Thesis

BSc Economics and Business Economics (IBEB)

An Investigation of Petrochemical-Sector FDI in Ports and of Foreign Ownership Characteristics in Petroleum Companies Located in the Houston Ship Channel (TX) and Europe's ARA Ports

Seminar: Urban, Port, and Transport Economics

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Forward

Before engaging with the subject at hand in a more academic manner, I would like to clarify that there is a personal explanation for my fascination of port investments in general, and for port-based petrochemical-sector investments in particular. The city of Rotterdam was the location of my studies and place of residence from 2013 until mid-2016. A vibrant, youthful and modern, but otherwise (arguably) unremarkable place, it has been fascinating to personally witness the city's global significance as a logistical center and petrochemical hub. Naturally, these unique and private ties have raised questions concerning the justifications for the current phenomena, and the likely future developments of the industry.

1.1 Introduction and Study Pretext

On the 28th September 2015 the Financial Times published an article about the then-upcoming takeover of a European oil refinery. It outlined the negotiation procedures leading up to the acquisition of the Kuwaiti Q8 refinery in the Port of Rotterdam's Europoort section by a major global oil trader, Gunvor (Hume, 2015). The article ("Gunvor closes in on Europe refinery deal") is – from the perspective of the current author - noteworthy for two reasons.

Primarily, Gunvor's acquisition of the Europoort refinery describes the continual process of economic interconnectedness, and it does so in both a geographic manner and in the way in which the negotiations overcome the commonly rigid divide between the public and private sector. Regarding the first distinction, multiple geographic regions combine in a single transaction; The refinery was originally built in 1962/63 in Rotterdam by the US-based Gulf Oil corporation, before Kuwait's national oil company purchased it in 1983 (Hume, 2015).

Since the Financial Times' publication in late September 2015, Gunvor has successfully acquired the plant (Gunvor Group, 2016). Historically, the Geneva-based Gunvor Group has had historical ties with Russia[1], and it is fascinating to observe how a variety of corporate and state-controlled interests are involved in a single foreign investment venture. Although the major players in oil extraction and processing (E&P) are the so-called oil majors (Shell, Total, BP, ExxonMobil and Chevron), the majority of the world's oil reserves (strategic reserves) are in the hands of governments and state-owned (national) oil companies from major oil producing countries (e.g. Saudi Aramco from Saudi Arabia or Rosneft from Russia). Despite the traditional focus of national oil companies in controlling strategic reserves, they are increasingly involved in the highly value-added activities of refining and trading, which were formerly largely operated by shareholder-controlled oil companies (SOCs). In general, industries as well as consumers from all over the world use refined products on a daily basis through either direct consumption (fuels for the transportation industry), or as inputs to vast production processes (e.g. chemical industry). Indeed, the oil business is a globally operating industry that transcends the public-private sector divide.

The second striking aspect of Hume's article is the considerable amounts of capital invested in the petroleum industry and in refining assets located in ports. Capital investments in oil refining assets can easily total up to 1 billion US$, and their future revenues are highly dependent on the volatilities of international oil prices and the ability to source the 'black gold' from the markets for refining. This implies substantial entry barriers as only a handful of large multinationals (see above) are able to (a) raise the required capital and (b) have the technical expertise to efficiently run a refining operation. Geographically, the world's largest oil refining complexes are concentrated in only

[1] Gunvor was co-founded by Gennady Timchenko and Torbjörn Törnqvist in 2000. In March 2014, the U.S. Treasury placed Timchenko on a list of sanctioned individuals because of his alleged ties with the Kremlin following the Russian annexation of Crimea. Volga Group, an investment firm owned by Timchenko, was also placed on this list (Baker, 2014).

three major port hubs: Houston, Rotterdam and Singapore. While the reason for setting up refining operations in a port can be explained by the location theory of Alfred Weber (1929)[2], the levels of foreign ownership and FDI in these places have rarely been studied.

Although extensive literature details the widely applicable macroeconomic determinants of foreign direct investments (see e.g. Blonigen, 2005), studies on port-specific ventures by multinational oil corporations are limited. There is a clear scarcity in academic literature that focuses on the scale and patterns of foreign investments in ports, and on the influence (a) of ports on multinational petroleum corporations, and (b) on the role multinational corporations play in the petrochemical sector per se. In order to address this absence in academic literature, the current paper attempts to draw links between FDI determinants - including sector-specific factors like geopolitics - and the dynamics of foreign ownership in port-based petroleum assets like refineries, tank storage facilities, pipelines and jetties. The sustained deficit in academic and empirical literature on these relationships gives the current paper a unique opportunity to fill this intellectual gap, and provides it with academic relevance.

1.2 Research Aim & Research Questions

The aim of this research is to study ownership structures of the oil refining clusters in major port hubs, including the tank storage facilities, in order to assess the level of foreign ownership. In view of this research aim and its broad economic setting, the four questions presented below will serve as strands along which the arguments presented in this thesis will be structured.

1. How are the trade and investment developments in the global petroleum industry structured?
2. To what extent do macroeconomic determinants influence the magnitude of Foreign Direct Investment (FDI) flows into a region?
3. In what ways are ports attractive investment locations to companies operating in the petroleum exploration and processing (E&P) industry?
4. What are the predominant ownership characteristics of petrochemical companies in the ports of the Amsterdam-Rotterdam-Antwerp region, and in the Port of Houston/Houston Ship Channel (TX)?

[2] In essence, A. Weber (1929) described that industry investments are best located where the weighted costs of transporting raw materials and final products are minimized.

By providing accurate and relevant responses to these research questions, this paper aims to eventually formulate policy recommendations to governments and other governing institutions, and to provide various stakeholders involved in the oil industry with academic insights. In view of the current scarcity in academic literature that focuses on petrochemical sector investments in ports, producing detailed and target-oriented solutions to the presented research questions is particularly valuable. Essentially, the findings are simply aimed to enhance the understanding of the oil exploration and processing industry, and to lead to improved approaches in increasing its efficiency.

The structure of the thesis is as follows. In the next chapter, the general determinants and macroeconomic influences of foreign investments are outlined, after which the geopolitical structure of the oil industry is discussed in the third chapter. Subsequently, this thesis evaluates why ports are attractive investment locations for oil corporations by employing Dunning's eclectic paradigm framework. Eventually, the foreign ownership structures of refineries and petrochemical storage facilities are compared between the Port of Houston and ports of Europe's ARA region. Lastly, stakeholder advice and policy recommendations will be concluded with reference to the earlier chapters.

2.1 Context of the Oil Industry

Throughout the course of modern civilizations, varying contemporary issues have guided most political debates. During the 1950s and 60s, the world was gripped by the unfolding conflict between communism and capitalism, and by their corresponding fears of a Cold War turning 'hot'. Several decades later, the focus of mainstream political attention shifted towards what many perceived as a clash between Western culture and anti-Western, anti-libertarian hostilities in the Near East, fueled by religious fundamentalism, and expressed by acts of terrorism as on the 11th September 2001. It is evident that the world changes, and that the topics we deem important change with it.

Nonetheless, a handful of developments have provided a thread along which history progresses from decade to decade; One consistent force behind many global developments was the growing interconnectedness of the world itself. Globalization has enabled closer ties between countries, and consequently more rapid diffusion of innovations across countries, more inclusive technological growth, and a world that as a whole is able to lift regions from poverty by advancing the reach of productive business conduct. Expanding industrialism and the transformation of countries from economically underdeveloped to globally integrated is a principal theme that underlies the function of ports as hubs of progress, and the multilateral benefits of foreign direct investments.

FDI is therefore a key mechanism by which these developments are propelled. For one thing, investments by multinational corporations enable a developing economy to partake in a greater market, but also to tap into a foreign investor's expertise in order to promote its own growth. In the past, vast literature has focused on the impacts foreign direct investments have had on the economies of host countries. Empirical evidence suggests that channels by which FDI-induced improvements are achieved include the transfers of technology and know-how, human resource specialization and expansion, improved integration in global markets, enhanced competition between firms, as well as more effective organizational strategy of companies' status quo and their strategy for growth (Moura & Forte, 2010). Arguably, investing in a foreign subsidiary is both a product of globalization itself, and a means to advancing the dynamics of globalization.

In executing global transactions that involve the physical movement of assets, the scope of global connectivity has historically been set by the possibilities of logistics. The movement of cargo is still most cost-efficiently accomplished by container or oil tanker shipment, and more than 80% of global cargo is transported by sea (Xiao et al., 2012). In this function it is seaports rather than airports that have a fundamental role to play in the integration of global markets, and in expanding businesses across countries and continents. The energy sector, and with particular respect to the focus of this paper, the petrochemical industry, relies heavily on the efficiency and availability of seaports, as most oil consumed for energy purposes was extracted far from the end-user's location. This implies that cost efficiency of both energy and petrochemical businesses is highly exposed to port availability.

In a wider sense, this paper therefore addresses the intersection of three superordinate topics. Firstly, the role of foreign direct investments (FDI) as a product and impetus of globalization is discussed. Herein, emphasis is placed on the theoretical link between ports and investments, and on how this link leads to petrochemical sector investments in ports. Secondly, this paper touches upon the fundamental role the energy industry plays in fueling globally integrated growth. Lastly, geopolitical factors which form the backbone of investments in the petrochemical sector are addressed, and an attempt is made to explain their distinct contributions to ownership structures in oil-related companies in the Amsterdam-Rotterdam-Antwerp (ARA) region and Houston, TX.

In the past, academic literature has mostly focused on the container shipment industry rather than the petrochemical sector. In comparison to the container/cargo shipments, it is important to recognize that oil markets in general, and specifically demand and supply dynamics of oil, are substantially more volatile – herein, geopolitics have a fundamental role to play.

2.2 Geopolitical Impacts - Political & Macroeconomic Background

Geopolitical determinants provide an important context in any attempt to examine investments in oil extraction and refining assets. Above all, the motivation of companies to invest in petrochemical assets is closely linked to the current and anticipated prices of oil and refined oil products. In this regard, global oil price developments are themselves fundamentally influenced by two determinants: the combination of supply and demand forces, as well as general market sentiments held by investors. In their origin, both oil-price determinants also share a common influential element in that they are significantly influenced by the geographical distribution of natural resources (petroleum) – geopolitics. Elements based on geopolitical and geo-economic factors thus actively shape the oil price through their contribution to demand and supply developments. Historically, the often volatile oil prices are therefore only partially explained by the inherent sensitivity of investors and of other market participants ('market sentiments') deriving from the systemic role oil plays in the majority of economic and manufacturing processes. Beyond market sentiments, the often more defining contributors to oil prices, are hence the underlying geopolitical changes that illustrate shifts in supply and demand patterns of the global oil trade.

The rapid pace at which geopolitical factors have developed in the recent months and years[3], particularly in the petroleum industry, adds complexity to any attempt at clearly defining the these factors exert on the investment decisions of firms in the long-run. Nonetheless, developments from approximately the years 2004-2016 allow an educated insight into which geopolitical determinants are at the center of the petrochemical industry, and into how these impact the global oil trade (volumes and

[3] Considered here are developments until August 2016.

balances). Significant trends from this time period have led to structural shifts in oil production and consumption across regions. At the forefront of these trends are two distinct drivers of change: increases in oil demanded from China (most notably following the rapid expansion of the domestic manufacturing sectors since the beginning of the 21st century), as well as the more recent resurgence of shale oil production in the United States.

Since around 2008, the United States has re-entered the market as a major oil producing economy. The US economy's primary objective to doing so has been the exploitation of proven shale oil reserves, and their re-entry to the oil extracting market has been supported by the extensive local use of hydraulic fracturing[4] (Crooks, 2016). The novel opportunities provided by the combination of innovative horizontal drilling and hydraulic fracturing have resulted in circumstances that enable the profitable extraction of shale oil from vast regions in the central United States. Prior to the introduction of these drilling and extraction tools, the known shale oil reserves were not accessible in an economically sound/profitable manner, and the US was therefore not a large-scale oil-producing nation. As a consequence of these events, price indices point to decreased oil prices since 2008[5]. The additional supplier boosts both economic competitiveness between oil producers, and supply flexibility.

Several other trends illustrate changes in the global oil market. Firstly, a general increase in the traded oil quantities has taken place, which arose partly as a result of globalization and the ongoing industrialization of developing countries. As more countries in vast global regions are economically integrated into the world's supply chains, demand for oil increases in accordance to the expansion of their manufacturing sectors (industrialization). Consequently, the quantities of traded oil have increased by around 18% between 2004 and 2014, from 48 million barrels per day (mb/d) to 57 mb/d (Evans & Pearce, 2016). Importantly, however, this 18% rise in oil exports/imports is not entirely a direct outcome of increasing demand, since in the same time period the global demand for oil increased by merely 11% (Evans & Pearce, 2016): this disproportionately robust growth in trade indicates that factors other than demand were influential. Regional patterns regarding production and consumption have likely shifted towards less oil being consumed within the country of extraction. Additionally it is reasonable to assume that for reasons such as (a) to exploit future oil price increases, and (b) to smoothen short-term demand fluctuations, oil and energy corporations have invested in inventory build-ups (Domm & DiChristopher, 2016).

Yet, the enhanced US-oil supply is insufficient at providing an adequate explanation for the disproportionate increase of trade volumes over approximately the last decade. To explain: prior to the resurgence of the domestic oil industry, the United States relied heavily on oil imports[6], and therefore the enhanced exports and subsequently decreased imports (since 2008) have resulted in a rather limited US to changes in global trade volumes.

[4] commonly referred to as 'fracking'.
[5] Fluctuations have led to temporarily increased prices since 2008.
[6] US oil imports arrived mostly from Canada, South and Central America, and the Middle East.

Nonetheless, the impact of the US shale oil renaissance is undoubtedly systemic for geopolitics. Due to the wider range of oil exploring and exporting countries, disruptive effects in the oil market are diminished. In comparison to previous decades, in which petroleum largely originated from a handful of geographical regions – most notably the Middle East, Russia, South and Central America - the extension of profitably extractable oil to the United States reduces the dependency of importing countries on these regions. Naturally, and as an outcome of added oil exporters, the (re-)introduction of US shale oil increases pressure on prices – amongst others, this development has directly impacted the traditional OPEC[7] countries.

Beyond US-based developments, one robust trend has been the changing pattern in destinations of Middle Eastern oil exports since 2004. Whereas total output volumes by Middle Eastern (ME) countries have only increased slightly (Evans & Pearce, 2016), the export destinations have shifted from the Europe and the United States to Asia; China, India, and other Asia Pacific countries are now the largest importers of Middle Eastern oil. To illustrate: whereas European imports of ME oil has decreased from 3203 thousand barrels/day (tb/d) to 2056 tb/d between 2004 and 2014, China's imports increased rapidly from only 1264 tb/d to 3457 tb/d (Evans & Pearce, 2016). This evolution is represented by the trade volume diagram on the following page, which demonstrates the significance of Asian countries as destinations for petroleum from the Middle East. Remarkably, this progression occurred despite China itself being a major oil producing nation.

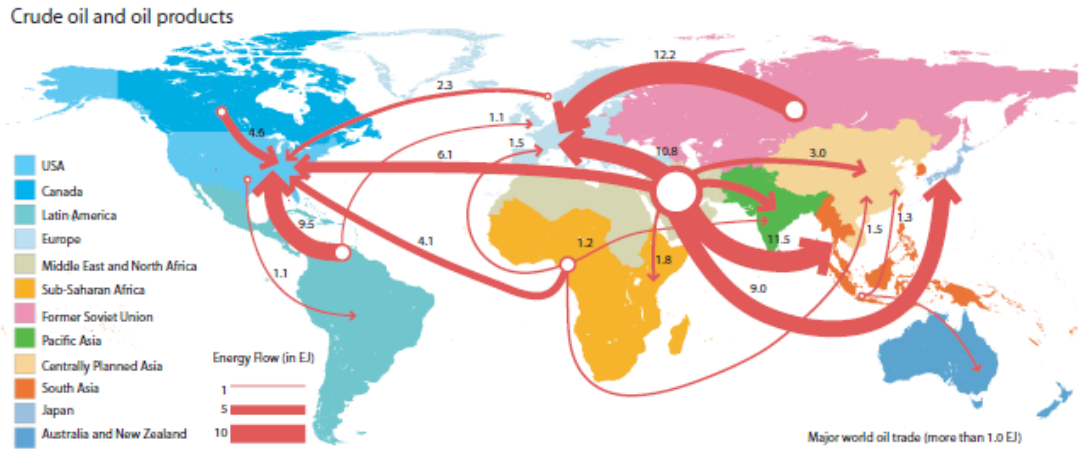
The lasting spike in Asian oil demand is fundamentally fueled by the industrialization and economic development in China and India, and by smaller nations that are similarly integrating into the global economy. In this global context, the increase in Asian oil demand parallels the approximately 41% increase in oil consumption by non-OECD countries since 2004. On the other hand, it stands in stark contrast to consumption patterns in other regions: developed countries[8] have been able to reduce oil consumption by 9% (Evans & Pearce, 2016).

To a similar scale as Middle Eastern countries, Russia (Former Soviet Union) also holds a powerful position in the global petroleum supply. Accordingly, Russian exports account for the majority of oil imported into member states of the European Union (and European countries in general), and they have for many years. In 2014, an average of 6028 thousand barrels of Russian oil were imported to the EU-28 daily, which signifies an approximately 13.6% rise versus 2004; This progression partly offset the respective decrease in Middle Eastern product imports. Nonetheless, exports from the Former Soviet Union have also developed in parallel to Middle Eastern trade flows: whereas in 83% (or 5343 out of 6440 tb/d) of all Russian exports were shipped towards Europe in 2004, Europe-bound petroleum accounted for merely 67% of all exports in 2014. Inversely, oil exports to China grew nearly threefold in this period, from 365 tb/d to 926 tb/d (Evans & Pearce, 2016). This emphasizes the influence rapidly

[7] Organization of Petroleum Exporting Countries
[8] as defined by the Organization for Economic Cooperation and Development (OECD)

developing Asian economies have on the geopolitics of oil markets, and respectively the global trade flows.

Nonetheless, the reduction of European imports as a proportion of total Russian oil exports is also based on (a) Russia's rising volume of total oil exports, and on (b) Europe's enhanced energy efficiency. According to Eurostat's report of gross energy consumption by the EU-28 countries, European energy consumption decreased from 1824.7 to 1666.3 million tons of oil equivalents within eight years[9] (Eurostat, 2015). More specifically, OPEC data illustrates that European demand for oil declined by nearly 25% between 2004 and 2014 (Evans & Pearce, 2016), which is largely due to stricter European energy efficiency standards, but also due to the proportional increase in European energy obtained from renewable sources.



Despite the longer term macroeconomic developments outlined above, which indeed shape the geopolitical environment of oil trade flows, short term changes and political events can have dramatic impacts. Consequently, a lot has changed already within the first half of 2016.

For one thing, in recent months the price of oil has reached historic lows, following a robust and continuous trend of decreasing prices since approximately mid-2014. This development peaked in January 2016, when the US crude oil WTI[10] index hit the lowest point since 2003 standing at below $27 (Domm & DiChristopher, 2016). Although such low prices naturally exert substantial pressures on oil-producing corporations and nations, OPEC and non-OPEC countries have since continued to supply oil to an already saturated and oversupplied market. As Domm and DiChristopher (2016) reported for CNBC at the time, the low prices are not simply a result of excessive crude oil stock buildups, but are also caused by ongoing changes in the industry's geopolitical landscape. Iran's re-establishment as an exporting nation, which came after Western countries lifted trade sanctions on Iran following a dispute over the country's nuclear program, allowed for additional stock buildups to take place. As John Kilduff

[9] (2005-2013)
[10] West Texas Intermediate

of Again Capital, LLC explained, "the Iranians are clearly stepping it up to battle for market share in Europe" (Domm & DiChristopher, 2016). The competitive struggle for market share between producing nations is enhanced by the lower profit margins resulting from the ongoing price slumps, but is somewhat offset by the international cartel of petroleum exporting countries (OPEC).

In order to re-connect the supply of oil with demand, OPEC countries have held several meetings during the course of 2016 with the aim of - at least discussing – decreasing the supply made available for export. The reasoning behind this is that the significant effect OPEC has on global oil prices (it accounted for 43% of global oil production in 2015) can be leveraged in order to increase prices to more profitable levels (Zhdannikov, Lawler, & El Gamal, 2016). As Russian Minister of Energy Alexander Novak expressed after a June 2016 meeting with his Venezuelan colleague, OPEC has temporarily decided against a production freeze to strengthen prices, although this policy is still an option for the future. Particularly, Iran's position against such a measure may change if the Iranian oil industry rehabilitates in the future (Zhdannikov, Lawler, & El Gamal, 2016). However, OPEC's motivation towards an increase in global oil prices has, in general, been balanced by the increasing competition resulting from the US' re-entry into the oil exploring market.

In order for the extraction of crude oil in the United States to be economically sound, certain minimal prices need to be exceeded. Considering that the US is not a member of the OPEC alliance, OPEC member countries have held meetings to discuss possible benefits from prolonging the currently low market prices. Naturally, this would counteract the desires for higher profit margins, but in return solidify the position of OPEC countries as market leaders in the oil industry; In the struggle for market share, maintaining low prices may drive out US competition. According to Bjarne Schieldrop of SEB (Oslo), such prices are necessary in order to "slow down shale" (Domm & DiChristopher, 2016). However, the effectiveness of price-decreasing measures by OPEC at slowing down shale extraction and production is questionable. Due to the cost variations associated with drilling different oil wells - which depend on a multitude of factors such size, volume of extractable oil, and geographical conditions - the break-even price levels vary substantially across US shale oil companies and wells (Rapier, 2016). Oil price levels below which it is unprofitable to extract and produce US shale oil are therefore not a definite US-dollar price per barrel, but rather a bell-curve of amounts depending on company and location. Although prices per barrel of crude oil may sink below 30 US-dollars, some companies may still extract profitably, whereas others are already forced to halt production at prices below $70. Additionally, hydraulic fracturing processes are becoming increasingly innovative and cost efficient. As Crooks (2016) points out, US shale wells have decreased costs by 30-40% since the oil price dropped in mid-2014, whereas other oil production projects were able to reduce costs by merely around 10-12% in the same period. From this, and from the extensive US shale oil inventory buildup that has already taken place results a fundamental difficulty for OPEC member states in determining how the cartel's substantial market power is best used to establish an optimal price that aligns with their interests - one that drives out US shale oil, but also satisfies OPEC's profit benchmarks.

Historically, OPEC countries have often had a strong influence on the price of oil, but it has not always been possible to avoid intra-cartel conflicts of interest. Some countries have thus demonstrated their willingness to find an agreement that limits oil supply in order to decrease prices with the aim of securing market share vis-à-vis the United States oil industry. In the commonly fast-paced petrochemical industry, this approach has paid off in recent months, at least as of July 2016. As the Wall Street Journal reported, "OPEC Is Winning the Market Share War" (Said, 2016). In line with theory presented above, OPEC member states are doing so by providing the largest output worldwide since the 1970s. Referencing the IEA[11], OPEC has been able to partially regain consumer reliance it had lost as a result of rising US shale, a development that is principally based on two factors: output increases by OPEC countries (particularly in the Middle East: Saudi Arabia, Iran and Iraq) and diminished shale oil yields due to plummeted prices.

Especially Saudi Arabia, Iran and Iraq have contemporarily relevant reasons for driving up their own production of crude oil, and these highlight the importance of geopolitics in the global petrochemical market; Whereas Saudi Arabia's oil industry is seeking to retain market share despite low prices and strong global competition, Iran's significant output surge results from the lifting of international sanctions following a multilateral agreement regarding its controversial nuclear program. Iran was thereby able to profitably increase its production by 750,000 barrels/day in July compared to January 2016 (Said, 2016). The interconnectedness of global events, politics and the petrochemical market is further illustrated by Iraq's incentives to boost production. According to The Wall Street Journal, Iraq requires revenues in order to finance its domestic war against the Islamic State[12].

The part geopolitics play in the petrochemical market is therefore a phenomenon of global reach. Moreover, geopolitical drivers are themselves dynamic and subject to a multitude of factors. Innovations on both the supply side - such as the ones that enabled the recent revival of US shale extraction through (more cost-effective) fracking and horizontal drilling – and on the demand side of the petrochemical industry – for instance caused by fluctuating demand from the Chinese manufacturing sector – continuously alter the patterns of regional pressures and the outline of the global oil trade.

Beyond the influence of technological advances and macroeconomic performance (e.g. economic crisis of 2007/08), political circumstances and international relations are considerations that are influential, but also difficult to foresee. Global politics thus often contributing to abrupt shifts in production and trade incentives for reasons that lie beyond the purely performance-related forces of business. Venezuelan, Iranian, and Iraqi production schedules have in recent months all been dictated by reasons based on politics, not business, and global petrochemical companies and countries are forced to adjust accordingly.

[11] International Energy Agency
[12] Islamic State of Iraq and Syria (ISIS)

In this context, it is particularly exciting to conduct research into the investments companies have undertaken worldwide in order to optimally prepare for the changing circumstances that are unique to the petrochemical industry. Investment decisions by multinational petrochemical corporations are subject to both industry-inherent features and those shared across sectors. Besides, the primary features of the oil industry's most common investment locations, ports, play a substantial role in determining investment features. Comparing global ownership structures of petrochemical investments in ports is therefore likely to clarify the links between geopolitical developments, port-specific features, and the decisions made by petrochemical MNCs.

The Port of Houston, as well as the ports in Amsterdam, Rotterdam, and Antwerp are regionally and internationally well integrated, and are of systematic importance to the oil industry. In addition to this similarity, the geopolitical developments outlined above are likely to have had different influences on ports in the United States in comparison to those in Europe or elsewhere. In any case, the Port of Houston (Houston Ship Channel) has established itself as a processing hub for the refining of US oil, and is thus directly affected by the regeneration of the US shale oil industry. Equally, in Europe the petrochemical industry relies heavily on the ports of the ARA region when it comes to processing imported crude oil, and in distributing both raw crude oil and refined oil products across Europe. Refineries and related companies have thus settled at both the Port of Houston and Europe's Amsterdam-Rotterdam-Antwerp hub. Nonetheless, distinctions exist that set the ARA ports and the Houston Ship Channel apart. Returning to the specified aim of this paper, large parts of this thesis introduce and outline factors that contribute to producing these differences; Geopolitical influences are naturally one such determinant, because they are, as discussed above, central to the global demand and supply dynamics of the oil market.

3.1 Theoretical Framework: An Overview of FDI

The pursuit of companies for the most profitable business ventures has led to a continuous and self-reinforcing growth of export sectors and related FDI activity, which makes foreign investments an integral part of advancing economic integration (OECD, 2009). Examining the associations between ports and FDI thus necessitates, at first, an illustration of why, how, and who, conducts FDI.

Foreign direct investments are the means through which corporations, government, or other entities are able to seek financial returns on economic activities conducted outside their home country. Setting up interests abroad can be achieved through multiple channels of which, however, many are considered indirect means of investment. Direct investments are the focus of this thesis, and they ignore the mere trading of portfolio securities on stock exchanges, but are rather concrete financial commitments to physical assets such as buildings and machinery that are not located within the MNC's home country (UNCTAD, n.d.).

The degree of influence a multinational corporation is able to exert in the target company is a second key component of foreign direct investments (FDI). Whereas indirect investments are equity purchases of less than 10% of a target company's shares, corporations conducting foreign direct investment typically acquire significant managerial influence over the investee firm. The Organization for Economic Cooperation and Development (OECD) has thus defined the benchmark for FDI at a minimum of 10% voting stock of the investee (OECD, 2009).

Within the FDI spectrum, more specific categories describe certain aspects of an investment. An important distinction is herein made between investments in pre-existing activities called brown field FDI, and ventures in which a parent company initiates a novel business setting by constructing an altogether new facility abroad: greenfield investments (OECD, 2009). The distinction between green- and brownfield FDI is thus primarily in the investor's mode of entry into a foreign market.

Greenfield investments are often conducted by companies seeking to exploit tax advantages or governmental subsidies by moving production or service sites to countries that offer these (De Mooij & Ederveen, Corporate tax elasticities: a reader's guide to empirical findings, 2008). Often, such financial incentives are offered by developing countries in which the losses imposed on the government budget by either relatively low corporate taxes or high subsidies are sacrificed, in order to promote growth generation through foreign investments that lead to job creation, sector diversification and human capital. As Reganati and Sica (2007) explain, greenfield FDI are therefore both an accelerator and a result of globalization, as the increasing global connectivity facilitates and motivates such investments.

Additionally, globalization has led to increased integration and conglomeration of companies from different countries - this takes the form of brownfield FDI. Such investments are acquisitions in which multinationals purchase a significant share in a foreign company with existing resources and assets. Accordingly, mergers and acquisitions (M&A) typically account for the majority of brownfield

investments. A significant advantage can be that, compared to a similar greenfield project, lower amounts of capital are necessary in order for a multinational corporation to initiate a brownfield investment (Meyer & Estrin, 2001)

Similarly, foreign direct investments are classified as engagements in either horizontal or vertical business ventures. In this regard, the distinguishing feature lies in the role a foreign subsidiary will take in the investing company's supply chain – vertical FDI targets are either suppliers or distributors which supplement, but do not substitute, the investor's activities. In contrast, horizontal FDI pursues projects that conduct the same business activities as the parent company, but abroad. These classifications are important investment characteristics, and they will be referred to and discussed throughout the following sections of this thesis, in both a port-specific and general sense.

3.2 An Outline of Investments in Ports

In a practical sense, ports across the world are principally organized in a similar fashion. Each port is controlled and organized by a port authority which acts as a public authority to regulate, operate and develop ports locations. As stated by the Port of Rotterdam Authority, its objective is to facilitate the port's competitive position as a logistical hub and processing location by "maintaining the safe and smooth handling of all shipping" (Havenbedrijf Rotterdam N.V., n.d.). In contrast to this, port authorities are not involved in the profitable operation of forwarding companies, petroleum-related corporations, and other private firms located within the port authorities' legislative boundaries. Their responsibilities therefore merely entail providing the land, facilitating the efficient operation of businesses, and ensuring a fair business environment that promotes the overall competitiveness of the port (Murphy, Dalenberg, & Daley, 1988). In order to attract companies and investment capital, port authorities thus strive to offer characteristics that are internationally competitive, and that will convince MNCs of the respective port's (cost and other) advantages over regional competitors.

In return, port companies, which are mostly engaged in the logistical and petrochemical industries, rely heavily on the business climate provided by the port (authorities) and the hinterland. As is true for most mature MNCs, port-based companies are driven by their achievement according to performance measures, most importantly profitability and efficiency. Cost-efficiency and minimization are consequently critical factors companies account for in their evaluations of foreign direct investments opportunities. In an FDI process, ports are therefore assessed for their ability to cater to needs of profit-maximizing MNCs, which depends on a multitude of variables such as geographic location, industry/sector within which a company operates, maritime accessibility, size, hinterland connections and network, as well as the diversity of companies already active at a certain location. Due to the variety of these factors, many of them extend beyond the influence of port authorities per se, and are primarily determined by the already established economic environment. In the general vicinity of ports, firms and

firm investments consequently depend on the availability of other companies for cooperation, and the shared infrastructural resources accessible to them.

As Notteboom (2004) points out, shipping and processing activities generally have high capital requirements. In the past, foreign investments in ports have therefore been conducted primarily by global players as these are best suited to meeting the financial prerequisites, and for which expensive initial investments in ports are most executable. In the petrochemical sector (as in the container shipping industry), globally operating firms and powerful oil-producing nations are therefore reasonably the major contributors of FDI (Notteboom, 2004). Nonetheless, differences are likely to prevail between ownership structures of petrochemical investments in different global regions. Such variances pertain to, amongst others, control by private corporations versus government-held entities, and the domestic versus foreign global ultimate owners (GUO). Before examining these aspects in greater detail[13], though, the macroeconomic FDI determinants are outlined in the remainder of this chapter.

3.3 Macroeconomic Determinants of Foreign Direct Investments (FDI)

The decisions of corporations to expand their market beyond the borders of the domestic country are always influenced by multiple factors, some of which are inherent to firms, whereas others are influential factors imposed onto companies externally. Through the dynamic process of economic research, competing and at times conflicting theories have been formulated that are meant to outline a particular set of variables most influential on corporations' FDI strategies. As Blonigen points out in a 'Review of the Empirical Literature on FDI Determinants' (2005), economic studies of prominently quoted FDI determinants have given rise to theories with "apparently contradictory hypotheses", which have then been supported by empirical evidence based on highly similar data sets. Theoretical work may thus have been the primary emphasis of previous economic research on this topic, rather than the pursuit of scientific proof through statistically significant relationships (Blonigen, A Review of the Empirical Literature on FDI Determinants, 2005).

Nonetheless, a robust group of key influential factors have been established that often guide FDI decision-making. Providing an outline and explanation for these factors and their function in determining site and extent of FDI is the focus of this paper's subsequent section.

The specific interaction of port-based or petrochemical FDI and the determinants discussed below is of varying significance; Nonetheless, all factors are commonly considered by firms during FDI decision, whether these are port/oil-related investments or in another industry entirely.

[13] By comparing the respective ownership features in the Houston Ship Channel and the Port of Rotterdam.

Bloniger (2005) provides a conclusive overview of foreign direct investment factors, and the discussion provided below is approximately organized in line with Blonigen (2005).

Exchange Rates

For a long time, the widely accepted conviction was that changes in exchange rates would ultimately be cancelled out, hence allowing the investment returns to be robust against exchange rate effects. The foundation of this belief was rooted in perfect capital markets: in the case of the MNE's domestic currency experiencing an appreciation, the cost of holding foreign resources decreases. However, it was generally accepted that this development would be paralleled by a decrease in nominal returns thus cancelling out any exchange rate effects.

The most prominent theory that departs from this assumption, constructed by Froot and Stein (1991), has widely changed the belief that exchange rate effects will dilute during capital transfers between an MNE and its affiliate abroad. The underlying assumption Froot and Stein introduce highlights the imperfections in capital markets - "information imperfections" (Froot & Stein, 1991), which suggests that costs of internally obtaining capital for investment are significantly lower than those associated with acquiring capital from an external source such as an independent financial institution. Empirical evidence backs up this claim, and specifically indicates that currency depreciations often lead to enhanced in-flows of investment capital (FDI) towards that respective economy. In the case of a relative currency appreciation of the firm's domestic currency, firm wealth increases and the costs of internal funding available for FDI decrease relative to those of companies abroad. Therefore, the imperfect capital markets attract foreign direct investments into economies subjected to a relative currency devaluation (Froot & Stein, 1991). Empirical support for this claim comes from Yuqing (2006) in a study that focused on Japanese FDI to several Chinese manufacturing sectors between 1981 and 2002. Results indicate a clear significant effect of real exchange rates - specifically the devaluation of the yuan by the People's Bank of China - on Chinese inward FDI (Yuqing, 2006). The positive influence of a devalued or depreciated currency on foreign direct investment inflow is therefore theoretically coherent, and also verified empirically.

Additionally, Blonigen (1997) presents another finding that, however, has only limited applicability to port investments: as firms often seek to invest in assets that are transferable across multiple markets within a firm, but without exposure to exchange rate effects, inward FDI is specifically promoted by domestic currency depreciations in sectors in which enterprises have a high degree of company-specific assets (Blonigen, Firm-Specific Assets and the Link Between Exchange Rates and Foreign Direct Investment, 1997). To illustrate, it could be argued that due to their inherent characteristics regarding, amongst others, intellectual property, companies in "high-technology" sectors like the IT industry would tend to be more likely to exploit FDI opportunities than sectors in which

innovation and firm-specific properties are of lesser importance (Blonigen, A Review of the Empirical Literature on FDI Determinants, 2005).

A second fundamental element of exchange rates are their volatility. Bénassy-Quéré, Fontagné, & Lahrèche-Révil (2001) studied the influence of exchange rate volatility on long-term capital inflows to a country while considering the theoretical tradeoff between price competitiveness and nominal exchange rate stability as a background. Results significantly demonstrated the negative effects of frequent exchange rate fluctuations on foreign direct investments, indicating that promoting a "stable financing of growth" especially in developing countries requires a certain degree of currency stability. With the interests of such countries in mind, Bénassy-Quéré, Fontagné, & Lahrèche-Révil (2001) thus suggest an approach of monetary regionalism based on currency blocks. However, Desai, Foley, & Hines (2004) produce seemingly contradictory empirical findings by establishing that during crises, which are typically paralleled by currency fluctuations and uncertainty, investments by foreign MNEs remain constant relative to investments of local firms. This they explain by the capacity of large MNEs to fund investments internally.

Two primary attributes of exchange rates, namely the rate itself as well as exchange rate volatility have thus both been established for their effects on foreign investment decisions by multinational enterprises. Whereas according to Froot & Stein (1991) and Yuqing (2006) a depreciation or devaluation of a currency can enhance inflows of foreign capital through FDI, Bénassy-Quéré, Fontagné, & Lahrèche-Révil (2001) find that exchange rate fluctuations can have an adverse effect on an economy's attraction of FDI.

Taxes

Naturally, the attractiveness of markets with regards to FDI is primarily dictated by the financial rewards MNEs can anticipate to earn following an expansion into a foreign economy. Due to its direct association with a multinational's investment return - which is a fundamental benchmark for most investment decisions - it is reasonable to assume that few single economic properties of a country are equally dominant to an FDI decision as corporate taxes. This is illustrated by measures introduced in February 2016 by the Indonesian government to promote foreign investments in over 50 sectors. With a history of long-term protectionism, Indonesia employed ‘tax breaks’ in order to promote competition to domestic companies in the form of FDI (Kapoor & Chalmers, 2016).

Important early research that studied the relationship between potential foreign direct investee countries and the associated attractiveness for MNE expansions was conducted by Hartman (1984). It is argued that earnings generated through a foreign direct investment will, in the long run, be taxed by both the foreign and host countries. It is therefore unavoidable that a combined taxation regimen consisting of fiscal policies by the MNE's domestic and foreign affiliates' countries are incurred; this is

referred to as double taxation. Both the host and parent country's tax procedures that target double taxation may thus impact foreign direct investment decisions (Hartman, 1984). Hartman's research aim addressed the decision multinationals face of whether to reinvest a foreign affiliate's earnings there, or whether to repatriate profits. Although Hartman implies that foreign and domestic tax regimes will ultimately both be imposed on any earnings generated through FDI, one should understand that the matter of repatriation timing is nonetheless important to MNEs, for instance to meet short-term liquidity demands. Additionally, Hartman finds that whilst the responsiveness of retained earnings FDI to tax rate changes is significantly higher than the responsiveness of transfers, using retained earnings as the marginal source of funding is cheaper than continual transfers. The failure of Hartman (1984) to account for and control variations in domestic (parent) country tax rates, however, limits the applicability of the study's further conclusions.

The responsiveness of inward FDI to changes in corporate taxation has been the subject of a steady research basis – most studies focus on confirming the plausibly inverse relationship between, primarily, corporate taxation in target countries and the respective countries' ability to attract investments from foreign MNEs. De Mooij and Ederveen (2003) combined empirical literature on the relationship between foreign tax regimes and FDI distribution and attempted to numerically define the responsiveness of the tax rate elasticity of FDI. Understanding the magnitude of impact that tax rates have on the investment decisions of multinational corporations' is fundamental to all parties involved because it helps to establish how business-friendly a country's economic environment is to profit-driven corporations. Equally, knowledge on how responsive FDI is to changes in corporate tax rates enables governments to estimate the (un-)desirable outcomes of a scheduled tax regimen modification. The meta-analysis of 25 studies, despite considerable variations between studies relating to differences between sectors and across regions, indicates that the median tax rate elasticity of FDI is at -3.3 (De Mooij & Ederveen, Taxation and foreign direct investment: a synthesis of empirical research, 2003). In similar terms, a 1% alteration in host-country taxes leads to a 3.3% inverse change in FDI. It is interesting to note with regard to port-related investments, that De Mooij and Ederveen (2003) discover a particularly high tax rate elasticity of foreign investments in plant expansions and the construction of new plants. Tax rate management is thus indicated to be an effective policy tool for governments seeking to promote expansion of capital by foreign MNEs, as is often the case for port-based investments.

In summary, although MNE's are generally subjected to taxes on a variety of levels and in all involved countries, several conclusions can be reached based on previous empirical research. Firstly, double taxation policies are always intertwined when considering tax rate effects on foreign investments (Hartman, 1984). Additionally, De Mooij and Ederveen determine that with specific focus on tax regimens in FDI host locations, the level of foreign investment is strongly impacted by national corporate tax rates (De Mooij & Ederveen, Taxation and foreign direct investment: a synthesis of empirical research, 2003).

Government, governance and institutions

On top of rather macroeconomic factors such as taxes and exchange rates, systemic features of a country contribute to foreign investment decisions. This consideration is rooted in the fact that companies are not exclusively guided by their pursuit of short-term financial rewards, but must account for the long-term stability and safety of an investment. Location and magnitude of direct investments are thus closely linked to both the system of government in place, and to the political ideology represented by the incumbent government.

In general, the manner of impact that institutions and institutional efficiency have on foreign investment activities is non-controversial and straightforward. As Blonigen (2005) explains, institutional organizations are necessary in order to ensure that an orderly economy is maintained, and that for several reasons. In large, enforcing a strong legal system facilitates FDI due to its role in protecting assets. A company's belief in the security of its assets abroad is fundamental to its willingness to conducting investments at a certain location. Additionally, institutional quality typically reflects the volume and quality of infrastructural investments such as public goods. Such investments facilitate the smooth functioning of markets and attract companies looking to sustain low costs of doing business abroad (Blonigen, A Review of the Empirical Literature on FDI Determinants, 2005). Infrastructural investments in roads, public transportation, telecommunication networks, health care, et cetera increase the attractiveness of potential FDI locations and increase the probability of investments into that market.

Nonetheless, historically it has been difficult to effectively study the correlation between the efficiency of a country's institutions/governance and the corresponding in-flow of foreign investments. The lack of universal and accurate measurements for institutions prevents a coherent analysis of mechanisms by which institutional quality promotes FDI – an alternative measure is hence commonly used as a proxy. In previous research, a frequently used form was a compound of various measures, often rating various institutions in a country based on surveys (Blonigen, A Review of the Empirical Literature on FDI Determinants, 2005). It is clear that such inaccurate measurement practices lead to difficulties in comparing countries, and hence in linking governance and institutional quality to foreign investments. lack

In practice, studies often rely on corruption indices to demonstrate countries' governance and institution characteristics. Busse and Hefeker (2007) determine from a sample of 83 developing countries during the years 1984-2003 that corruption, government stability, and liability of government are all "highly significant" determining factors of foreign direct investments into a country. Political risk, stability, and the quality of institutions present in a potential host country are thus essential determinants, particularly when multinational corporations face the decision of determining an investment location. Asiedu's (2006) findings are in accordance with this, and it is demonstrated that

corruption and political instability deter many MNCs from conducting investments. Although most research fails to quantify the impact magnitude of corruption, Wei (2000) finds that an increase in corruption from the level in Singapore to Mexico (both in 1997) would have a similarly disincentivizing effect on FDI as an increase in taxes by 20% (Wei, 2000). Asiedu (2006) thus explains that "good infrastructure (…), an efficient legal system" as well as a robust agenda for investments have been shown to attract FDI.

Trade Protectionism and Trade Effects

Besides establishing a taxation schedule, governments are directly responsible for setting up a framework within which companies can import into and export out of a country. In order to protect domestic producers, governments can establish trade protectionist policy by which the costs of importing for foreign multinationals is increased. In order to avoid the costs incurred by trade protectionism measures, companies importing into the host country from abroad may be incentivized to produce in a particular country instead of trading. As Blonigen (2005) indicates, this kind of tariff-jumping FDI is not a plausible solution to all MNEs. Specifically, the considerable costs associated with initiating a foreign investment will provide smaller exporting with firms substantial financing difficulties. Blonigen therefore concludes that tariff-jumping foreign direct investments decrease the variable costs of MNEs, but they incur considerably high fixed costs for setting up the foreign affiliate. Equally, this reasoning implies that a firm's affinity towards conducting horizontal FDI is positively correlated with the scale of business an MNE has in a country. This scale effect of foreign market demand on the conversion by MNEs from exporting to foreign investments is also addressed by Helpman, Melitz and Yeaple (2003), who on a related note add that, according to their findings, firms that conduct FDI over exports are relatively more productive and larger (Helpman, Melitz, & Yeaple, 2003). These results are most appropriately explained by a combination of (a) the ability of productive firms to pay for high "sunk costs" when initiating an FDI and (b) the market demand for its products (Helpman, Melitz, & Yeaple, 2003).

4.1 Eclectic Paradigm: Ownership, Location and Internalization

The investment determinants discussed in the previous section are focused on factors that are not industry-specific, but that relate to the overall economic and political circumstances of a location. Beyond these properties, however, the petrochemical industry as well as ports exhibit characteristics that make foreign investments attractive. Accordingly, there are FDI determinants not taken into consideration by the Hecksher-Ohlin-Samuelson theory of international production and trade. For instance, this pertains to the situation in which positive transaction costs exert influence on intermediate goods transactions. In order to address such logical gaps, Dunning constructed a framework for evaluating foreign direct investments (FDI) by specifically analyzing the characteristics demonstrated by locations and companies (Dunning; 1973, 1988, 2001). Naturally, foreign direct investments have a multifactorial nature, and accordingly, no present theory alone can accurately capture all aspects of FDI. In this respect, Dunning's eclectic paradigm focuses on describing the "extent, form, and pattern" FDIs take as a source of international production (Dunning, 1988). In this pursuit, the eclectic paradigm comprises three components.

Firstly, ownership-specific components (O) assess the productivity benefits a subsidiary gains from the parent corporation's control of intangible, but transferable, assets. These factors are alternatively called competitive or monopolistic advantages, and are inherent to companies already prior to FDI-based expansion (Dunning, 1988). Assets considered to provide ownership-specific advantages are thus income-generating and mostly intangible, and enable a multinational company to profit from foreign production. To exemplify, such O advantages as defined by Dunning include the control of intellectual property (IP), a robust corporate culture, as well as expertise-related intangibles that enhance a multinational's inclination towards expanding internationally. It is evident that ownership-specific advantages can significantly contribute to FDI decisions – nonetheless, it is likewise probable that FDI activity itself also influences corporate culture and other intangible assets (e.g. know-how). This indicates a positive dynamic and reinforcing process between FDI projects and the O specific advantages available to MNCs. Dunning's arguments emphasize that on the basis of such dynamics, companies that have previously established subsidiaries abroad are theoretically more inclined to do so in the future (Dunning, The determinants of international production, 1973).

Further, Dunning implies that the political, competitive, and infrastructural circumstances of a location play an important role in where MNC's conduct investments. Such location-specific components (L) relate to exploitable advantages that result from the non-transferable features of a location or economy (Dunning, The determinants of international production, 1973). These include labor costs, tax policy, trade policy and the absence of tariff and non-tariff barriers, industry competitiveness, as well as proven agglomeration economics at an investment location (Dunning, The eclectic (OLI) paradigm of internatonal production: past, present, and future, 2001). In this context, firms evaluate alternative locations to identify the most profitable site for their value-added activities.

Thirdly, the eclectic framework accounts for how efficiently foreign direct investments are able to exploit know-how and other resources in order to generate earnings. Such internalization-specific advantages (I) are fundamentally the result of an MNC's decision to use the ownership-specific advantages (O) internally through FDI projects, instead of acquiring them through the (intermediary) open market (Dunning, 2001). This decision faced by multinationals is thus primarily based on whether it is most effective for a corporation to produce a product itself, or to outsource its production by contracting an outside company. Consequently, the higher the transaction and production costs are of exporting or licensing compared to FDI, the more effective it is for a firm to conduct foreign direct investments. Equally, the opposite is true: The lower the net benefit of internalizing foreign production versus engaging in cross-border markets, the less attractive FDI is to an MNC (Dunning, 2001).

The eclectic paradigm was thus designed to address how international production is financed through FDI, and how multinational corporations attempt to profit from their ownership, location, and internalization (OLI) advantages. Fundamentally, Dunning specifies that all three advantage categories are necessary in order for foreign direct investments to be economically viable. In response to the alternative channels by which companies can achieve international expansion, the eclectic paradigm thus provides a straightforward decision-making framework. This facilitates a detailed but clearly structured evaluation of FDI projects, and of the economic circumstances provided by a location and/or an industry.

The table below simplifies the most essential aspects of the eclectic paradigm. Dunning argues that licensing or exporting are the preferred choices whenever either of the OLI advantages are insignificant, or absent from an investment scenario. Only once all three criteria are adequately satisfied, is FDI-based expansion the most efficient form of market entry (Dunning, 1988). In consideration of the large foreign direct investments that have traditionally been undertaken in the petrochemical sector, and particularly within ports, it is worth examining the OLI advantages in this industry in greater detail.

		Advantage category		
	(Dunning, 1988)	Ownership-specific advantage	Location-specific advantage	Internalization-specific advantage
Form of Market Entry	**Licensing**	**Yes**	No	No
	Exporting	**Yes**	**Yes**	No
	FDI	**Yes**	**Yes**	**Yes**

In the petroleum sector, foreign direct investments are generally conducted by both private-sector and government-controlled corporations (the "nationals"). One can assume that, by and large, the decision-making objectives between the private MNCs and nationals do not significantly vary. In consequence, the large extent to which both private and public investors have conducted FDI projects indicates that OLI advantages are sufficiently present in the oil E&P industry. Now, then, the question arises of how precisely these ownership (O), location (L), and internalization (I) benefits emerge in the petroleum industry.

4.2 Ownership-Specific FDI Advantages in the Oil Industry

In the oil industry, revenues are to a significant degree dictated by market forces – free market mechanisms determine both supply and demand levels, and consequently impose prices. Petroleum companies are therefore price takers (Damodaran, n.d.), and only to a limited extent able to manipulate profits by adjusting revenues. The impact managerial decisions can have on enhancing earnings to boost profits is hence equally restricted. Generally, profitability in the petrochemical industry is therefore relatively dependent on the minimization of excess costs, for instance through technical efficiency of the supply chain (Pirog, 2007). In their practical application, the ownership advantages outlined by the eclectic paradigm of international production (Dunning, 1973) are thus primarily focused on cost-efficiency factors via, amongst others, economies of scale. In this regard, two performance measures are most widely employed to measure sector-specific profitability. Primarily, the gross refining margin (GRM) is the difference between revenues and the costs of cash inputs, implying that it measures performance exclusively on the basis of cash flows. To address the GRM's failure to account for non-cash expenses like depreciation (which is often significant due to high capital requirements), the net refining margin (NRM) is calculated by using the GRM as well as a deduction in non-cash costs (The World Bank, 2009).

In principle, ownership-specific advantages mostly emerge from a parent corporation's control of intangibles, and to a lesser extent tangible assets. As Dunning (2001) describes, such assets (O advantages) are most dominant when they are not available to rival corporations of other nationalities, and most crucially not in possession of companies that originate from an MNC's target investment location. The transfer of such inherent ownership characteristics from the parent corporation to the subsidiary facilitates the multinational's exploitation of profitable opportunities abroad, because it enables the MNC to transmit its competitive advantages to a new venture (FDI) abroad. The cross-border transferability of such properties is therefore the root of the competitive edge large multinationals hold on the basis of their intangible – and transferable tangible – assets.

Within the highly capital-intensive petrochemical industry, a diverse variety of applicable O advantages exist that can be leveraged by companies abroad. Large multinationals (the "majors" and "nationals") generally control an asset portfolio for petroleum exploration and processing (E&P); As

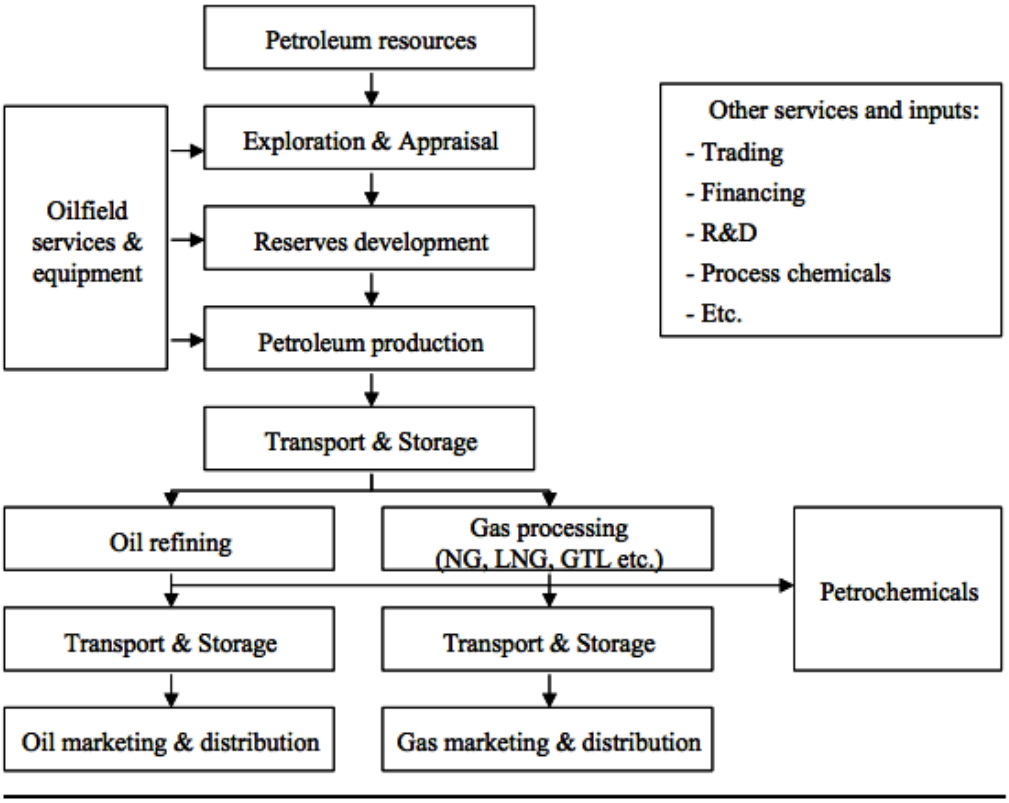
Olmstead (2001) points out with particular focus on exploration projects, the markets for E operations are cooperative rather than competitive: there is a "competition with mother earth", and only to a lesser extent direct competition between exploration firms (Olmstead, 2001). This widespread cooperation between large MNCs occurs at the E&P level, whilst on a corporate level companies maintain fundamentally competitive relationships (Olmstead, 2001). Arguably, such cooperation agreements between major oil corporations represent useful intangible assets that MNCs can leverage during the formation of foreign direct investments. In an attempt to explain these collaborative dynamics, the World Bank (2009) attributes these to the significant financial and procedural risks that accompany oil exploration and processing projects. These intangible relationships between otherwise rival companies are an essential competitive advantage shared by large multinational corporations, and they warrant the expansion of the ownership-specific advantages themselves through FDI (Dunning, The determinants of international production, 1973).

Equally, the physical assets held by globally operating MNCs provide them with a distinct competitive advantage, which serves as an explanation both for why the petrochemical industry is dominated by firms with significant market shares, and for their continued efforts towards internationalization. An examination of activities performed by companies in the petrochemical industry, for instance by viewing the value chain on page 27 (The World Bank, 2009) emphasizes this point.

Essentially, the extensive capital requirements necessary to perform tasks in the petrochemical sector are apparent at all stages of the process. Oil exploration, transportation, refining, and storage procedures therefore encourage the formation of large multinational companies, and their subsequent exploitation of technical and risk-bearing economies of scale. From this, it can be argued that the industry shows a tendency towards exhibiting natural monopolistic characteristics. In accordance with this reasoning, the World Bank (2009) concludes that there are a wide range of benefits brought about by both horizontal and vertical integration within the petrochemical industry.

In view of the petroleum value chain diagram on the following page, petroleum is, following its extraction, transported to processing facilities (refineries). Subsequently, the products yielded from the refineries' fractional distillation processes, are distributed. At this stage, in order to facilitate adjustments in line with demand and supply fluctuation, it is essential for petroleum companies to have systems in place that provide flexibility regarding the efficient transportation and storage of unprocessed crude oil and refined oil. Additionally, flexibility is required for the MNC to exploit possible price hedging opportunities. Herein, larger and more geographically integrated corporations are generally able to employ superior technical and procedural know-how, and to hold more extensive capital and physical resources. Due to these entry requirements an integrated process performed by a single oil and gas company can be relatively more cost-efficient, especially with reference to the characteristics of the petrochemical value chain (storage, transport, marketing & distribution).

Figure 1: Petroleum value chain



This cost-effectiveness is further enhanced by the greater competences/know-how of globally active corporations regarding technical procedures. For instance, companies rely heavily on their technical knowledge when determining the specifications of refineries, which are crucial to their efficiency. As companies gain experiences in a particular industry, their competence has been shown to progress in line with the conceptual learning curve (see Epple et al. (1991) and Lieberman (1984)). In studying such relationships, Lieberman (1984) states that in the chemical processing industry, which is also highly knowledge-intensive, learning effects are more strongly a function of cumulated investments (i.e. scale, R&D), than of calendar time. The influence of corporate size is thus positively correlated with technical efficiency, and it is reasonable to assume that MNCs in the oil industry are able to exploit such learning opportunities when (and by) conducting FDI. To exemplify, a petrochemical application of learning effects is in the configurations of refineries. These pertain to the capacity of plants to convert a certain combination of crude oil inputs into various yield products; they are thus central for productivity. Two scenarios serve to describe this issue.

Firstly, some crude inputs are lighter (less dense) or sweeter (lower sulphur content) than other feedstock, and input variations can heavily impact the value of refined outputs because lighter yields like gasolene, are more valuable than heavy ones. It is thus evident how corporate know-how on the technical assembly of plants are a crucial predeterminant for the cost-efficiency of an entire petrochemical operation (investment). Secondly, refining is a cyclical market, and its profitability is highly subjected to short-term marginal variations in supply and demand. Building on this notion, the

World Bank (2009) suggests that cost-efficiency is of increasing value to petrochemical refineries because many oil product end uses are themselves becoming more flexible. For instance, fuel-switching is relatively easy in both power generation and heating due to the high availability of alternatives like gas or coal. The hereby created elevation in price elasticities of demand highlight the significance of being able to produce at competitive cost levels, and multinationals can achieve this by exploiting scale economies in, for instance, research and development (R&D). For petroleum MNCs, the ownership-specific advantages defined by Dunning (1973, 1988, 2001) are hence enhanced by both the inherent properties of the industry, and by their own competitive advantages based primarily on scale. It can consequently be argued that the scale benefits global players have over competitors in almost all economic sectors are particularly pronounced in the petroleum industry.

Importantly, the oil industry's "majors" like Shell and ExxonMobil are additionally able to employ economies of scale with regards to their ability in acquiring financial capital from independent institutions. As has been argued previously, oil exploration and refining ventures are, in essence, risky ventures due to the high capital requirements and lengthy lead times involved (Stevens, 2005). Empirical research has demonstrated that scale facilitates the per-se acquisition of funding, and do so at more desirable conditions regarding repayment schedules and interest rates (Brav, 2009). Large multinational corporations are often more diversified and more effective at hedging risks than localized competitors. This is favourably reflected in the (perceived) creditworthiness of MNCs, and in the investment risks alleged by external – financial or otherwise – institutions.

Ultimately, the coming together of high capital intensity, technical knowledge requirements, and often highly leveraged investments are the most powerful drivers of scale benefits enjoyed by large petroleum companies. For MNCs, ownership advantages in this regard provide an advantageous setting for foreign investment activities. The intersection of these properties thus provides an explanation for the petrochemical industry's tendency towards exhibiting a highly concentrated market which is dominated by relatively few, globally operating corporations.

4.3 Location-Specific FDI Advantages of Ports to Oil Companies

Dunning's eclectic paradigm can act as a useful tool for identifying the optimal mode of entry a company should employ when expanding into a foreign market. The table on page 24 summarizes the relationship between the OLI-specific advantages and the proposed form of market entry, and it indicates that O advantages alone merely warrant international expansion per se. Nonetheless, given only the presence of ownership advantages, the matrix remains silent on the optimal participation strategy. Therefore ownership factors theoretically reinforce a company's foreign ambitions, but are not directly applicable to the decision of whether these ambitions are most effectively realized by exporting,

licensing, or FDI. Narrowing the range of economic participation strategies thus requires further analysis into the presence or absence of location (L) and internalization (I) advantages.

Due to the petrochemical sector's global scale, location-specific factors are of particular significance. The previously outlined geopolitical context within which companies operate naturally predetermines the suitability of locations as appropriate FDI sites. For instance, oil companies are unlikely to establish foreign investment ventures at a location that lacks demand and/or supply. Within the oil industry, the range of geographically viable investment locations is thus initially determined by the global pattern of oil extraction and trade flows. Following these two criteria, efficient investment locations can then be described by three categories.

Primarily, the regionality of oil extraction projects motivates the development of regional hubs for the export and global distribution of petroleum. Based on the global scattering of proven oil resources - they are primarily located in the Middle East, Russia, and South America, - export-oriented investments have accumulated at locations rich in proven oil reserves. Saudi Arabia's Ras Tanura has therefore, besides capital it acquired from the operator and major oil company Saudi Aramco, received FDI from companies like Schlumberger and Halliburton in order to meet the demands of the Saudi exploration industry. Equally, the largest oil export port in South America, Puerto Miranda, was established in order to provide Venezuela with adequate export capacities. Venezuela particularly, where proven oil reserves exceed those of any other country worldwide, has relied heavily on the inflow of foreign capital from oil majors like Shell, Esso, and Gulf Oil for the establishment of their most important port. In order to satisfy the demands of the oil industry's supply side, regions that are strong net exporters of crude oil have naturally been a prime target of significant FDI inflow. The regional distribution of petrochemical FDI that focuses on petroleum exports is thus primarily dictated by geographic (natural-resource) determinants.

Equally, geopolitical factors determine that, for reasons of transportation cost minimization, the localization of import-oriented FDI is based on the regional dispersion of oil demand (Weber, 1929). As oil demand is largely shaped by industrialization and productivity (for instance from the Chinese manufacturing sector), import-oriented FDI locations have accumulated around (a) the most developed, and (b) the fastest developing global regions. To illustrate, the most important oil trading hubs are located in the ARA (Amsterdam-Rotterdam-Antwerp) region in northwestern Europe, in Louisiana and the Port of Houston (USA), as well as in Singapore (The World Bank, 2009). Each are strategically located at regions of high oil demand in order to limit excess costs of transportation (Weber, 1929). As trading hubs, the mentioned ports also offer conditions that satisfy the requirements needed for efficient oil (and oil products) distribution. Beyond arguments of basic demand and supply regionality, distributional and logistical efficiency of FDI sites are therefore important, too.

As either (a) important oil production facilities or (b) trading and distribution opportunities are necessary in order to attract foreign capital, petrochemical hubs are typically located at ports. The

location-specific advantages (L) described by Dunning (1973, 1988, 2001) offer explanations for why this investment pattern arises.

In order to describe these phenomena in terms of location advantages, a distinction must once again be made between horizontal and vertical FDI, which are often motivated by different objectives. Horizontal FDI is in its most basic form a reproduction of domestic production abroad with the aim of gaining market access. The proximity-concentration framework (Brainard, 1993) illustrates the tradeoff between concentration of production and the proximity to to-be-served markets. Investing in or close to the import market naturally limits the costs of trade due to the proximity advantage, but it requires extensive upfront capital (this is the loss of giving up a more concentrated production), which is described in greater detail by the section on ownership-specific advantages. Although vertical FDI projects naturally share the proximity-concentration tradeoff, they are largely guided by cost motives.

As in petrochemical sector investments the headquarters usually remain in a corporation's home country, all such ventures can – to a certain extent – be characterized as vertical. Additionally, this is true because large oil corporations operate in an already highly integrated market that provides them with reasonable market access in most FDI target countries. Accordingly, FDI in the petroleum industry is largely (a) driven by cost-reduction objectives and (b) of vertical nature. In seeking cost-efficiency, four main reasons explain why firms have identified ports as the most efficient locations for oil refineries and similar processing and storage facilities.

Firstly, ports have historically been established at busy waterways and deltas in order to serve a large population. Accordingly, the vast majority of busy ports are situated in close proximity to metropolitan and highly inhabited regions. In fact, a self-reinforcing mechanism is at work here: early settlers established ports, which over centuries attract more citizens and thereby commercial activities, leading to ever enlarging ports as metropolitan areas form around them. For petrochemical corporations, this suggests that ports exhibit a tendency to be in the proximity of end-users of refined oil products, which include private household consumers (transportation, heating) as well as commercial users. This proximity of ports to oil product demand centers enables companies to cost-effectively deliver products to end-users. In an analysis that does not focus on the specific examination of petrochemical companies but rather on container carriers, Wiegmans et al. (2008) demonstrate that during the strategically relevant decision of site (location), investment-planning companies consider the "immediacy of consumers" and a reasonably sophisticated hinterland as important criteria. Despite marked differences between industry characteristics, it is reasonable to assume that deap-sea container operators and oil companies share relatively common selection criteria in this regard.

Secondly, and more simply, ports provide the most cost-efficient conditions for feeding unprocessed petroleum into refinery plants. Whereas in recent decades many products have increasingly been transported by air, shipping remains the most efficient mode for moving oil. Crucially, this is based on the comparative crude oil volumes a single tanker can transport, which significantly exceeds those of alternative modes of transportation. With regards to this most economical mode of

transportation, Haezendonck et al. (2000) find that a critical competitive property seaports possess in attracting various forwarding companies includes maritime accessibility. Maritime accessibility is therefore a natural precondition for petroleum transportation. Particularly the largest tankers - those registered under the Ultra-Large Crude Carrier (ULCC) and Very-LCC classes - are single-purpose vessels intended to transport crude oil from the extraction site to the final refinery (EIA, 2014). The transportation cost-minimization locations that most adequately connect seafaring oil tankers with the distribution networks of refined oil products is thus situated at ports. Consequently, petroleum corporations are able to maximize the probability of meeting cost-reduction objectives by conducting FDI in facilities located either within, or in the proximity of, ports with both sufficient maritime accessibility. In order to limit incurred costs, oil companies seek to eliminate costs of transportation that exceed those naturally imposed by moving crude oil (products) to demand centres. Due to the relative cost-efficiency of moving crude oil by sea, oil companies have strategically located the vast majority of refineries at ports with the objective of avoiding expenses involved in moving crude oil across land.

Moving refined oil products on land is nonetheless ultimately necessary in order to reach end-consumers. In this regard as well, ports are at a privileged position when it comes to infrastructural and other endowments that enable (petrochemical) companies to distribute products. At the final stage of the petrochemical value chain (The World Bank, 2009), which involves both (a) transport and storage and (b) oil marketing and distribution stages, several properties establish the suitability of locations as sites for oil industry FDI. The efficiency of with which oil companies market and distribute oil products therefore relies heavily on the transport infrastructure in the hinterland of ports. Sophisticated infrastructure for transportation (roads, rails, river harbours) are necessary support-systems to these activities. In general, the distribution of oil products occurs by roads (trucks), waterways (barges), or by pipelines.

Herein, the physical state of the refined oil products plays a fundamental role: whereas some gases like liquefied petroleum gas (LPG) and natural gas liquids can be transported by either pipeline, barges, or trucks, dry gases like methane are only moved via pipelines (The World Bank, 2009). Similarly, liquid oil products such as kerosene, benzene and diesel are transported by barges, trucks, and pipelines. Within these transport limitations, ports are most effective at providing petroleum corporations with adequate infrastructure, which may be based on ports' systemic integration into energy networks. Hinterland connections via road, waterways, and rail thus provide important location-specific advantages that can enable oil companies to realize significant expense reductions.

Additionally, ports provide optimal conditions for either re-exporting or re-distributing crude oil (products). Although the vast majority of refined oil products are headed inlands from seaports, significant amounts are also redistributed to other regions. Herein, demand fluctuations play a significant role. For instance, a certain region may exhibit robust demand for a certain range of oil yields, but not for others. Locating refineries and similar petrochemical facilities at ports enables the

industry's multinationals ("majors") to re-distribute (and re-export) excess crude oil supplies or refinery yields for which local demand is (temporarily) lacking. To exemplify, Finland historically had a long-standing oil import agreement with the Soviet Union, and then refined the oil in order to then sell it to central European countries. In a similar fashion, situations may arise in which oil corporations can themselves profit from employing similar strategies for political, demand and supply-driven, or other reasons. In order to maximize the flexibility of their transportation patterns, and to be able to adjust to evolving market conditions, ports thus provide an additional significant location-specific advantage according to Dunning's eclectic paradigm.

Whereas relatively simple macroeconomic factors qualify how attractive regions and countries are as FDI targets (see sections 2.2 and 3.3), applying Dunning's definition of location-specific advantages to the petrochemical sector explains why companies have identified ports as optimal investment locations. The non-transferable properties of ports, which transcend any political or geopolitical circumstances, simply providee adequate conditions for petroleum companies to maximise cost-efficiency. Most crucially, four factors clarify the competitive advantages they provide: Ports are generally located close to demand centers, they typically offer sophisticated hinterland infrastructure, as well as superior accessibility for petroleum transportation as compared to alternatives modes of transport. Such benefits ports deliver for the marketing of oil and its refined products are the most significant location-specific advantages they provide to this industry. Additionally, ports locations enable companies to respond flexibly to changes in demand and supply, which is exemplified by the manner in which port properties facilitate re-export opportunities.

4.4 Internalization-specific FDI advantages in the Petrochemical Industry

Returning to the matrix of Dunning's eclectic paradigm, it is evident that the combination of ownership and location advantages are not yet sufficient to motivate the initiation of foreign direct investments. In order to determine whether FDI represents the most efficient form of market entry, one has to evaluate the presence (or absence) of internalization-specific factors. International expansion by FDI is thus only sufficiently warranted if companies are able to exploit significant advantages of conducting foreign production by their own means, rather than through exporting or a licensing agreement (Dunning, 1988).

Herein, the failure of intermediate markets to provide adequate alternatives to FDI is the prevalent explanation behind the advantages of internalization. Particularly, Dunning reasons that FDI is the most adequate and effective form of market entry whenever the (a) cost benefits of setting up a greenfield or brownfield investment exceed (b) the amortized up-front costs (of FDI) avoided by, for instance, licensing or exporting. (Dunning, 1988). Generally this is the case whenever the costs of conducting a transaction internally through FDI are lower than the costs of open market transactions

with an intermediary firm. The economic rationality of FDI projects in terms of the internalization advantages they provide is therefore fundamentally determined by the efficiency of intermediaries.

Focusing on the petrochemical sector, the question then arises of why there is a lack in cost-efficient intermediary alternatives that allow MNCs to expand through licensing or exports. Interestingly, the explanation to this phenomenon is likely to lie within two distinct properties of the petroleum industry itself. The high capital intensity (and substantial initial capital requirements), as well as the central role technical knowledge plays in the oil industry both lead to an enhancement of ownership-specific advantages that large multinationals make use of. Since petrochemical corporations have accumulated the exploitable O advantages outlined in 4.2, for instance through scale, the open market has been unsuccessful at establishing an intermediate market that provides MNCs with competitive cost-savings benefits. Simply put, the minimal and predominantly niche intermediary market that *does* exist (e.g. oil field servicing) fails to provide sufficient efficiency benefits that motivate MNCs to serve foreign markets by relying on exports or licensing. Compared to other industries, the impact of scale on the ability of firms to meet the considerable capital requirements thus acts as a catalyst to the leverage of ownership-specific advantages, which themselves enhance the benefits of internalization.

The internalization-specific advantages of FDI projects in exploiting earnings-generating resources and know-how are therefore promoted by the specific properties of the petrochemical industry. In view of this, however, it is unclear whether such internalization advantages have a stable and robust impact across regions. In an attempt to address this issue, the subsequent section of this thesis will empirically analyze if, and how, foreign ownership structures in petrochemical companies differ across regions despite their operating within the same globally integrated market.

5.1 Qualitative Comparison of Ownership Structures in Petrochemical Investments in port locations of the ARA region and the Houston Ship Channel

To analyze (a) the predominant ownership characteristics of petrochemical companies in the studied ports, and consequently (b) the structural differences in FDI that arise between firms in the Houston Ship Channel and those located in the Amsterdam-Rotterdam-Antwerp (ARA) region, one must first clarify the scientific and analytical approach that is to be taken.

5.2 Methodology - Data

The data employed for this analysis includes both statistical and descriptive information, and primarily outlines the Global Ultimate Ownership (GUO) characteristics of considered companies. This paper focuses on comparing GUO features of petrochemical companies in the ports locations of the ARA region (Europe) and the Houston Ship Channel (Texas, United States). The Houston Ship Channel and the ARA-area ports are strategically chosen as comparable locations based on the function of port regions as continental, national, or regional oil trading areas ('hubs'). To illustrate, in the ARA ports extracted crude oil from the North Sea, the Middle East, Russia, and Africa is imported and processed into various products at local refineries. Subsequently, the refined oil products are distributed across the economically well-developed northwest of Europe, as well as into central Europe via the river Rhein. Similarly, in the United States the Texas Gulf Coast petroleum market has developed into a trading hub of national scale, as a shift from an import to an export-oriented market has taken place following the recent surge in US shale extraction (Ngai & Hays, 2014). As within the US more oil is flowing south for exportation, and less imported oil is heading north, the Houston Ship Channel is branded the "new Cushing", demonstrating its new rival position with the more northern Oklahoma-based oil hub that traditionally sets US oil prices.

Conducting a qualitative comparison of ownership structures in US and Europe-based oil trading hubs provides insights into the dynamics of the petrochemical industry for two reasons. Firstly, firms in both regions operate within the same globally integrated industry. Theory explains that in integrated industries, the shared supply and demand forces will move the market towards relative geographical homogeneity, and this can be seen as indicating similar patterns in ownership structure between the two studied locations. Secondly, the involved regions (Netherlands, Belgium and the United States) exhibit a reasonably similar level of economic development. For instance, the International Monetary Fund (2015) places all three nations within the top 21 countries ranked by GDP per capita at purchasing power parity (IMF, 2016). Oil companies in the Houston Ship Channel and the ARA ports thus theoretically operate within a global and homogenous industry, and within relatively similar regional macroeconomic circumstances. These similarities motivate an examination of

ownership structures between these two locations, because any structural variations that may be found during are unlikely to result from significant divergences in economic conditions.

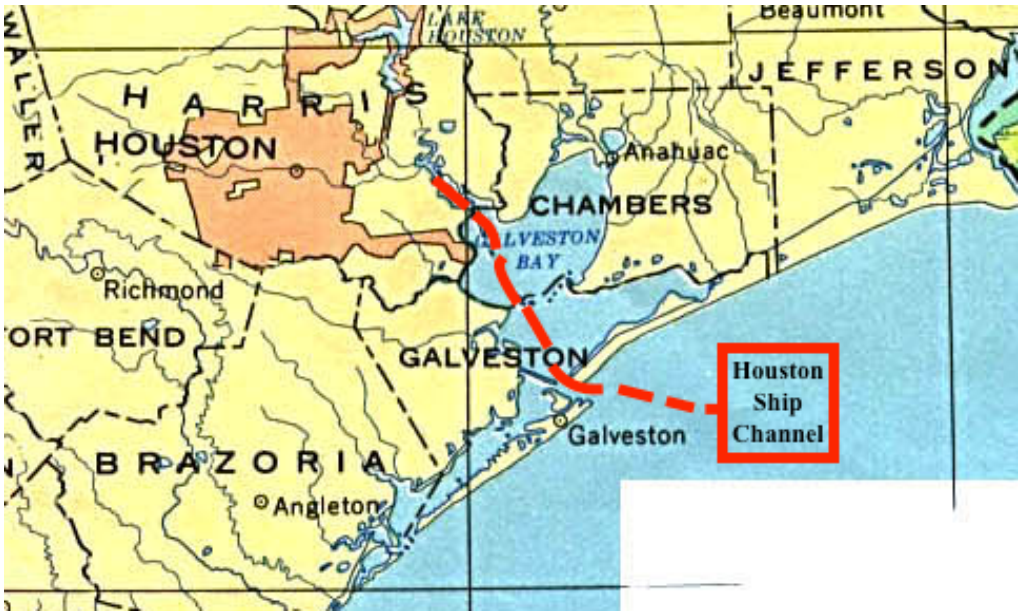
The ownership data used for this study comes from the Orbis Database of Bureau van Dijk (BvD). Orbis is a relatively extensive global platform for business data. Although Bureau van Dijk can provide corporate data on a vast range of measures, this study focuses on Global Ultimate Ownership (GUO), which most accurately serves as a measure for comparing FDI in petrochemical companies. It does so by specifying the entity that ultimately holds the managerial control and can exert its own interests onto the particular company. Thereby, global ultimate ownership data is used to identify the targets of foreign direct investments. The "NAICS - Houston Ship Channel" (see Appendix 1) summarizes how filtering for appropriate business activities limited the ORBIS data for US companies to the desired firms. This was achieved by using the industry activity classification codes defined by the North American Industry Classification System (NAICS). The Appendix 1 table provides more detailed explanations behind the inclusion (IN) or exclusion (OUT) of business activities in NAICS codes for which such an explanation was deemed appropriate.

However, the NAICS industry codes pertain predominantly to companies in the North American market (US and Canada). In European markets, NACE Rev. 2 are a more widely used measure. Nonetheless, the highly analogous designs of the two systems enables this study to filter for Houston-based companies using NAICS codes, and for corresponding industry activities in Amsterdam, Rotterdam, Antwerp by using NACE industry classes. In order to achieve this, the current paper filters for NACE industries that parallel those activities chosen for the Houston Ship Channel (NAICS). To exemplify, NAICS code 4861 (Pipeline Transportation of Crude Oil) is excluded from the analysis for reasons outlined in the 'NAICS - Houston Ship Channel' (Appendix 1), and consequently NACE Rev. 2 code 4950 "Transport via Pipeline" is excluded for equivalent reasons. Despite their selection via different industry classification systems, the petroleum companies in the Houston Ship Channel and the ARA region are thus equal in the activities they conduct.

Nonetheless, the selected industries are - with regards to the focus of this paper (petroleum/petrochemical E&P activities) - to a certain degree ambiguous. The boundary of applicable commercial activities in terms of their relevance to the formulated research aim, is thus not always apparent. Whenever the decision of including or excluding an industry code is ambiguous, the principle followed by this paper relies primarily on whether the respective activity is core to the oil "majors" like BP and Chevron. Petroleum exploration and processing (E&P) activities are thus naturally included, and activities not directly related to E&P activities are rather excluded from the ownership structure evaluation (although even this distinction proved difficult to uphold). This explains why, in contrast to pipeline transportation, (natural) gas exploration activities are included as part of this study.

Beyond limiting data by industry classifications, geographic specifications are necessary. For the ARA region, the geographic limitations are simply the three cities themselves: Amsterdam, Rotterdam, Antwerp. With regards to the Port of Houston (Houston Ship Channel), the circumstances

are not immediately clear. As illustrated by the map of the Houston Ship Channel's surrounding region (below), the scope of Houston's city limits is insufficient in capturing activity in the HSC. Most port-based petrochemical activity is located in Harris County, but significant business has also settled in Galveston County and, but to lesser extent, in Chambers County. Excluding the latter two from the current study would lead to unrepresentative results because companies (like LBC Houston LP) have expanded beyond Harris County limits since the port was founded in 1914 (Port of Houston Authority, n.d.) .



5.3 Methodological Approach to Data Analysis

After accessing the data on Orbis (BvD), the information is downloaded to enable manipulations via Microsoft Excel. Editing and handling data via Microsoft Excel facilitates the qualitative analysis of ownership structures (GUO) in the HSC and ARA ports individually, as well as the subsequent comparison of the identified GUO patterns. Thereafter, and in accordance with the stated aim of this paper, the identification of foreign ownership characteristics is the primary target. In order to achieve this, the hundred (100) largest companies in each location (Houston and ARA) are selected in terms of generated revenues in the last available year, given that their Global Ultimate Owner is known. The reasoning behind this sample specification is that extensive and complete business data is more widely available for the larger companies. Additionally, to ensure the relevance of information, only companies for which revenues are know from within the last five years (2010 and later) are included. To exemplify, the "Eni Exploration and Production Holding B.V." was excluded because the latest available revenue statement concerned the fiscal year 1999 - since this indicates that Orbis data

on this company was not updated in recent years, this study regards it as insufficiently accurate. From this, two distinct questions are explored by analyzing the filtered and limited data.

1. To what extent are the identified companies in the two locations owned by foreign Global Ultimate Owners?
2. How extensive is the influence of private sector companies (e.g. oil "majors"), "national" oil companies, and others on the Global Ultimate Owners of companies in the ARA region and the Houston Ship Channel?

The first question will be addressed by comparing the two locations in terms of the percentage of companies that are controlled by the respective percentages of domestic versus foreign Global Ultimate Owners. This provides a simple but adequate overview of the extent to which foreign companies exert influence on petrochemical companies through foreign direct investments (FDI).

On the basis of these findings, this study will proceed to conduct a detailed analysis of the background of the GUOs with respect to their classification as an either private sector companies, such as British Petroleum (BP) or Total, nationals, or others (e.g. funds). It is expected that this will enable a more accurate description of the influence various market participants (such as governments and related national institutions) have on the port-based petrochemical companies.

5.4 Results & Discussion of Foreign GUO Structures

At first, findings are discussed regarding the question:

1. To what extent are the identified companies in the two locations owned by foreign Global Ultimate Owners?

Results

Foreign Ownership in Petrochemical Companies in the Houston Ship Channel and the ARA Region (EU) by Global Ultimate Ownership

Location	**Percentage of Foreign GUOs**	**Percentage of National (Local) GUOs**
Houston Ship Channel	13	87
ARA Region (EU)	86	14

The results obtained from Orbis data indicate a significant divergence in ownership structures of petroleum companies between the two locations. The table of page 37 summarizes the outcomes from evaluating the origin of global ultimate ownership (GUO) as either foreign or national (local)[14]. It is determined that the foreign influence in firms located in Amsterdam, Rotterdam, or Antwerp (ARA) significantly exceeds the extent of foreign ownership in comparable firms in the Houston Ship Channel. Statistically, the degree of foreign ownership proxied by the GUO country is found to be 13% in the HSC, where companies are commonly controlled by US-based corporations or entities (87% local GUOs). In terms of corporate ownership structures, the Texas Gulf Coast oil market is thus (still) relatively domestic in comparison to the highly internationalized European (ARA) petrochemical industry.

On the basis of GUO variations alone, it can be concluded that MNCs have estimated the Houston Ship Channel to be of limited strategic value. Particularly in view of (a) the surge in shale oil production in both Canada and the United States as well as (b) the recent establishment of Houston as a trading hub for oil and refined oil products (Ngai & Hays, 2014), these results seem surprising. Despite the Port of Houston (HSC) having "generate(d) more trade value than any other seaport" on the Gulf Coast according to the Texas FDI report 2016 (The State of Texas Governor, 2016), foreign capital inflows to oil facilities clearly falls short of investments international MNCs have conducted in similar firms located in northwestern Europe. Nonetheless, evidence exists to suggest that the appeal of Houston as a target for FDI is increasing. The Texas FDI report 2016 (The State of Texas Governor, 2016) explains in an exemplary case that the petrochemical company INEOS AG (Switzerland) has initiated a $400 million investment in the Houston metropolitan area. Crucially, and clearly representative of FDI variations in the two locations, the same company already holds ownership of an Antwerp-based company with several established (individual) facilities; One of them, INEOS Manufacturing Belgium, has generated US$ 97.4 million in the last available year (2015). In parallel to the generally obtained results, the contrast between the investments INEOS holds in the ARA region, and the current (but transforming) deficiency thereof in Houston serves as a fitting metaphor for the general pattern of foreign investments in the two locations.

In the Amsterdam-Rotterdam-Antwerp region, the hundred largest petroleum companies (by latest available revenues) are to a significantly higher extent targets of FDI: 86% of ARA-based companies whose primary activities are oil E&P-related, are controlled by a foreign ultimate owner. Thus, on the basis of the used sample(s), ARA companies are over 6.5 times more likely to be part of a foreign direct investment engagement than their counterparts in the HSC. Although the magnitude of this divergence may not be representative of all petrochemical/petroleum companies in the HSC and the ARA area, the sample employed for the purpose of this paper is likely to demonstrate tendencies

[14] To avoid uncertainty: the use of the term 'national' herein describes the Global Ultimate Owner (GUO) as originating from the country (nation) in which the investment location is being assessed. This differs from the term's use as describing a company that is under the direct or indirect control of a national government.

that are expected to remain in more expansive and inclusive studies. Two separate but linked circumstances serve as plausible explanations for the observed phenomenon.

Firstly, the timing of this study is likely to be a significant explanatory factor to the established findings. As explained in the location-specific advantages of ports (see section 4.3), maritime accessibility is primarily an advantage to companies involved in commodity logistics (like oil and oil products), and moving products between continents by sea. In the US petroleum industry, however, many such transactions were disallowed for approximately 40 years due to a local ban on oil exports[15]. This restricted the extent to which foreign companies were able to conduct business in the United States, and prevented MNCs from flexibly controlling and adapting outward crude oil flows from the United States to other destinations. Additionally, and as is elaborated in the upcoming paragraph, the profitability of entering US petroleum activities was, to foreign MNCs, further limited by the often long-term trade deals the United States had established with exporting countries (Opec and non-Opec). In particular, the ban of US oil (product) exports is likely to have restricted the prospects of foreign MNCs with regards to conducting FDI in the Houston Ship Channel. In this respect, a critical change in circumstances occurred in December 2015, when the US Congress lifted the decades-old export ban, as reported by Reuters (Volcovici & Ngai, 2015) and the Wall Street Journal (Harder & Cook, 2015). Consequently, both sources point either directly or indirectly to a probable future boost in the involvement of foreign companies.

As Volcovici and Ngai (2015) explain, Houston-based companies (e.g. Enterprise Products Partners LP) and – importantly in the context of this study - foreign companies have thus recently increased their investments to exploit the transformed legal circumstances. Rotterdam-based Vitol, for instance, was (in January 2016) preparing to export 600,000 barrels of US light crude oil per week. The vast infrastructural facilities (primarily pipelines, maritime accessibility, terminals) in place at the Houston Ship Channel naturally make it an attractive investment location for foreign MNCs. Specifically, Vitol has reached an agreement with Enterprise Products Partners LP for the use of its pipeline capacities to facilitate future crude oil exports; According to Enterprise's COO James Teague, the respective exports would be the first such transaction in "the Gulf Coast in almost 40 years" (Volcovici & Ngai, 2015). Moreover, the Wall Street Journal states that in view of probable future FDI engagements, the Gulf Coast has "extensive networks of oil pipelines and storage tanks. However, in order to allow for exports rather than imports of oil, preexisting facilities will have to be retrofitted. It is likely that here, too, foreign capital inflows will increase: to exemplify, Enbridge Inc., based in Calgary (Canada), is preparing to build three new terminals along the Gulf Coast for US$ 5 billion (Harder & Cook, 2015).

The developments that have and will continue to unfold in the wake of the lifted US export ban are, at the present time, not adequately reflected in financial statements, and they are thus not

[15] Exports of crude oil and oil products to Canada were exempted from this.

included in the Orbis data obtained for the purpose of this study. The significant divergence in foreign or local GUO between petrochemical companies in Houston and the ARA region is thus predicted to diminish as the foreseen developments take place.

Beyond the influence of timing and the recently lifted export ban, the specific geographic patterns of US oil imports are thought to have influenced the relatively low level of foreign ownership in Houston-based companies. As (Olson, 2014) explains with reference to EIA[16] data, 65% of all US oil imports from December 2014 to May 2015 were imported from the Western Hemisphere. Specifically Canada[17], Venezuela, Mexico and Colombia exported large volumes of oil to the United States. In fact, within the top-5 oil-exporting countries to the US, only Saudi Arabia is located clearly to its East. This implies that geographically, the U.S. has in recent years imported oil primarily from the north and south. Building on the argument of geographical petroleum origins, the EIA (2015) adds that the largest decrease in oil imports was recorded on the Gulf Coast, where within the years 2010-2014 oil imports had fallen by 94%. Primarily, this development is attributed to the increased use of Canadian as well as domestic oil (EIA, 2015). In this regard, both the timing of the current study and the geographic patterns of US oil imports provide explanations to the comparatively low degree of FDI versus corresponding GUO statistics for ARA-based companies.

5.5 Types of Global Ultimate Ownership of Petrochemical Companies in the Houston Ship Channel and the ARA Region

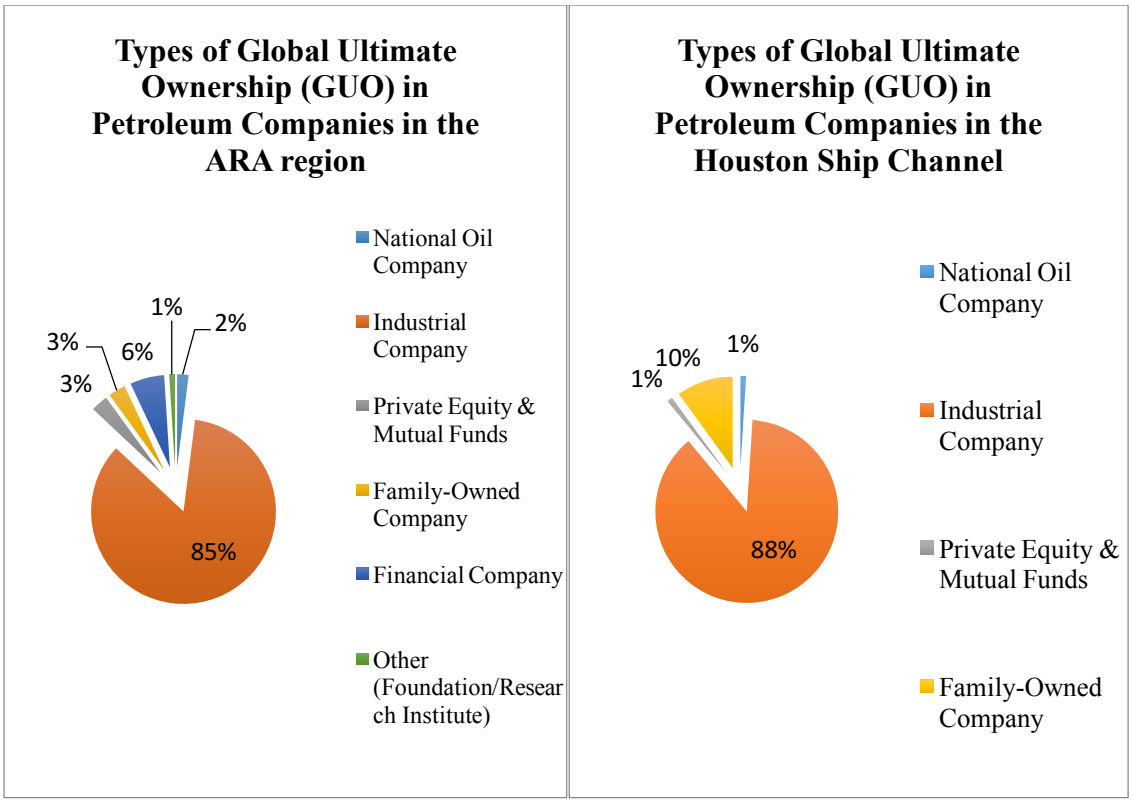
Beyond analyzing the extent to which petroleum companies are targeted by FDI ambitions of multinational corporations, this study seeks to provide insight into particular characteristics of the entities that act as global ultimate owners in the considered corporations. Herein, the following question serves as a guideline.

> 2. How extensive is the influence of private sector companies (e.g. oil "majors"), "national" oil companies, and others on the Global Ultimate Owners of companies in the ARA region and the Houston Ship Channel?

To classify the characteristics of GUO entities, the same two-hundred petrochemical companies are studied as in the previous section of this thesis; One-hundred companies in the ARA region and HSC respectively are thus selected according to their relative turnovers, given that both revenues are known for the fiscal year 2010 or later, and that the global ultimate owner of each company is known. The data obtained from the Orbis database specifies both the name of global ultimate owners,

[16] U.S. Energy Information Administration
[17] Canada accounts for 40% of all U.S. oil imports (EIA, 2016).

as well as the type of business entity it is. In view of the statistics available on the two-hundred selected companies, this paper established that six categories appropriately describe the various types of GUO entities. Specifically, ultimate owners are found to national oil companies, industrial companies, private equities and mutual funds, family-owned companies, financial companies (including banks), as well as research institutions. The graphed results (below) give rise to three distinct observations regarding the ownership of studied companies.



Firstly, it is evident that the majority of companies are controlled by firms Orbis (BvD) classifies as an 'industrial company'. This can take two forms: either, the studied company is itself the entity that holds global ultimate ownership (directly shareholder-controlled oil company), or the parent company is classified as an industrial company. For instance, Hilcorp Energy Corporation (Houston) is the de-facto global UO of itself – it is not controlled by a parent corporation. In contrast, the 'Total Raffinaderij Antwerpen' refinery is owned by France's largest oil company Total S.A., which is also classified as an industry company by the Orbis database. The petroleum exploration and processing facilities in Houston and in Europe's ARA region are thus to a large extent controlled by industrial corporations.

In other aspects, the results indicate a clear divergence in terms of GUO characteristics exhibited by companies in the two studied locations. Whereas in Amsterdam-Rotterdam-Antwerp, the global ultimate owners are relatively diverse beyond the industry-wide dominance of industrial companies, GUOs in the Houston Ship Channel are less varied. Statistically on the basis of the used

sample, five types of global UOs hold a minimum of 2% of petrochemical companies in the ARA region[18], whereas only two GUO types retain a similar market share in Houston. The results therefore indicate that the ownership patterns in the ARA region are more diversified in terms of (parent) global ultimate ownership than in Houston. This observation parallels the comparatively small extent of foreign capital involvement in the Houston Ship Channel. Although companies in both locations are held by "nationals", industrial companies, private equity and mutual funds, as well as individual families, the superior ownership diversity in the ARA region is particularly expressed by the influence of financial companies (6%) and foundations/research companies (1%) on petrochemical firms.

Thirdly, the examination of ultimate owners demonstrates a considerably less significant influence of national oil companies (NOCs) than was previously expected. Although in both Houston Ship Channel and ARA ports s global ultimately ownership by NOCs is indeed found to be present, the proportion of all companies to which this applies is limited: in Houston, merely 1% of corporations are held by government-controlled MNCs, and in the ARA area this is the case for 6% of firms. Ultimately, and although shareholder-controlled oil companies (i.e. industrial companies) are naturally expected to hold majority market share in the petroleum industry, these degrees of influence national corporations and governments exert on the oil industry (opposite of exceeds) previously anticipated levels.

Lai, O'Hara, and Wysoczanska (2015) establish three objectives that primarily motivate national oil companies (NOCs) in their pursuit to internationalize. Although most literature focuses on the sought of MNCs to secure either natural resources (oil/gas) or strategic assets like technologies, Lai, O'Hara and Wysoczanska (2015) highlight the role of sectoral specialization. It is argued that seeking natural resources is predominantly useful when NOCs attempt to initially establish themselves abroad, in order to diminish the comparative disadvantages often experienced by latecomers to a market. Their empirical analysis of China's two largest national oil companies (Sinopec and CNPC), and their motivations for conducting foreign direct investments between 2002-2010 establish that sectoral specifications are most important when NOCs conduct foreign ventures. In particular, upstream firms (like CNPC) seek natural resources, whereas downstream petrochemical companies (Sinopec) was found to focus on acquisitions of strategic assets. In essence, both arguments underline MNCs' rational pursuit to obtaining foreign assets through FDI, and in line with this reasoning the results obtained by the current paper emerge as counterintuitive.

Additonally, national oil companies frequently conduct international acquisitions and greenfield investments to diminish the efficiency deficit they are found to have versus stakeholder-controlled (non-national) oil companies (Hartley & Medlock III, 2013). Nonetheless, Hartley and Medlock show that evidence in support of the success of this policy is weak. In a study that includes nationalized oil companies (NOCs), partially privatized national oil companies (pNOCs) and

[18] Namely industrial companies, national oil companies, private equity & mutual funds, family-owned companies, and financial companies

shareholder-owned oil companies (SOCs), NOCs and pNOCs are found to improve efficiency more quickly than SOCs, although SOCs still retain a significant efficieny premium on their nationalized counterparts. It is argued that on the basis of this lack in cost-effectiveness, national oil companies are theoretically more likely to engage their vast capital resources in FDI. This stands in stark contrast to the global ultimate ownership statistics found by this paper (only 1% of Houston-based oil companies are owned by NOCs, and 6% in the ARA region).

In response to the de-facto and perceived acquisitions foreign companies have made in ports (and other industries) of developed countries, many such countries have felt growing suspicions amongst the population, and political cadres, towards the influence of foreign interests in domestic companies. As Alon, Leung and Simpson (2015) emphasize with a focus on Chinese national oil companies and their subsidiaries in developed countries (e.g. Chimbusco Europe B.V. in Antwerp) suspicions of Chinese investments have indeed arisen in many developed countries like the United States and also European Union members. Foreign governmental influence, for instance via Rosneft (Russia) and Sinopec and CNPC (China) are thus commonly undesired. National security concerns are among the most commonly cited justifications for such doubts (Alon, Leung, & Simpson, 2015). In order to address such issues, many countries have created policy measures that introduce added obstacles, regulations and oversight. This applies most heavily to industries that are central to strategic and security interests, and the oil industry is thus particularly affected. The results produced by this paper indicate a degree of influence NOCs exert on US and EU-based petrochemical companies that substantially falls short of initally expected outcomes[19]: strict regulations (often motivated by the suspicions of foreign government influences) aimed at foreign NOC investments are likely to be a significant contributing factor to the obtained results.

[19] by the author of this paper.

6.1 Conclusion

This study determines that the patterns of global oil trading are largely governed by the regional distribution of natural resources (oil). Regarding the investments conducted in the petrochemical industry, geopolitical developments are - due to the influence they exert on demand and supply determination - a fundamental driver of international capital flows in the form of foreign direct investments (FDI). Multinational oil corporations (e.g. Total and ExxonMobil) attempt to exploit the profitable (cost-effective) opportunities triggered by disruptions in the industry's geopolitical circumstances (see section 2.2), by establishing foreign subsidiaries with regard to both their corporate strategy and the geopolitical framework within which they operate.

In recent years, two long-term developments have contributed to shifts in the global pattern of petroleum trade. First and foremost, the dynamics of globalization have led to rapid growth in many Asian economies, and the expansion of particularly the Chinese and Indian manufacturing sectors have dramatically shifted oil export destinations (from the Middle East, Russia, and other oil producing nations) towards the east. In combination with a marked decrease in fuel consumption by the EU-28 states, petroleum exploration and processing (E&P) companies were - and are still - confronted with global developments that significantly influence the trade and investment developments in the global petroleum industry[20]. Secondly, the resurgence of US shale oil, facilitated by innovations in horizontal drilling and hydraulic fracturing (fracking), has established an additional major oil producer. In recent years, this has decreased the global supply dependence on OPEC-country production, but has also enhanced production to an already oversupplied market. Since mid-2014, this has resulted in decreased prices as quoted by the West Texas Intermediary (WTI) and other oil index prices. Additionally, national politics and regime changes contribute to the structure of global oil flows; Iran's enhanced production schedule following the nuclear deal with western countries that resulted in the lifting of economic sanctions against the Islamic Republic of Iran are a contemporary example of this. In response, and despite intra-cartel conflicts of interest, OPEC countries have recently attempted to exert their influence in order to raise prices to more profitable levels. This has, however, proven largely unsuccessful due to the considerable variations in cost-efficiency of US oil wells (some are able to extract petroleum very cost-effectively). In conclusion, this paper therefore defines geopolitics as the most significant influential factor the trade and investment developments in the global petroleum industry.

[20] How are the trade and investment developments in the global petroleum industry structured?

In addressing the second research question[21], this paper analyzes previous academic literature, wherein five factors are found to be most prominent. At first, multinational corporations take into consideration exchange rate effects between their domestic currency and the currency in use at an FDI host country. Particularly, a host country currency depreciation (or, alternatively, devaluation) is established as having a reinforcing and positive effect on foreign capital investments into an economy. In contrast, currency volatility is perceived as risk-bearing, and extensive literature outlines the adverse effects of currency fluctuations on FDI inflows. Secondly, double taxation schedules, as well as high corporate taxes in general, disincentivize investments. Beyond the purely financial factors (exchange rates; taxes), governments can promote the attraction of foreign investment through other means. Firstly, the presence of proven and stable governments and related governing/institutional bodies are commonly necessary in able to ensure fair and safe business conduct. Equally, a fourth macroeconomic mechanism governments can employ to attract (direct) capital of foreign MNCs is a liberal trade policy. Particularly, this is emphasized by the negative correlation academic literature has established between trade protectionism and inflows of foreign capital.

On top of the wide-ranging macroeconomic determinants of FDI - which go beyond the specific properties of the petrochemical industry -, the benefits of ports as locations for petroleum and petroleum-related investments are defined. On the basis of Dunning's eclectic paradigm, ownership, location, and internalization-specific advantages of ports are established. Ownership-specific advantages, which are explained to be a crucial prerequisite for any company's foreign ambitions, are based on cost-efficiency advantages of large multinationals via, for instance, scale economies. Through the control of intangible assets including cooperative relationships between oil exploration companies, technological know-how, or financing advantages when initiating foreign (green or brownfield) investments large multinationals are able to leverage their inherent (scale) characteristics into more efficient FDI ventures when compared to the local smaller companies. Additionally, transferable tangible assets are important ownership-specific advantages to established petroleum companies in their pursuit to expand internationally. Secondly, location-specific advantages fundamentally arise because - to petrochemical companies - ports provide the most cost-efficient circumstances for activities in petroleum transportation (shipping), refining and in the distribution of unrefined crude oil and processed oil products via the typically sophisticated hinterland accessibility and logistical possibilities. Moreover, because large ports are usually strategically located close to petroleum demand and/or supply centers, their location as FDI sites contribute to minimizing added transportation costs involved in reaching end-users. In many ways, these port-specific location advantages that serve oil companies in their pursuit for cost-efficiency, are the most direct response to the underlying question posed by this

[21] To what extent do macroeconomic developments influence the magnitude of foreign direct investment (FDI) flows into a region?

paper: why do petroleum firms exhibit a tendency towards conducting foreign direct investments in ports, instead of elsewhere? Thirdly, the eclectic paradigm necessitates the presence of internalization-specific advantages in order for foreign direct investments to be economically viable. In the case of port-based petrochemical investments, this paper links the advantages of internalizing foreign production procedures (rather than serving markets by licensing or exporting) primarily to the failure of intermediary markets to provide adequate and, crucially, cost-effective intermediary alternatives to FDI expansions by petroleum multinationals. Two variables are established as the underlying drivers of these internalization advantages. For one thing, the oil industry's high capital intensity creates an entry barrier that prevents other companies from efficiently serving MNCs on the intermediary market. Additionally, the major and global players active in the oil industry hold superior technological know-how via largely their human capital - this too, establishes internalization advantages by preventing the comparatively efficient provision of services by intermediary markets.

Finally, the penultimate chapter of this thesis investigates the structural ownership differences between petrochemical companies located in the ports of Amsterdam, Rotterdam, and Antwerp (European Union), to those located in the Houston Ship Channel (TX, United States). In order to examine this subject, two independent (and subordinate) research questions were employed to ensure a methodical approach to this paper's final research question[22]. By analyzing the largest 100 petrochemical companies in both locations, the ARA-based entities are found to be significantly more likely to be held by a foreign global ultimate owner (GUO) than comparable companies located in Houston (TX). In fact, based on the used sample, which was obtained from the Orbis database, 86% of petroleum-related companies in the three European ports were held by foreign GUOs, whereas for corresponding companies in the Houston Ship Channel, this is true for merely 13%. One surprising explanatory factors that likely contributed to these results was found to be the timing of this study, which is shortly after US Congress re-allowed domestic oil exports. Additionally, the geographic patterns of US oil imports are a probable explanatory variable: most crude oil imported by the US originates in the western hemisphere; Hence, the Gulf Coast has had a limited function to large (importing) MNCs, despite Houston's position as an important oil hub. Thus, besides the traditionally protectionist oil trade policies designed by US congress, the timing of this study as well as the geographic distribution of imported oil serve as justifications for the divergence between foreign ownership in Europe (ARA) and Texas-based ports (Houston).

In the second part of investigating the structural ownership differences between petrochemical companies in Houston and the ARA port-regions, this paper addressed the question of: How extensive

[22] What are the predominant ownership characteristics of petrochemical companies in the ports of the Amsterdam-Rotterdam-Antwerp region, and in the Port of Houston/Houston Ship Channel (TX)?

is the influence of private sector companies (e.g. oil majors), national oil companies, and others, on the global ultimate owners of companies in the ARA region and the Houston Ship Channel? Particularly, this questions sought to examine the influence of (a) governments via national oil companies (NOCs) or other state-controlled entities, (b) the proportion of companies held by shareholder-controlled oil companies (SOCs), which are herein described as 'industrial companies', and (c) the control market participants of various other classifications[23] hold. Contrasting the initially formulated prediction of relatively widespread control of petrochemical companies by state-held entities, this paper finds only limited support for this hypothesis. On the basis of the selected sample (see appendices 2 and 3), the research outcome specifies that 6% and 1% of oil-related companies in the ARA region and the Houston Ship Channel respectively, were held by NOCs. According to the obtained sample of companies, the clear majority of firms are held by industrial companies (including the oil majors[24]): statistically, this applies to 88% of companies in the Houston Ship Channel, and 85% in Europe's ARA region. Moreover, global ultimate owners classified as private equities and mutual funds and family-owned companies (10% in Houston versus 0% in ARA) were of varying importance to companies in the two locations. Additionally, and above the dominance of industrial companies, several sampled firms are ultimately owned by financial companies and research institutes - these two GUO types were, however, exclusively represented in ARA data. This parallels the location's greater variation in ownership structures vis-à-vis the Port of Houston (HSC).

Further, despite the high degree of integration and globality of the oil industry, and it being a market that is driven by capitalist desires of firms and individuals, the underlying influence of governments is clearly evident throughout this thesis. Beyond the ownership structures established here in chapter 5[25], governmental influence is nonetheless reflected in the underlying structures of foreign direct investments in ports. In the energy sector in general, and the petroleum industry in particular, governments are aware of the political - due to unpopularity amongst voters - and self-perceived threats they enable by catalyzing the influences of foreign governments in domestic companies; Amongst others concerns, foreign government influences are commonly perceived as national security, or energy security threats. In these regards, an important conclusion inspired by this paper is the significant degree of government influence, either through trade protectionism or open market transactions, that is present in the strategically valuable oil E&P industry.

The conclusions drawn from this paper, and in a wider perspective the focus of this paper per se, are valuable on the basis of the vast implications developments in the petroleum business[26] have on

[23] Private Equity & Mutual Funds, Family-Owned Company, Financial Company, Other (Foundation/Research Institution)
[24] ExxonMobil, Total, BP, Chevron, Royal Dutch Shell
[25] where governments and government-controlled entities, on the basis of the studied sample, were found to have limited control of petrochemical companies.
[26] Extraction, refining and processing, and logistics/distribution.

most members of society. The oil industry is clearly not a niche market, but it serves the most basic and fundamental needs of modern human life: heating, transportation, power generation, and the production of plastics, rubbers, et cetera. Optimizing extraction and production processes is necessary to sustain the effective conduct in this critical industry, and continued efforts to scientifically uncover its hidden patterns and opportunities for improvement is therefore imperative. Regarding the outcomes of the current paper, several conclusions allow for recommendations to market participants to be formulated; governments, port authorities, and oil company decision-makers are herein the primary targets of advice.

At first, advice is presented to governments. Following popular economic theory (see, amongst others, Hecksher-Ohlin-Samuelson), the benefits of free trade and deregulation of protectionist policies are well defined. Their facilitating impact on competitive business environments enhance efficiency, and the accumulation of agglomeration economies. Focusing on outcomes that are specific to port locations, it is argued that deregulation and liberal trade policy attract foreign capital, and they lead to superior efficiency of port-based companies through enhanced competition. Additionally, trade liberalism can improve the hinterland features provided by non-state actors[27]. Governments are therefore advised to restrict their own limitations on business conduct; Adequately, this research finds that US protectionism (reflected in part by the long-term ban of domestic oil products) contributed to the comparatively limited FDI and foreign ownership in port companies vis-a-vis comparable companies in the EU based ports of Amsterdam, Rotterdam and Antwerp. In this regard, deregulation as well as continued efforts to ensure the provision of typically public goods are deemed the most effective measures in attracting efficient petrochemical companies to a port location. Additionally, and as previously described, several macroeconomic features are found to have well-defined effects on foreign capital inflows, and, these should be designed in line with objectives of both domestic and foreign MNCs to promote oil-sector efficiency in ports.

Beyond governments, legislative control of ports is held by port authorities, and consequently, their objectives show a certain degree of overlap. As stated by the Port of Rotterdam Authority, their primary target is "maintaining the safe and smooth handling of all shipping" (Havenbedrijf Rotterdam N.V., n.d.). Primarily, this includes the provision of security infrastructure, maintaining adequate maritime accessibility, and providing sufficient land for use by private companies that settle at the respective port location. These essentially infrastructural activities can convince foreign MNCs to initiate foreign ventures which, on the basis of the results obtained by this study, was more effectively done by the port authorities in the ARA region. Although further research regarding the role of port authorities and their policy recommendations would be valuable, the superior conduct by the European

[27] Although these are naturally limited due to free-rider problems (non-excludability); hinterland infrastructure relies heavily on public provisions.

port authorities (e.g. Port of Rotterdam Authority) is a likely contributor to the enhanced foreign ownership characteristics of companies here. In this regard, port authorities are advised to continue their efforts at providing adequate infrastructural circumstances to private companies, as far as these activities are in accordance with the generally passive role they play in the commercial activities of ports.

Although oil companies are not an immediate target of the recommendations produced by this research, several pieces of advice stand to reason. For one thing, petroleum companies benefit significantly from agglomeration economies in ports, such as the petroleum hubs that have formed in Rotterdam and around Houston. Investing in these locations is often accompanied by added benefits such as a stable business environment (e.g. robust demand and political circumstances), and for oil companies they are found to provide cost-minimizing properties like maritime accessibility and hinterland transportation capacities. Although - in contrast to governments and port authorities - this paper does not place focus on the means towards improving oil companies' decisions, the aforementioned recommendations are established as accurate through the conducted qualitative literature review.

In order to build up on the outcomes of this paper, several areas of further research are recommended. Firstly, a more detailed examination of the influence of governments on the petroleum market is necessary, with particular focus on the investment and ownership structures. In essence, this research generated results that contrast the widely held belief that governments hold a significantly more substantial stake in petroleum companies across in vast (port) locations around the world. In line with this, it would additionally be valuable to conduct a further analysis of what drives national oil companies, and where their objectives differ from those of shareholder-controlled oil companies. Considering the multifactorial determinants of petroleum FDI (see chapters 2-4), future follow-up research is necessary to ultimately establish - in a scientific manner - the explanations behind the significant foreign ownership differences that have been demonstrated between petroleum companies in the Port of Houston (HSC) and in Amsterdam, Rotterdam, and Antwerp.

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APPENDICES

Appendix 1 NAICS - Houston Ship Channel

NAICS Code (primary codes only)	Activity	Decision and Justification (if deemed applicable)
211…21111	Oil and Gas Extraction	IN
211111	Crude Petroleum and Natural Gas Extraction	IN
211112	Natural Gas Liquid Extraction	IN Natural gas extraction is included because (1) oil majors like ExxonMobil participate in this market directly, or via substitutes (e.g. ExxonMobil's MEGAS in Europe) (2) gas exploration specialists share many infrastructural factors with crude oil E&P and marketing processes.
32411, 324110	Petroleum Refineries	IN
4247	Petroleum and Petroleum Products Merchant Wholesaler	IN
42471, 424710	Petroleum Bulk Stations and Terminals	IN Clarification: these are not conventional gas stations, which are registered under 'Retail Trade', not 'Wholesale Trade'
42472	Petroleum and Petroleum Products Merchant Wholesaler (except Bulk Stations and Terminals)	IN
324191	Petroleum Lubricating Oil and Grease Manufacturing	OUT The value chain of this activity does not specifically coincide with the focus of this paper, which are primarily oil E&P companies.
4861	Pipeline Transportation of Crude Oil	OUT Although major oil firms may in specific projects be involved in establishing

pipelines, they are also rather motives for, than outcomes of, the investments targeted by this paper. Similar reasons pertain to road, rail, water & truck transportation.

Appendix 2 – Orbis Data for the ARA Port

	Company name	City	Operating revenue (Turnover) th USD Last avail. yr	Last avail. year	GUO - Name	GUO - Country ISO code	GUO - Type	GUO - Direct %	Foreign GUO?
1	Trafigura Beheer B.V.	AMSTERDAM	97,242,600	2015	FARRINGFORD N.V.	CW	Industrial company	-	Yes
2	Gunvor International B.V.	AMSTERDAM	59,032,800	2010	FREFIKA INVEST LTD. CORP.	PA	Industrial company	-	Yes
3	30/06/16	ROTTERDAM	27,802,627	2014	ROYAL DUTCH SHELL PLC	GB	Industrial company	-	Yes
4	EXXONMOBIL PETROLEUM & CHEMICAL	ANTWERPEN	25,883,413	2015	EXXON MOBIL CORP	US	Industrial company	100.00	Yes
5	PETROBRAS GLOBAL TRADING B.V.	ROTTERDAM	15,982,118	2015	PETROLEO BRASILEIRO S.A.	BR	Industrial company	-	Yes
6	International Petroleum Products (IPP) B.V.	AMSTERDAM	7,970,511	2014	SOUTHPORT MANAGEMENT SERVICES LIMITED	VG	Industrial company	0.00	Yes
7	PETROBRAS NETHERLANDS B.V.	ROTTERDAM	5,775,075	2014	PETROLEO BRASILEIRO S.A.	BR	Industrial company	100.00	Yes
8	Eni North Africa B.V.	AMSTERDAM	5,248,715	2015	ENI S.P.A.	IT	Industrial company	-	Yes
9	KUWAIT PETROLEUM - BELGIUM	ANTWERPEN	2,925,486	2013	GOVERNMENT OF KUWAIT	KW	Public authority, State, Government	-	Yes
10	IEOC Production B.V.	AMSTERDAM	2,083,780	2015	ENI S.P.A.	IT	Industrial company	-	Yes
11	Eni G&P Trading B.V.	AMSTERDAM	2,024,401	2015	ENI S.P.A.	IT	Industrial company	-	Yes
12	Chemoil Europe B.V.	ROTTERDAM	1,371,152	2010	GLENCORE PLC	GB	Industrial company	0.00	Yes
13	Trafoil Trading B.V.	ROTTERDAM	1,112,161	2014	BURANDO HOLDING B.V.	NL	Financial company	100.00	No
14	Diamond Offshore Netherlands B.V.	AMSTERDAM	1,025,121	2014	DIAMOND OFFSHORE DRILLING COMPANY N.V.	CW	Industrial company	100.00	Yes
15	Eni Angola Exploration B.V.	AMSTERDAM	1,007,684	2015	ENI S.P.A.	IT	Industrial company	-	Yes
16	Agip Karachaganak B.V.	AMSTERDAM	993,180	2015	ENI S.P.A.	IT	Industrial company	-	Yes
17	Saipem Contracting Netherlands B.V.	AMSTERDAM	948,643	2015	SAIPEM S.P.A	IT	Industrial company	-	Yes
18	TOTAL RAFFINADERIJ ANTWERPEN	ANTWERPEN	875,847	2014	TOTAL S.A.	FR	Industrial company	-	Yes
19	ONGC Nile Ganga B.V.	AMSTERDAM	834,513	2014	OIL & NATURAL GAS CORPORATION LIMITED	IN	Industrial company	100.00	Yes
20	EFR BELGIUM	EKEREN	710,699	2015	TDR CAPITAL LLP	GB	Private Equity firms	-	Yes
21	Shell Lubricants Supply Company B.V.	ROTTERDAM	689,165	2014	ROYAL DUTCH SHELL PLC	GB	Industrial company	-	Yes
22	Eni Iraq B.V.	AMSTERDAM	674,810	2014	ENI S.P.A.	IT	Industrial company	-	Yes
23	Varo Energy Netherlands B.V.	ROTTERDAM	635,677	2011	VARO ENERGY NETHERLANDS B.V.	NL	Industrial company	100.00	No
24	OILCHART INTERNATIONAL	ANTWERPEN	621,697	2014	EUROPETROL	BE	Industrial company	59.60	No
25	V Marine Fuels B.V.	ROTTERDAM	592,279	2013	GRINDROD LIMITED LTD	ZA	Industrial company	0.00	Yes
26	Mitsui E&P Middle East B.V.	AMSTERDAM	583,052	2015	MITSUI & CO LTD	JP	Industrial company	100.00	Yes
27	Eni Algeria Exploration B.V.	AMSTERDAM	578,844	2015	ENI S.P.A.	IT	Industrial company	-	Yes
28	Eni Angola Production B.V.	AMSTERDAM	573,045	2015	ENI S.P.A.	IT	Industrial company	-	Yes
29	LUKOIL International Services B.V.	AMSTERDAM	560,467	2014	PUBLIC JOINT STOCK COMPANY OIL COMPANY LUKOIL	RU	Industrial company	-	Yes
30	Cunico Resources N.V.	AMSTERDAM	504,248	2014	CUNICO RESOURCES N.V.	NL	Industrial company	100.00	No
31	Frisol Bunkering B.V.	ROTTERDAM	490,160	2011	FRIS HOLDING B.V.	NL	Industrial company	100.00	No
32	De Nederlandse Energie Maatschappij B.V.	ROTTERDAM	446,212	2015	DE NEDERLANDSE ENERGIE MAATSCHAPPIJ B.V.	NL	Industrial company	100.00	No
33	KOGAS Iraq B.V.	AMSTERDAM	382,640	2014	KOREA GAS CORP.	KR	Industrial company	100.00	Yes
34	ENSCO Holland B.V.	AMSTERDAM	352,542	2014	ENSCO PLC	GB	Industrial company	-	Yes
35	Chimbusco Europe B.V.	ROTTERDAM	344,803	2015	CHINA-PEOPLE'S REP.	CN	Public authority, State, Government	-	Yes
36	Eni Iran B.V.	AMSTERDAM	288,586	2015	ENI S.P.A.	IT	Industrial company	-	Yes
37	PETROBRAS INTERNATIONAL BRASPETRO B.V.	ROTTERDAM	227,383	2014	PETROLEO BRASILEIRO S.A.	BR	Industrial company	-	Yes
38	Expro Worldwide B.V.	AMSTERDAM	216,754	2014	UMBRELLASTREAM LIMITED PARTNERSHIP INCORPORATED	GB	Industrial company	-	Yes
39	HESS EXPLORATION AND PRODUCTION MALAYSIA B.V.	ROTTERDAM	213,146	2014	HESS CORP	US	Industrial company	-	Yes
40	Altius Petroleum International B.V.	AMSTERDAM	189,992	2014	KNOC BLACK HILL LTD	CA	Industrial company	-	Yes
41	WOLF OIL CORPORATION	HEMIKSEM	185,629	2015	CHAMPION CHEMICALS	BE	Industrial company	99.00	No
42	Shell Downstream Services International B.V.	ROTTERDAM	162,156	2014	ROYAL DUTCH SHELL PLC	GB	Industrial company	-	Yes
43	Eni Algeria Production B.V.	AMSTERDAM	160,273	2015	ENI S.P.A.	IT	Industrial company	-	Yes
44	Santos Petroleum Ventures B.V.	AMSTERDAM	146,821	2015	SANTOS LTD	AU	Industrial company	-	Yes
45	Biodiesel Amsterdam B.V.	AMSTERDAM	141,915	2014	DIKON HOLDING B.V.	NL	Financial company	0.00	No
46	Agip Oil Ecuador B.V.	AMSTERDAM	140,391	2015	ENI S.P.A.	IT	Industrial company	-	Yes
47	Galp Energia Overseas Block 14 B.V.	ROTTERDAM	134,156	2015	GALP ENERGIA, S.G.P.S., S.A.	PT	Industrial company	-	Yes
48	Impala Terminals Group B.V.	AMSTERDAM	126,812	2013	MR WALTER CUTAJAR	MLT	One or more named individuals or families	-	Yes
49	Eni Tunisia B.V.	AMSTERDAM	126,442	2015	ENI S.P.A.	IT	Industrial company	-	Yes
50	Sonneborn Refined Products B.V.	AMSTERDAM	125,080	2014	JPMORGAN CHASE & CO	US	Industrial company	-	Yes
51	Eni Australia B.V.	AMSTERDAM	108,848	2015	ENI S.P.A.	IT	Industrial company	-	Yes
52	Horizon Sourcing B.V.	ROTTERDAM	98,245	2014	HORIZON INTERNATIONAL HOLDINGS LLC	US	Industrial company	-	Yes
53	INEOS MANUFACTURING BELGIUM	ANTWERPEN	97,423	2015	J.A RATCLIFFE	GB	One or more named individuals or families	-	Yes
54	BELGIAN TRADING AND BUNKERING	ANTWERPEN	90,117	2015	CHARLES DE WIT HOLDING	BE	Industrial company	99.99	No
55	NGC E&P Investments (Netherlands) B.V.	AMSTERDAM	88,187	2015	THE NATIONAL GAS COMPANY OF TR	TT	Industrial company	100.00	Yes
56	Indorama Ventures Europe B.V.	EUROPOORT ROTTERDAM	80,188	2014	INDORAMA VENTURES PUBLIC COMPANY LIMITED	TH	Financial company	-	Yes
57	Eni China B.V.	AMSTERDAM	69,709	2015	ENI S.P.A.	IT	Industrial company	-	Yes
58	Saka Indonesia Pangkah B.V.	AMSTERDAM	67,228	2014	PERUSAHAAN GAS NEGARA (PERSERO) TBK	ID	Industrial company	-	Yes
59	Eni Dacion B.V.	AMSTERDAM	66,505	2015	ENI S.P.A.	IT	Industrial company	-	Yes
60	BIOPETROL ROTTERDAM B.V.	BOTLEK ROTTERDAM	60,380	2015	GLENCORE PLC	GB	Industrial company	-	Yes
61	CHEMOIL BELGIUM	MERKSEM	58,443	2014	GLENCORE PLC	GB	Industrial company	-	Yes
62	DE WIT BUNKERING	ANTWERPEN	54,903	2015	CHARLES DE WIT HOLDING	BE	Industrial company	99.99	No
63	Gazprom EP International Services B.V.	AMSTERDAM	51,725	2015	PUBLIC JOINT STOCK COMPANY GAZPROM	RU	Industrial company	-	Yes
64	Offshore Drilling Services (Netherlands) B.V.	AMSTERDAM	51,533	2014	DIAMOND OFFSHORE DRILLING COMPANY N.V.	CW	Industrial company	-	Yes
65	Eurotank Amsterdam B.V.	AMSTERDAM	46,215	2014	VIP TERMINALS SARL	LU	Industrial company	0.00	Yes
66	Eni Croatia B.V.	AMSTERDAM	41,996	2015	ENI S.P.A.	IT	Industrial company	-	Yes
67	Amstel Trading II B.V.	AMSTERDAM	40,972	2014	STICHTING ADMINISTRATIEKANTOOR AMSTEL TRADING	NL	Foundation/Research Institute	100.00	No
67	Amstel Trading II B.V.	AMSTERDAM	40,972	2014	STICHTING ADMINISTRATIEKANTOOR AMSTEL TRADING	NL	Foundation/Research Institute	100.00	No
68	KOGAS Badra B.V.	AMSTERDAM	33,174	2014	KOREA GAS CORP	KR	Industrial company	100.00	Yes
69	NuStar Terminals B.V.	AMSTERDAM	30,759	2014	NUSTAR ENERGY LP	US	Industrial company	-	Yes
70	Chevron Netherlands B.V.	VONDELINGENPLAAT RT	24,589	2014	CHEVRON INVESTMENTS (NETHERLANDS) INC.	US	Industrial company	100.00	Yes
71	Eni Venezuela B.V.	AMSTERDAM	23,746	2015	ENI S.P.A.	IT	Industrial company	-	Yes
72	SHAFT SINKERS BELGIUM	ANTWERPEN	22,705	2014	SHAFT SINKERS HOLDINGS PLC	GB	Industrial company	100.00	Yes
73	RENKERT OIL EUROPE	ANTWERPEN	21,912	2014	RENKERT OIL, LLC	US	Industrial company	-	Yes
74	Ieoc Exploration B.V.	AMSTERDAM	21,790	2015	ENI S.P.A.	IT	Industrial company	-	Yes
75	ANTWERP TERMINAL & PROCESSING COMPANY - REFINERY	ANTWERPEN	19,937	2015	VIP TERMINALS SARL	LU	Industrial company	-	Yes
76	POLYOL BELGIUM	WILRIJK	16,024	2014	DOW CHEMICAL CO	US	Industrial company	-	Yes
77	AGAAT	ANTWERPEN	14,707	2015	N.V. HOLDIFIMA	NL	Financial company	93.14	Yes
78	GPB Neftegaz Services B.V.	AMSTERDAM	13,874	2010	GAZPROMBANK	RU	Bank	-	Yes
79	Eni Benelux B.V.	ROTTERDAM	12,247	2014	ENI S.P.A.	IT	Industrial company	-	Yes
80	Eni Bulungan B.V.	AMSTERDAM	8,332	2015	ENI S.P.A.	IT	Industrial company	-	Yes
81	Eni Gas & Power Lng Australia B.V.	AMSTERDAM	7,442	2015	ENI S.P.A.	IT	Industrial company	-	Yes
82	PRIMA LNG	BERCHEM-ANTWERPEN	6,539	2014	FENTENER VAN VLISSINGEN FAMILY	NL	One or more named individuals or families	-	Yes
83	INTERCAN	HEMIKSEM	4,241	2015	CHAMPION CHEMICALS	BE	Industrial company	99.00	No
84	Billiton Development B.V.	AMSTERDAM	4,204	2015	BHP BILLITON PLC	GB	Industrial company	0.00	Yes
85	AEGEAN BUNKERS AT SEA	SINT-JOB-IN-'T-GOOR	4,017	2014	AEGEAN MARINE PETROLEUM NETWORK INC.	MH	Industrial company	-	Yes
86	HARGREAVES CARBON PRODUCTS	BERCHEM-ANTWERPEN	3,657	2015	HARGREAVES SERVICES PLC	GB	Industrial company	-	Yes
87	DUVAL SERVICE COMPANY	BERCHEM-ANTWERPEN	3,749	2015	DUVAL HOLDING	BE	Financial company	-	No
88	STATIONS SUPPORT SERVICES	EKEREN	2,761	2015	TDR CAPITAL LLP	GB	Private Equity firms	-	Yes
89	APX Clearing B.V.	AMSTERDAM	2,317	2014	DEUTSCHE BÖRSE AG	DE	Financial company	-	Yes
90	Drill Ship International B.V.	ROTTERDAM	2,063	2014	PETROLEO BRASILEIRO S.A.	BR	Industrial company	-	Yes
91	Eni Togo B.V.	AMSTERDAM	1,402	2015	ENI S.P.A.	IT	Industrial company	-	Yes
92	Eni Ireland B.V.	AMSTERDAM	1,214	2015	ENI S.P.A.	IT	Industrial company	-	Yes
93	Ocean Rig Block 33 Brasil B.V.	AMSTERDAM	796	2014	DRYSHIPS INC.	MH	Industrial company	-	Yes
94	Ocean Rig Black Sea Operations B.V.	AMSTERDAM	385	2014	DRYSHIPS INC.	MH	Industrial company	-	Yes
95	Galp Energia Tarfaya B.V.	ROTTERDAM	132	2015	GALP ENERGIA, S.G.P.S., S.A.	PT	Industrial company	-	Yes
96	STATION SERVICES	EKEREN	43	2015	TDR CAPITAL LLP	GB	Private Equity firms	-	Yes
97	ANTWERP TERMINAL & PROCESSING COMPANY - PETROCHEMICALS	ANTWERPEN	40	2015	VTTI B.V.	NL	Industrial company	-	Yes
98	Himalaya Energy Syria B.V.	AMSTERDAM	17	2014	HIMALAYA ENERGY SYRIA B.V.	NL	Industrial company	100.00	No
99	MEKANISCHE KOLENVEREDELING	BERCHEM-ANTWERPEN	14	2015	HARGREAVES SERVICES PLC	GB	Industrial company	-	Yes
100	MOL Central Asia B.V.	AMSTERDAM	7	2015	MOL MAGYAR OLAJ-ES GAZIPARI RT.	HU	Industrial company	100.00	Yes

Appendix 3

	Company name	ISH - Name	City	Operating revenue (Turnover) th USD Last avail. yr	Last avail. year	GUO - Name	GUO - Country ISO code	GUO - Type	GUO - Direct %
1	SUN COAST RESOURCES INC		HOUSTON	750,000	2016	SUN COAST RESOURCES INC	US	Industrial company	100.00
2	HILCORP ENERGY CO		HOUSTON	750,000	2016	HILCORP ENERGY CO	US	Industrial company	100.00
3	ALTA MESA		HOUSTON	750,000	2015	ALTA MESA	US	Industrial company	100.00
4	ULTRA PETROLEUM CORP		HOUSTON	750,000	2016	ULTRA PETROLEUM CORP	US	Industrial company	100.00
5	LBC HOUSTON LP	CHALLENGER INFRASTRUCTURE FUND	SEABROOK	350,000	2016	CHALLENGER INFRASTRUCTURE FUND	AU	Mutual & Pension Fund/Nominee/Trust/Trustee	-
6	EQUILON ENTERPRISES LLC	ROYAL DUTCH SHELL PLC	HOUSTON	350,000	2016	ROYAL DUTCH SHELL PLC	GB	Industrial company	-
7	CITATION OIL & GAS CORP		HOUSTON	350,000	2016	CITATION OIL & GAS CORP	US	Industrial company	100.00
8	PRIME NATURAL RESOURCES INC		HOUSTON	350,000	2016	PRIME NATURAL RESOURCES INC	US	Industrial company	100.00
9	OXY INC		HOUSTON	350,000	2016	OXY INC	US	Industrial company	100.00
10	ZAZA ENERGY CORP	TOREADOR RESOURCES CORP	HOUSTON	350,000	2016	ZAZA ENERGY CORPORATION	US	Industrial company	-
11	SWIFT ENERGY EXPLORATION SERVICES INC		HOUSTON	175,000	2016	SWIFT ENERGY EXPLORATION SERVICES INC	US	Industrial company	100.00
12	BG NORTH AMERICA	BG GROUP LIMITED	HOUSTON	175,000	2015	ROYAL DUTCH SHELL PLC	GB	Industrial company	-
13	BIOURJA TRADING LLC		HOUSTON	175,000	2016	BIOURJA TRADING LLC	US	Industrial company	100.00
14	GE OIL & GAS LOGGING SERVICES INC	GE ENERGY MANUFACTURING, INC.	HOUSTON	175,000	2016	GE ENERGY MANUFACTURING, INC.	US	Industrial company	WO
15	OXY VINYLS LP	OCCIDENTAL CHEMICAL HOLDING CORPORATION	LA PORTE	112,500	2016	OCCIDENTAL PETROLEUM CORP	US	Industrial company	-
16	OILTANKING OF TEXAS INC		HOUSTON	112,500	2016	OILTANKING OF TEXAS INC	US	Industrial company	100.00
17	PETROLEUM WHOLESALE LP		HOUSTON	112,500	2016	PETROLEUM WHOLESALE LP	US	Industrial company	100.00
18	ATHLON SOLUTIONS LLC		HOUSTON	112,500	2015	ATHLON SOLUTIONS LLC	US	Industrial company	100.00
19	PETRO SOURCE CORP		HOUSTON	62,500	2016	PETRO SOURCE CORP	US	Industrial company	100.00
20	UNIT PETROLEUM CO		HOUSTON	62,500	2016	UNIT PETROLEUM CO	US	Industrial company	100.00
21	BG LNG SERVICES LLC	BG GROUP LIMITED	HOUSTON	62,500	2015	ROYAL DUTCH SHELL PLC	GB	Industrial company	-
22	SOUTHLAND ROYALTY CO		HOUSTON	62,500	2014	SOUTHLAND ROYALTY CO	US	Industrial company	100.00
23	WALTER OIL & GAS CORP	WALTER FAMILY	HOUSTON	62,500	2016	WALTER FAMILY	US	One or more named individuals or families	100.00
24	DCP NGL SERVICES LP	DCP MIDSTREAM LLC	HOUSTON	62,500	2014	DCP MIDSTREAM LLC	US	Industrial company	-
25	WILDHORSE RESOURCES		HOUSTON	62,500	2015	WILDHORSE RESOURCES	US	Industrial company	100.00
26	CSQUARED		KEMAH	62,500	2016	CSQUARED	US	Industrial company	100.00
27	BLANCHARD REFINING CO LLC	MARATHON PETROLEUM CORP	TEXAS CITY	62,500	2015	MARATHON PETROLEUM CORP	US	Industrial company	WO
28	BAY OIL CO	DICKINSON	DICKINSON	37,500	2016	BAY OIL CO	US	Industrial company	100.00
29	SHELL DEER PARK REFINING		DEER PARK	37,500	2016	SHELL DEER PARK REFINING	US	Industrial company	100.00
30	SOUTH COAST PRODUCTS INC		HOUSTON	37,500	2016	SOUTH COAST PRODUCTS INC	US	Industrial company	100.00
31	LAREDO ENERGY II LP		HOUSTON	37,500	2016	LAREDO ENERGY II LP	US	Industrial company	100.00
32	GULF COAST OIL & GAS		HOUSTON	37,500	2016	GULF COAST OIL & GAS	US	Industrial company	100.00
33	OROURKE DISTRIBUTING CO INC	MR DENNIS O'ROURKE	HOUSTON	37,500	2016	MR DENNIS O'ROURKE	US	One or more named individuals or families	100.00
34	JOHANN HALTERMANN LTD		HOUSTON	37,500	2016	JOHANN HALTERMANN LTD	US	Industrial company	100.00
35	PETROSANTANDER INC		HOUSTON	37,500	2016	PETROSANTANDER INC	US	Industrial company	100.00
36	SOUTHERNFARE		KATY	37,500	2013	SOUTHERNFARE	US	Industrial company	100.00
37	CREST ENERGY PARTNERS		HOUSTON	37,500	2016	CREST ENERGY PARTNERS	US	Industrial company	100.00
38	CAPITAL STAR OIL & GAS		HOUSTON	37,500	2014	CAPITAL STAR OIL & GAS	US	Industrial company	100.00
39	GE OIL & GAS COMPRESSION SYSTEMS LLC	GENERAL ELECTRIC CO	HOUSTON	37,500	2015	GENERAL ELECTRIC CO	US	Industrial company	MO
40	WILLIAMS & CO		HOUSTON	17,500	2016	WILLIAMS & CO	US	Industrial company	100.00
41	SOUTHWEST AIRPORT SERVICES		HOUSTON	17,500	2016	SOUTHWEST AIRPORT SERVICES	US	Industrial company	100.00
42	MARWELL PETROLEUM INC		HOUSTON	17,500	2016	MARWELL PETROLEUM INC	US	Industrial company	100.00
43	MARKWEST PINNACLE LP		HOUSTON	17,500	2016	MARKWEST PINNACLE LP	US	Industrial company	100.00
44	GEORGE R BROWN PARTNERSHIP		HOUSTON	17,500	2016	GEORGE R BROWN PARTNERSHIP	US	Industrial company	100.00
45	PETROMAX OIL INC	MR SAM PATEL	HOUSTON	17,500	2015	MR SAM PATEL	US	One or more named individuals or families	100.00
46	SABCO OIL & GAS CO LLC		HOUSTON	17,500	2016	SABCO OIL & GAS CO LLC	US	Industrial company	100.00
47	KUIFS PETROLEUM LP		HOUSTON	17,500	2016	KUIFS PETROLEUM LP	US	Industrial company	100.00
48	PETRECO		HOUSTON	17,500	2016	PETRECO	US	Industrial company	100.00
49	JONES OIL INC		HOUSTON	17,500	2016	JONES OIL INC	US	Industrial company	100.00
50	WHITE TUCKER CO		HOUSTON	17,500	2016	WHITE TUCKER CO	US	Industrial company	100.00
51	NORTHWEST PETROLEUM LP		HOUSTON	17,500	2015	NORTHWEST PETROLEUM LP	US	Industrial company	100.00
52	ANCHOR DRILLING FLUIDS USA INC		HOUSTON	17,500	2014	ANCHOR DRILLING FLUIDS USA INC	US	Industrial company	100.00
53	OIL PRODUCTS DISTRIBUTION LTD		HOUSTON	17,500	2016	OIL PRODUCTS DISTRIBUTION LTD	US	Industrial company	100.00
54	ROOSTER PETROLEUM LLC	ROOSTER ENERGY LTD.	HOUSTON	17,500	2016	ROOSTER ENERGY LTD.	CA	Industrial company	WO
55	HARRISON INTERESTS LTD		HOUSTON	17,500	2016	HARRISON INTERESTS LTD	US	Industrial company	100.00
56	CAMAC INTERNATIONAL CORP		HOUSTON	17,500	2016	CAMAC INTERNATIONAL CORP	US	Industrial company	100.00
57	DOF SUBSEA USA INC	DOF SUBSEA AS	HOUSTON	17,500	2016	DOF ASA	NO	Industrial company	-
58	RENEWABLE BIOFUELS INC		HOUSTON	17,500	2016	RENEWABLE BIOFUELS INC	US	Industrial company	100.00
59	JX NIPPON CHEMICAL TX INC	JX HOLDINGS, INC.	PASADENA	17,500	2016	JX HOLDINGS, INC.	JP	Industrial company	MO
60	FREUDENBERG OIL & GAS LLC	FREUDENBERG SE	HOUSTON	17,500	2016	FREUDENBERG FAMILY	DE	One or more named individuals or families	-
61	LUKOIL OVERSEAS OFFSHORE PROJECTS IN	PUBLIC JOINT STOCK COMPANY OIL COMPANY LUKOIL	HOUSTON	17,500	2015	PUBLIC JOINT STOCK COMPANY OIL COMPANY LUKOIL	RU	Industrial company	MO
62	RECAPTURE SOLUTIONS LLC	INTERVALE CAPITAL LLC	HOUSTON	17,500	2015	MR REED CHERINGTON CHARLES	US	One or more named individuals or families	-
63	SIANA OIL & GAS		HOUSTON	17,500	2016	SIANA OIL & GAS	US	Industrial company	100.00
64	MARKWEST HYDROCARBON		HOUSTON	17,500	2016	MARKWEST HYDROCARBON	US	Industrial company	100.00
65	GAITHER PETROLEUM CORP		HOUSTON	7,500	2016	GAITHER PETROLEUM CORP	US	Industrial company	100.00
66	SUGARLAND PETROLEUM INC		HOUSTON	7,500	2016	SUGARLAND PETROLEUM INC	US	Industrial company	100.00
67	DAVIS PETROLEUM		HOUSTON	7,500	2016	DAVIS PETROLEUM	US	Industrial company	100.00
68	MEADOWS GROUP		HOUSTON	7,500	2016	MEADOWS GROUP	US	Industrial company	100.00
69	GOLD STAR PETROLEUM		SPRING	7,500	2016	GOLD STAR PETROLEUM	US	Industrial company	100.00
70	SCOMI OILTOOLS INC	SCOMI OILTOOLS BERMUDA LIMITED	HOUSTON	7,500	2016	SCOMI GROUP BERHAD	MY	Industrial company	-
71	BRIGHTOIL PETROLEUM USA INC	MR LAM SIT KWONG	HOUSTON	7,500	2016	MR LAM SIT KWONG	HK	One or more named individuals or families	100.00
72	FREDCO OIL FIELD SERVICE INC		CHANNELVIEW	3,000	2015	FREDCO OIL FIELD SERVICE INC	US	Industrial company	100.00
73	METRON OIL & GAS OPERATIONS LTD		HOUSTON	3,000	2010	METRON OIL & GAS OPERATIONS LTD	US	Industrial company	100.00
74	GINGER OIL CO	GINGER OIL AB	HOUSTON	3,000	2012	GINGER OIL AB	SE	Industrial company	100.00
75	JOY RESOURCES INC		HOUSTON	3,000	2015	JOY RESOURCES INC	US	Industrial company	100.00
76	MARATHON E G PRODUCTION LTD		HOUSTON	3,000	2012	MARATHON E G PRODUCTION LTD	US	Industrial company	100.00
77	TRINITY PETROLEUM CONSULTANTS LTD		HOUSTON	3,000	2016	TRINITY PETROLEUM CONSULTANTS LTD	US	Industrial company	100.00
78	APEX OIL & GAS INC		HOUSTON	3,000	2012	APEX OIL & GAS INC	US	Industrial company	100.00
79	SAVANNAH OIL & GAS LLC		HOUSTON	3,000	2016	SAVANNAH OIL & GAS LLC	US	Industrial company	100.00
80	WADI PETROLEUM		HOUSTON	3,000	2016	WADI PETROLEUM	US	Industrial company	100.00
81	JEFFERSON PIPELINE CO	MR JOHN H YOUNG	HOUSTON	3,000	2015	MR JOHN H YOUNG	US	One or more named individuals or families	100.00
82	GENESIS		HOUSTON	3,000	2015	GENESIS	US	Industrial company	100.00
83	ZIMMER & ASSOCIATES		HOUSTON	3,000	2011	ZIMMER & ASSOCIATES	US	Industrial company	100.00
84	TEPEE PETROLEUM CO	MR TOWNES G PRESSLER SR	HOUSTON	3,000	2016	MR TOWNES G PRESSLER SR	US	One or more named individuals or families	100.00
85	OIL FIELD DEVELOPMENT ENGINEERING LLC		HOUSTON	3,000	2011	OIL FIELD DEVELOPMENT ENGINEERING LLC	US	Industrial company	100.00
86	SONANGOL USA CO	SONANGOL E.P	HOUSTON	3,000	2016	GOVERNO DA REPUBLICA DE ANGOLA	AO	Public authority, State, Government	-
87	TP PETROLEUM		HOUSTON	3,000	2015	TP PETROLEUM	US	Industrial company	100.00
88	PETER PAUL PETROLEUM CO	THE HUDDLESTON FAMILY	HOUSTON	3,000	2015	THE HUDDLESTON FAMILY	US	One or more named individuals or families	100.00
89	HAMMAN OIL & REFINING CO		HOUSTON	3,000	2016	HAMMAN OIL & REFINING CO	US	Industrial company	100.00
90	MCCOMBS ENERGY		HOUSTON	3,000	2016	MCCOMBS ENERGY	US	Industrial company	100.00
91	BLUE STAR LTD		HOUSTON	3,000	2015	BLUE STAR LTD	US	Industrial company	100.00
92	BOMINFLOT BUNKER OIL CORP		HOUSTON	3,000	2014	BOMINFLOT BUNKER OIL CORP	US	Industrial company	100.00
93	JAPEX CORP		HOUSTON	3,000	2015	JAPEX CORP	US	Industrial company	100.00
94	LUBRICATION SOLUTION	TECALEMIT INC.	HOUSTON	3,000	2015	TECALEMIT INC.	US	Industrial company	100.00
95	TRADE WINDS OIL & GAS INC	MR JAMES E SCOTT III	HOUSTON	3,000	2016	MR JAMES E SCOTT III	US	One or more named individuals or families	100.00
96	TRANSWORLD OIL USA		HOUSTON	3,000	2016	TRANSWORLD OIL USA	US	Industrial company	100.00
97	PELICAN REFINING		CHANNELVIEW	3,000	2016	PELICAN REFINING	US	Industrial company	100.00
98	ORION OIL & GAS		HOUSTON	3,000	2015	ORION OIL & GAS	US	Industrial company	100.00
99	COUGAR OIL & GAS INC		HOUSTON	3,000	2012	COUGAR OIL & GAS INC	US	Industrial company	100.00
100	STAR FUELS INC		HOUSTON	3,000	2016	STAR FUELS INC	US	Industrial company	100.00