these measures. Auty (2007a; 2007b) suggested the comparative analysis of country case studies, that measure rent flows and directly analyze their political and economic impacts, may give more efficient results rather than simply treating commodity revenues as a black box and measuring the assumed outcomes. We agree with Auty (2007a; 2007b) suggestion for the comparative analysis of time series country case studies, rather than cross-country regressions. Therefore, we used a country case study and time series analysis approach, rather than cross country approach.

4.1 Descriptive Analysis of the Netherlands through Econometric Methodology

We used the time period from 1970 to 2006 for the bivariate Engle Granger regression analysis. The justification is that, 1970s are the period of the start of a significant contribution of gas revenues in the GDP, as we already shown in the previous chapter. Whereas, the reason behind 2006 is that we do not include effect of recent financial and economic crisis in our regression analysis. In the literature, the question of causality is highly controversial. According to Diebold (2001: 254)

> '[T]he statement 'X causes Y' is just shorthand for the more precise, but longwinded, statement, X contains useful information for predicting Y.'

As Huang and Cameron (2011: 6) explained, the logic behind the Granger inspired test is simple 'causality does not run chronologically backwards'. In addition, the limitation of Granger test results is that they do not consider the influences of other variables. Therefore, we only used bivariate regression analysis and other explanatory variables are not included in the regression. In line with Diebold (2001), Huang and Cameron (2011: 8) also analysed that

> 'Past variations in the X appear to provide information that contributes to explaining variations in (the current) Y more than past variations of Y alone.'

The basic premise of Granger Causality is: since the future cannot predict the past, if a variable X Granger causes variable Y, then changes in X should precede changes in Y. The Granger test assumes that the information relevant to the prediction of the respective variables is contained solely in the time series data. This test assumes that all variables are stationary.

4.1.1 Adoption of Econometric Technique through Trial and Error Methods

First, we used five bivariate regressions for the analysis of the resource curse literature. Summary statistics (1970-2006) are given in appendix A.2. We used total natural gas rents as an independent variable, whereas, social contribution, gross capital formation, manufacturing exports, public spending on education and tertiary school enrolment as dependent variables. Social contribution is used, as a proxy, for the analysis of welfare or rentier economy, because, the increase in natural resource rents leads the country to welfare tendency and also creates a rentier economy. Rentier economy means that the use of natural resource rents in consumption side, instead of production side. We also define rentier economy as resource rents that are not contributing to the development of the country. Whereas, gross capital formation and manufacturing exports represents the productive side of the economy. We used two measures of education such as public spending on education and tertiary school enrolment. In this paper, the four variables are used for the analysis of physical and human capital development such as gross capital formation, manufacturing exports, public spending and tertiary enrolment. They also represent the productive side of the economy.

We used the data of the Netherlands in our study and found that results confirm the resource curse literature. For example, the negative sign of manufacturing exports indicates the effect of Dutch Disease. The negative sign of gross capital formation indicates the adverse effect of natural resource rents. There is positive relationship between public spending on education and natural resource rents, but, we could consider this variable as ambiguous good, in case of the Netherlands. Therefore, we consider the tertiary school enrolment as another measure of education. We also find negative relationship between tertiary school enrolment and resource revenues. Overall, when we used the Netherlands as a case study for the analysis of resource curse hypothesis (1970-2006), we find that there is more consumption use of resource revenues, instead of production use. Furthermore, we also divide the data for the detailed analysis into two time periods, such as 1970-1988 and 1989-2006[50]. Since, we did not find any significant change in the statistical results, therefore, we divide the data into four time periods, 1970-79; 1980-89; 1990-99 and 2000-06, for the more appropriate and accurate periodical analysis of the Netherland's experience.

The introduction of periodical methodology in cointegrating and ECM regressions is an innovative feature of this research paper. Prior to this paper,

[50] Results are not given due to space limitations and they are also not relevant to our findings.

no work has been done on the periodical analysis. In the literature, many cross country regressions had been used for the analysis of resource curse in almost similar time period without any periodical analysis, for example, Sachs and Warner (1995) for time period (1970-89); Wantchekon (1999) for time period (1970-98); Gylfason (2001) for time period (1980-1997); Stijns (2001) for time period (1970-1999); Bravo, et.al (2005) for time period (1970-1990); and Philippot (2010) for time period (1990-2003).

4.1.2 Periodical Time Series Analysis of the Netherlands (1970-2006)

After these trial and error techniques, we divide the data into four time periods for the periodical analysis of the Netherlands. It is possible that the long period of negative effect may hide the positive effect of other periods. Therefore, we used four time periods, such as, 1970-79; 1980-89; 1990-99 and 2000-06. We also redefined the categories. We used total natural resource rents as an independent variable for the measurement of natural capital. Moreover, we used different dependent variables, such as, manufacturing exports and manufacturing value added for the measurement of DD effect, gross capital formation, public spending on education and tertiary school enrolment for the measurement of human capital development and social contribution as a measurement of rentier effect and GDP growth as a measurement of resource curse. It is pertinent to mention here that we have also found different results, which can give more detailed contribution to the 'RC' literature.

4.2 Econometric Procedure[51] for the Netherland's Periodical Analysis (1970-2006)

First, we identified whether our time series are stationary or nonstationary. We used Autocorrelation Function (ACF) and correlogram tests and found that our time series are nonstationary. Furthermore, we also performed DF and ADF test for the detection of unit root. These tests confirm the presence of unit root and also indicate that the series are nonstationary. Second, we determined that all time series are integrated of the same order, I (1). Third, we estimated cointegration regression and performed DF and ADF test for the presence of unit root in the residuals of these regressions. The results confirm that the error term of these regressions are stationary in many regressions, while, the error terms are also nonstationary in some cases. It is the evident that these series are cointegrated and there exists a long-run relationship between these time series. But also, there are some series that are not cointegrated. Fourth, we performed Engle-Granger two step methods for the estimation of Error Correction Models.

Error Correction Models are useful for estimating both short term and long term effects of one time series on another time series. In addition, they

[51] Definations on econometric terms are given in appendix (A.20).

are used for integrated and stationary time series data and can be estimated with OLS. Therefore, we used first difference time series data and are integrated of order I (1). The integration process incorporates the effect of past shocks into the time series, permanently. The first difference of time series also solves the problem of spurious regressions. Overall, we performed seven bivariate cointegrating regressions with one independent variable (total natural resource rents) and seven dependent variables (social contribution, gross capital formation, education spending, manufacturing exports, manufacturing value added, tertiary enrolment and GDP). Mathematically, it can be represented as follows.

- The cointegrating regression can be determined through this equation:

Dependent variable = α + β Independent variable + μ

- β = It shows that long run changes in independent variable have a positive or negative impact on long run changes in dependent variable.

Now, this equation can also be calculated as:

μ = Dependent variable - α - β Independent variable

- Application of DF or ADF (also known as Engle-Granger and Augmented Engle Granger)[52] unit root test on the residuals estimated from the cointegrating regression, for the confirmation of cointegation relation between the time series.
- If two variables are cointegrated, than the relationship between the two can be expressed as ECM. It can be shown as:

Δ Dependent Variable = γ + δ Δ Independent Variable + $\varphi\mu$ (t-1) + ε

- δ = It shows that short run changes in independent variable have a positive or negative impact on short run changes in dependent variable.
- $\varphi\mu$ (t-1) = It represents that the equilibrium error term is zero and suggesting that dependent variable adjusts to changes in independent variable in the same time period. It is known as speed of adjustment.
- Δ = It represents first difference (Current Value – Lagged Value)

4.2.1 Cointegrating and ECM Regression Results of Time Period (1970-79)

Summary statistics (1970-79) are available in the appendix A.3. We followed the same steps in this regression analysis (1970-79), as we already mentioned in section 4.2. The nonstationary and stationary (first difference) trends of time

[52] Gujarati (2003 : 823)

series (1970-79) are also available in appendices A.9 and A.10. The results are shown in Table 4.1 and 4.2.

Table 4.1: Cointegrating Regression Results of Time Period (1970-79)

Independent Variable: Total Natural Resource Rents (OLS Results 1970-79)[53]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Tou Test of Cointegration
Social Contribution	10	2.8604*	30*	0.7942	34.093	1.704
Gross Capital Formation	10	-1.6744*	23.65*	0.7473	27.116	8.631*
Education Spending	10	0.3488*	13.5*	0.6279	5.767	1.387
Manu. Exports	10	0.3023*	1.65*	0.1709	70.465	3.385*
Manu. Value added	10	-1.2945*	7.69*	0.4902	24.148	0.595
Tertiary Enrollment	10	1.4728*	1.33	0.1428	18.906	1.409
GDP	10	-0.7209*	2.29*	0.2227	3.813	3.977*

Source: Own Calculations

Table 4.2: ECM Regression Results of Time Period (1970-79)

Independent Variable: Total Natural Resource Rents (ECM Results 1970-79)[54]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Speed of Adjustment
Gross Capital Formation	9	-0.1947	8.38*	0.7363	-0.5927	-0.8758
Manu. Exports	9	-0.0526	2.67*	0.4638	0.1652	-0.8838
GDP	9	0.7052**	22.05*	0.8802	-0.4379	-1.803

Source: Own Calculations

The results indicate that the time series of manufacturing exports and total natural resource rents are cointegrated and there exists a long term relationship between them. The long run impact of a change in natural resource rents on manufacturing exports is positive (0.3023) and statistically significant, whereas, the short run impact of a change in natural resource rents on manufacturing exports is negative (-0.0526), but it is not statistically significant. There is also negative and statistically significant long term relationship between gross capital formation and natural resource revenues. Similarly, the time series of GDP and total natural resource rents are cointegrated. The long run impact of a change in natural resource rents on GDP is negative (-0.7209) and statistically significant, whereas, the short run impact of a change in natural resource rents on GDP is positive (0.7052) and statistically significant.

[53] *0.05 **0.1 level of Significance
[54] ibid

To conclude, the short run changes in natural resource revenues have a positive impact on short run changes in GDP, whereas, the long run changes in revenues have a negative impact on long run changes in GDP; gross capital formation and a positive effect on long run changes in manufacturing exports. These statistical significant results indicate the presence of resource curse through GDP and confirm our rentier hypothesis, during this time period (1970-79). Other time series (social contribution, education spending, manufacturing value added and tertiary enrolment) are not cointegrated, during this time period. Therefore, we did not find any long run relationship in these bivariate regressions.

4.2.2 Cointegrating and ECM Regression Results of Time Period (1980-89)

Summary Statistics (1980-89) are given in appendix A.4. We followed the same steps in this regression analysis (1980-89), as we already mentioned in section 4.2. The nonstationary and stationary (first difference) trends of time series (1980-89) are shown in appendices A.11 and A.12, respectively. The Tou test of cointegration indicates that all bivariate regressions are cointegrated, except tertiary enrolment, during this time period. The statistical results of this time period are shown in Table 4.3 and Table 4.4.

The results indicate that the time series of social contribution and total natural resource rents are cointegrated and there exists a long term relationship between them. The long run impact of a change in natural resource rents on social contribution is positive (1.1858) and statistically significant, whereas, the short run impact of a change in natural resource rents on social contribution is positive (0.502) and statistically significant. Similarly, the time series of gross capital formation and total natural resource rents are cointegrated. The long run impact of a change in natural resource rents on gross capital formation is negative (-0.6394) and statistically significant, whereas, the short run impact of a change in natural resource rents on gross capital formation is negative (-0.2529) and statistically significant. The speed of adjustment is negative (-0.8923).

The long run (0.3197) and short run impact (0.1631) of a change in natural resource rents on education spending is positive in both periods and statistically significant, whereas, the speed of adjustment is negative (-0.3408). The long run (-1.442) and short run impact (-1.419) of a change in natural resource rents on manufacturing exports is negative, in both periods and statistically significant, whereas, the speed of adjustment is negative (-0.6542). Similarly, the long run (-0.2416) and short run impact (-0.7158) of a change in natural resource rents on manufacturing value added is also negative, in both periods and statistically significant, whereas, the speed of adjustment is negative (-0.3961). The time series of GDP and total natural resource rents are cointegrated. The long run impact of a change in natural resource rents on GDP is negative (-0.5353) and statistically significant, whereas, the short run impact of a change in natural resource rents on GDP is positive (0.0009), but it is not statistically significant. The speed of adjustment is negative (-0.8525).

In sum, the short run changes in natural resource revenues have a positive impact on short run changes in social contribution and education spending, but, negative impact on short run changes in gross capital formation, manufacturing exports and manufacturing value added. Whereas, the long run changes in natural resource revenues have a positive impact on long run changes in social contribution and education spending, but, a negative effect on long run changes in gross capital formation, manufacturing exports and manufacturing value added. These statistical significant results indicate the use of resource revenues in the consumption side, through social contributions, instead of production side, during this time period. These finding also confirms the signs of 'Dutch Disease' (manufacturing exports and manufacturing value added) and presence of resource curse (GDP, gross capital formation).

Table 4.3: Cointegrating Regression Results of Time Period (1980-89)

Independent Variable: Total Natural Resource Rents (OLS Results 1980-89)[55]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Tou Test of Cointegration
Social Contribution	10	1.1858*	13.12*	0.6212	42.46	2.502*
Gross Capital Formation	10	-0.6394*	10.23*	0.5611	22.65	3.623*
Education Spending	10	0.3197*	6.03*	0.4296	4.6728	2.233*
Manu. Exports	10	-1.442*	32.83*	0.8041	76.38	2.061*
Manu. Value added	10	-0.2416*	4.29*	0.349	18.2	2.472*
Tertiary Enrollment	10	-0.6914*	29.07*	0.7842	32.4	1.932
GDP	10	-0.5353**	2.72*	0.2536	3.15	3.693*

Source: Own Calculations

Table 4.4: ECM Regression Results of Time Period (1980-89)

Independent Variable: Total Natural Resource Rents (ECM Results 1980-89)[56]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Speed of Adjustment
Social Contribution	9	0.502**	1.95*	0.3934	-0.1228	-0.8426
Gross Capital Formation	9	-0.2529**	7.71*	0.72	-0.07	-0.8923
Education Spending	9	0.1631**	0.78	0.2056	-0.1681	-0.3408
Manu. Exports	9	-1.419*	2.19*	0.4223	0.1892	-0.6542
Manu. Value added	9	-0.7158**	9.04*	0.7508	-0.0934	-0.3961
GDP	9	0.0009	2.14*	0.4454	0.0915	-0.8525

Source: Own Calculations

[55] ibid
[56] ibid

4.2.3 Cointegrating and ECM Regression Results of Time Period (1990-99)

Summary Statistics (1990-99) are given in appendix A.5. We followed the same steps in this regression analysis (1990-99), as given in 4.2. The nonstationary and stationary (first difference) trends of time series are available in appendices A.13 and A.14. The Tou test of cointegration indicates that all bivariate regressions are not cointegrated, except tertiary enrolment, during this time period. These cointegration results are opposite to previous decade (1980-89). The results are shown in Table 4.5 and 4.6.

The results indicate that the time series of tertiary enrolment and total natural resource rents are cointegrated and there exists a long term relationship between them. The long run impact of a change in natural resource rents on tertiary enrolment is negative (-4.380) and statistically significant, whereas, the short run impact of a change in natural resource rents on tertiary enrolment is not statistically significant. The speed of adjustment is negative (-0.3685). This cointegrated relationship between total natural resource rents and tertiary enrolment also suggesting (similar contradictory results in Chapter 3) a tension between hypotheses, such as, rentier and institutional hypotheses.

Table 4.5: Cointegrating Regression Results of Time Period (1990-99)

Independent Variable: Total Natural Resource Rents (OLS Results 1990-99)[57]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Tou Test of Cointegration
Social Contribution	10	1.1428**	2.48*	0.2365	38	1.467
Gross Capital Formation	10	-0.238	0.11	0.014	21.66	1.609
Education Spending	10	0.5714**	3.2*	0.2857	4	1.402
Manu. Exports	10	-3.001*	9.45*	0.5415	81	1.74
Manu. Value added	10	0.8571**	2.54*	0.2411	16	1.399
Tertiary Enrollment	10	-4.38*	2.15*	0.2117	47..66	2.629*
GDP	10	-1.047**	2.28*	0.2216	3.333	1.335

Source: Own Calculations

Table 4.6: ECM Regression Results of Time Period (1990-99)

Independent Variable: Total Natural Resource Rents (ECM Results 1990-99)[58]						
Dependent Vari-ables	n	Coefficient	F-value	R-Squared	Constant	Speed of Adjustment
Tertiary Enrollment	9	0.5147	6.31*	0.6776	1.5607	-0.3685

Source: Own Calculations

[57] ibid

[58] ibid

We interpret these results from two different perspectives. First, the cointegrating relationship between revenues and tertiary enrolment during this decade (1990-99) confirms the institutional hypothesis because there is no cointegrating relationship between these two time series in the previous decades, such as, (1970-79) and (1980-89). The studies also explain the institutional changes during this decade, as we explained in the previous chapters. Second, the long term negative and statistical significant relationship between tertiary enrolment and resource revenues, confirms our rentier hypothesis.

4.2.4 Cointegrating and ECM Regression Results of Time Period (2000-06)

Summary Statistics (2000-06) are given in appendix A.6. We followed the same steps in this regression analysis (2000-06), as given in 4.2. The nonstationary and stationary (first difference) trends of time series are available in appendices A.15 and A.16. The Tou test of cointegration indicates that all bivariate regressions are cointegrated, except education spending, during this time period. The results are shown in Table 4.7 and 4.8.

Table 4.7: Cointegrating Regression Results of Time Period (2000-06)

Independent Variable: Total Natural Resource Rents (OLS Results 2000-06)[59]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Tou Test of Cointegration
Social Contribution	7	-2.2*	3.2*	0.3903	38.4	3.353*
Gross Capital Formation	7	-0.3	0.06	0.0112	20.1	2.102*
Education Spending	7	0.2	0.36	0.0667	4.6	0.562
Manu. Exports	7	-1.7*	15.88*	0.7605	80.9	4.112*
Manu. Value added	7	-0.7**	2.69*	0.35	14.9	2.206*
Tertiary Enrollment	7	3.9*	7.93*	0.6133	50.7	1.952*
GDP	7	1.5**	1.53	0.2344	-0.5	2.397*

Source: Own Calculations

The results indicate that the time series of social contribution and total natural resource rents are cointegrated and there exists a long term relationship between them. The long run impact of a change in natural resource rents on social contribution is negative (-2.2) and statistically significant, whereas, the short run impact of a change in natural resource rents on social contribution is also negative (-1.674) and statistically significant. The speed of adjustment is negative (-1.142). The long run (-1.7) and short run impact (-1.307) of a change

[59] ibid

in natural resource rents on manufacturing exports is negative, in both periods and statistically significant, whereas, the speed of adjustment is negative (-1.491). On the contrary, the long run (1.5) and short run impact (1.255) of a change in natural resource rents on GDP is positive, in both periods and statistically significant, whereas, the speed of adjustment is negative (-0.9659).There is also positive and statistical significant relationship between tertiary enrolment and resource revenues. Other results (gross capital formation and education spending) are not statistically significant. Therefore, we did not discuss the results, but these values are available in Table 4.7 and 4.8.

Table 4.8: ECM Regression Results of Time Period (2000-06)

Independent Variable: Total Natural Resource Rents (ECM Results 2000-06)[60]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Speed of Adjustment
Social Contribution	6	-1.6741*	19.99*	0.9302	-0.5543	-1.142
Gross Capital Formation	6	0.6295	1.61	0.517	-0.4775	-0.471
Manu. Exports	6	-1.307*	4.98*	0.7684	0.0087	-1.4912
Manu. Value added	6	-0.9342	0.86	0.2026	-0.1447	-0.3947
Tertiary Enrollment	6	0.8019	0.5	0.2515	1.0049	-0.3362
GDP	6	1.255*	2.13*	0.5864	-0.2897	-0.9659

Source: Own Calculations

In sum, the short run changes in natural resource revenues have a negative impact on short run changes in social contribution and manufacturing exports, but, natural resource revenues have a positive effect on short run changes in GDP. In addition, the long run changes in revenues have a negative impact on long run changes in social contribution, manufacturing value added and manufacturing exports, but, natural resource revenues have a positive effect on long run changes in GDP and tertiary enrolment. These statistical significant results indicate the absence of resource curse (social contribution, GDP and tertiary enrolment) and confirm our institutional hypothesis of a shift towards possible "blessing" due to lagged effects of policy changes in the sustainability of resource revenues from 1990s onwards, but there are still some symptoms of Dutch Disease (manufacturing value added and manufacturing exports).

4.2.5 Cointegrating and ECM Regression Results of Time Period (1995-2006)

We used another time period (1995-2006) for the further analysis of our results of time period (2000-06) and our investment and institutional hypotheses.

[60] ibid

Summary Statistics (1995-2006) are given in appendix A.7. We followed the same steps in this regression analysis (1995-2006), as given in 4.2. The nonstationary and stationary (first difference) trends of time series are available in appendices A.17 and A.18. The Tou test of cointegration indicates that bivariate regressions are cointegrated, except gross capital formation, education spending and GDP, during this time period. The results are shown in Table 4.9 and 4.10. These results also show similar trends, except GDP.

Table 4.9: Cointegrating Regression Results of Time Period (1995-2006)

Independent Variable: Total Natural Resource Rents (OLS Results 1995-2006)[61]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Tou Test of Cointegration
Social Contribution	12	-1.9152*	9.55*	0.4885	38.33	2.485*
Gross Capital Formation	12	-1.1186*	3.65*	0.2675	21.52	1.875
Education Spending	12	0.5084*	7.35*	0.4237	4.03	1.778
Manu. Exports	12	-1.745*	18.89*	0.6539	81.01	2.955*
Manu. Value added	12	-1.2542*	9.75*	0.4937	15.98	1.986*
Tertiary Enrollment	12	5.3559*	15.74*	0.6114	47.43	2.001*
GDP	12	-0.5593*	0.62	0.0586	2.76	1.905

Source: Own Calculations

Table 4.10: ECM Regression Results of Time Period (1995-2006)

Independent Variable: Total Natural Resource Rents (ECM Results 1995-2006)[62]						
Dependent Variables	n	Coefficient	F-value	R-Squared	Constant	Speed of Ad-justment
Social Contribution	11	-0.7149*	3.25*	0.4482	-0.106	-0.7742
Manu. Exports	11	-2.116*	20.04*	0.8336	0.249	-0.9666
Manu. Value added	11	-0.2316*	1.04	0.2056	-0.309	-0.2775
Tertiary Enrollment	11	0.2762	1.53	0.2769	1.053	0.1603

Source: Own Calculations

[61] ibid
[62] ibid

Chapter 5
Conclusions and Recommendations

After analysing the effects of natural resource revenues on physical and human capital development (investment effect) and social welfare benefits (rentier effect) in the case of Netherlands, we conclude the following points:

- There seems to be evidence that natural resource revenues have been used to increase social welfare benefits (especially, rapid increase in unemployment benefits) and arguably increase 'leisure' while reducing economic activity, but there is no clear impact on physical investment and manufacturing activity.
- The increase in tertiary education enrolment, after 1990s, suggests that government revenues have been used to improve human capital, but, the comparative statistics indicates that the numbers of registered students are higher in social sciences and humanities, rather than scientific subjects. These preferences suggest education being 'consumption good', instead of a production good. Because, the study of different subjects may have different implications in terms of potential labour productivity.
- Abundance of natural resources or dependence on natural resources was found not to be significant in the Netherlands, after the 1990s. We find that there is low percentage of natural resource revenues (average 2% of GDP), after 1990s. Even though Netherlands is natural resource (gas) abundant country, it does not depend on these natural resource revenues due to policy towards the stabilization of resource revenues at a level absorbable in investment activity.
- Building on a pre-existing contextual national history of economic and political development, Dutch governments appeared to have shown a capacity to learn about sustainability (through reduction in the rate of extraction), to reduce the comparative rate of growth of welfare expenditure while maintaining genuine savings. If the effects remain same in future after 1990s policy shift, than there is a possibility that there has been conversion of a natural resource curse into a blessing. The idea of 'welfare to work' may be creating a 'Dutch Miracle' (as proposed by Becker, 2000:230) rather than 'Dutch Disease'.
- The Netherlands have greater advantage over other countries due to its context of a historic institutional process, political stability, very low level of corruption and good governance (according to International Standards). Nevertheless, the Netherlands almost took a period of 18 years (1970-1987) to recover from the adverse effects of 'Dutch Disease' and 'resource curse'. Therefore, we can conclude that not only political (as mentioned in resource curse literature) but policy choices (towards the management of resource revenues and appropriate distribution of resource revenues) are also important. For example, the

establishment of 'Fund for Enhancement of the Economic Structure' (FES) for the management of resource revenues is a key policy option, which was adopted in case of Netherlands.

- Overall, an institutional economic approach seems to be most appealing for understanding its impact on natural resource windfalls. Market forces do tend to produce a more rentier economy, but this can be off-set, if not eliminated, by government actions on productive capital development.
- This paper was not able to explore long duration Dutch political history, due to disciplinary limitations. But, before and after the resource revenues, there are much more opportunities to explore Dutch history which can be done in any future research.
- Non sustainable international trade experiences may be highly correlated with irresponsible fiscal policies. Resource booms may boost public sector consumption "giveaways" in order to win votes and satisfy interest groups. But, this leads towards harmful economic performance. Wierts and Schotten (2008) estimated that 1% of GDP rise in gas revenues generally brings about a 0.2% increase in budget balance while 0.8% point goes to increasing consumption. Whereas, 1% decline in GDP in gas revenues brings about a 0.2% decrease in budget balance and 0.8% point goes to reducing consumption. Therefore, we recommend limiting extraction to absorbable levels of revenues and establishment of fund for the distribution of resource revenues towards investment of these revenues in physical and human capital development are the best policies, if historic political structures permit.

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Appendices

A.1: Literature Review on Measurement Variables

Author	Dependent Variables	Independent Variables	Type of Data/Period	Results
Sachs and Warner (1995)	Real Growth Per Person	Natural Resource Exports as a share of GDP	Cross-country (1970-89)	Negative relationship between natural resource intensity and growth
Wantchekon (1999)	Authoritarianism (measure through level of democracy)	Ratio of Mineral Exports to Total Exports	Cross- Country (1970-98)	Negative relationship between resource dependence and authoritarianism
Gylfason (2001)	Three variables: 1. Public Expenditure on education relative to National Income (% of GDP) 2.Expected years of schooling for females 3.Secondary School enrollment	Share of Natural Capital in National Wealth (% of GDP) (1994 as proxy)	Cross-Country (1980-1997)	Negative relationship between economic growth and natural capital via the education channel
Stijns (2001, 2005)	Six variables: 1.Average years of primary, secondary, tertiary education and total education for women 2.Life expectancy at birth 3.Educational expenditure per capita	Subsoil Wealth (Metal, Minerals, Oil, Gas, Coal), Natural Resource Exports, Political Freedom	Panel data (1970-1999)	Positive relationship between human capital indicators and resource rents

A.1: Literature Review on Measurement Variables (Continued)

Papyrakis & Gerlagh (2004)	1.High levels of Investment 2.Schooling 3.Innovation	Initial income per capita	Conditional convergence regression	Increase in income frustrates economic growth through reduction in work effort
Bravo-Ortega & De Gregorio (2005)	Average year of schooling among the over-25 population	Share of natural resources exports in GDP	Panel Data (1970-1990)	Natural resources have a positive effect on income per capita and a negative effect on the growth rate.
Arezki & Van de Ploeg (2008)	Income Per Capita	Ratio of Natural Capital & Stock of Natural Capital	Instrumental Variables	Resource curse exists due to low level of openness and bad institutions
Wierts & Schotten (2008)	Budget Balance (Fiscal Policy Measurement)	Gas Revenues (% of GDP)	Dutch Economy	Revenues use for Welfare Benefits, but lesson from literature for the optimal use of resource revenues
Louis-Marie Philippot (2010)	1. Public spending on education 2. School enrollment rates	1.Resource rents 2.Share of Natural capital in national wealth	Panel Model (1990-2003)	Negative relationship between resource abundance & human capital
Roman and Jose, 2012	Aggregate value per person employed in the activity sector	Percentage of students in all levels of education with respect to total population, Research & Development and regional variables, etc.	1995, 2006 & 2007 Dutch Economy	Natural Resource Curse has more negative effect, not in lower productivity, but also, higher productivity regions

Source: Own Analysis

A.2: Summary Statistics of Time Period (1970-2006)

Summary Statistics (1970-2006)					
Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Natural Resource Rents	37	1.78	1.39	0	5
Social Contribution	37	40.45	4.45	32	50
Gross Capital Formation	37	21.54	2.1	18	28
Public Expenditure on Education	37	5.37	1	4	7
School Enrollment, Tertiary (Gross)	37	27.18	9.88	12	48
Manufacturing Exports	37	74.94	4.06	69	72
Manufacturing Value Added	37	17.72	3	13	24
GDP Growth	37	2.02	1.6	-2	5

Source: Own Calculations

A.3: Summary Statistics of Time Period (1970-1979)

Summary Statistics (1970-1979)					
Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Natural Resource Rents	10	2.1	1.19	0	3
Social Contribution	10	40.1	3.84	32	45
Gross Capital Formation	10	23.6	2.31	21	28
Public Expenditure on Education	10	6.5	0.52	6	7
School Enrollment, Tertiary (Gross)	10	22	4.66	12	27
Manufacturing Exports	10	71.1	0.87	70	72
Manufacturing Value Added	10	21.7	2.21	18	24
GDP Growth	10	2.3	1.82	-1	5

Source: Own Calculations

A.4: Summary Statistics of Time Period (1980-89)

Summary Statistics (1980-1989)					
Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Natural Resource Rents	10	2.9	1.72	0	5
Social Contribution	10	45.9	2.6	42	50
Gross Capital Formation	10	20.8	1.47	19	23
Public Expenditure on Education	10	5.6	0.84	5	7
School Enrollment, Tertiary (Gross)	10	30.4	1.34	29	33
Manufacturing Exports	10	72.2	2.78	69	76
Manufacturing Value Added	10	17.5	0.7	16	18
GDP Growth	10	1.6	1.83	-2	4

Source: Own Calculations

A.5: Summary Statistics of Time Period (1990-99)

Summary Statistics (1990-1999)					
Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Natural Resource Rents	10	0.7	0.48	0	1
Social Contribution	10	38.8	1.13	37	41
Gross Capital Formation	10	21.5	0.87	20	23
Public Expenditure on Education	10	4.4	0.51	4	5
School Enrollment, Tertiary (Gross)	10	44.6	4.59	35	49
Manufacturing Exports	10	78.9	1.96	76	82
Manufacturing Value Added	10	16.6	0.84	15	18
GDP Growth	10	2.6	1.07	1	4

Source: Own Calculations

A.6: Summary Statistics of Time Period (2000-06)

Summary Statistics (2000-2006)					
Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Natural Resource Rents	7	1.28	0.48	1	2
Social Contribution	7	35.57	1.71	34	39
Gross Capital Formation	7	19.71	1.38	18	22
Public Expenditure on Education	7	4.85	0.37	4	5
School Enrollment, Tertiary (Gross)	7	55.71	2.42	52	59
Manufacturing Exports	7	78.71	0.95	77	80
Manufacturing Value Added	7	14	0.57	13	15
GDP Growth	7	1.42	1.51	-1	3

Source: Own Calculations

A.7: Summary Statistics of Time Period (1995-2006)

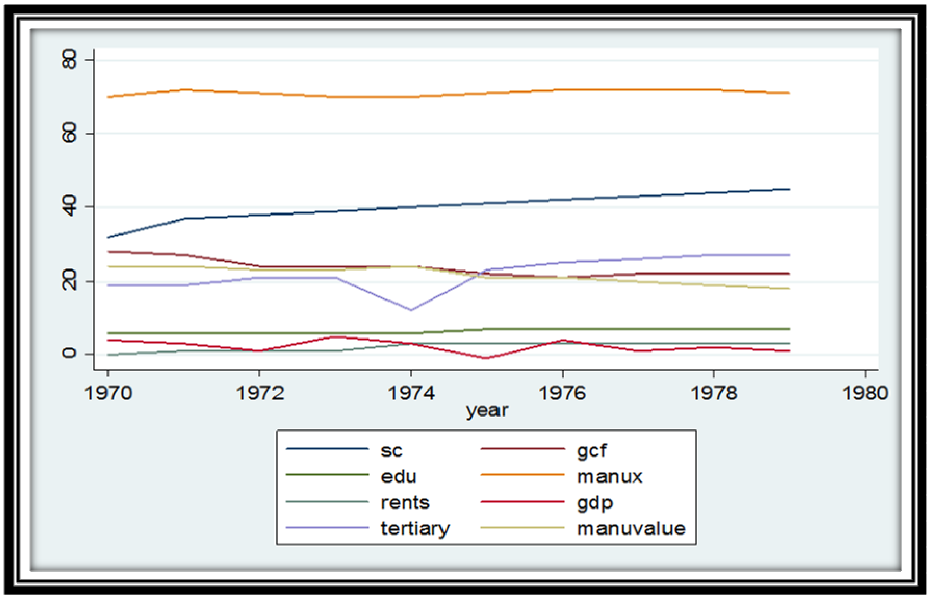
Summary Statistics (1995-2006)					
Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Natural Resource Rents	12	0.916	0.668	0	2
Social Contribution	12	36.58	1.831	34	39
Gross Capital Formation	12	20.5	1.445	18	22
Public Expenditure on Education	12	4.5	0.522	4	5
School Enrollment, Tertiary (Gross)	12	52.33	4.579	47	59
Manufacturing Exports	12	79.41	1.443	77	82
Manufacturing Value Added	12	14.83	1.193	13	17
GDP Growth	12	2.25	1.54	-1	4

Source: Own Calculations

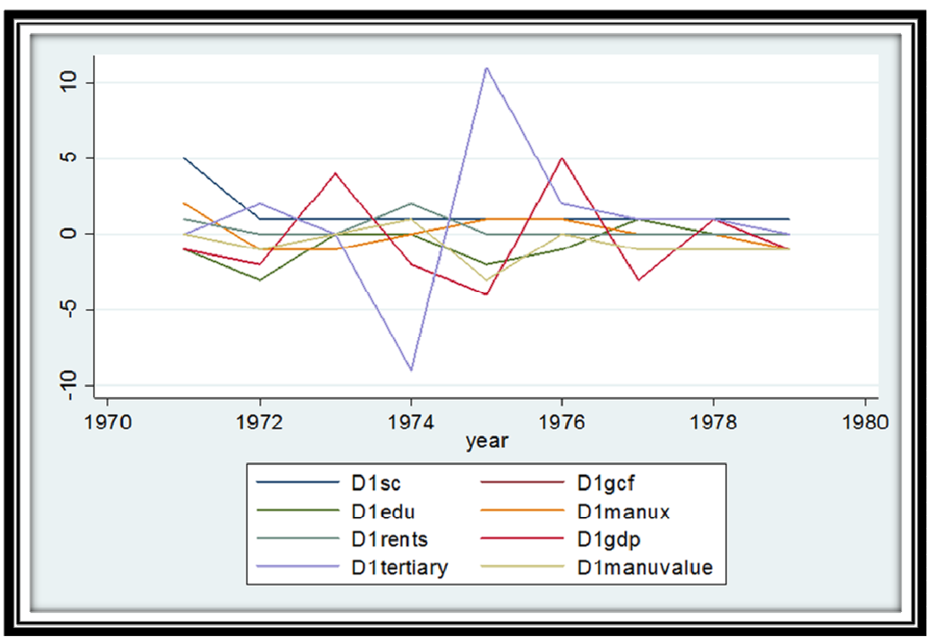
A.8: Regression Variables and Sources

Variables	Name	Source
Rents	Natural Resource Reveneus (% of GDP)	WDI,2011
Sc	Social Contribution (% of Revenue)	Bos, 2008
Educ	Public Spending on Education, Total (% of GDP)	WDI,2011
Tertiary	Tertiary School enrollment (% Gross)	WDI,2011
Gcf	Gross Capital Formation (% of GDP)	WDI, 2011
GDP	GDP Per Capita Growth (Annual %)	WDI,2011
Manux	Manufacturing Exports (% of Merchandise Exports)	WDI,2011
Manuvalue	Manufacturing Value Added (% of GDP)	WDI,2011
D1rents	First Difference of Natural Resource Rents (% of GDP)	Own Calculations
D1sc	First Difference of Social Contribution (% of Revenue)	Own Calculations
D1edu	First Difference of Public Spending on Education, Total (% of GDP)	Own Calculations
D1tertiary	First Difference of Tertiary School enrollment (% Gross)	Own Calculations
D1 GCF	First Difference of Gross Capital formation (% of GDP)	Own Calculations
D1GDP	First Difference of GDP Per Capita Growth (Annual %)	Own Calculations
D1manux	First Difference of Manufacturing exports (% of Merchandise)	Own Calculations
D1manuvalue	First Difference of Manufacturing Value Added (% of GDP)	Own Calculations

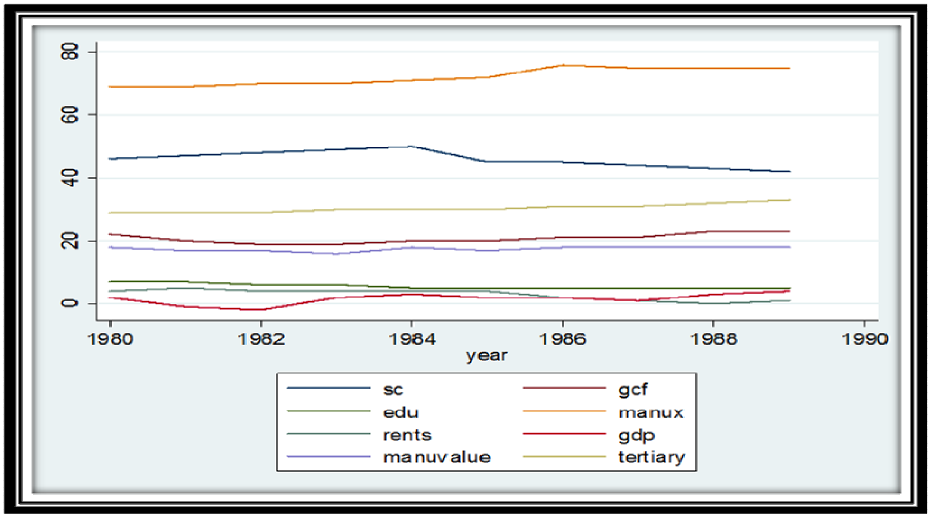
A.9: Non stationary Time Series of Regression Variables (1970-79)



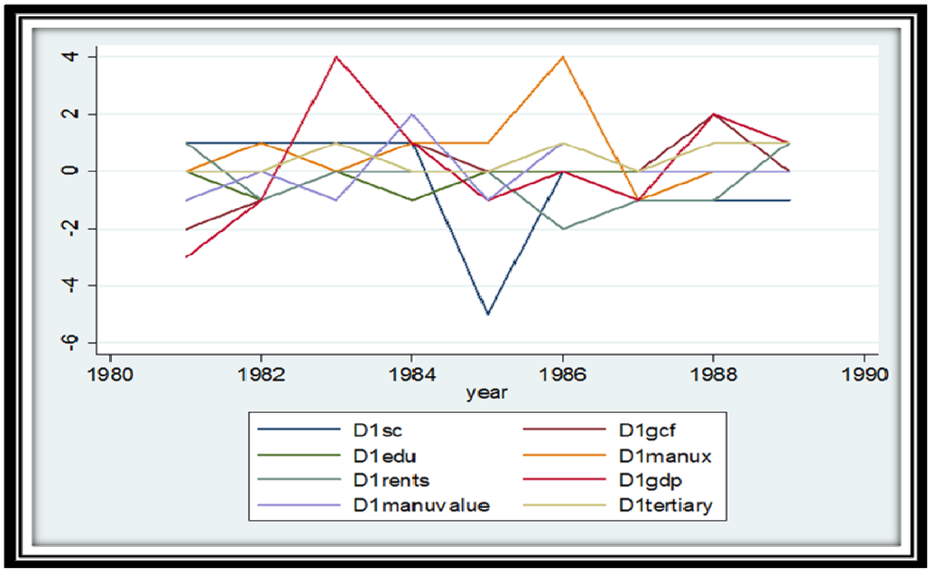
A.10: Stationary Time Series of Regression Variables (1970-79)



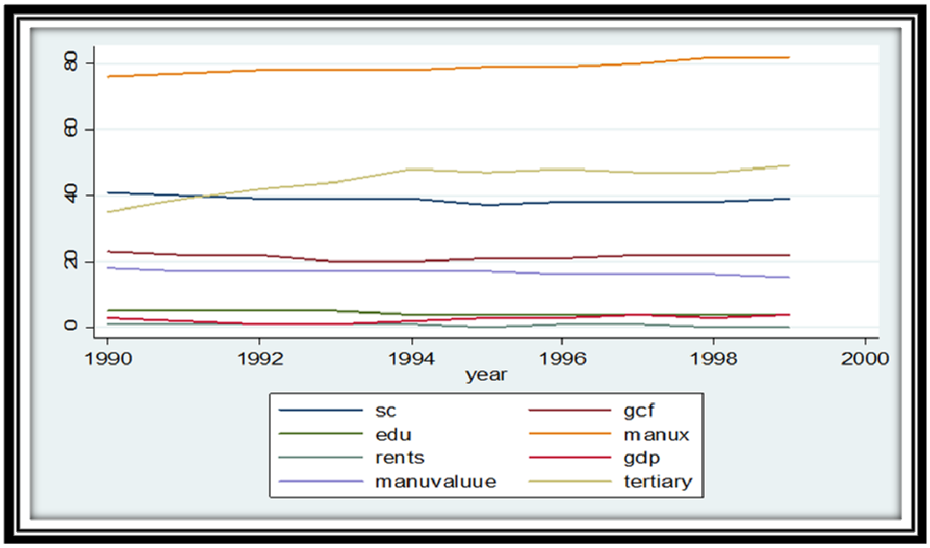
A.11: Non stationary Time Series of Regression Variables (1980-89)



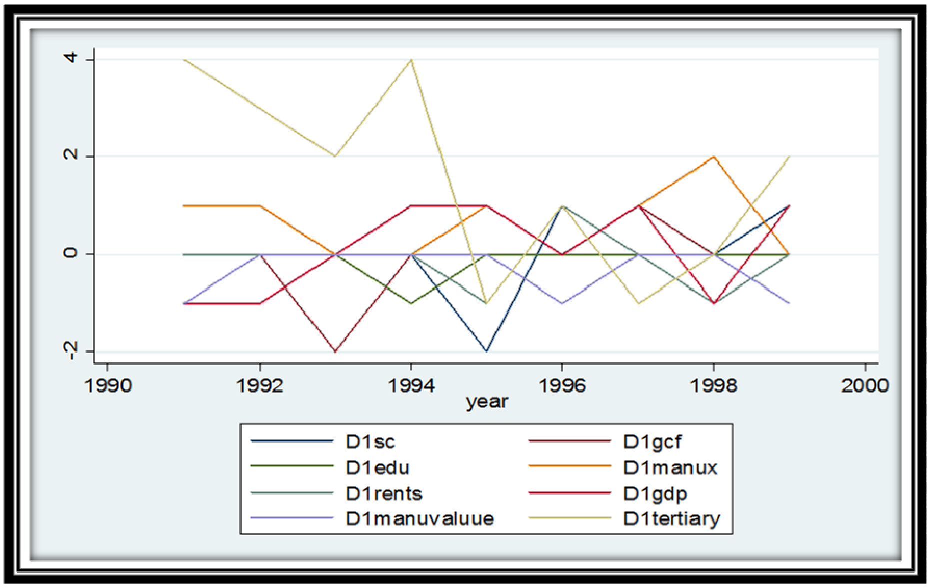
A.12: Stationary Time Series of Regression Variables (1980-89)



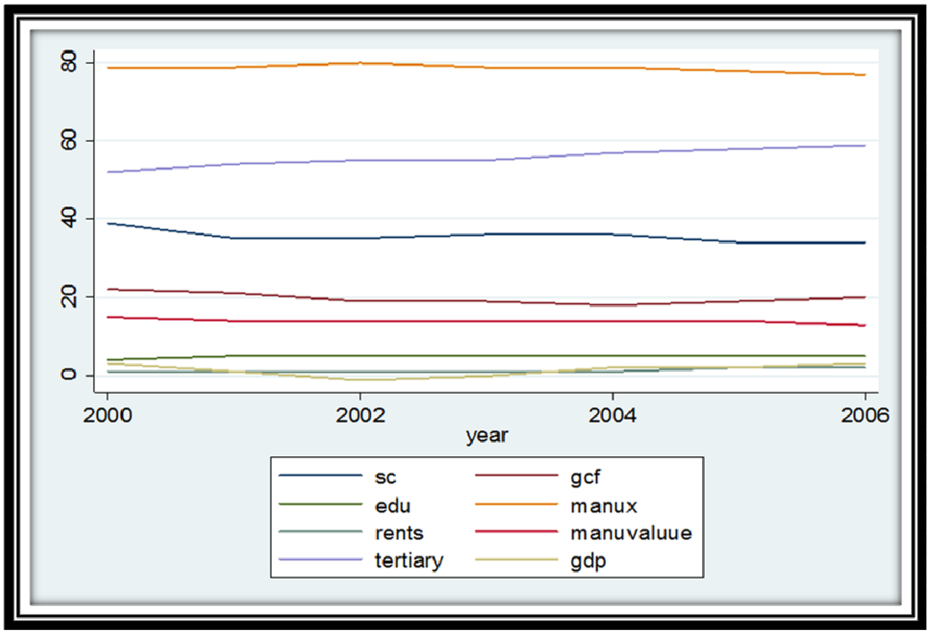
A.13: Non stationary Time Series of Regression Variables (1990-99)



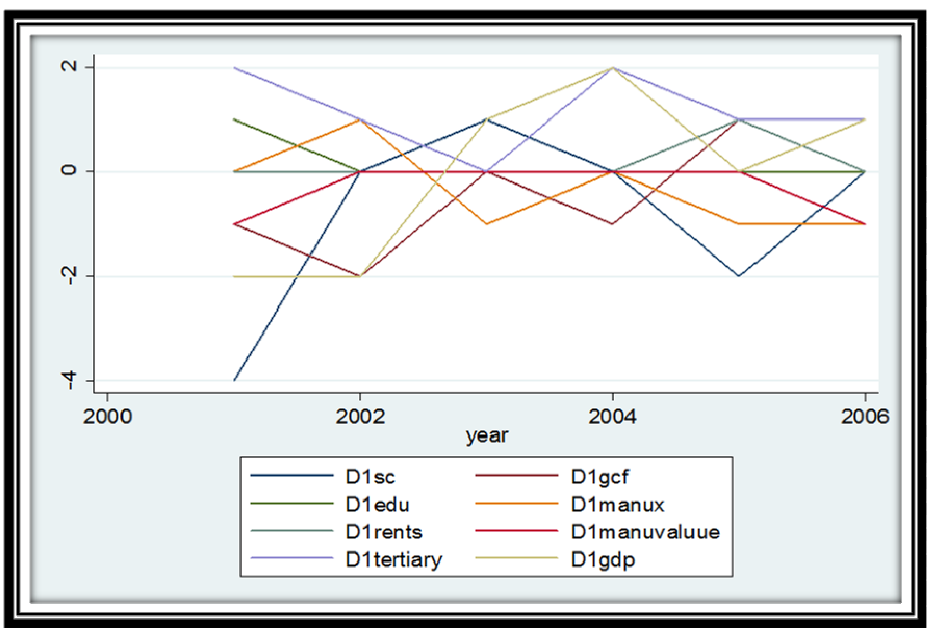
A.14: Stationary Time Series of Regression Variables (1990-99)



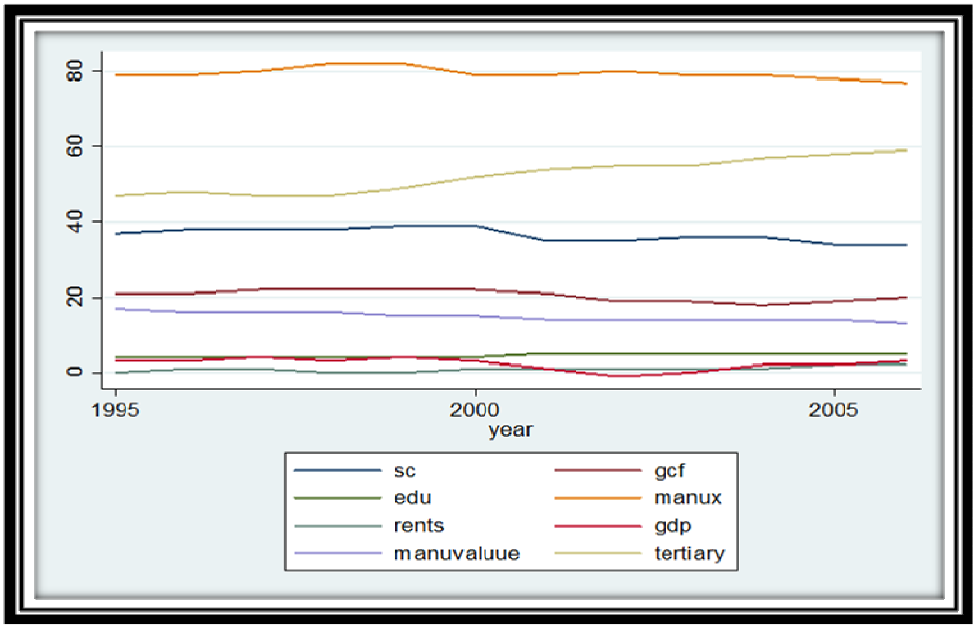
A.15: Non stationary Time Series of Regression Variables (2000-06)



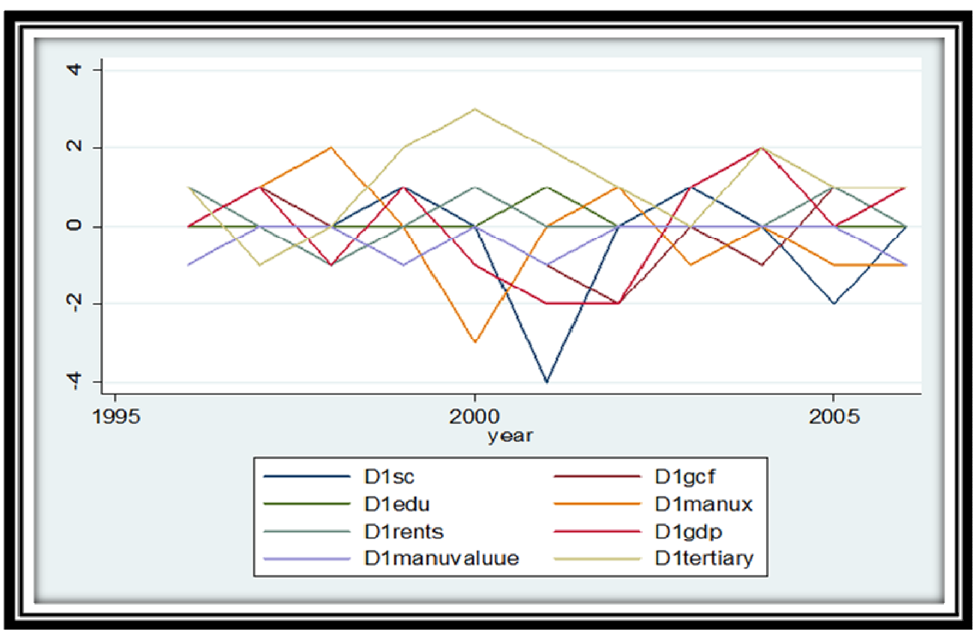
A.16: Stationary Time Series of Regression Variables (2000-06)



A.17: Stationary Time Series of Regression Variables (1995-2006)



A.18: Stationary Time Series of Regression Variables (1995-2006)



A.19: Glossary

Control of Corruption
Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (WGI, 2012).

Domestic product
Domestic product (market prices) equals the sum of value added of industries (basic prices), balance of taxes and subsidies on products. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

Employees Social Contribution
Compensation of employees is the total remuneration paid by employers to their employees in return for work done. Employees are all residents and non-residents working in a paid job. Managing directors of limited companies are considered to be employees; therefore their salaries are also included in the compensation of employees. The same holds for people working in sheltered workshops. Compensation of employees is distinguished between wages and salaries and employers' social contributions. Wages and salaries include income taxes and employees' social contributions even if they are actually withheld by the employer and paid directly to tax authorities, social security schemes and pension schemes. Wages include payments that are periodically and directly paid to employees. Besides they contain extra's (such as bonuses, overtime pay, tips, commission), wages in kind (such as free housing, free food, 'company car', day nursery, lower interest rates on mortgages, free travel (or at reduced prices) and holiday allowances. Furthermore, certain refunds for costs made by the employee, such as travel expenses to and from work, are included as well. Employers' social contributions consist of payments to insurers made by employers for the benefit of their employees. They can be classified in employers' social security contributions, employers' private social contributions (o.w. pension schemes) and the imputed social contributions. In most cases the employers directly pay the employers' social contributions to the insurers. However, to show that these contributions are paid for the benefit of employees, these payments are recorded as two transactions: a) employers pay employers' social contributions to their employees and b) employees pay the same contributions to social insurance funds (CBS, 2012).

Exports of goods and services
All goods intended for use or consumption outside the Netherlands. These are goods manufactured in or originally imported into the Netherlands. Includes goods exported temporarily from the Netherlands which, by commission of a Dutch resident living abroad, undergo treatment (passive finishing trade). The statistical value is the value of the goods at the moment they cross the border. For exports this value is the value of the goods inclusive of freight and insurance charges up to the Dutch border (CBS, 2012).

Exports of natural gas
It means exports of natural gas through cross border pipelines (CBS, 2012).

GDP growth (annual %)
The annual percentage growth rate of GDP at market prices is based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources (WDI, 2011).

Genuine Savings
Genuine savings are known as ddjusted net savings, including particulate emission damage (% of GNI). Adjusted net savings are equal to net national savings plus education expenditure and minus energy depletion, mineral depletion, net forest depletion, and carbon dioxide and particulate emissions damage (WDI, 2011).

GNI per capita growth (annual %)
GNI per capita is gross national income divided by midyear population. GNI (formerly GNP) is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad (WDI, 2011).

Government Effectiveness
It reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (WGI, 2012).

Gross capital formation (% of GDP)
Gross capital formation (formerly gross domestic investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation (WDI, 2011).

Gross Domestic product
Gorss domestic product (market prices) equals the sum of value added of industries (basic prices), balance of taxes and subsidies on products. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

Gross National income

Gross national income (primary income) is a part of GDP flows to the rest of the world (wages and salaries to non-resident employees' interests and dividends to non-resident financiers), while income generated in the rest of the world is transferred to the Netherlands. National income is the sum of GDP and net primary income from the rest of the world. The volume of national income is affected by the difference in export and import price movement, while the volume of national product is not. A trading gain (caused by export prices rising sharper than import prices) increases the volume change of national income. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

Imports of gaseous natural gas

It means imports of gaseous natural gas through cross border pipelines (CBS, 2012).

Imports of goods and services

All goods introduced into the free economic trade of the Netherlands for use or consumption, i.e. goods for which import duties and national taxes have been paid. Includes goods imported temporarily into the Netherlands which, by commission of a non-resident, undergo treatment (active finishing trade); and goods from non-EU countries which enter the economic trade in the Netherlands via bonded warehouses. The statistical value is the value of the goods at the moment they cross the border. For imports from EU countries this value is inclusive of freight and insurance charges up to the Dutch border. For imports from non-EU countries this value is inclusive of freight and insurance charges up to the border of the European Union (CBS, 2012).

Indigenous production

It means extraction of natural gas from nature, on-shore and off-shore in the Dutch territorial part of the North Sea (CBS, 2012).

Manufacturing exports (% of merchandise exports)

Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals); (WDI, 2011).

Manufacturing, value added (% of GDP)

Manufacturing refers to industries belonging to ISIC divisions 15-37. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. Note: For VAB countries, gross value added at factor cost is used as the denominator (WDI, 2011).

National income

National income (primary income) is a part of GDP flows to the rest of the world (wages and salaries to non-resident employees' interests and dividends to non-resident financiers), while income generated in the rest of the world is transferred to the Netherlands. National income is the sum of GDP and net primary income from the rest of the world. The volume of national income is affected by the difference in export and import price movement, while the volume of national product is not. A trading gain (caused by export prices rising sharper than import prices) increases the volume change of national income. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

National saving (net)

National saving equals disposable income less final consumption expenditure and an adjustment item for net equity in pension funds reserves. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

Natural gas rents (% of GDP)

Natural gas rents are the difference between the value of natural gas production at world prices and total costs of production (WDI, 2011).

Net Domestic product

Net domestic product (market prices) equals the sum of value added of industries (basic prices), balance of taxes and subsidies on products. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

Net National income

Net national income (primary income) is a part of GDP flows to the rest of the world (wages and salaries to non-resident employees' interests and dividends to non-resident financiers), while income generated in the rest of the world is transferred to the Netherlands. National income is the sum of GDP and net primary income from the rest of the world. The volume of national income is affected by the difference in export and import price movement, while the volume of national product is not. A trading gain (caused by export prices rising sharper than import prices) increases the volume change of national income. Gross includes consumption of fixed capital while net excludes consumption of fixed capital (CBS, 2012).

OECD Members

These are 33 countries. Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea. Rep, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and United State (WDI, 2011).

Operating surplus/mixed income
Operating surplus/mixed income is the balance that remains after deducting from the value added (basic prices) the compensation of employees and the balance of other taxes and subsidies on production. The operating surplus of family enterprises is called mixed income (CBS, 2012).

Political Stability and Absence of Violence
It reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism (WGI, 2012).

Public spending on education, total (% of GDP)
Public expenditure on education consists of current and capital public expenditure on education includes government spending on educational institutions (both public and private), education administration as well as subsidies for private entities (students/households and other privates entities (WDI, 2011).

Real effective exchange rate index (2005 = 100)
Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs (WDI, 2011).

Regulatory Quality
Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (WGI, 2012).

Rule of Law
Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence (WGI, 2012).

School enrolment, tertiary (% gross)
Tertiary (ISCED 5 and 6). Total is the total enrolment in tertiary education (ISCED 5 and 6), regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving (WDI, 2011).

Social contributions (% of revenue)
Social contributions include social security contributions by employees, employers, and self-employed individuals, and other contributions whose source cannot be determined. They also include actual or imputed contributions to social insurance schemes operated by governments (WDI, 2011).

Tertiary education

It includes the higher professional education, university education and private education at these levels. Here, tertiary education includes research and development, except for the indicator Expenditure on education institutions per student, excluding R&D. In addition to transferring theoretical knowledge, higher professional education is particularly aimed at developing skills and competence that are well-matched with the practical capabilities of students. Institutions of higher education perform contract research for companies, but only on a small scale. This research is mainly aimed at business applications. In addition to transferring theoretical knowledge, university education is particularly aimed at acquiring general skills and a scientific level of thinking. Another main task of universities is research. This research leads to fundamentally new insights, not specifically aimed at usability in industry or business. Research is often referred to as R&D (CBS, 2012).

Total consumption

It is the amount of natural gas used by companies, households and transport in the Netherlands (CBS, 2012).

Total education

Expenditure on education is broken down into the sectors primary, secondary and tertiary education (CBS, 2012).

Total expenditure on education

It includes government expenditure on households and companies and the remaining education expenditure by households, other than for education institutions. Income received is subtracted from this expenditure. For the government this includes reclaimed wrongfully paid student grants and loans, and allowances for school costs and interest received on student loans. For households these are the allowances for school costs, provisions for students with a disability and part of the student grants and loans meant as an allowance for school and college fees, books and materials and public transport. For companies the compensation in the costs of supervising apprentices and trainees are subtracted from their expenditure. Except for the interest received this is done to avoid double counting, because the received income is used to cover (part of) the expenses. Some expenditure and receipts are not included in the calculation of the total expenditure on education. For the government these are the student loans provided and received repayments on these loans. For households these are the allowances for the cost of living, the student loans and the repayments of these loans. For companies these are the subsidies received for providing transport for pupils. Student loans and the repayments are not included because they are not considered real expenditures as they will be repaid after a given time. The allowances for the cost of living have a general purpose rather than education and are therefore not included in the cost of education. Similarly the subsidies given to companies outside the education sector for providing transport for pupils are excluded, as they provide this service purely for commercial reasons (CBS, 2012).

Total natural resources rents (% of GDP)
Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents (WDI, 2011).

Total supply of Natural Gas
The amount of natural gas primarily that is available for consumption in the Netherlands (CBS, 2012).

A.20: Econometric Terms

Cointegrated:

Economically, two variables will be co integrated if they have a long term, or equilibrium relationship between them.

Cointegration:

It means that despite being individually nonstationary, a linear combination of two or more time series can be stationary. The EG or DF or ADF test can be used to find out if two or more time series are cointegrated.

ECM:

The Error Correction Mechanism was first used by Sargen and later popularized by Engle and Granger corrects for disequilibrium. It is known as a 'Granger Representation Theorem', states that if two variables Y and X are co integrated, then the relation between the two can be expressed as ECM.

Integrated Time Series:

The random walk model (RWM) without drift is nonstationary, but its first difference is stationary. Therefore, the RWM without drift integrated of order 1, denoted as I (1).

Non stationary/ Unit Root Time Series:

The presence of unit root in time series, is known as, nonstationary time series.

Speed of Adjustment:

The one-period lagged value of the error term from the cointegrating regression (ECM), is known as speed of adjustment.

Stationary Time Series:

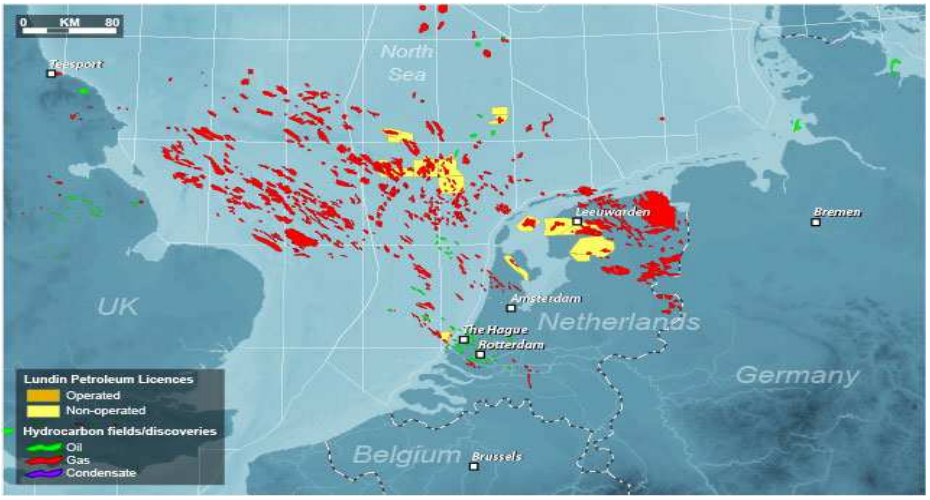
A time series is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. Unit root is absent in stationary time series.

Unit Root:

In time series econometric models, a unit root is a feature of processes that evolve through time that can cause problems in statistical inference, if it is not adequately dealt with.

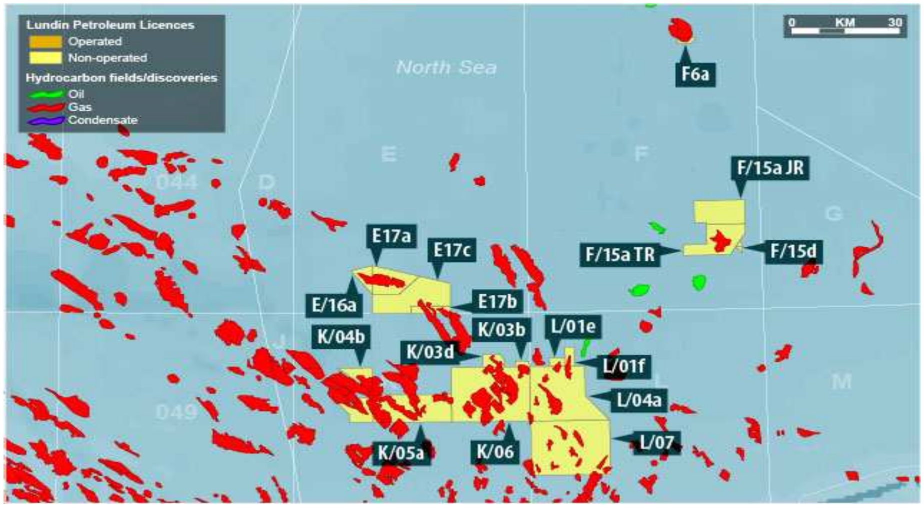
A.21 Map of the Netherlands

Map A.21.1 Regional Location Map



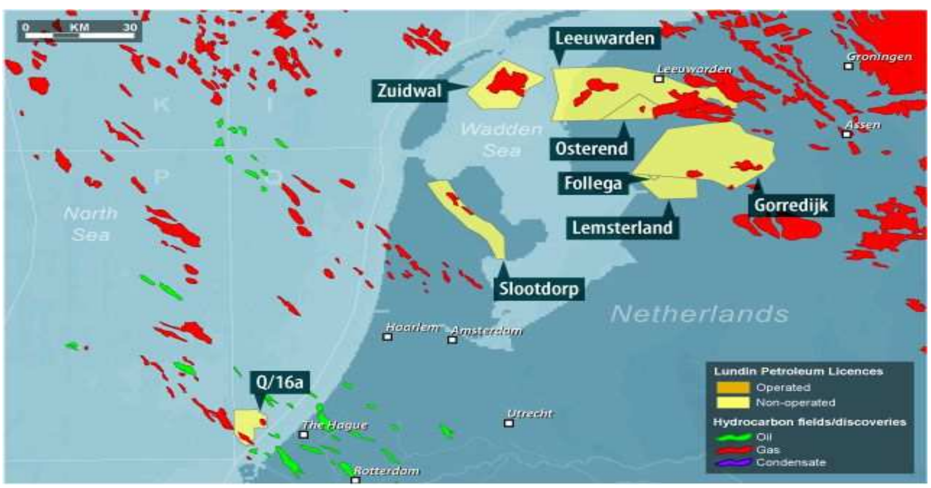
Source: Netherlands maps and images - Lundin Petroleum

Map A.21.2 Offshore Location Map



Source: Netherlands maps and images - Lundin Petroleum

Map A.21.3 Inshore Location Map



Source: Netherlands maps and images - Lundin Petroleum