The Financial Growth of Multinational Upstream Oil and Gas Companies: M&A, Functional Currencies, and Impairment Losses

MATSUMARA Fumihiko

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<th>著者</th>
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<td>多国籍石油ガス上流企業の財務成長・合併買収、機能通貨、及び減損損失</td>
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The Financial Growth of Multinational Upstream Oil and Gas Companies: M&A, Functional Currencies, and Impairment Losses

（邦題：多国籍石油ガス上流企業の財務成長：合併買収、機能通貨、及び減損損失）

Fumihiko Matsubara

（松原文彦）
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Appendix 1

Appendix 2
Chapter 1. Introduction

1. Background and motivation

I have been in the energy industry for nearly two decades as an employee of a Japanese general trading firm, in charge of a variety of energy-related businesses. Much of my role entails acquiring overseas upstream oil and gas assets through mergers and acquisitions (M&A). To be clear, it is not a job for just one person, as M&A projects are driven by the team. I joined this team as a subordinate at a young age and went on to lead it. I have performed integral roles as the team’s business development manager to carry out various aspects of M&A, such as conducting feasibility studies, due diligence, negotiating economic valuation with sellers, analyzing risk returns for projects, obtaining and managing corporate approvals, and utilizing project finance as a limited recourse of financial responsibility. The total value of M&A in which I have participated in the upstream oil and gas industry, including both company and asset acquisitions, is approximately US$ 600 million. Our team completed seven M&A deals between 2003 and 2019. The results of my M&A experiences were not all positive. Some projects went well, while others did not due to external factors such as high oil and gas prices, or internal factors, such as poor project management and an underestimation of risks.

In this study, I will examine three points gleaned from my personal experiences: (1) the growth path of Japanese upstream oil and gas companies, (2) functional currencies used in the target companies, and (3) impairment losses in the upstream oil and gas business. These three factors relate to a practitioner’s viewpoint. This work is an empirical study on multinational oil companies since 2010s following the shale revolution in the US. There are many definitions of “financial growth.” Some scholars argue that it means increasing and maximizing total revenues. Others argue that it refers to total assets or net profits after tax. In this study, financial growth means increasing total revenues, net profits after tax, and total assets. Total revenues for upstream oil and gas companies are generally the sum of the production volume of crude oil and natural gas times crude oil and natural gas prices. Total revenues are employed as a useful indicator for financial growth in this study. Total assets can be considered business resources for firms. Net profits after tax can be considered as a value created for one fiscal year from the firm’s resources.

Crude oil and natural gas play vital roles in the world economy. Table 1-1 compares the numbers given in Edith Penrose’s book The Large International Firm in Developing Countries: The International Petroleum Industry (1968) with the 2018 figures. Between 1966 and 2018, world crude oil production has increased by approximately 280%.
We see that the US was the world’s largest producer in 1966 and 2018. However, the US was not always the largest producer during this period. The largest producer has always been one among the US, Russia, or Saudi Arabia. The US was the largest crude oil producer from 1966 to 1984, with the exception of 1980 and 1981. Russia was the largest oil producer between 1985 and 1991. From 1992 until 2013, Saudi Arabia took the lead, with the exception of 2009 and 2010. The US again became the largest oil producer from 2014 to 2018, except in 2016.

Figure 1-1 shows the historical oil production trends for the US, Russia, and Saudi Arabia.

Table 1-1. Comparison between 1966 and 2018

<table>
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<tr>
<th></th>
<th>Penrose’s data as of 1966</th>
<th>2018</th>
</tr>
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<tbody>
<tr>
<td>World crude oil production</td>
<td>34 million barrels per day</td>
<td>94.7 million barrels per day</td>
</tr>
<tr>
<td>World estimated population</td>
<td>3 billion</td>
<td>7.6 billion</td>
</tr>
<tr>
<td>Crude oil per person</td>
<td>More than 0.5 tons</td>
<td>0.59 tons</td>
</tr>
<tr>
<td>World’s largest producer</td>
<td>The United States</td>
<td>The United States</td>
</tr>
</tbody>
</table>

Source: BP Statistical Review of World Energy 2019, United Nations (Department of Economic and Social Affairs)


3 The total volume includes crude oil, shale oil, oil sands, condensates, and natural gas liquids, such as ethane, LPG, and naphtha. The total volume excludes liquid fuels from other sources such as biomass and derivatives of coal and natural gas (BP Statistical Review 2019 of World Energy 2019, p. 16).

4 Russia’s figures for crude oil production were unknown until 1985.

5 The author downloaded the data from BP Statistical Review of World Energy 2019 and generated Figure 1-1.
As global production grows, upstream oil and gas companies become bigger. According to a world investment report of the United Nations Conference on Trade and Development (UNCTAD), five of the top 10 companies among the world’s top 100 non-financial multinational enterprises (MNEs) were multinational oil and gas companies when ranked by foreign assets in 2017. Additionally, 14 petroleum companies were listed in the world’s top 100 non-financial MNEs when ranked by foreign assets in 2018.

2. Focus and macro environment

Crude oil and natural gas are extracted simultaneously but processed and refined separately. While crude oil is refined to produce oil products, natural gas can be transported by pipelines or converted into liquefied natural gas (LNG). Some oil and gas companies are highly integrated, while others focus solely on either upstream or downstream processes. Figure 1-2 shows the value chain of the oil and gas industry. Crude oil and natural gas are produced underground simultaneously through wells and follow the separation of liquid and gas. They are processed differently, as shown by the trajectory going from the left of Figure 1-2 to the right. This study focuses on the upstream oil and gas industry, as that is the industry in which I have worked for nearly two decades. Natural gas can be transported by pipelines or ships once it becomes liquefied natural gas.

Figure 1-2. Value chain of oil and gas


6 Royal Dutch Shell (1st), Total (3rd), BP (4th), ExxonMobil (7th), and Chevron (10th).

The shale revolution in the US surprised industry participants, leading to steady growth in production (BP 2016, p. 53). Technology developed by George P. Mitchell of Mitchell Energy together with Devon Energy and Chesapeake made it possible to extract hydrocarbons from shale reservoirs (Heck and Rogers, 2014). Since the shale revolution influenced the supply–demand balance, upstream oil and gas companies had to cope with the changing environment in order to prevent financial losses. Figure 1-3 shows figures for global crude oil production and consumption since 1966. In general, both production and consumption are increasing steadily.

Figure 1-3. Crude oil production (left) and consumption (right) since 1966 (thousand barrels per day)

Source: Generated by the author from BP Statistical Review 2019.8

Figure 1-4 shows the FOB spot prices of West Texas Intermediate (WTI) at the Cushing, Oklahoma delivery point since 1986. Unlike the steadiness of crude oil production and consumption, crude oil prices (WTI) have been volatile. Figure 1-5 shows a count of the equipment used for drilling, called a “rotary rig,” done by Baker Hughes in the United States; this count is also volatile. The state of Texas is leading the rotary rig count. The number of rotary rigs indicates a US production increase. Figure 1-5 shows that production in Texas is the key driver of the US production increase, which is one of reasons for the significant oil price decrease since 2014.

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Figure 1-4. West Texas Intermediate (WTI) spot price FOB (USD/barrel) since 1986

Source: Generated by the author from data provided by US Energy Information Administration (EIA).⁹

Figure 1-5. Rotary rigs for selected US states

Source: Generated by the author from data provided by Baker Hughes, “North America Rig Count.”¹⁰

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3. Scope of the study

The scope of analysis for each chapter is as follows. There are six chapters. Chapter 2 explains the theory of firm growth developed by Edith Penrose in her 1959 book *The Theory of the Growth of the Firm*. I clarify how the three points I raised are related to Penrose’s theory. I also point out how the valuation of the acquisition price in M&A transactions may generate goodwill. I further point out the limitations of Penrose’s theory in light of these three points. Chapter 2 also explains the difference between Penrose’s theory of firm growth and the notion of financial growth used in this study.

I sorted the top-tier oil and gas companies into four groups: major oil companies, national oil companies (NOCs; export-oriented, government-owned), national flag oil companies (NFOCs; import-oriented companies representing a nation), and independent oil companies. This classification plays an important role in organizing this study.

Chapter 3 discusses the study’s first main point, regarding the growth paths of Japanese upstream oil and gas companies. Scholars and practitioners have often asked whether Japan can create an internationally competitive upstream oil and gas company (Kikkawa, 2003; Koike et al, 2008; Matsubara, 2019). The key question is whether Japanese companies should pursue the paved road to growth taken by other large oil and gas companies (Jackson and Hobbs, 2006) or whether they should create their own path by adapting technologies to create higher efficiency, which is their core competency (Abo et al., 2008). Chapter 3 shows that, with the exception of China, no other country has more than two national flag oil companies; Japan has two. Previous studies suggest that one of the issues for Japan’s upstream oil and gas companies is that there is “too little for too many.” Chapter 3 discusses if merging Japan’s two national flag oil companies would make sense.

Chapter 4 discusses functional currencies in oil and gas companies. An entity’s functional currency is the currency of the primary economic environment in which the entity operates (PwC Japan, 2016). The functional currency could be a different currency from the one in the financial statements. The currency in which the financial statements are presented is the presentation currency (PwC Japan, 2016). I conducted data surveys of functional currencies among the top 50 oil and gas companies ranked by Energy Intelligence. I categorized them into four groups: major oil companies, national oil and gas companies (export-oriented), national flag oil and gas companies (an import-oriented nation’s representative), and independents. As cross-border M&A grow, the importance of knowing the issues around functional currencies increases, as they serve as measures of companies’ resources. Managers always seek to improve
their managerial decisions, which makes it essential to have a performance-measurement tool (Meyer, 2004).

Chapter 5 discusses impairment losses. The oil price crunch in 2015 revealed the close relationship between impairment losses and the upstream oil and gas industry. The impairment losses were incurred in various currencies, especially after M&A. I examine the general tendencies among the four groups outlined earlier and shed light on impairment losses in the oil and gas industry.

Chapter 6 summarizes the previous chapters and concludes the study. This work sheds light on the operational and financial growth paths for Japanese upstream oil and gas companies. This study asks how multinational upstream oil and gas companies would grow financially through investments in M&A and project management. This study also stresses the close relationship between impairment losses and upstream oil and gas companies. M&A can help companies grow. However, upstream oil and gas companies are also exposed to impairment losses after M&A. This study offers several implications that could help Japanese upstream oil and gas companies become internationally competitive.
Chapter 2. Growth through M&A and research questions

1. Introduction
In chapter 2, I discuss the following five points: (a) corporate growth via M&A and the limitations of Penrose’s theoretical considerations, (b) the valuation of acquisition prices in M&A transactions that may generate goodwill, (c) M&A and impairment losses, (d) the choice of functional currency and corporate value in international M&A, and (e) a case of Japanese upstream oil and gas. Further, I discuss the topic of (e) in chapter 3, the topic of (d) in chapter 4 and the topic of (c) in chapter 5.

2. (a) Corporate growth by M&A and the limitation of Penrose’s theory

2.1 Corporate growth by M&A
Penrose (1959) discussed the growth path for firms using M&A for external expansion (p. 195). She considered M&A as not just company acquisitions but also asset acquisitions (pp. 173–175). Penrose (1959) stated that “if a planned expansion is considered profitable regardless of any change in the existing position of other producers or in the distribution of the ownership of existing industrial assets, then the firm will choose to expand through acquisition only if acquisition is considered cheaper than internal expansion” (p. 156). There is evidence that cross-border M&A have increased (UNCTAD, 2018; Xie et al., 2017; Hagen and Prettl, 2017; Shimizu et al., 2004). A situation in which the target firms’ resources are necessary for the buyer’s business expansion supports M&A, as Penrose (1959) explained. If the target firms’ resources are not only denominated and presented differently but also controlled and managed in different currencies, this impacts the buyer firm’s M&A strategy.

Gadiesh et al. (2001) emphasized the importance of performing integration, designing the new company, and executing strategies. Marks and Mirvis (2011) pointed out the behavioral and cultural factors influencing M&A success, focusing on pessimistic mindsets, downsizing, and restructuring. Appelbaum et al. (2000a; 2000b) also discussed the behavioral approach, focusing on communication and corporate culture during the pre-, during-, and post-acquisition phases.

It appears that M&A are a popular methodology for company growth (Shimizu et al., 2004). However, they are not always successful. Bower (2001) pointed out that nearly 70% of M&A fail, when they do not meet executives’ financial expectations. Sharifi et al. (2005) pointed out

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11 UNCTAD (2018) stated that “the aggregate value of net cross-border M&As, which had been on the rise since 2013, contracted in 2017. The number of M&A transactions, however, sustained its upward trend to almost 7,000” (p. 24). Available online at: https://unctad.org/en/PublicationsLibrary/wir2018_en.pdf (accessed on July 25, 2019)
the lack of a strategic approach among M&A failures and explained the importance of sharing the M&A strategy between business groups. They also depicted the pre-M&A process flow, describing the exact steps to take when approaching a target company and executing the transaction. Gomes et al. (2013) divided M&A into pre- and post-M&A phases. The pre-M&A phase evaluates the project, and the post-M&A phase controls the acquired assets.12

M&A have grown in size and become more internationalized. The value of global M&A deal transactions in the upstream oil and gas industry in 2017 was US$ 172 billion (EY, 2017). Galperina and Klen (2017) presented an overview of the global M&A trends in the energy sector and found cyclical movements—an upward and downward cycle of M&A deals in terms of timing. They also found a high proportion of unsuccessful deals. Domingues and Godoy (2012) discuss impairment losses among 19 multinational13 oil and gas companies between 2003 and 2008, showing that the highest impairment value disclosed among the 19 companies was US$ 2,455 million dollars, for PetroChina in 2008. They also argued that the impact of oil prices and constant discovery rates of proven reserves would prevent companies from incurring impairment losses.

One of consulting companies in the US, AT Kearney (2017), pointed out that 22% of all deals announced in 2015 were not consummated, accounting for US$106 billion (p. 3). However, some scholars consider the merger between Exxon and Mobil to be successful (Caiazzza et al., 2013; Cole, 2013). Previous studies suggest that M&A do not just combine two different corporate entities into one but also include human factors. I consider the relationship among impairment losses, M&A, and project management important, and I discuss it below.

2.2 Limitation of Penrose’s theory

Some scholars have made significant contributions to the study of management strategies. However, traditional management strategy theories lack a consideration of an important aspect of financial growth for multinational corporations: fluctuations in financial growth due to currency volatility and impairment losses. These fluctuations may be caused by the volatility of crude oil prices and foreign currency risk exposure. As I will discuss in chapter 4, currency exchange rates have a particularly close relationship with crude oil prices, especially for oil-producing countries.

12 In this study, functional currency is an item of the pre-M&A phase and impairment losses is an item of the post-M&A phase.
13 The 19 companies were BP, Chevron, China Petroleum, ConocoPhillips, Eni, ExxonMobil, Hess, Marathon, Murphy, Petro-Canada, Petrobras, PetroChina, Repsol, Royal Dutch Shell, Sasol, StatoilHydro, Suncor, Total, and YPF.
Porter (1979) advocated the Five Forces model as a way to carry out a structural analysis of any industry. Porter’s five forces are the bargaining power of customers, the bargaining power of suppliers, the threat of new entrants, the threat of substitute products, and competitive rivalry within an industry. Nonaka et al. (2013) pointed out, however, that Porter’s five forces are useful for analysts but not helpful to businesses that are dynamically changing.

Kaplan and Norton (1993, 2000, 2005, 2007) developed the Balanced Scorecard tool. Kaplan and Norton (1993) explained that the Balance Scorecard tool measures a company’s performance from four major perspectives: (1) financial, (2) customer, (3) internal process, and (4) innovation and learning. These four perspectives are vertically interrelated (Kaplan and Norton, 2000). However, Awadallah and Allam (2015) pointed out that the Balanced Scorecard (BSC) is limited, as it does not clearly define the relationship with organization performance, the objectives and definition of measures that exclude key stakeholders, and the success factors for the key performance indicators.

Another theory was advocated by Christensen (1997), who analyzed cheap, low-quality commodities that are seemingly not a threat to expensive, high-quality ones. However, the low-quality commodities influence the market and eventually become the dominant product, pushing the high-quality, expensive commodities out of the market. Christensen (1997) supported his theory by citing examples like hard disk drives, automobiles, mini mills for steel, computers, and printers. Christensen (1997) also pointed out that disruptive innovation requires a separate entity or strong firewalls, as the disrupting organization may not always coexist with the disrupted organization.

Penrose’s theory is extremely useful for explaining the significance of this study. Penrose’s theory explains how the firm can grow by separating its resources from its services. The concept of firm resources and services may seem to have something in common with accounting information, such as the balance sheet (what firms own) and profit and loss statements (what firms produce). Both concepts describe what firms own and what they produce from what they own. The business of the upstream oil and gas sector, where firms have hydrocarbon reserves and conduct oil and gas production, may seem to have something in common with accounting information. Upstream oil and gas companies have hydrocarbon reserves (what that own), and they produce crude oil and natural gas from hydrocarbon reserves (what they produce). I find Penrose’s theory quite helpful as a theoretical framework for this study. Table 2-1 describes what firms own and what firms produce from what they own in accounting and in the upstream oil and gas sector following Penrose’s theory.
Table 2.1. Commonality among Penrose’s theory, accounting, and upstream oil and gas business

<table>
<thead>
<tr>
<th>Penrose (1959)</th>
<th>What firms own</th>
<th>What firms produce</th>
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<tbody>
<tr>
<td>Accounting</td>
<td>Resources</td>
<td>Services</td>
</tr>
<tr>
<td>Upstream Oil and Gas Business</td>
<td>Reserves and Resources</td>
<td>Production of Oil and Gas</td>
</tr>
</tbody>
</table>

Source: Elaborated by the author.

Penrose (1955) pointed out that firms do not grow automatically; they grow in response to human decisions (p. 532). Penrose (1955) also asked questions about the limitations of a firm’s growth in terms of size, which remain unanswered. Penrose (1959) quoted the CEO of a large US company who said that US$10 million in total revenue was the threshold for managing a company efficiently by managements (p. 163). Penrose seems to have considered firm growth to be driven by human decisions but questioned the limitations of firm growth. In this study, however, financial growth is considered in terms of how firms record their resources and managerial services numerically. In pursuing financial growth, especially in the upstream oil and gas business, firms are often exposed to financial turbulence such as impairment losses. In chapter 5, I discuss the close relationship between the upstream oil and gas business and impairment losses. Penrose’s theory concerns firm growth. Firms can grow via internal expansion (p. 66, p. 179), which means business growth without mergers, and via external expansion (p. 65, p. 195), which means business growth via M&A. This study discusses financial growth and how it is influenced by the selection of functional currencies and impairment losses. This point is the difference between Penrose’s theory of firm growth and the notion of financial growth applied in this study.

When Penrose (1959) discussed the theory of firm growth, it was still too early to have an accounting discussion of fair value measurements on assets. Impairment accounting was discussed extensively in the 1980s and was officially implemented in the 1990s with the Statement of Financial Accounting Standards (SFAS) No. 121. Fair value is defined as “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date” (PwC 2019, p. 4–2). Financial assets and liabilities are initially measured at fair value, but gains and losses are not considered as reversals of impairment losses or impairment losses. PwC (2009) explained that financial assets at fair value do not require impairment tests (if objective evidence), while “loans and receivables,” “held-to-maturity investments,” and “available-for-sale financial assets” do require impairment tests (p. 22).

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Fair value measurements are not only a critical part of applying the acquisition method but are also important in post-acquisition accounting, including the various impairment tests required by both US Generally Accepted Accounting Principles (US GAAP) and International Financial Reporting Standards (IFRS). Under US GAAP, guidance for the impairment testing of indefinite-lived intangible assets and goodwill is provided in Accounting Standards Condition (ASC) 350, while guidance for long-lived assets is provided in ASC 360. Under IFRS, International Accounting Standards (IAS) 36 provides guidance for indefinite-lived intangible assets, goodwill, and long-lived assets (PwC 2019, p. 7-61).

Penrose (1959) may not have paid much attention to this. The managerial services that firms create depend on the quality of their resources. If they are impaired due to internal and/or external reasons, impairment losses follow. Management would need to determine how long to continue managerial services by relying on firms’ resources.

3. (b) Valuation of acquisition price: goodwill

The discounted cash flow (DCF) model is a common tool that firms undertaking M&A use to value the target company (Schweiger, 2002; Kanekyo et al., 2013; Schweiger and Very, 2015). Since M&A projects are often carried out in a competitive environment, a potential buyer may compete against other rival companies to acquire the same target company or target assets. The valuation of the target company or assets has to be high enough to win the competition once there are good reasons to justify the tender price. Some scholars have discussed the synergy values that acquisitions can create, such as cost synergies, revenue synergies, market power synergies, and intangible synergies (Schweiger and Very, 2015). However, Ficery et al. (2007) pointed out that synergy expectations are often not monetized, as they are usually described as intangible benefits, such as access to new markets, skills, or culture. As shown in Figure 2-1, Schweiger (2002) broke down acquisition amounts into “no synergies required,” “must capture some or all synergies,” and “overpaid” M&A. In this study, “overpaid” indicates impairment losses (p. 3).
Once the M&A transaction is successfully closed, a process called “purchase price allocation” (PPA) is conducted to record the transaction under US and international accounting standards for business combination. The purchase price of the target company must be allocated to the fair values of identifiable tangible and intangible assets, such as trademarks, technology, customer relationships, and order backlogs, in order to provide relevant information about the acquisition (Paugam et al., 2015, p. 363). Some scholars have also discussed PPA and goodwill. Goodwill is the residual value left after PPA, which allocates the purchase price to goodwill and identifiable intangible assets with finite lives (Zhang and Zhang, 2007).

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Figure 2-2 shows a simplified depiction of PPA. Prior to PPA, goodwill includes intangible assets. Following PPA, a value for intangible assets is identified, leaving a residual value of goodwill without intangible assets.

4. (c) M&As and impairment losses

Impairment losses have a close relationship with the shale revolution in the upstream oil and gas industry. The shale revolution significantly influenced the global energy market, and industry participants were “repeatedly surprised by the strength of US tight oil and shale gas” (BP 2016, p. 53). The shale revolution did not originate from the major oil companies, NOCs, or large international oil companies, but from an entrepreneur named George Mitchell, the founder of Mitchell Energy. George Mitchell’s innovative method of hydraulic fracturing and horizontal drilling developed by Devon Energy turned the power balance between oil suppliers and oil buyers upside down (Heck and Rogers, 2014). The dynamism of the crude oil supply changed drastically due to the additional supply of US tight oil, shale gas, together with offshore Brazilian deep-water crude oil and crude oil from Canadian oil sands (BP, 2016, p. 27). The price of crude oil, which was once over US$100 per barrel in 2014, dropped to less than US$40 per barrel in 2016. This is one of the reasons why global upstream oil and gas companies incurred impairment losses. Companies that aggressively pursued business expansion through shale oil and gas M&A were exposed to significant impairment losses. This was especially true for independent US companies.

4.1 Impairment of goodwill

As shown in Figure 2-2, goodwill is defined as “the difference between the purchase price and the aggregate fair values of net tangible assets” (Ampofo and Sellani, 2005), and goodwill impairment is considered as “the difference between the book value of goodwill and the implied fair value of goodwill” (Seetharaman et al., 2006). Beatty and Weber (2006) discussed the FASB’s adoption of SFAS 142, Goodwill and Other Intangible Assets, under US GAAP in June 2001. Prior to this adoption, goodwill was recognized and amortized over a period under 40 years. SFAS 142 requires goodwill to have two-step impairment tests (SFAS 144): the undiscounted cash flow basis and discounted cash flow basis (EY, 2016, p. 36). Chalmers et al. (2011) examined whether a goodwill impairment regime is better than amortization for determining the underlying economic value of goodwill. Godfrey and Koh (2009) found evidence suggesting that impairment write-offs after the introduction of the US goodwill impairment accounting regime (through SFAS 142) are negatively associated with firms’
underlying investment opportunities. Ketz and Schams (2003) discussed whether the new rules would discourage M&A activity. The difference between the impairment tests of US GAAP and IFRS was also discussed. IFRS does not allow two-step impairment tests for potential goodwill impairment (Jer man and Manzin, 2008; EY, 2018b, p. 25). Ramanna (2008) found evidence consistent with lobbying support for SFAS 142, which allowed an increase in firms’ discretion under the standard. Some scholars discussed the reasons for overpayment at the time of investment (Hake, 2004; Gu and Lev, 2011) while others investigated whether goodwill impairment is indicated predictively by performance parameters in the post-acquisition phase (Hayn and Hughes, 2006; Kabir and Laswad, 2014). Conversely, some scholars investigated the events after the announcement of goodwill impairment losses, such as declines in stock price (Hirschey and Richardson, 2003) and estimations of near-term future cash flow (Jarva, 2009). Others argued that there is an incentive for goodwill impairment because of management’s desire to manage earnings (Sevin and Schroeder, 2005; Verriest and Gaeremynck, 2009).

4.2 Growth through project management

M&A are not the only forces causing impairment losses. The failure of project management in upstream oil and gas companies may also cause impairment losses. Project management in the upstream oil and gas industry proceeds in three stages: (1) exploration, (2) development, and (3) production (PwC Japan, 2016). Exploration activities in upstream oil and gas fields are considered risky in terms of project management because investment is necessary before it is determined whether the exploration will succeed. Penrose (1968) pointed out that “the risk that is said to be inherent in exploration is the risk that the knowledge obtained after the expenditure of large sums of money will be of little economic value” (p. 237). The increased risk is due to the lack of information on geological structures, reservoir seals, and hydrocarbon charges (Suslick et al., 2009). Projects in the development and production stages are also exposed to business risk. EY (2014) identified 365 projects with a proposed capital investment above US$1 billion in the upstream oil and gas, LNG, pipeline, and refining sectors in 2014. Of the 365 projects, 163 were identified as upstream oil and gas projects, with an average project capital expenditure of US$6.6 billion per project. EY (2014) further pointed out that 64% of the

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16 EY (2018b) stated about long-lived assets that “The two-step approach requires that a recoverability test be performed first (the carrying amount of the asset is compared with the sum of future undiscounted cash flows using entity specific assumptions generated through use of eventual disposition). If it is determined that the asset is not recoverable, an impairment loss calculation is required” (p. 25). As for goodwill under US GAAP, EY (2018b) stated that “Before ASU 2017-04, Simplifying the Test for Goodwill Impairment, the company performs a recoverability test under the two-step approach first at the reporting unit level. After the adoption of ASU 2017-04, the company performs an impairment test under the one-step approach at the reporting unit level” (p. 28).
projects faced cost overruns, while 73% reported schedule delays. Project delay and cost overruns can be considered signs of poor project management, which may cause impairment losses. Wit (1988) explained how to determine whether a project was successfully delivered and pointed out that cost overruns and schedule delays are signs of failure. Asrilhant et al. (2004) described strategic project management as occurring in two stages: evaluation elements and control elements. Walkup and Ligon (2006) explained how “the stage-gate process allows the right decision to be made at the right time by the right people” (p. 2), taking upstream oil and gas projects from the feasibility study phase into the development phase followed by the production phase.

4.3 Impairment of long-lived assets

The question of whether companies should adopt a methodology for successful efforts or the full costs of exploration is a matter of longstanding debate in the upstream oil and gas industry (Baker, 1976; Lilien and Pastena, 1982; Chen, K. and Lee, 1995; Aboody, 1996; Alciatore et al., 2000; Bryant, 2003; Abushaiba and Eldanfou, 2014; PwC Japan, 2016). The main difference between the full cost and successful effort methods is the treatment of costs for unsuccessful activities. Costs are capitalized in the full cost method whereas they are expensed in the successful effort method (Abushaiba and Eldanfou, 2014, p. 120).

The issues around the timing of expenses incurred, such as capital expenditure for exploration, are not limited to the exploration phase. If a project fails, it results in an impairment of long-lived assets. Riedl (2004) found evidence suggesting that the reporting of write-offs for long-lived assets under SFAS 121 has decreased qualitatively since the standard was applied. Zucca and Campbell (1992) found examples of discretionary write-downs on long-lived assets from financial statements (77 write-downs across 67 firms) and indicated that no significant evidence of positive stock market reaction to the write-downs’ announcements could be found. Kosi and Valentinic (2013) argued that discretionary write-downs are caused by the tax-minimization incentives of private firms. Cotter et al. (1998) pointed out that discretionary write-downs cause corporate governance issues that influence managers’ write-down decisions. I argue that discretionary write-downs aggravate issues concerning reversals of impairment losses. EY (2018b) pointed out that impairment reversals are permitted under IFRS (with the exception of goodwill) while US GAAP prohibits such reversals. Some scholars argue that

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17 EY (2014) found 205 projects with cost data available and 242 projects with time data available out of the 365 megaprojects identified (p. 4).

18 To be clear, poor project management may not be the only cause of impairment losses for long-lived assets. Asset acquisitions that fail may also cause the impairment of long-lived assets.
reversals of impairment losses for long-lived assets could cause a “cookie jar” reserve type of earnings management (Duh et al., 2009; Abdelghany, 2005). One can use the reserve when needed to fill in financial losses just as one can eat a cookie when one is hungry. Others argue that managers may reverse impairment losses if they are incentivized by a bonus arrangement (Trottier, 2013). This phenomenon is also observed in regulatory listing requirements in China (Chen et al., 2009) and various performance parameters in Australia (Brown et al., 1992).

Duh et al. (2009) explained that the reversal of impairment losses is permitted under IFRS (IAS 36: revised in 2004) but that US GAAP prohibits such reversals (SFAS No. 121, superseded in 1995, and No. 144, issued in 2001 by FASB). FASB’s stance is that an impairment loss should result in a new basis for the impaired assets and explains that such a reversal provides managers the discretion to undertake earnings management.

4.3.1 Research questions: Impairment losses

Firm resources are regularly exposed to changes in the business environment, such as changes in crude and natural gas prices. Creating financial growth requires that management recognize the true value of the firm’s resources. If this value decreases significantly, it has to be written off as an impairment loss. This study considers that issue, along with financial growth for firms.

How can oil and gas companies manage the risk of impairment losses that arise when business circumstances change? In 2016, after the oil price crash, what were the general tendencies among the group(s) of top-tier oil and gas companies that incurred significant impairment losses? Can any company manage impairment losses? If yes, why? These questions will be explored in chapter 5.

5. (d) Choice of functional currency and corporate value in international M&A

To achieve financial growth, firm managers must rely on accounting information. When accounting becomes the language of performance measurement, some aspects of functional currencies should be considered. Some scholars have discussed activity-based costing as a tool to manage costs, as accounting provides the information managers seek (Drucker, 1995; Ness and Cucuzza, 1995). As cross-border M&A become more popular, Revsine (1984) pointed out the potential for incompatibility among financial statements through the misuse of FASB guidelines, as firms could be “ill-advised to select the functional currency in order to gain some near-term income enhancement” (p. 514).

Functional currency issues are beyond simple currency conversion, as it becomes a burden for management and impacts post-M&A integration. In 2016, Shell, whose functional currency is the US dollar, acquired British Gas (BG), whose functional currency was the British pound
(GBP). In the acquisition, Shell chose to keep the US dollar as the functional currency. This meant that BG’s operation had to be adjusted based on Shell’s functional currency. Normally, the buyer can change the target company’s functional currency. However, if another company owns a majority share in the target, the buyer cannot change the target company’s functional currency if the majority shareholder is opposed. In some cases, it also influences the discount ratio for the calculation of acquisition value. Eiteman et al. (2016) explain the method of treating all foreign risk “as a single problem, by adjusting the discount rate applicable to foreign projects relative to the rate used for domestic projects to reflect the greater foreign exchange risk, political risk, agency costs, asymmetric information, and other uncertainties perceived in foreign operation” (p. 545). Penrose (1959) did not fully discuss functional currencies among firm resources. I discuss this in chapter 4.

The major currency translation methods for financial statements are the temporal method, in which the translation gains and losses are included as part of income, and the current rate method, in which the translation gains and losses are taken directly to owner’s equity (Ruland and Doupnik, 1988). Companies with a functional currency similar to that of their parent companies generally use the temporal method. Companies that use local currency as their functional currency employ the current rate method.19

Discussions regarding functional currencies are closely related to those on currency translation for foreign subsidiaries. A foreign subsidiary’s functional currency is the currency of the primary economic environment in which the subsidiary operates and in which it generates cash flows (Eiteman et al., 2016, p. 335). In other words, all other currencies are foreign. Kikuya (2000) explained that foreign currency translation was not a big issue for practitioners in Japan until 1971 because of its fixed exchange rate system. As cross-border M&A grow, issues around functional currency are becoming more important for companies that have foreign currency exposure, particularly after the transition to a floating exchange rate system. It is also helpful in selecting a joint venture partner; approximately 71% of upstream ventures is financed through alliances or joint ventures (JVs; EY, 2015). The selection of a joint venture partner may also automatically mean the selection of a functional currency for JVs, unless one has absolute power and authority to change it. In minority stake acquisitions, it is important to recognize the consequences.

Arnold and Holder (1986) interviewed the executive managers of 22 US MNEs. Of the 18 companies that used local currencies as functional currencies, they found that only five had taken formal steps to address the six indicators mandated by the Financial Accounting Standards

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19 This study does not take into account the effect of financial growth resulting from the difference between
Boards (FASB) Statement 52: Foreign Currency Translation. These indicators are cash flow, sales price, market sales, expenses, financing, and intercompany transactions and arrangements. This survey indicates that, in practice, US multinational companies’ management teams exercised their discretionary power to select their functional currencies under FASB 52, particularly those that used local currencies as functional currencies. However, other scholars found no evidence indicating that the choice of functional currencies or other accounting choices by management were opportunistic or deceptive (Ayres, 1986; Taylor et al., 1990; Aiken and Arden, 2003).

In 1983, of the 338 multinational corporations that selected a foreign currency as their functional currency, Doupnik and Evans (1988) found that only 126 made the appropriate choice to follow the steps mandated under the framework determined by US GAAP. Further, of the 102 companies that selected the US dollars as their functional currency, 99 followed the appropriate procedures required by the accounting rules. Their study indicates that companies that choose the US dollar as their functional currency adhere to FASB rules more strictly.

Bartov and Bodnar (1995) identified a significant lagged relationship between changes in the US dollar and company value under FASB. Companies using the US dollar as their functional currency have to report exchange-rate gains or losses on their income statement. This significant lagged relationship disappears for companies using a foreign currency as their functional currency, as they report an unrealized exchange-rate adjustment in the cumulative translation adjustment. According to Bartov and Bodnar (1995), the use of a foreign currency as the functional currency enables investors to determine the true foreign currency exposure of US companies.

Mehta and Thapa (1991) studied several US multinationals and the functional currencies of their subsidiaries. They discovered that Exxon’s (ExxonMobil) subsidiaries mainly used local currencies as their functional currencies, with the exception of operations in highly inflationary economies such as Norway, Malaysia, and the Middle East. There, they used the US dollar as the functional currency. However, all of Texaco’s (Chevron) subsidiaries used the US dollar as their functional currency. Both Exxon and Texaco carried out similar operations under US GAAP through their overseas subsidiaries; however, the former chose the local currency while the latter chose the US dollar as the functional currency. Mehta and Thapa (1991) also revealed that some US multinationals had changed their functional currencies in the past. For example, Exxon (ExxonMobil) changed the functional currency of its Norway operations from the US dollar to the local currency in 1985. Other companies whose international subsidiaries changed

companies that adopt the current rate method and those that adopt the temporal method.
to local currencies include Data General, General Electric, and Caterpillar Tractor. These companies’ functional currency was originally the US dollar, but it was changed to the respective local currency in the mid-1980s.

Nobes (2006) asserted that, in the United Kingdom, a company’s functional currency would generally be the currency of the country of operation. Aoki et al. (2016) found the same trend in Japan, indicating that 54 out of 61 Japanese companies that had adopted the International Financial Reporting Standards (IFRS) used the current rate method for currency translation, signifying that their functional currency must be the local currency. Taylor et al. (1990) discussed functional currency choice and currency translation methods before the introduction of the Australian Accounting Standards, under which an agreement among firms regarding the method of translating foreign subsidiaries’ assets and liabilities has to be reached. However, no such agreement could be reached regarding the reporting method for the resulting gains or losses. Some scholars have also discussed the choice of functional currency and currency translation from the viewpoint of purchasing power parity (Ruland and Doupnik, 1998), currency risk management in US multinationals (Duangploy et al., 1997; Shin and Soenen, 1999), as well as in hyperinflated (Ziebart, 1985; Duangploy and Owings, 1997) and moderately inflated economies (Morrison and Dole, 2014).

Several studies, such as Doupnik and Evans (1988) and Mehta and Thapa (1991), indicated that management has some discretion in choosing the functional currency as long as they abide by accounting rules.

5.1 Research questions: Functional currencies

It is essential to have a currency that measures the financial growth of firms. The functional currency plays this role. The selection of a functional currency also determines what become foreign currencies for firms. All impairment losses are also measured by the functional currency and are expressed in the presentation currency in financial statements.

This study asks the following research questions: Do functional currencies differ depending on the type of oil and gas company? Do any upstream oil and gas companies use another country’s currency as their functional currency? If so, why? Do the management teams of oil and gas companies have the discretion to choose the functional currency? If they do, why do they change it? What events cause a change in the functional currency? In addressing these

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20 Ziebart (1985) defined hyperinflation as a cumulative inflation rate of 100% over a three year period. Ziebart (1985) listed 18 countries that met this criterion: Argentina, Bangladesh, Bolivia, Brazil, Chile, Costa Rica, Ghana, Iceland, Israel, Mexico, Nicaragua, Peru, Sierra Leone, Somalia, Turkey, Uruguay, Yugoslavia, and Zaire (p. 23).

21 Hypothetically, a company in Southeast Asia that chose the US dollar as their functional currency would record
questions, I argue that it is necessary to shape accounting strategies to address functional currency issues.

6. (e) The case of Japan: A problem of undersized companies

Financial growth is influenced by the selection of a functional currency and impairment losses. Turbulence is part of any financial growth. Here, I discuss the growth path that Japanese upstream oil and gas companies take. Two groups of scholars advocate two different directions. Which strategy is better is debatable. This topic may not be directly related to this study’s focus on financial growth, but financial growth requires a steady growth path.

Why do some oil and gas companies outperform financially compared to others? Studies point to several reasons why the Japanese petroleum industry is vulnerable. First, there are many undersized companies in the industry. This is considered a “one-project, one-company structure,” in which a company is established for a specific project and does not participate in any others (Abo et al., 2008; Kikkawa, 2012; Thorarinsson, 2018). The presence of too many undersized companies leads to a loss of bargaining power, which could be an underlying cause of the “Asian premium” (Kikkawa, 2003). This premium causes oil and gas prices to be higher in the Asian market than in US and European markets (Ogawa, 2002; Doshi and D'Souza, 2010; Zhang et al., 2018). Second, Abo et al. (2008) and Kikkawa (2012) found that the separation of upstream and downstream processes is at the root of the Japanese petroleum industry’s vulnerability. Upstream businesses are vulnerable to low oil prices because they have to sell crude oil, while the downstream business is vulnerable to high prices when their feedstock for refined oil products becomes costly. Firms that integrate upstream and downstream businesses are naturally hedged regardless of the oil and gas price environment. (I will discuss this point in chapter 5.) Third, Pollio and Uchida (1999) and Koike (2006) pointed out that a shortage of qualified geoscience engineers is another hurdle to creating internationally competitive oil and gas companies. Fujita (2015) mentioned Japan’s high exchange rate and its focus on energy efficiency as additional causes.

Regarding business strategies for addressing this, one major point of academic discussion is the acquisition of shares and the timing of acquisitions (Abo et al., 2008). Abo et al. (2008) recommend that Japanese oil and gas companies acquire interests in assets at a later stage of the project life cycle and enhance the recovery ratio of hydrocarbons by using their competitive advantage in different technologies, which has always been a strength of Japanese manufacturers.

their accounting books in US dollars even if that is not the local currency.
Hayashi (2006) summarized the speeches of Peter Jackson and David Hobbs, two scholars from Cambridge Energy Research Associates, Inc. (CERA), who recommended that Japanese oil and gas companies acquire more shares at the initial stage of a new upstream project, rather than acquiring fewer shares initially and increasing their shareholding later. Jackson and Hobbs (2006) gave their recommendation based on an analysis of top performers in other countries in terms of (1) portfolio focus and depth, (2) capital discipline, (3) acquisition strategies, and (4) long-term vision. In addition to their proposals on acquisition size and timing, they also recommended that Japanese oil and gas companies assume operatorship and acquire strategic alliances with large independent oil and gas companies.

6.1 Research questions: Japanese upstream oil and gas companies

Petroleum Intelligence Weekly (PIW) is an energy-related information service that ranks the top 50 oil and gas companies. The PIW top 50 ranking is published by Energy Intelligence, a publishing company, and is a common tool for measuring energy companies’ performance used by scholars and practitioners in the oil and gas industry. PIW generates its own measurements and ranks oil and gas companies by oil and gas production and reserves, sales of refined products, and refining capacity (Energy Intelligence, 2013). Some scholars have used this ranking in their studies (Victor, 2007; Pirog, 2007; Wolf, 2009; Kikkawa, 2010, 2012; Mitchell et al., 2012). Those scholars use the PIW ranking as a firm performance indicator. The five years between 2012 and 2016 were chosen for two reasons: (1) data accessibility (PIW does not publicly disclose its rankings every year) and (2) the 2014 decline in oil prices from over US$100 per barrel to less than US$50. The business environment changed drastically after the oil price collapse in 2014.

I found no Japanese companies among the top 20 or 30 oil and gas companies in the PIW top 50 between 2012 and 2016. Inpex, a Japanese upstream oil and gas company, was ranked 50th in 2015 and 43rd in 2016 (PIW 2015, 2016). Japanese oil and gas companies such as refinery companies have a strong influence on the demand side of oil and gas. Japan was the world’s 4th-largest oil consumer in 2015 (BP 2016) and the largest importer of LNG (International Gas Union 2019, p. 17). It also depends heavily on oil and gas imports from the Middle East (Motomura, 2014).

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Japanese and US scholars advocate different strategies for Japanese upstream oil and gas companies. In 2006, Jackson and Hobbs (2006) of CERA recommended that Japanese oil and gas companies acquire exploration projects with as large a participation ratio as possible directly from export-oriented NOCs or from underperforming companies. By contrast, Abo et al. (2008) contested CERA’s recommendations and argued that CERA’s strategies were poorly suited to the Japanese context. Abo et al. (2008) recommended acquiring upstream oil and gas projects in the later stages of production. CERA recommended obtaining a larger share in the initial stages of upstream oil and gas projects (which are highly speculative), while Japanese scholars (Abo et al., 2008) recommended acquiring a larger share at a later stage and enhanced recovery (which may be a safer, steadier growth path). These lead to the following research questions:

Research question (1): What can the Japanese government do to create a homegrown, internationally competitive upstream oil and gas company?
Research question (2): Which of the two strategies should Japanese oil and gas upstream companies pursue, and why?

Unlike the questions on functional currencies and impairment losses, these research questions are rooted in the core value of firm growth that Penrose (1959) discussed. However, financial firm growth is impossible without good strategies for firm growth; therefore, these are relevant research questions given the concept of financial growth used in this study.

To answer these questions, I analyzed the financial statements of the top-ranked international energy companies according to the PIW top 50 between 2012 and 2016 (PIW 2013, 2014, 2016). I also conducted four interviews with industry experts—two Japanese, one American, and one Russian.
Both “functional currency” and “impairment losses” are accounting terminologies; however, they should be built into the M&A process. Figure 2-3 shows the analytical framework used in this study. M&A, including asset acquisitions and share acquisitions, are external actions designed to expand the business. Project management is another force used to expand the business, albeit an internal one. Goodwill is generated by M&A but not by project management. Goodwill is recognized only in a business combination (EY 2018b, p. 23). Figure 2-4 presents the process flow of the corporate approvals required to execute M&A transactions (Sharifi et al., 2005, p. 13). The two red boxes detail where considerations of functional currencies and impairment losses come in. The two left-hand columns show the process to establish a target company or target assets for an M&A deal. The two right-hand columns show the process to obtain corporate approval for completing M&A transactions. As Figure 2-4 shows, functional currencies and impairment losses are integral M&A components for selecting the target company or assets and post-merger integration.
7. Categorization of top performers

Table 2-2 depicts the top 50 companies as ranked by PIW and categorized by country of domicile. I divided the 50 companies into four groups: major oil companies, national oil companies (NOCs; export-oriented, government-owned), national flag oil companies (NFOCs; import-oriented companies representing a nation), and independent oil companies. Here, ExxonMobil, Shell, BP, and Chevron are the major oil companies. NOCs are companies in which the majority of shares are held by their respective national governments and the surplus energy balance is exported. NFOCs are energy companies that are from net energy-import countries and are under government influence to facilitate the nation’s energy policy. NFOCs are considered the country’s representative in the global energy market (Kikkawa, 2015). France’s Total S.A. (Total) is considered a major oil company; however, it is intentionally categorized as a national flag oil company because, until the early 1990s, the French

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23 The full-scope due diligence report would usually include a geo-scientific subsurface reserve report; risk analysis of surface facilities; business, legal, accounting, tax, finance, structure, and economic valuations of the target company and assets; and an environmental risk review.
government owned more than 30% of its shares. This study applies the definition of NFOCs. A separate category was created for the remainder of the companies: independent oil and gas companies.

The PIW ranking between 2012 and 2016 is stable, and the classification can be kept when organized across the four categories. The classification shows where Japan’s national flag oil company should be placed (chapter 3), how multinational oil companies would choose their functional currencies (chapter 4), as well as impairment losses (chapter 5) by category. It is important to clarify how different these four categories are for the studies in the following chapters.
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<tr>
<td>ONGC</td>
<td>India</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SPC (Syria)</td>
<td>Syria</td>
</tr>
<tr>
<td>EGPC</td>
<td>Egypt</td>
<td>44</td>
<td>48</td>
<td>50</td>
<td></td>
<td></td>
<td>OMV</td>
<td>Austria</td>
</tr>
<tr>
<td>Pertamina</td>
<td>Indonesia</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hess</td>
<td>USA</td>
</tr>
<tr>
<td>Statoil</td>
<td>Norway</td>
<td>(54)</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td>PTT</td>
<td>Thailand</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48</td>
<td>Bashneft</td>
<td>Russia</td>
</tr>
</tbody>
</table>

Note: Major (green), national flag (red), national oil (orange) and independent (blue).

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24 PIW publishes only the top 50, but it also includes companies below that rank that place within the top 50 the following year.

25 Chevron announced an agreement to acquire Anadarko on April 12, 2019. However, Occidental delivered a revised proposal to acquire Anadarko on May 5, 2019. Occidental completed the acquisition of Anadarko on August 8, 2019, in a transaction valued at $55 billion, including the assumption of Anadarko’s debt.

26 TNK-BP was acquired by Rosneft in 2013.
7.1 Major oil companies

Major oil company rankings are almost stable, with the exception of Chevron’s gradually declining ranking. Three of the four companies have been consistently ranked in the top 10. France’s Total is considered a major oil company (PwC Japan, 2016), but Kikkawa (2012) excluded it because he considered it a national flag oil company. I follow those criteria. All four companies originated from companies belonging to the “Seven Sisters” companies that once dominated the oil and gas industry.27 These include Exxon, Mobil, and Chevron—the successor entities of the Standard Oil Trust, which was dissolved after a US Supreme Court decision in 1911. The remaining four are Gulf Oil, Texaco, British Petroleum, and Shell (Yergin, 1990). As shown in Figure 2-5, they transformed over the years into the current organizations. Figure 2-5 shows that all Seven Sisters experienced M&A. Until the 1980s, cross-border M&A were not very active, and M&A were conducted in the same country. Table 2-3 shows their rankings and other information. All other US companies are considered non-major companies in this study.

Major oil companies have been a dominant research area. The research on major oil companies shows the pain they have gone through to protect their positions and grow. ExxonMobil struggled to negotiate with oil-producing governments such as Indonesia, Equatorial Guinea, Chad, Qatar, Saudi Arabia, Iraq, and Russia (Cole, 2013). BP struggled with oil spills from the Deepwater Horizon disaster and competition with other rival companies (Harrell, 2016). Chevron was challenged by organizational management issues (Miranda-Stone and Leary, 2007). Shell was challenged by and suffered from environmental problems (Brenneman et al., 1998). Stevens (2016) raised concerns about the future of major oil companies as they faced the choice of managing a gentle decline by downsizing or risking a rapid collapse by trying to carry on business as usual (p. 2).

### Table 2-3. Ranking of major oil companies based on 2016 results

<table>
<thead>
<tr>
<th>2016</th>
<th>Company</th>
<th>Country</th>
<th>% Share of govt ownership</th>
<th>Ranking 2012-2016</th>
<th>Academic journals and books</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>ExxonMobil</td>
<td>US</td>
<td>-</td>
<td>3-3-4-4-3</td>
<td>Cole, 2013</td>
</tr>
<tr>
<td>6</td>
<td>BP</td>
<td>UK</td>
<td>-</td>
<td>6-6-7-7-6</td>
<td>Harrell, 2016</td>
</tr>
<tr>
<td>8</td>
<td>Shell</td>
<td>The Netherlands</td>
<td>-</td>
<td>7-7-6-6-8</td>
<td>Brenneman et al., 1998; Frynas, 2010</td>
</tr>
</tbody>
</table>

Source: Table 2-2 (PIW 2013, 2014, 2016).

27 The changing competitive landscape of the global upstream petroleum industry, *Journal of World Energy Law and*
7.2 National oil companies

The study of NOCs has been another dominant research area. NOCs are firms that are governed by the majority shareholders, have a surplus energy balance,\(^{28}\) and are exporters (Kikkawa, 2012). The examples mentioned by Kikkawa (2012) are Saudi Aramco (Saudi Arabia) and PDV (Venezuela).

---

As shown in Table 2-4, Rosneft and YPF have outperformed the other NOCs, increasing their rankings; while Pemex, Socar (Azerbaijan), and SPC (Syria) have either dropped or disappeared from the rankings. Five companies (Saudi Aramco, NIOC, PDV, Rosneft, and Gazprom) were ranked in the top 10 in 2016, while only three attained this ranking in 2012. This indicates that a change has occurred in the power relationship of the world economy, such as the growth of NOCs in oil-producing countries, rather than in the composition of control over major oil companies. Among the 25 companies listed below, six (Rosneft, Gazprom, Statoil, PDO, Ecopetrol, and YPF) are not wholly owned by their governments but are instead majority owned. The remaining companies are 100% owned by their governments. Of the six companies that are majority owned, all have had their rankings increase, with the exception of Statoil, which has seen its rankings decrease.

NOCs have achieved economic development by utilizing oil and gas resources in their countries. Stevens (2016) pointed out that private international oil companies, such as major oil

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Table 2-4. Ranking of national oil companies based on 2016 results

<table>
<thead>
<tr>
<th>2016</th>
<th>Company</th>
<th>Country</th>
<th>% Share of govt ownership</th>
<th>Ranking 2012–2016</th>
<th>Academic journals and books</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Aramco</td>
<td>Saudi Arabia</td>
<td>100</td>
<td>1-1-1-1-1</td>
<td>Seznece, 2016</td>
</tr>
<tr>
<td>2</td>
<td>NIOC</td>
<td>Iran</td>
<td>100</td>
<td>2-2-2-2-2</td>
<td>Brumberg and Ahram, 2007</td>
</tr>
<tr>
<td>3</td>
<td>PDV</td>
<td>Venezuela</td>
<td>100</td>
<td>5-5-5-5-5</td>
<td>Witten, 2008; Philip, 1999</td>
</tr>
<tr>
<td>4</td>
<td>Rosneft</td>
<td>Russia</td>
<td>69.5</td>
<td>19-16-8-8-6</td>
<td>Pousenkova, 2007</td>
</tr>
<tr>
<td>5</td>
<td>Gazprom</td>
<td>Russia</td>
<td>50.003</td>
<td>10-8-8-9-9</td>
<td>Yang et al., 2011; Lunden et al., 2013</td>
</tr>
<tr>
<td>6</td>
<td>Sonatrach</td>
<td>Algeria</td>
<td>100</td>
<td>14-14-15-13-12</td>
<td>Rihane and Oudaifia, 2016</td>
</tr>
<tr>
<td>7</td>
<td>KPC</td>
<td>Kuwait</td>
<td>100</td>
<td>12-11-13-14-14</td>
<td>Stevens, 2008</td>
</tr>
<tr>
<td>8</td>
<td>Adnoc</td>
<td>UAE</td>
<td>100</td>
<td>18-18-17-17-15</td>
<td>Turshen, 2002</td>
</tr>
<tr>
<td>9</td>
<td>QP</td>
<td>Qatar</td>
<td>100</td>
<td>17-17-18-18-17</td>
<td>Da, 2011; Dargin, 2007</td>
</tr>
<tr>
<td>10</td>
<td>Pemex</td>
<td>Mexico</td>
<td>100</td>
<td>11-11-13-15-18</td>
<td>Ramirez-Cendero and Paz, 2017</td>
</tr>
<tr>
<td>11</td>
<td>Petronas</td>
<td>Malaysia</td>
<td>100</td>
<td>20-20-20-20-19</td>
<td>Gale, 1981</td>
</tr>
<tr>
<td>12</td>
<td>INOC</td>
<td>Iraq</td>
<td>100</td>
<td>22-21-21-21-21</td>
<td>Jafec, 2006</td>
</tr>
<tr>
<td>13</td>
<td>NNPC</td>
<td>Nigeria</td>
<td>100</td>
<td>25-23-23-22-21</td>
<td>Idemudia, 2009</td>
</tr>
<tr>
<td>14</td>
<td>EGPC</td>
<td>Egypt</td>
<td>100</td>
<td>24-24-24-24-26</td>
<td>Mabro, 2006</td>
</tr>
<tr>
<td>17</td>
<td>Kazmunaygas</td>
<td>Kazakhstan</td>
<td>100</td>
<td>34-33-32-30-32</td>
<td>Serikuly and Sabroyvna, 2013</td>
</tr>
<tr>
<td>18</td>
<td>Libya NOC</td>
<td>Libya</td>
<td>100</td>
<td>32-30-30-31-33</td>
<td>Analoui et al., 2015</td>
</tr>
<tr>
<td>19</td>
<td>PDO</td>
<td>Oman</td>
<td>60</td>
<td>37-34-33-33-34</td>
<td>Khan and Arunkumar, 2018</td>
</tr>
<tr>
<td>20</td>
<td>Ecopetrol</td>
<td>Colombia</td>
<td>88.49</td>
<td>39-42-35-36-36</td>
<td>López et al., 2011</td>
</tr>
<tr>
<td>22</td>
<td>YPF29</td>
<td>Argentina</td>
<td>51</td>
<td>More than +9</td>
<td>Grosse, 2003</td>
</tr>
</tbody>
</table>

Source: Table 2-2 (PIW 2013, 2014, 2016).

29 The Argentinian government took over YPF from Respol in 2012. According to the World Bank, Argentina had been an energy exporter until 2010 and thereafter turned into an importer. The country has significant shale resources, so YPF is considered a NOC in this study, although their current position is that of an energy importer.
companies, dominated the global oil industry outside North America and communist countries for the first 70 years of the 20th century. Stevens (2016) pointed out that, after 1970, this dominance was gradually replaced by the growing role of national oil companies established by the major exporting countries, which took control of their own oil and gas reserves (p. 4). NOCs’ business is in line with national policies. NOCs have been trying to promote domestic employment and to grow into international oil and gas companies. Qatar’s remarkable economic growth via Qatar Petroleum (Da, 2011), the development of Iran’s NIOC from being a state-owned enterprise to an international company (Brumberg and Ahram, 2007), and Saudi Aramco’s plan to list shares (Seznec, 2016) are all examples of such companies. NOCs can be said to have taken over the business from the Seven Sisters, but this was not easy. Their problems included the Iraqi invasion of Kuwait in 1990 (Stevens, 2008), conflicts and legal disputes with a major oil company in Venezuela (Witten, 2008), severe economic reforms in the early 1990s in Russia (Yang et al., 2011), and the rapid depletion of oil and gas reserves in Egypt (Mabro, 2006). Some NOCs also faced the need to develop human training programs in Oman (Khan and Arunkumar, 2018) and to build corporate–community relations in the context of corporate social responsibility in Nigeria (Idemudia, 2009).

7.3 National flag oil companies (NFOCs)

In addition to the major oil companies and NOCs, national oil importers have had an impact on countries’ crude oil imports. NFOCs are energy companies from countries that are net energy importers and are under government influence to facilitate the nation’s energy policy. They are considered the country’s representative in the global energy market (Kikkawa, 2015). Some purely private enterprises (Total, Repsol, and BG) are also included this category if their domestic energy resources do not satisfy domestic demand. They are recognized as the country’s representative export-oriented NOC in diplomacy over natural resources (Kikkawa 2010). They aim to acquire strategic oil and gas upstream interests in overseas petroleum and natural gas. Total is categorized as a national flag oil company because it can be considered France’s representative, as the French government owned more than 30% of the shares until the early 1990s. The NFOCs mentioned by Kikkawa (2012) are Total-France and Eni-Italy.

Inpex (Japan) and BG (UK) outperform others in this category, while OMV (Austria) disappeared from the PIW rankings between 2012 and 2016. Some scholars have studied Chinese government-owned oil companies, including CNPC, Sinopec, and CNOOC, that have increased their footprints through investments (Jiang and Sinton, 2011). This study categorizes them as NFOCs as well. This study identified 10 NFOCs among the PIW top 50 in 2016, as shown in Table 2-5, which also presents country names, share of government ownership, and research sources.
Table 2-5. Ranking of national flag oil companies based on 2016 results

<table>
<thead>
<tr>
<th>2016</th>
<th>Company</th>
<th>Country</th>
<th>% Share of govt ownership</th>
<th>Ranking 2012-2016</th>
<th>Academic journals and books</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CNPC</td>
<td>China</td>
<td>100</td>
<td>4-4-3-3-3</td>
<td>Jiang and Sinton, 2011</td>
</tr>
<tr>
<td>10</td>
<td>Total</td>
<td>France</td>
<td>n.a.</td>
<td>8-10-11-10-10</td>
<td>Cho, 2009</td>
</tr>
<tr>
<td>12</td>
<td>Petrobras</td>
<td>Brazil</td>
<td>28.7</td>
<td>15-13-12-12-12</td>
<td>Ramirez-Cendra and Paz, 2017</td>
</tr>
<tr>
<td>23</td>
<td>Eni</td>
<td>Italy</td>
<td>30.1</td>
<td>22-21-22-23-23</td>
<td>Pozzi, 2010</td>
</tr>
<tr>
<td>25</td>
<td>ONGC</td>
<td>India</td>
<td>68.94</td>
<td>29-28-28-26-25</td>
<td>Maji and Sur, 2015</td>
</tr>
<tr>
<td>30</td>
<td>Repsol</td>
<td>Spain</td>
<td>n.a.</td>
<td>31-36-34-37-30</td>
<td>Vandenbergh, 2011</td>
</tr>
<tr>
<td>30</td>
<td>CNOOC</td>
<td>China</td>
<td>100</td>
<td>33-32-31-32-30</td>
<td>Jiang and Sinton, 2011</td>
</tr>
<tr>
<td>43</td>
<td>Inpex</td>
<td>Japan</td>
<td>18.94</td>
<td>More than +7</td>
<td>Sugaya et al., 2002</td>
</tr>
</tbody>
</table>


NFOCs are viewed as representatives of their country by export-oriented companies due to the diplomacy over natural resources (Kikkawa, 2010). National flag oil companies aim to acquire strategic interests in overseas crude oil and natural gas. The NFOC is a national policy company in non-oil producing countries that is engaged in upstream oil and gas projects. The companies Kikkawa (2010) categorized as NFOCs are Inpex in Japan (43<sup>rd</sup>), Japec in Japan (unranked), CNPC in China (3<sup>rd</sup>), Total in France (10<sup>th</sup>), Sinopec (20<sup>th</sup>), Eni (23<sup>rd</sup>) and Repsol (30<sup>th</sup>), as Table 2-5 shows.

Some of the issues NOFCs faced were similar to those faced by major oil companies and national oil companies. Total was challenged by environmental issues (Cho, 2009). Inpex faced declining reserves in Indonesia and the contract expiration of a major producing block in Indonesia (Sugaya et al., 2002). Jiang and Sinton (2011) stressed that “Misconceptions are widespread about the relationship between the Chinese government and the NOCs [meaning NFOCs in this study].” Jiang and Sinton (2011) pointed out that Chinese NOCs (meaning NFOCs in this study) are owned (mainly) but the state but are not run by the state (p. 25). While NOCs develop domestic reserves of crude oil and natural gas, NFOCs must acquire foreign reserves. Because NFOCs and NOCs play different roles, their relationships with the government may differ.

When Penrose (1968) chose the upstream oil and gas industry for her research, most of the dominant companies in the industry were major oil companies, and the growth of NOCs and national flag oil companies was slow. The advantage of this study is that it occurs after the growth of NOCs and NFOCs has taken place.

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<sup>30</sup> Shell finalized the acquisition of BG in 2016.
7.4 Independent oil companies

The remaining companies do not belong to any of the three categories discussed above and thus fall into the independent oil company category. These companies are free from government control and have never been ranked in the top 10 by PIW in this category between 2012 and 2016. As Table 2-6 shows, CNR’s and Reliance’s rankings increased while those of ConocoPhillips, Suncor, and Occidental decreased between 2012 and 2016.

Table 2-6. Ranking of independent oil companies based on 2016 results

<table>
<thead>
<tr>
<th>2016</th>
<th>Company</th>
<th>Country</th>
<th>% Share of govt ownership</th>
<th>Ranking 2012–2016</th>
<th>Academic journals and books</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Lukoil</td>
<td>Russia</td>
<td>-</td>
<td>16-15-16-16-16</td>
<td>Firlej and Rarick, 2008</td>
</tr>
<tr>
<td>29</td>
<td>ConocoPhillips</td>
<td>US</td>
<td>-</td>
<td>12-31-28-29-29</td>
<td>Kitov, 2009</td>
</tr>
<tr>
<td>35</td>
<td>Novatek</td>
<td>Russia</td>
<td>-</td>
<td>38-37-37-34-35</td>
<td>Lunden et al., 2013</td>
</tr>
<tr>
<td>38</td>
<td>CNR</td>
<td>Canada</td>
<td>-</td>
<td>More than +12</td>
<td>n.a.</td>
</tr>
<tr>
<td>44</td>
<td>Reliance</td>
<td>India</td>
<td>-</td>
<td>50-(n.a.)-(n.a.)-(n.a.)-44</td>
<td>Dhingra and Aggarwal, 2014</td>
</tr>
<tr>
<td>45</td>
<td>Chesapeake</td>
<td>US</td>
<td>-</td>
<td>More than +5</td>
<td>Lane and Moriaity, 2016</td>
</tr>
<tr>
<td>46</td>
<td>EOG</td>
<td>US</td>
<td>-</td>
<td>More than +4</td>
<td>n.a.</td>
</tr>
<tr>
<td>47</td>
<td>Suncor</td>
<td>Canada</td>
<td>-</td>
<td>40-45-47-48-47</td>
<td>n.a.</td>
</tr>
<tr>
<td>47</td>
<td>BHP Billiton</td>
<td>Australia</td>
<td>-</td>
<td>48-46-45-43-47</td>
<td>Hanson and Stuart, 2001</td>
</tr>
<tr>
<td>50</td>
<td>Tatneft</td>
<td>Russia</td>
<td>-</td>
<td>More than +1</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Source: Table 2-2 (PIW 2013, 2014, 2016).

Among the independent oil companies shown in Table 2-6, there are six US companies, four Russian companies, two Canadian companies, and one company each from India and Australia. Heck and Rogers (2014) explained that the shale revolution in the US was driven by George Mitchell of Mitchell Energy and Devon Energy, which acquired Mitchell Energy in 2002. Together with Devon, Chesapeake played an important role by employing a new horizontal drilling technique to explore for, and extract, natural gas (Lane and Moriaity, 2016). The fact that the companies that caused the US shale revolution were not major oil companies, but independent oil companies, seems to show the innovation power of the latter. BHP Billiton is not considered an oil and gas company, as it is a major mining company. Like other companies, BHP Billiton was challenged by environmental issues in their mining business in Papua New Guinea (Hanson and Stuart, 2001). Russia’s Lukoil partnered with US energy company ConocoPhillips (Kitov, 2009). Independent oil companies with little or no government influence may tend to make business decisions to increase shareholders’ value and pursue profits within their discretion, in contrast to NOCs and NFOCs.

It is important to use the four categories above, as this study discusses Japan’s NFOC, Inpex
Corporation. The categorization helps to differentiate it from major oil companies, NOCs, and independent oil companies. The categorization also helps to visualize general tendencies in the selection of functional currencies. Figure 2-3 shows how the key factors in this study are interrelated. Investments from an internal growth cycle such as project management and from an external growth cycle such as M&A are necessary for creating financial growth among upstream oil and gas companies. Two acquisition types are possible in M&A transactions: the acquisition of companies and that of assets. Penrose (1959) predicted that the latter would be more popular. Both types of acquisitions are closely related to impairment losses. Project management investments can also lead to impairment losses if projects are managed poorly; however, goodwill is generated through M&A. The selection of the functional currency determines the currency unit used to measure firm resources; it also determines the firm’s foreign currency exposure.
Chapter 3. Growth path of Japanese companies

1. Introduction

Japanese scholars and practitioners have debated why Japan has been unable to develop a globally competitive upstream oil and gas company. Japan was the 4th largest oil importer in 2016 (IEA, 2019). It is important for the economy to secure access to oil and natural gas. Thus, developing an internationally competitive upstream oil and gas company is vital for Japan.

Japan has limited natural reserves of crude oil and natural gas. Therefore, it is important for Japan to use crude oil and natural gas efficiently (Vorobeva and Kolesnikov, 2016). Moreover, the Great East Japan Earthquake of March 11, 2011, and the resultant accident at the Fukushima nuclear power plant had a lasting impact on Japanese energy use and security. This disaster occurred when Naoto Kan, of the Democratic Party of Japan (DPJ), was prime minister. Prior to the earthquake, the DPJ was in favor of increasing the nuclear power supply to reduce greenhouse gas emissions (Valentine et al., 2011). After the Fukushima disaster, Japan’s energy policy was reconstructed, and the role of nuclear power in Japan was questioned (Duffield and Woodall, 2011; Joskow and Parsons, 2012; Vivoda, 2012). The notion of diversifying the crude oil and natural gas supply had been discussed before (Lesbirel, 2004; Motomura, 2014). The plan was to increase future imports of crude oil and natural gas from Russia relative to imports from the Middle East, Japan’s current main supply source.

Renewable energy sources have received a significant amount of attention (Moe, 2012; Huenteler et al., 2012) because hydrocarbons such as crude oil and natural gas cause greenhouse gas emissions (Duffield and Woodall, 2011). Japan faces the challenge of having to decrease emissions while also having to address its dependence on nuclear power (McLellan et al., 2013; Hong et al., 2013; Hayashi and Hughes, 2013a, 2013b; Pereira et al., 2014). Japan’s 2016 self-sufficiency rate was 8.5%, compared to 20.2% in 2010 (Ministry of Economy, Trade and Industry, 2017). According to the government, Japan could develop LNG projects overseas (Lam, 2000; Hegaret et al., 2004; Kumar et al., 2011), but that would require access to natural gas from upstream resources. Tanaka (2013) warns that Japan is at the “crossroads” of a major energy policy change. It is essential for Japan to have a mechanism for securing oil and gas. Why is Japan unable to develop a globally competitive upstream oil and gas company?

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31 The core of chapter 3 and the relevant conclusions in chapter 6 refer to Matsubara (2019).
32 The Japanese government is investigating whether methane hydrate, embedded in nearby seas, can be recovered economically. A government agency, JOGMEC, has facilitated this project since 2000.
2. Previous Research

2.1 Players in the market

Abo et al. (2008) identified three kinds of upstream oil and gas companies in Japan: (a) government-owned, (b) private petroleum, and (c) general trading firm-led. Thorarinsson (2018) pointed out that private petroleum companies’ upstream entities, such as JXTG, Cosmo Oil, Showa Shell, and Idemitsu, are driven by their downstream business, such as refineries (p. 20). With the exception of government-owned companies, which are categorized as NFOCs, all players in Japan are independent companies.

2.1.1 Government-owned upstream oil and gas companies

Two companies were formerly wholly owned by the Japanese government: Inpex Corporation (Inpex) and Japan Petroleum Exploration Co., Ltd. (Japex). Although they are now majority privatized, they are still partially government-owned upstream oil and gas entities. Japan Oil, Gas and Metals National Corporation (JOGMEC), which is also owned by the government, falls into the first category. JOGMEC’s role is different from that of Inpex and Japex. The latter two companies support private companies financially in research and development activities for new technology and oil stockpiling (Koike, 2008). Thorarinsson (2018) pointed out that JOGMEC’s main role in the oil area was to provide financial support for oil development, research and development, and oil stockpiling (p. 17). JOGMEC was not created as a profit-oriented company but as an incorporated administrative agency that did not enjoy the privilege of government guarantees for fundraising (Koike et al., 2008). The restrictions placed on JOGMEC have historical bases. The Japan National Oil Corporation (JNOC), the former government-owned upstream oil and gas company, was established to secure oil and gas supplies for Japan (Eguchi, 1980). However, JNOC was unable to deliver positive results after spending considerable time and taxpayers’ money (Koike, 2008). Hence, under the reforms initiated by the then Prime Minister, Junichiro Koizumi, JOGMEC took over JNOC’s role in 2004 (Koike et al., 2008). Figure 3-1 shows how Japanese government-owned upstream oil and gas companies have evolved through repeated M&A. Table 3-1 shows the daily production volume for government-owned upstream oil and gas companies.
2.1.2 Private companies: Petroleum company- (refinery-) led groups

Thorarinsson (2018) pointed out that some of the private Japanese upstream oil and gas companies are driven by downstream business, such as refineries. These refinery-led groups evolved as shown in Table 3-2 and Figure 3-2, and some, such as JXTG, Idemitsu, and Cosmo, entered the upstream oil and gas industry by leveraging their experience with refineries. Downstream oil and gas companies are overcoming their “too little for too many” issues through M&A as a result of the government’s initiative (Kikkawa, 2015). The same cannot be said for upstream companies.

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**Table 3-1. Daily upstream oil and gas production for government-owned upstream oil and gas companies**

<table>
<thead>
<tr>
<th></th>
<th>Inpex</th>
<th>Japex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (1,000 BOED)</td>
<td>450</td>
<td>61</td>
</tr>
<tr>
<td>Government share (%)</td>
<td>18.94%</td>
<td>34%</td>
</tr>
</tbody>
</table>

**Source:** Annual reports and company webpages.

Inpex: Inpex (2018)


---

**Note:**


34 Kikkawa (2010) named Sakhalin Oil Development Cooperation Co., Ltd. as a Japanese government-owned company. Its production number is not available.

35 BOED stands for “Barrel of Oil Equivalent per day.” Natural gas is measured in cubic feet. BOED combines crude oil and natural gas, using the conversion rate of one barrel of oil to 6,000 cubic feet.
Table 3-2. Daily upstream oil and gas production for the three largest refineries in Japan

<table>
<thead>
<tr>
<th>Production (1,000 BOED)</th>
<th>Idemitsu</th>
<th>Cosmo Oil</th>
<th>JXTG Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>37</td>
<td>53</td>
<td>130</td>
</tr>
<tr>
<td>Government share (%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


Figure 3-2. Evolution of refinery companies in Japan

The total aggregate refining capacity of the 23 Japanese refineries was approximately 3.52 million barrels per day as of June 2018 (Petroleum Association of Japan, 2018). Among PIW’s top

---

50 companies in 2013, three had a refining capacity greater than 4 million barrels per day. Although the data points for 2013 and 2018 are different, placing all 23 refineries under one company would theoretically create one of the world’s top refining companies. Kikkawa (2012) pointed out two issues with Japan’s oil and gas industry: (1) a split between the upstream (development and production) and downstream (refining and distribution) sectors and (2) a surplus of undersized upstream companies.

### 2.1.3 Private upstream oil and gas companies: General trading firms

Abo et al. (2008) identified as a unique feature of the Japanese upstream oil and gas industry the presence of ex-zaibatsu, bank-led industrial conglomerates; these are Mitsubishi Corporation, Mitsui & Co, Marubeni, Itochu, Sumitomo Corporation, and Sojitz. The ex-zaibatsu group developed the upstream oil and gas business from the standpoint of a trading business. Pollio and Uchida (1999) categorized the ex-zaibatsu such as Mitsubishi, Mitsui, Sumitomo, and Fuji/Fuyo as “national project companies.” Thorarinson (2018) categorized them as “trading companies”. The three groups that comprise the major players in Japan’s upstream oil and gas companies are governmental owned, privately held, and trading companies. Table 3-3 shows the daily upstream oil and gas production of the six big general trading firms.

<table>
<thead>
<tr>
<th>Production (1,000 BOED)</th>
<th>Mitsubishi</th>
<th>Mitsui</th>
<th>Marubeni</th>
<th>Itochu</th>
<th>Sojitz</th>
<th>Sumitomo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government share (%)</td>
<td>244</td>
<td>244</td>
<td>34</td>
<td>32</td>
<td>13</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Annual reports and company webpages.  
Mitsubishi Corporation: Mitsubishi Corporation (2018)  
Marubeni Corporation: Marubeni Corporation (2019)  
Itochu Corporation: Itochu Corporation (2019)  
Sojitz Corporation: Sojitz Corporation (2018)  
Sumitomo Corporation: Sumitomo Corporation (2018)

### 3. Discussion and analysis for Japanese upstream oil and gas companies

#### 3.1 Research question (1) for Japanese oil and gas companies: Issues of undersized firms

The first research question is “What can the Japanese government do to create a homegrown, internationally competitive upstream oil and gas company?” Studies suggest that the “too little for too many” upstream oil and gas companies may lack bargaining power, leading to the “Asian

---

37 ExxonMobil, Sinopec, and CNPC.  
38 Sojitz stopped disclosing information on oil and gas production in the 3rd quarter of 2018.  
39 Horaguchi (1992) pointed out that MNCs decide to stay in or withdraw from foreign upstream projects based on the project economy. The bargaining power of MNCs may be useful for negotiating with governments in resource-producing countries, which may cause confrontation between MNCs and governments. Horaguchi (1992) clarifies that it is the project economy that decides whether MNCs stay or withdraw from upstream projects rather than the depletion of natural resources (p. 145).
premium” issue (Kikkawa, 2003). Given the “too little for too many” problem, mergers in the Japanese oil and gas industry should help mitigate the problem of undersized companies. In 2018, the total production of Inpex and Japex combined was less than that of any other G7 country’s national flag oil company, such as France’s (Total) and Italy’s (Eni). Adding Repsol in Spain, Table 3-4 shows comparisons among Inpex, Total, and Eni, which are all national flag oil companies. Figure 3-3 shows how the top 50 companies based on the 2016 PIW ranking would be categorized, together with their respective government ownership as well as their 2012 ranking for comparison.

Table 3-4. Comparison of selected companies among NFOCs

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total (10th)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production (thousand BOED)</td>
<td>2,775</td>
<td>2,566</td>
<td>2,452</td>
<td>2,347</td>
<td>2,146</td>
<td></td>
</tr>
<tr>
<td>Reserve (thousand BOE)</td>
<td>12,050</td>
<td>11,475</td>
<td>11,518</td>
<td>11,580</td>
<td>11,523</td>
<td></td>
</tr>
<tr>
<td>Total sales (million euro)</td>
<td>209,363</td>
<td>171,493</td>
<td>149,743</td>
<td>165,357</td>
<td>236,122</td>
<td></td>
</tr>
<tr>
<td>Net profits (million euro)</td>
<td>13,559</td>
<td>10,578</td>
<td>8,287</td>
<td>10,518</td>
<td>12,837</td>
<td></td>
</tr>
<tr>
<td>Total number of employees</td>
<td>104,460</td>
<td>98,227</td>
<td>102,168</td>
<td>96,019</td>
<td>100,307</td>
<td></td>
</tr>
<tr>
<td><strong>Eni (23rd)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production (thousand BOED)</td>
<td>1,851</td>
<td>1,816</td>
<td>1,759</td>
<td>1,760</td>
<td>1,598</td>
<td></td>
</tr>
<tr>
<td>Reserve (thousand BOE)</td>
<td>7,153</td>
<td>6,990</td>
<td>7,490</td>
<td>6,890</td>
<td>6,602</td>
<td></td>
</tr>
<tr>
<td>Total sales (million euro)</td>
<td>75,822</td>
<td>66,919</td>
<td>55,762</td>
<td>68,945</td>
<td>94,226</td>
<td></td>
</tr>
<tr>
<td>Net profits (million euro)</td>
<td>4,126</td>
<td>3,374</td>
<td>(1,464)</td>
<td>(8,778)</td>
<td>1,303</td>
<td></td>
</tr>
<tr>
<td>Total number of employees</td>
<td>31,701</td>
<td>32,934</td>
<td>33,536</td>
<td>34,196</td>
<td>34,846</td>
<td></td>
</tr>
<tr>
<td><strong>Inpex (43rd)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production (thousand BOED)</td>
<td>450</td>
<td>521</td>
<td>514</td>
<td>408</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>Reserve (thousand BOE)</td>
<td>4,010</td>
<td>3,857</td>
<td>3,304</td>
<td>3,264</td>
<td>2,434</td>
<td></td>
</tr>
<tr>
<td>Total sales (million yen)</td>
<td>971,388</td>
<td>933,701</td>
<td>874,423</td>
<td>1,009,564</td>
<td>1,171,226</td>
<td></td>
</tr>
<tr>
<td>Total sales (million euro)</td>
<td>7,450</td>
<td>7,373</td>
<td>7,266</td>
<td>7,514</td>
<td>8,341</td>
<td></td>
</tr>
<tr>
<td>Net profits (million yen)</td>
<td>96,783</td>
<td>(2,100)</td>
<td>56,131</td>
<td>(25,505)</td>
<td>75,597</td>
<td></td>
</tr>
<tr>
<td>Net profits (million euro)</td>
<td>742</td>
<td>(17)</td>
<td>466</td>
<td>(190)</td>
<td>538</td>
<td></td>
</tr>
<tr>
<td>Total number of employees</td>
<td>1,194</td>
<td>1,231</td>
<td>1,323</td>
<td>1,542</td>
<td>1,494</td>
<td></td>
</tr>
<tr>
<td><strong>Japex (n.a.)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production (thousand BOED)</td>
<td>61</td>
<td>61</td>
<td>72</td>
<td>74</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Reserve (thousand BOE)</td>
<td>387</td>
<td>302</td>
<td>352</td>
<td>349</td>
<td>313</td>
<td></td>
</tr>
<tr>
<td>Total sales (million yen)</td>
<td>267,980</td>
<td>230,629</td>
<td>207,130</td>
<td>240,302</td>
<td>304,911</td>
<td></td>
</tr>
<tr>
<td>Total sales (million euro)</td>
<td>2,055</td>
<td>1,821</td>
<td>2,245</td>
<td>1,789</td>
<td>2,172</td>
<td></td>
</tr>
<tr>
<td>Net profits (million yen)</td>
<td>14,770</td>
<td>(30,958)</td>
<td>3,343</td>
<td>2,090</td>
<td>29,567</td>
<td></td>
</tr>
<tr>
<td>Net profits (million euro)</td>
<td>113</td>
<td>(244)</td>
<td>29</td>
<td>16</td>
<td>211</td>
<td></td>
</tr>
<tr>
<td>Total number of employees</td>
<td>1,741</td>
<td>1,788</td>
<td>1,825</td>
<td>1,847</td>
<td>1,818</td>
<td></td>
</tr>
</tbody>
</table>

Exchange rate of yen against 1 euro

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>130.38</td>
<td>126.64</td>
<td>129.8</td>
<td>126.64</td>
<td>129.8</td>
</tr>
</tbody>
</table>

Note 1: Eni changed the presentation of sales in 2016. Only net sales numbers are available since 2016.
Note 2: The employee count method may vary, so the above may not be a complete comparison.
Note 3: The fiscal year ends in March for Inpex and Japex.
Note 4: Exchange rates for Japanese yen to euro are average exchange rates for calendar months.
Source: Annual reports, factbook, and company webpages.

Inpex: Inpex (2019)
Total: Total S. A. (2018)

3.2 Merger between two of Japan’s national flag companies

No country except China has more than two national flag oil companies. Japan has two: Inpex and Japex. It seems logical to consider merging these two companies. On May 15, 2015, Kaname Tajima, a member of the House of Representatives from the Chiba prefecture, broached the possibility of merging Inpex and Japex with Prime Minister Shinzo Abe (The House of
Representatives, Japan, 2015). Abe responded by saying that the government was not in a position to lead a merger, as it was a minority shareholder in Inpex and Japex. However, the government actually owns the “golden share” in Inpex, with veto rights regarding certain proposals (Inpex, 2018), and also owns more than one third of Japex’s shares (Japex, 2018). The top management of both Inpex and Japex are drawn from the Ministry of Economy, Trade, and Industry (METI). The government’s stake entitles it to a consideration of a merger. The combined production of the five general trading companies—two upstream oil and gas companies and three refinery-led companies—is about 1.3 million BOED (as shown in Figure 3-4). The square sizes in Figure 3-4 represent the proportion of production volume among the Japanese companies. Combined, the aggregate production is still less than that of Eni and less than half that of Total (see Table 3-4, p. 40 and Figure 3-4, p. 42). In terms of other parameters, such as reserves of hydrocarbon, total sales, net profits after tax, and employee numbers, the total of the two Japanese companies is inferior to that of the other two European companies. The Japanese government may be able to consider merging some of its upstream oil and gas companies.

Another growth opportunity for Japanese upstream oil and gas companies is to pursue the acquisition of overseas oil and gas companies via a Japanese consortium. For example, Total acquired Petrofina, a Belgium company, in 1999. Eni in Italy also developed its business by acquiring foreign oil and gas companies. Eni and ADNOC, Abu Dhabi’s NOC, closed their strategic partnership through which Eni acquired a 20% equity interest in the ADNOC refinery in 2019. If a strong NFOC is born in Japan, it may be possible to expect growth through various M&A for overseas opportunities with the support of the Japanese government.

Figure 3-3. Categorization of top 50 companies ranked by PIW (2012 & 2016)

<table>
<thead>
<tr>
<th>National Flag</th>
<th>National Flag</th>
<th>National Flag</th>
<th>National Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (81%)</td>
<td>Petrobras (51%)</td>
<td>Eni (22%)</td>
<td>CNOOC (33%)</td>
</tr>
<tr>
<td>Repsol (31%)</td>
<td>Shell (5%)</td>
<td>Inpex (5%)</td>
<td></td>
</tr>
<tr>
<td>BG (42%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Major Oil
- ExxonMobil (31%)
- BP (6%)  
- Shell (7%)  
- Chevron (8%)

Independent
- Lukoil (16%)
- Surgutneftegaz (21%)
- ConocoPhillips (12%)
- Novatek (10%)
- CNR (below 5%)
- Anadarko (46%)
- Devon (44%)
- Reliance (50%)
- Chesapeake (below 5%)  
- EOG (below 5%)
- Suncor (40%)
- Occidental (46%)
- BHP Billiton (48%)
- Talinteft (below 50%)

National Oil
- Rosneft (19%)
- Gazprom (10%)
- Statoil (26%)
- PDO (37%)
- Ecopetrol (39%)
- YPF (50%)

Source: Table 2-2 (PIW 2013, 2014, 2016).

Figure 3-4. Selected Japanese companies’ oil and gas production (in BOED)

Note: (1) refers to Sojitz (13,000 BOED) and (2) refers to Sumitomo Corporation (5,575 BOED).
Source: From Table 3-1, 3-2, 3-3.

3.3 Japanese government’s ownership

One might argue how much of a shareholding percentage the Japanese government should maintain in Inpex. As mentioned, the Japanese government holds the golden share in Inpex with veto rights over certain proposals (Inpex, 2018) and also holds more than one-third of Japex’s shares (Japex, 2018). Eni S.p.A. (2019) discloses its major shareholders, explaining that “the Italian Ministry of
Economy and Finance has de facto control of Eni SpA by virtue of interests held either directly or via the Cassa Depositi e Prestiti SpA (CDP).” The Ministry of Economy and Finance owns 4.34% share and CDP S.p.A. owns a 25.76% share, totaling 30.10%. Total explained its relationship with the French state, detailing that “since the repeal on October 3, 2002 of the decree of December 13, 1993 establishing a golden share of Elf Aquitaine held by the French government, there are no longer any agreements or regulatory provisions governing shareholding relationships between Total and the French government.”

The Italian and Japanese governments have been using golden shares with veto rights, and the French government has used golden shares. Hence, the percentage ownerships of governments do not seem to be an issue. Total is categorized as an NFOC by Kikkawa (2003, 2010, 2012). However, Total is considered a major oil company (Kanekiy, et al., 2013; PwC Japan, 2016). Both Eni and Total have been major players in the upstream oil and gas industry. It is therefore too early to discuss whether the Japanese government should release their ownership of the golden share in Inpex until Inpex achieves sufficient growth, like Total and Eni.

3.4 Research question (2) for Japanese upstream oil and gas companies: CERA vs. Abo et al.

The second research question is “What strategy should Japanese upstream oil and gas companies pursue and why?” There are two contrasting positions on this question. One recommends the acquisition of existing companies. In 2006, Jackson and Hobbs (2006) of CERA recommended that Japanese oil and gas companies acquire exploration projects with as large a participation ratio as possible directly from export-oriented NOCs or from underperforming companies. As exploration projects consume significant resources, they recommended selling a portion of equity or project ownership to new investors to monetize the projects. They stressed that this had been the traditional path followed by other upstream oil and gas companies. Abo et al. (2008) contested CERA’s recommendations, however, and argued that CERA’s strategies were poorly suited to the Japanese context. Abo et al. (2008) recommended acquiring production projects in the later stages of production. Based on the historical evidence of Japanese companies’ success in improving operational efficiency in multiple industries, Abo et al. (2008) recommended that Japanese upstream oil and gas companies pursue the strategy of optimizing hydrocarbon recovery such as crude oil and natural gas from projects. Table 3-5 compares strategy suggestions between CERA (2006) and Abo et al. (2008).

Table 3-5. Comparison of Jackson and Hobbs’ (2006) and Abo et al.’s (2008) strategy suggestions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Target project status</td>
<td>Exploration/development</td>
<td>Production</td>
</tr>
<tr>
<td>Timing of acquisition</td>
<td>Upfront or early timing</td>
<td>Later part of project life</td>
</tr>
<tr>
<td>Participation ratio</td>
<td>As large as possible</td>
<td>Large enough to be an operator</td>
</tr>
<tr>
<td>Acquisition</td>
<td>Buy directly from export-oriented NOCs or underperforming companies</td>
<td>Buy assets for which production is declining</td>
</tr>
<tr>
<td>Growth driver</td>
<td>Development of surrounding areas, acquisition, strategic alliances</td>
<td>Optimization of operations and enhanced oil recovery, niche operations, acquisition, strategic alliances</td>
</tr>
</tbody>
</table>

Source: Generated by the author from Jackson and Hobbs (2006) and Abo et al. (2008).

Although the strategies point in different directions, they both discuss the importance of being an operator of upstream oil and gas projects. Companies that participate in upstream oil and gas projects take one of two forms: operator or non-operator. Jackson and Hobbs (2006) emphasized the importance of taking on operatorship, while Abo et al. (2008) pointed out that it is difficult for Japanese companies to be operators in exploration projects. Abo et al. (2008) also noted that the survival ratio of active projects is just 10.7% among the 168 projects that Japanese companies participated in as operators of upstream oil and gas projects. Enhancing project management capability requires taking on operatorship. Whittaker and Young (2013) analyzed the upstream oil and gas business from the viewpoint of non-operatorship, which is not well-highlighted in the industry. They pointed out that 23% of global equity production was delivered through non-operated stakes. Non-operated ventures (NOVs) account for 22-59% of major oil production; these projects are operated by other ventures. Teece et al. (2014) also pointed out that NOVs are a key part of the investment portfolio of upstream entities.

### 3.5 Results of interview

It has been more than a decade since the two groups of scholars advocated the two different strategies, yet Japanese upstream oil and gas companies still struggle to become top performers. I conducted four interviews with experts in Japan’s upstream oil and gas business and who have experience working with global companies. Two experts were from Japan, one was from the US, and one was from Russia. The details of the interviewees are as follows:

1. Japanese expert: more than 20 years of experience in a Japanese upstream oil and gas company
2. Japanese expert: more than 30 years of experience in a Japanese upstream oil and gas company
3. US expert: more than 20 years of experience in a major US and Japanese oil company
4. Russian expert: more than 25 years of experience in a Russian upstream oil and gas company that engaged in international projects with a Japanese company.
Table 3-6. Comments from experts

<table>
<thead>
<tr>
<th>No.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>“The path advocated by CERA has proven to be effective. However, it is also clear that CERA’s path requires skilled engineers who are knowledgeable and have experience in exploration. As Abo et al. (2008) explained, Japan might find itself more suited for increased oil recovery (IOR) and enhanced oil recovery (EOR) technologies.”</td>
</tr>
<tr>
<td>(2)</td>
<td>“Japanese upstream oil and gas companies may need to allocate their resources for oil and gas exploration as CERA advocates. It is difficult for upstream oil and gas companies to achieve enough growth without successful exploration. The exploration cost, in some cases, may not be too high, and once the company finds significant resources, it could yield cash flows that would last for 20 or 30 years. Looking at JNOC’s history, it is essential to nurture skilled geo-scientists. If Japanese upstream oil and gas companies cannot retain skilled engineers, it may be necessary to enter into strategic alliances with other foreign companies.”</td>
</tr>
<tr>
<td>(3)</td>
<td>“The exploration project is highly risky for any upstream oil and gas company. If one does not have the skilled engineers to carry out exploration projects, then it becomes even more difficult. If one is comfortable with the IOR/EOR path suggested by Abo et al. (2008), it is logical to pursue that route. However, that does not mean that the IOR/EOR path does not require any engineers. It is essential to be capable and responsive to any technical challenges that one might have in IOR/EOR.”</td>
</tr>
<tr>
<td>(4)</td>
<td>“Both strategies are critically important. It is just like wheels for a wagon to move forward. Exploration activities cost less than the capital expenditure for development projects. As the potential of resources grow, it is logical to share risk by taking on new investors, as CERA points out. Hence, one would have to consider CERA’s path. The beauty of IOR/EOR is that one can increase hydrocarbon recovery without finding new oil and gas project fields. When oil price is low, it is important for any upstream oil and gas company to increase hydrocarbon recovery.”</td>
</tr>
</tbody>
</table>

Source: Based on the interviews by the author.

Table 3-6 shows comments from the four experts. These experts are professional, top-level managers who have carried out investments of several hundred million dollars in oil and gas field development.

The Increased Oil Recovery (IOR) and Enhanced Oil Recovery (EOR) processes are what Abo et al. (2008) advocated, even though Abo et al. (2008) did not use these terms. There are three levels of oil recovery. The first, called “primary recovery,” refers to oil and gas recovery by natural flowing. The second level is called “secondary recovery,” and entails oil and gas recovery by
adding physical pressure via techniques such as water flooding, gas injection, and gas cycling. The third level is called “tertiary recovery” and refers to oil and gas recovery by changing the characteristics of reservoir and fluid formation via techniques such as steam injection, miscible flooding, chemical flooding, and microbial EOR (Kanekiyo et al., 2013, pp. 141–145). Garcia et al. (2014) stated that “IOCs, NOCs, and independent oil and gas companies are extending the field life of producing oil and gas fields by sophisticated enhanced oil recovery techniques, such as water flooding, polymer flooding, gas and CO2 injection together with the development of industrial models to bring costs down, coupled with the need to manage the complexity of brownfields” (p. 25). Kanekiyo et al. (2013) explained that there is no clear distinction between IOR and EOR, even though only tertiary recovery can be considered EOR.

According to four experts, both strategies are important, and it is crucial to have skilled engineers capable of solving geoscientific problems in oil and gas projects. Building strategic alliances with foreign oil and gas companies to reinforce technical staff could be another way for Japanese companies to grow.

4. Implication for Japanese upstream oil and gas companies

Inpex can clearly be categorized as an NFOC. The Japanese government owns the golden share with a veto right together with an approximate 19% shareholding in Inpex. The Ministry of Economy, Trade, and Industry (METI) appoints an ex-employee of METI as the CEO of Inpex. Japan’s national flag oil company should benchmark other countries’ NFOCs (but not NOCs or independent companies). Japex can be considered as an NFOC too. The government owns 34% of Japex equity position. Although both Inpex and Japex are now majority privatized, they are still partially government-owned upstream oil and gas entities. Given the “too little for too many” problem, mergers in the Japanese oil and gas industry should help mitigate the problem of undersized companies. Another growth opportunity for Japanese upstream oil and gas companies is to pursue the acquisition of oversea oil and gas companies via Inpex and Japex. If a strong NFOC is born in Japan, it may be possible to expect growth through various M&A for overseas opportunities with the support of the Japanese government.

In chapter 3, I have discussed the possible growth paths for Japanese upstream oil and gas companies. Inpex and other Japanese upstream oil and gas companies can grow by adopting the growth paths advocated by the two groups of scholars—CERA (2006) and Abo et al. (2008). This chapter may seem unrelated to firms’ financial growth, but financial growth is indispensable, and it is impossible without business growth. During a company’s growth process, periods of fluctuation can occur that cause financial losses. To address how to spur financial growth through M&A, I will discuss the functional currency selection and impairment losses that may influence financial growth.
in the following chapters. Chapter 6 summarizes the research in this study. Chapter 3 has discussed the business growth that generates financial growth for upstream oil and gas companies.
Chapter 4. Functional currencies

1. Introduction: Role of functional currencies for multinational oil companies

The upstream oil and gas companies are constantly innovating technologically. The shale gas revolution in the US is one example of the dynamic evolution of technology in the global oil and gas industry (BP, 2016). The participants in the oil and gas sector includes large international oil companies, national oil companies, national flag oil companies and independent companies. To identify outperforming upstream oil and gas companies, it is important to determine a performance measurement tool. Some companies are vertically integrated, while others have either an upstream or a downstream footprint. This study focuses on upstream companies in the oil and gas sector.

IAS 21 states that “An entity’s functional currency is the currency of the primary economic environment in which an entity operates.” An “entity” refers to a corporation that operates in a certain country. IAS 21 also explains that the presentation currency is the currency in which financial statements are presented. Some companies may choose functional currencies as matter of routine. This study suggests that the functional currency should be strategically selected. Both IFRS and US GAAP address functional currencies (PwC Japan, 2016). Crude oil, refined oil products, and LNG have largely been traded internationally in US dollars for a long time (PwC Japan, 2016). However, in accordance with the relevant accounting principles, upstream oil and gas companies must choose a functional currency for the reporting of their financial statements. The issues surrounding functional currency, especially for upstream oil and gas companies, have not been addressed in previous studies. Some studies have focused only on the issues related to foreign currency translation, neglecting issues that influence the upstream business. Functional currency difficulties are likely to emerge as oil becomes an important commodity. In practice, the choice of functional currency should be based on good reasons. However, some companies simply follow prior decisions. As cross-border M&A grow, the issue of functional currency is becoming more important because its selection implies the selection of a financial growth measurement for MNEs. The selection of a functional currency is also helpful in selecting JV partners. Approximately 71% of upstream joint ventures is financed through alliances or JVs (EY, 2015).

43 IFRS (IAS21) webpage: “An entity’s functional currency is the currency of the primary economic environment in which the entity operates.” Available online at: https://www.ifrs.org/issued-standards/list-of-standards/ias-21-the-effects-of-changes-in-foreign-exchange-rates/ (accessed on July 7 2019)
44 FASB webpage (Summary of Statement No. 52): “An entity’s functional currency is the currency of the primary economic environment in which that entity operates.” Available online at: https://www.fasb.org/summary/stsum52.shtml
2. Functional currencies by category

2.1 Functional currencies for major oil companies

Kikkawa (2010) categorized four companies—ExxonMobil, Royal Dutch Shell, BP, and Chevron—as major oil companies. All four originated from the Seven Sisters companies that once dominated the oil and gas industry between the 1920s and 1960s (Bagheri and Minin, 2015). The Seven Sisters are a group of international oil companies that included Exxon, Mobil, and Chevron, the successor entities of Standard Oil Trust (which was dissolved by a US Supreme Court decision in 1911), Gulf Oil, Texaco, British Petroleum, and Shell (see Figure 2-5, p. 29). All four companies use the US dollar as their functional currency. ExxonMobil and Chevron follow US GAAP while Shell and BP follow IFRS as their accounting principle. Table 4-1 summarizes the data survey for the major oil companies.

Table 4-1. Major oil companies

<table>
<thead>
<tr>
<th>Rank 2016</th>
<th>Name</th>
<th>Country</th>
<th>Currency in annual report</th>
<th>Govt. ownership (%)</th>
<th>Conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Exxon Mobil</td>
<td>USA</td>
<td>USD(^4) USD(^5)</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>6</td>
<td>BP</td>
<td>UK</td>
<td>USD(^6) USD</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
<tr>
<td>8</td>
<td>Royal Dutch Shell</td>
<td>Netherlands</td>
<td>USD(^7) USD</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
<tr>
<td>11</td>
<td>Chevron</td>
<td>USA</td>
<td>USD(^8) USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
</tbody>
</table>

Note: Functional and presentation currencies as of December 2014. Source: PIW 2016 (Table 2-2) and company financial statements.

2.2 Functional currencies for national oil companies

NOCs are companies in which the government holds a greater than 50% share and that have a surplus energy balance (exporting position; Kikkawa 2010, p. 100). Table 4-2 summarizes the data survey for NOCs. NOCs hold a dominant position in the upstream and gas industry, particularly in the Organization of Petroleum Exporting Countries (OPEC), with nearly 70% of the world’s hydrocarbon reserves (PwC Japan, 2016). Nine out of 14 member countries in OPEC (as of 2019) were ranked among the 21 companies in Table 4-2, representing approximately 43% of the total. While privately held companies seek to maximize shareholder value, state-owned companies do not always do so (Penrose, 1968; Pirog, 2007). State-owned companies often seek to provide job

\(^{45}\) ExxonMobil Annual Report (2014) stated that “The method of translating the foreign currency financial statements of the Corporation’s international subsidiaries into U.S. dollars is prescribed by GAAP” (p. 26). It also stated that “For all operations, gains or losses from remeasuring foreign currency transactions into the functional currency are included in income” (p. 36). It can be concluded that ExxonMobil’s functional currency must be US dollars.

\(^{46}\) BP Annual Report (2014) stated that “In the consolidated financial statements, the assets and liabilities of non-US dollar functional currency subsidiaries, joint ventures and associates, including related goodwill, are translated into US dollars at the rate of exchange ruling at the balance sheet date” (p. 101).


\(^{48}\) Chevron Annual Report (2014) stated that “The U.S. dollar is the functional currency substantially all of the Company’s operations and those of its equity affiliates” (p. 38).
opportunities and facilitate wealth distribution. Furthermore, they seek to become mechanisms for achieving economic growth and implementing foreign policies using oil as a strategic commodity. Therefore, their need to maximize shareholder value competes with other strategic objectives. Differing objectives might be considered important for NOCs if their objectives lead to different characteristics and outcomes (Pirog 2007, p. 1). NOCs show a clear tendency to select their national currencies as functional currencies, with the exception of five companies: Saudi Aramco in Saudi Arabia, PDV in Venezuela, Pertamina in Indonesia, Statoil in Norway, and YPF in Argentina. Among the NOCs, Statoil and YPF are the only companies with different functional and presentation currencies. This difference in functional and presentation currencies is not seen among 100% government-owned NOCs; hence, Statoil and YPF are likely conscious of being observed by outside investors, unlike 100% government-owned NOCs. Approximately 36% of the companies in this category use the US dollar as their functional currency, excluding those that did not disclose their choice.

Table 4-2. National oil companies

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Country</th>
<th>Currency in annual report</th>
<th>Gov’t ownership (%)</th>
<th>Conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Aramco</td>
<td>Saudi Arabia</td>
<td>USD(^a) USD(^b)</td>
<td>100</td>
<td>n.a.(^c)</td>
</tr>
<tr>
<td>2</td>
<td>NOIC</td>
<td>Iran</td>
<td>n.a.</td>
<td>100</td>
<td>n.a.</td>
</tr>
<tr>
<td>5</td>
<td>PDV</td>
<td>Venezuela</td>
<td>USD(^d) USD</td>
<td>100</td>
<td>IFRS</td>
</tr>
<tr>
<td>12</td>
<td>Sonatrach</td>
<td>Algeria</td>
<td>n.a.</td>
<td>100</td>
<td>n.a.</td>
</tr>
<tr>
<td>14</td>
<td>KPC</td>
<td>Kuwait</td>
<td>Kuwaiti Dinars(^e)</td>
<td>100</td>
<td>IFRS</td>
</tr>
<tr>
<td>15</td>
<td>ADNOC</td>
<td>UAE</td>
<td>AED(^f) AED</td>
<td>100</td>
<td>IFRS</td>
</tr>
<tr>
<td>17</td>
<td>QP</td>
<td>Qatar</td>
<td>Qatari Riyal(^g)</td>
<td>100</td>
<td>Local(^h)</td>
</tr>
<tr>
<td>18</td>
<td>Pemex</td>
<td>Mexico</td>
<td>Mexican Peso(^i) Mexican Peso</td>
<td>100</td>
<td>IFRS</td>
</tr>
</tbody>
</table>

\(^a\) For example, the Russian government develops relationships with countries like China and India by selling a minority stake of Russian upstream oil and gas project companies to Chinese and Indian government-owned companies.

\(^b\) Saudi Aramco Oil Company, Global medium term note program, Base prospectus (2019) stated that “The Company has determined that the U.S. Dollar is the functional currency as a substantial amount of its products are traded in U.S. Dollars in international markets. However, a substantial amount of costs of the Company are denominated in Saudi Riyals which has been exchanged at a fixed rate to the U.S. Dollar since 1986.” (p. 65). It is assumed that Saudi Aramco’s functional currency must be US dollars in 2014.

\(^c\) Saudi Aramco changed its presentation currency from US dollars to SAR on January 1, 2017 (Saudi Aramco Base Prospectus, April 1, 2019, p. F92.).

\(^d\) Saudi Aramco adopted IFRS in 2018, but it is unclear what accounting standards they used in December 2014.

\(^e\) PDV’s financial statements in 2013 stated that “The Company’s functional currency is the U.S. dollar” (p. 8). PDV’s financial statements in 2015 stated that “The Company’s functional currency is the U.S. dollar” (p. 7). It can be assumed that PDV’s functional currency in 2014 must be US dollars.

\(^f\) KPC Annual Report (March 2016) stated that “The consolidated financial statements are presented in Kuwaiti Dinars, which is the Group’s functional currency” (p. 81).

\(^g\) ADNOC does not disclose its financial statements, but the Abu Dhabi Accountability Report, where ADNOC is listed as a state-owned enterprise, is prepared in accordance with IFRS using AED as the functional currency. Thus, it is assumed that ADNOC uses AED as its functional currency.

\(^h\) Qatar Petroleum Annual Report (2014) stated that “The summary consolidated financial statements are presented in Qatari Riyal (QR) which is the Group’s functional and presentation currency” (p. 120).

\(^i\) Qatar Petroleum’s Annual Report 2014: “1974–2014 40 Years of Excellence” stated the following: “The summary consolidated financial statements have been prepared in accordance with the requirements of Emiri Decree No. 10 of 1974 (as amended by Law No. 5 of 2012), concerning the establishment of QP, the Council of Ministers’ Decision No. 6 of 1976 (as amended) and QP Chairman Resolution No. 17 of 2013 related to accounting policies.” (p. 120)

\(^j\) Pemex financial statement (2014) stated that “These consolidated financial statements are presented in Mexican pesos, which is both PEMEX’s functional and reporting currency,” (p. 11).
Table 4-2. (Continued)

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Petronas</td>
<td>Malaysia</td>
<td>Ringgit 59</td>
<td>Ringgit</td>
<td>100</td>
</tr>
<tr>
<td>21</td>
<td>INOC</td>
<td>Iraq</td>
<td>n.a.</td>
<td>n.a.</td>
<td>100</td>
</tr>
<tr>
<td>21</td>
<td>NNPC</td>
<td>Nigeria</td>
<td>n.a.</td>
<td>n.a.</td>
<td>100</td>
</tr>
<tr>
<td>26</td>
<td>EGPC</td>
<td>Egypt</td>
<td>n.a.</td>
<td>n.a.</td>
<td>100</td>
</tr>
<tr>
<td>27</td>
<td>Pertamina</td>
<td>Indonesia</td>
<td>USD61</td>
<td>USD</td>
<td>100</td>
</tr>
<tr>
<td>32</td>
<td>Kazmunaygas</td>
<td>Kazakhstan</td>
<td>KZT62</td>
<td>KZT</td>
<td>100</td>
</tr>
<tr>
<td>33</td>
<td>Libya NOC</td>
<td>Libya</td>
<td>n.a.</td>
<td>n.a.</td>
<td>100</td>
</tr>
<tr>
<td>39</td>
<td>Uzbekneftegaz</td>
<td>Uzbekistan</td>
<td>n.a.</td>
<td>n.a.</td>
<td>100</td>
</tr>
<tr>
<td>36</td>
<td>Ecopetrol</td>
<td>Colombia</td>
<td>C. Pesos63</td>
<td>C. Pesos</td>
<td>88.49</td>
</tr>
<tr>
<td>6</td>
<td>Rosneft</td>
<td>Russia</td>
<td>RUB65</td>
<td>RUB</td>
<td>69.5</td>
</tr>
<tr>
<td>28</td>
<td>Statoil</td>
<td>Norway</td>
<td>USD66</td>
<td>NOK67</td>
<td>67</td>
</tr>
<tr>
<td>34</td>
<td>PDO</td>
<td>Oman</td>
<td>n.a.</td>
<td>n.a.</td>
<td>60</td>
</tr>
<tr>
<td>41</td>
<td>YPF68</td>
<td>Argentina</td>
<td>USD69</td>
<td>Argentina Pesos</td>
<td>51</td>
</tr>
<tr>
<td>9</td>
<td>Gazprom</td>
<td>Russia</td>
<td>RUB30</td>
<td>RUB</td>
<td>50.003</td>
</tr>
</tbody>
</table>

Note: Functional and presentation currencies as of December 2014.
Source: PIW 2016 (Table 2-2) and each company’s financial statements.

2.3 Functional Currencies for national flag oil companies

National flag oil companies are energy companies that are wholly or partially owned by governments whose countries are net importers of energy (Kikkawa, 2010). Table 4-3 summarizes the data survey for national flag oil companies. It also includes companies without the government as a shareholder.

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59 Petronas’s Annual Report (2014) stated that “The Group and the Company’s financial statements are presented in ringgit Malaysia, which is the Company’s functional currency” (p. 136).
60 Petronas’s Annual Report (2014) stated that “The financial statements of the Group and of the Company have been prepared in accordance with Malaysian Financial Reporting Standards (MFRS), International Financial Reporting Standards and the Companies Act, 1965 in Malaysia.” (p. 136)
61 Pertamina Annual Report (2014) stated that “The consolidated financial statements are presented in US dollar, which is the Company’s functional currency” (p. 401).
62 Kazmunaygas Annual Report (2014) stated that “The consolidated financial statements are presented in Kazakhstan Tenge (“Tenge”), which is the Company’s functional and presentation currency” (p. 96).
63 Ecopetrol’s financial statements (2014) stated that “(and) references to “COPS,” “Colombian Peso” or “Columbian Pesos” are to Colombian Pesos, the functional currency under which we prepare our financial statements” (p. 4).
64 Ecopetrol’s financial statements (2015) are reported according to IFRS from January 2015.
65 Rosneft financial statements (2014) stated that “The consolidated financial statements are presented in Russian rubles, which is the functional currency of Rosneft Oil Company” (p. 24).
67 Statoil changed its presentation currency in January 1, 2016 from Norwegian krone to USD (Statoil Annual Report, 2016, p. 9).
68 In 2012, the Argentinian government reacquired YPF. In this report, the energy balance was calculated based on data provided by the World Bank. I took the average of each country’s energy balance between 2011 and 2013. According to the World Bank, Argentina had been in an energy-exporting position until 2010 but switched to an importing position after 2011. The country is known to have significant shale resources; therefore, YPF is considered as an NOC in this study, despite its current position as an energy importer.
69 YPF Form 20-F (2014) stated that “YPF’s functional currency is the U.S. dollar” (p. 198).
70 Gazprom’s Annual Report does not explicitly identify its functional currency and includes an explanation on whether the presentation currency differs from the functional currency based on IAS21-53. Therefore, this study considers the
Table 4-3. National flag oil companies

<table>
<thead>
<tr>
<th>Rank 2016</th>
<th>Name</th>
<th>Country</th>
<th>Currency in Annual Report</th>
<th>Government Ownership (%)</th>
<th>Conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CNPC</td>
<td>China</td>
<td>RMB71, RMB</td>
<td>100</td>
<td>Local72</td>
</tr>
<tr>
<td>30</td>
<td>CNOOC</td>
<td>China</td>
<td>RMB73, RMB</td>
<td>100</td>
<td>Local72</td>
</tr>
<tr>
<td>20</td>
<td>Sinopec</td>
<td>China</td>
<td>RMB75, RMB</td>
<td>72.47</td>
<td>IFRS</td>
</tr>
<tr>
<td>25</td>
<td>ONGC</td>
<td>India</td>
<td>Rupee96, Rupee</td>
<td>68.94</td>
<td>Local71</td>
</tr>
<tr>
<td>23</td>
<td>Eni</td>
<td>Italy</td>
<td>Euro78, Euro</td>
<td>30.1</td>
<td>IFRS</td>
</tr>
<tr>
<td>12</td>
<td>Petrobras</td>
<td>Brazil</td>
<td>Brazilian Real79, USD</td>
<td>28.7</td>
<td>IFRS</td>
</tr>
<tr>
<td>43</td>
<td>Inpex</td>
<td>Japan</td>
<td>Japanese Yen80, Japanese Yen</td>
<td>18.94</td>
<td>Local81</td>
</tr>
<tr>
<td>10</td>
<td>Total</td>
<td>France</td>
<td>Euro82, USD52</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
<tr>
<td>30</td>
<td>Repsol</td>
<td>Spain</td>
<td>Euro84, Euro</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
<tr>
<td>37</td>
<td>BG</td>
<td>UK</td>
<td>GBP86, USD</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
</tbody>
</table>

Note: Functional and presentation currencies as of December 2014, except ONGC and Inpex, which are as of March 2015. Source: PIW 2016 (Table 2-2) and each company’s financial statements.

These companies are viewed as representatives of their country by import-oriented companies due to diplomacy over natural resources (Kikkawa, 2010). National flag oil companies aim to acquire strategic interests in overseas crude oil and natural gas. Victor (2007) pointed out that NOCs from large oil-importing countries differ from NOCs from large oil-exporting countries: The former are

functional and presentation currencies to be the same.

71 The CNPC Annual Report (2014) stated that “The company and most of its subsidiaries adopt RMB yuan as currency used in bookkeeping. The combined financial statement of the Company is listed in RMB yuan”, “Our foreign currency transactions are converted into RMB yuan” (p. 42). It is assumed that CNPC’s functional currency is RMB yuan even though they do not use the term of “functional currency.”

72 The CNPC Annual Report (2014) stated that “CNPC (hereinafter referred to as the Company) follows Accounting Standards for Business Enterprises – Basic Principles and the specific rules of accounting standards, guidelines for the application of accounting standards, interpretations of accounting standards, and relevant regulations issued by the Ministry of Finance” (p. 42).

73 CNOOC’s Annual Report used the term “recording currency” instead of “functional currency” (CNOOC Annual Report 2014, p. 25).

74 CNOOC Annual Report 2014 stated: “The financial statements of the Company have been prepared in accordance with the going concern basis and the ‘Accounting Standards for Business Enterprises – Basic Standard’ issued by the Ministry of Finance on 15 February 2006 and other relevant accounting standards and regulations” (p. 25).

75 Sinopec Annual Report and Accounts (2014) stated that “The functional currency of the Company’s and most of its subsidiaries is Renminbi” (p. 81).


77 ONGC Annual Report (2014–2015) stated that “The financial statements are prepared under the historical cost convention on accrual basis in accordance with Generally Accepted Accounting Principles (GAAP), applying the Successful Efforts Method as per the Guidance Note on Accounting for Oil and Gas Producing Activities (Revised) issued by the Institute of Chartered Accountants of India and Accounting Standards notified under the Companies (Accounting Standards) Rules, 2014 and provisions of the Companies Act, 2013.” (p. 287).

78 Eni Form 20-F (2014) stated that “Financial statements of foreign investees having a functional currency other than the euro, that represents the Group’s functional currency, are translated into euro” (p. F-13).

79 Petrobras Form 20-F (2014) stated that “The functional currency of Petrobras and all of its Brazilian subsidiaries is the real” (p. 12).

80 Japanese accounting standards do not include the idea of “functional currency.”


82 Total Statutory auditors’ report on the consolidated financial statements (2014) stated that “The statutory financial statements of Total S.A., the parent of the Group, remain prepared in euro” (p. 6).

83 Total changed the presentation currency of its consolidated financial statements from the euro to the USD, effective from January 2014, but the statutory financial statements of its parent company are prepared in euro (p. 6).

84 Repsol’s Consolidated Financial Statements (2014) stated that “The consolidated financial statements are presented in euros, which is the functional currency of the Repsol Group’s parent company” (p. 119).

85 Shell acquired BG in 2016.

86 BG Annual Report and Accounts (2014) stated that “The functional currency of the Company is Pounds Sterling” (p. 90).
import-oriented, while the latter are export-oriented. Generally, national flag oil companies receive substantial financial support from their governments.

Scholars have explored international oil companies, including national flag oil companies. Although international oil companies’ oil and gas production roles are diminishing (Stevens, 2016), they are still active players in the upstream oil and gas industry. The data survey identifies a pattern among the 10 national flag oil companies: the selection of their national currencies as functional currencies. The survey reveals that three companies—Total in France, Petrobras in Brazil, and BG in the United Kingdom—have different functional and presentation currencies. None of the companies in this category uses the US dollar as their functional currency.

### 2.4 Functional currencies for independent oil and gas companies

This study created another category for the remaining companies: “independent oil and gas companies.” Table 4-4 summarizes the data survey for independent oil and gas companies. These independent companies are free from government control, as their respective governments hold no shares. Since they are independent from governmental control, they should be able to prioritize corporate profits over national interests.

Five countries—the US, India, Australia, Russia, and Canada—have independent oil and gas companies. According to Lukoil’s 2015 annual report, its accounting principles changed from US GAAP to IFRS while its functional currency changed from US dollars to the Russian ruble. The functional and presentation currencies of three other top-ranked Russian companies—Surgutneftegas, Novatek, and Tatneft—are the Russian ruble. These four Russian companies conduct similar oil and gas businesses in Russia as well as in other countries. The fact that Lukoil’s functional currency differs from that of the other three Russian companies supports the case that management has some discretion in choosing the functional currency. In 2014, BHP Billiton of Australia and Lukoil of Russia used the US dollar, which was not their national currency, as the functional currency. Some of the top 50 NOCs do not disclose their functional currencies because they are not listed on any stock markets. Not disclosing their accounting principles could explain the mindset gap between state-owned and non-state-owned energy companies. Approximately 57% of the companies in this category use the US dollar as their functional currency.
Table 4-4. Independent oil and gas companies

<table>
<thead>
<tr>
<th>Rank 2016</th>
<th>Name</th>
<th>Country</th>
<th>Currency in annual report</th>
<th>Government Ownership (%)</th>
<th>Conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>ConocoPhillips</td>
<td>USA</td>
<td>USD97 USD USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>40</td>
<td>Anadarko</td>
<td>USA</td>
<td>USD98 USD USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>42</td>
<td>Devon Energy</td>
<td>USA</td>
<td>USD99 USD USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>45</td>
<td>Chesapeake</td>
<td>USA</td>
<td>USD90 USD USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>46</td>
<td>EOG</td>
<td>USA</td>
<td>USD91 USD USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>47</td>
<td>Occidental</td>
<td>USA</td>
<td>USD92 USD USD</td>
<td>n.a.</td>
<td>US GAAP</td>
</tr>
<tr>
<td>44</td>
<td>Reliance</td>
<td>India</td>
<td>Rupee82 Rupee n.a.</td>
<td>Local94</td>
<td>IFRS</td>
</tr>
<tr>
<td>47</td>
<td>BHP Billiton</td>
<td>Australia</td>
<td>USD95 USD USD</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
<tr>
<td>16</td>
<td>Lukoil98</td>
<td>Russia</td>
<td>USD97 USD USD</td>
<td>n.a.</td>
<td>US GAAP98</td>
</tr>
<tr>
<td>35</td>
<td>Novatek99</td>
<td>Russia</td>
<td>RUB100 RUB n.a.</td>
<td>IFRS</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Surgutneftegas101</td>
<td>Russia</td>
<td>RUB102 RUB n.a.</td>
<td>IFRS</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Tatneft103</td>
<td>Russia</td>
<td>RUB104 RUB n.a.</td>
<td>IFRS</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Suncor</td>
<td>Canada</td>
<td>Canadian $105 Canadian $</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
<tr>
<td>38</td>
<td>CNR</td>
<td>Canada</td>
<td>Canadian $106 Canadian $</td>
<td>n.a.</td>
<td>IFRS</td>
</tr>
</tbody>
</table>

Note: Functional and presentation currencies as of December 2014, with the exception of Reliance at March 2014.

Source: PwC 2016 (Table 2-2) and company financial statements.

87 ConocoPhillips Annual Report (2014) stated that “Adjustments resulting from the process of translating foreign functional financial statements from U.S. dollars are included in accumulated other comprehensive income in common stockholders’ equity” (p. 83).
88 Anadarko Annual Report (2014) stated that “Anadarko’s operating revenues are realized in U.S. dollars, and the predominant portion of Anadarko’s capital and operating expenditures are U.S.-dollar-denominated” (p. 83). Although it did not explicitly refer to their functional currency, it must be US dollars.
89 Devon Energy (2014) Letter to Shareholders and Form 10-K stated that “The United States dollar is the functional currency for Devon’s consolidated operations” (p. 64).
90 Chesapeake Annual Report (2014) did not explain what the functional currency is for Chesapeake. Given the fact that Chesapeake adapted to US GAAP and they considered the euro as a foreign currency, their functional currency must be USD dollars. They may choose not to explain it because it is so obvious.
91 EOG Annual Report (2014) stated that “The reporting currency for our financial statements is the U.S. dollar. However, certain of our subsidiaries are located in countries other than the U.S. and have functional currencies other than the U.S. dollar” (p. 20).
92 Occidental SEC 10-K (2014) stated “The functional currency applicable to all of Occidental’s foreign oil and gas operations is the United States dollar since cash flows are denominated principally in United States dollars” (p. 52).
93 Reliance Industries Limited Annual Report (2016-17) “Life is Beautiful. Life is Digital” stated that “Company’s financial statements are presented in Indian Rupees (₹), which is also its functional currency” (p. 290). Previous years’ annual reports, including Annual Reports (2013-14), (2014-15), and (2015-16), did not refer to the changes of functional currency. Therefore, one can assume the functional currency is Indian rupees for Reliance in 2014.
94 Reliance Industries Limited Annual Report (2013–14) “Growth is Life” stated that “These financial statements have been prepared to comply with Accounting Principles Generally accepted in India (Indian GAAP), the Accounting Standards notified under the Companies (Accounting Standards) Rules, 2006 and the relevant provisions of the Companies Act, 1956” (p. 172), (83).
95 BHP Billiton Annual Report (2014) stated that “The US dollar is the functional currency of most operations within the Group” (p. 268).
96 Kikkawa (2010) categorized Lukoil as a national oil company. However, this study considers it an independent company, as it is free from Russian government ownership.
97 Lukoil changed its functional currency from the US dollar to the Russian ruble in 2015.
98 Lukoil changed its accounting rule from US GAAP to IFRS in 2015.
99 Novatek can be considered one of Russia’s national oil companies.
100 Novatek Annual Report did not explicitly identify its functional currency or include any explanation of whether the presentation currency differs from the functional currency based on IAS 21–53. Therefore, this study considers its functional and presentation currency to be the same.
101 Surgutneftegaz can be considered one of Russia’s national oil companies.
102 Surgutneftegaz financial statements (2014) stated that “The national currency of the Russian Federation is Russian Ruble (RUB), which is the functional currency of the Group’s entities” (p. 17).
103 Kikkawa (2010) was unclear; however, Tatneft can be considered one of Russia’s national oil companies.
104 Tatneft Annual Report (2014) stated that “Management has determined the functional currency for each consolidated subsidiary of the Group is (intentionally omitted) the Russian Ruble” (p. 115).
105 Suncor Annual Report (2014) stated that “These consolidated financial statements are in Canadian dollars, which is the company’s functional currency” (p. 80).
106 CNR Annual Report (2014) stated that “The consolidated financial statements are presented in Canadian dollars, which is the Company’s functional currency” (p. 66).
3. Non-US oil and gas companies with the US dollar as functional currency

Seven non-US companies—Saudi Aramco, PDV, Pertamina, Statoil, Lukoil, YPF, and BHP Billiton—are unique in their choice of the US dollar as their functional currency. In the past, these seven companies actively worked on developing investment programs. Philip (1999) claimed that PDV could not afford its investment plan given the sharply increasing foreign debt in Venezuela. Goentoro (2016) stated that Indonesian company Pertamina had a hard time obtaining approvals under government regulations for projects and land acquisition. M&A are chosen by some companies as a growth strategy. Argentine oil company YPF was acquired by the Spanish oil company Repsol in 1999, as reported by Vandenberghhe (2011). Statoil merged with Norsk Hydro in 2007 (Thurber and Istad, 2010). BHP Billiton attempted to acquire Rio Tinto but was thwarted (Floris et al., 2013). Some companies have chosen strategic alliances, such as Lukoil with BP, Agip/Eni, and ConocoPhillips (Gorst, 2007).

The decision on the functional currency is important, as it also determines the firm’s foreign currencies. All seven of the non-US companies mentioned above are top-tier companies in the upstream oil and gas business. Their selection of functional currencies must be based on good reasons. Table 4-5 shows these non-US companies with the US dollar as their functional currency. None uses their own local currency as a functional currency. I categorize the seven companies into the following four categories: (a) US dollars as pegged currency, (b) globalization, (c) hyperinflation, and (d) currency depreciation.

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107 Major oil companies are excluded.
Table 4-5. Non-US companies with the USD as functional currency: 2014

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Country</th>
<th>Currency in annual report</th>
<th>Government Ownership (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Aramco</td>
<td>Saudi Arabia</td>
<td>USD</td>
<td>100</td>
<td>NOC/(a)</td>
</tr>
<tr>
<td>5</td>
<td>PDV</td>
<td>Venezuela</td>
<td>USD</td>
<td>100</td>
<td>NOC/(c)</td>
</tr>
<tr>
<td>27</td>
<td>Pertamina</td>
<td>Indonesia</td>
<td>USD</td>
<td>100</td>
<td>NOC/(c)</td>
</tr>
<tr>
<td>28</td>
<td>Statoil</td>
<td>Norway</td>
<td>USD</td>
<td>67</td>
<td>NOC/(d)</td>
</tr>
<tr>
<td>41</td>
<td>YPF</td>
<td>Argentina</td>
<td>USD</td>
<td>51</td>
<td>NOC/(c)</td>
</tr>
<tr>
<td>16</td>
<td>Lukoil</td>
<td>Russia</td>
<td>USD</td>
<td>n.a.</td>
<td>Independent/(d)</td>
</tr>
<tr>
<td>47</td>
<td>BHP Billiton</td>
<td>Australia</td>
<td>USD</td>
<td>n.a.</td>
<td>Independent/(b)</td>
</tr>
</tbody>
</table>

Source: Tables 4-2 and 4-4.

3.1 (a) US dollars as pegged currency

Saudi Aramco has been using US dollars as its functional currency. Saudi Arabia is the biggest oil producer in the OPEC group, and the Saudi riyal is pegged against the US dollar at a fixed exchange rate similar to those of the currencies of other oil-producing Middle Eastern countries.

3.2 (b) Globalized operations for independent oil and gas companies

BHP Billiton is a listed company in both Australia and the United Kingdom and is one of the world’s major mining companies, with approximately 60,000 employees in 87 locations (BHP Billiton Annual report 2017, p. 44). It has offices in 14 countries. As for major oil companies, a diversified company entering the global stage is likely to choose US dollars as its functional currency. Figures 4-2 depicts the British pound and Australian dollar against the US dollar, along with the WTI crude oil price. Unlike for the currencies of oil-producing countries, the exchange rate of the British pound and Australian dollar against the US dollar correspond to the WTI crude oil price. As shown in Table 4-6, the correlation between USD/GBP and WTI was 0.69 while that between USD/AUD and WTI was 0.85 from January 2012 to December 2018.

108 Saudi Aramco changed its presentation currency from US dollars to SAR on January 1, 2017 (Base prospectus, April 2019, p. F92.)
3.3 (c) Functional currency selection in hyperinflation

Companies such as Pertamina, PDV, and YPF have followed this pattern. The local currency for each company is the Indonesian rupiah (Pertamina), Venezuelan bolivar (PDV), and Argentinean peso (YPF). Figure 4-3 illustrates each country’s currency against the US dollar along with the WTI crude oil price. I also add the US dollar/Norwegian krone exchange rate and WTI as a reference in Figure 4-3 (see the upper left-hand corner). The black line in the figure shows the WTI crude oil price, while the blue line shows each country’s currency rate against the US dollar. As the figure shows, when the crude oil price is low, each country’s currency becomes weaker against the US dollar, as if devalued currencies were offsetting the impact of the low crude oil price. In other words, even if the crude oil price were low, a stronger US dollar against each country’s currency would help to stabilize their business.

Previous studies suggest that firms choose to change their functional currencies to US dollars during a period of hyperinflation, defined as a cumulative inflation rate of 100% over a three-year period (Ziebart, 1985).

In 1961, the Government of Indonesia signed the first Product Sharing Contract (PSC). Since then, foreign contractors have carried out most oil and gas production under PSC arrangements. The general assumption in the early years of PSC licensing was that PSC entities would be foreign-incorporated (PwC 2018, p. 85). Pertamina in Indonesia was established in 1968. A PSC entity is automatically entitled to maintain its books in English and calculate its Income Tax Liability using the US dollar (reconfirmed by MoF Regulation No.24/PMK.011/2012 as last amended by MoF Regulation No.1/PMK.03/2015; PwC 2018, p. 82). Hossain (2005) pointed out that Indonesia is considered an inflation-prone country and was on the verge of hyperinflation in the 1950s and

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1960s. During the peak of the Asian currency crisis in 1998, Indonesia’s inflation rose to approximately 60% (Hossain 2005, p. 94). Since a PSC would allow PSC entities to choose US dollars as a functional currency in Indonesia, it is assumed that Pertamina also chose US dollars as their functional currency.

Argentina is also considered an inflation-prone country. Since late 2017, the three-year cumulative inflation rate has exceeded 100%. During the first half of 2018, the Argentine peso devalued significantly, and interest rates were raised in excess of 40%. Venezuela is also in a hyperinflationary state. In December 2017, the three-year cumulative inflation rate exceeded 30,000% with a projected three-year cumulative inflation rate in excess of 1,500,000% by December 2018 (EY 2018c, p. 2). EY (2018c) considered Argentina and Venezuela to be in hyperinflationary states in 2018 (p. 1).

Table 4-6. Correlation between exchange rates (against US dollar) and WTI crude oil

<table>
<thead>
<tr>
<th>Exchange rate</th>
<th>GBP</th>
<th>Australian dollar</th>
<th>Norwegian krone</th>
<th>Indonesian rupiah</th>
<th>Argentinean peso</th>
<th>Venezuelan bolivar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>0.69</td>
<td>0.85</td>
<td>-0.87</td>
<td>-0.77</td>
<td>-0.48</td>
<td>-0.57</td>
</tr>
</tbody>
</table>

Source: Calculated by the author from Trading Economics data.
Note: Dates of holidays differ between foreign exchange markets for exchange rates and Nymex for WTI. Therefore, when there was a day when one side became a holiday, it was used without changing the price of the previous day.

Figures 4-2 and 4-3 show the opposite trends of foreign currency rates against crude oil prices (WTI). Crude oil would be exported at an international price (the US dollar in this case) in an oil-producing country. If the oil-producing country had a hyperinflated economy, the currency value against US dollar would fall. Then, the export volume would increase because of the cheaper local currency. Since hyperinflation is a rapid inflationary trend, the value of the currency would fall between the export contract date and the payment date for oil cargoes after the delivery, which could cause foreign exchange loss for the firms. Thus, it is difficult for firms in hyperinflationary countries to choose local currencies as their functional currencies. Using the US dollar as the functional currency—the currency of transactions and financial reporting—can allow firms to avoid exchange losses due to the depreciation of the home country’s currency. Hence, it may be logical to choose US dollars as the functional currency. When a currency is in hyperinflation, some national oil companies tend to rely on US dollars as the functional currency to stabilize their financial performance in oil-producing countries.

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3.4 (d) Functional currency selection in high-inflation but not hyperinflation states

Unlike in the abovementioned countries, the inflation rates in Norway and Russia between 2008 and 2018 were not considered hyperinflationary. Figure 4-4 shows the inflation rates in Norway and Russia, which are below 30%. When firms are in a moderate- or high-inflation (but not hyperinflationary) economy, they still choose the US dollar as their functional currencies. However, Statoil in Norway and Lukoil in Russia made a different decision when they changed their functional currencies.

Figure 4-4 Inflation rates (%) in Norway (left) and in Russia (right) between 2008 and 2018

Source: Trading Economics.
Norway (left): https://tradingeconomics.com/norway/inflation-cpi (accessed on September 1, 2019)

In 2015, Lukoil in Russia changed its accounting principles from US GAAP to IFRS and its functional currency from the US dollar to the Russian ruble. The reason for the change in accounting principles is not clearly stated. However, among the major Russian oil and gas companies, Lukoil was the only one that adopted US GAAP in 2014. All other Russian independent oil and gas companies, such as Surgutneftegas, Novatek, and Tatneft, as well as Russian NOCs, such as Rosneft and Gazprom, chose the Russian ruble as their functional currency. Hence, the trigger for the change in Lukoil’s functional currency was likely the change in its accounting principles. Figure 4-5 shows a cross-chart between the US dollar/Norwegian krone and US dollar/Russian ruble. Statoil in Norway changed its functional currency from the Norwegian krone to the US dollar in 2009 while Lukoil changed it from the US dollar to the Russian ruble in 2015. It seems that the selection of functional currency depends on each company’s strategy when they are not in a hyperinflationary economy. The rationale behind Lukoil’s change from the US dollar to the Russian ruble is discussed in chapter 5.
4. Change in functional currencies

Several oil and gas companies changed their functional currencies. This study conducted a survey of the financial reports of the top 50 companies and their subsidiaries and identified those that changed their functional currencies. Between 2011 and 2016, the 59 companies shown in Figure 4-1 were in the PIW top 50 (nine fell outside of the top 50 rankings). Table 4-7 shows the three companies that changed their functional currencies: PTTEP in Thailand, Aker BP in Norway, and Lukoil in Russia.

Why do they change it? What events led them to make that change?

Table 4-7. Companies that changed their functional currencies

<table>
<thead>
<tr>
<th>(1)</th>
<th>PTTEP</th>
<th>(2)</th>
<th>Aker BP</th>
<th>(3)</th>
<th>Lukoil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationality</td>
<td>Thai</td>
<td>Norway</td>
<td>Russia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>National Flag</td>
<td>Independent</td>
<td>Independent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old Functional Currency</td>
<td>THB</td>
<td>NOK</td>
<td>USD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old Presentation Currency</td>
<td>THB</td>
<td>NOK</td>
<td>USD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old Accounting Rule</td>
<td>Thai GAAP</td>
<td>IFRS</td>
<td>US GAAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>Accounting rule change</td>
<td>Acquisition</td>
<td>Accounting rule change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Functional Currency</td>
<td>USD</td>
<td>USD</td>
<td>RUB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Presentation Currency</td>
<td>THB</td>
<td>USD</td>
<td>RUB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Accounting Rule</td>
<td>TFRS/IFRS</td>
<td>IFRS</td>
<td>IFRS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources:
(1) PTTEP: Annual report 2011, Challenge.
(3) PJSC “LUKOIL”: Annual report 2015, Always Moving Forward.

119 BP Global Investment Limited owned 30% of the shares of Aker BP as of January 2018: https://www.akerbp.com/en/investor/the-share/largest-shareholders/
4.1 PTTEP

PTTEP is a national flag oil company from Thailand. Although it was not regularly ranked by PIW, it was ranked 50th in the PIW top 50 in 2013. The company changed its functional currency from the Thai baht to the US dollar in January 2011. Since then, PTTEP has complied with the Thai Financial Reporting Standards, which conforms to IFRS. According to PTTEP, the benefits of changing its functional currency were (1) reporting in US dollars to reflect its operation and performance, (2) the ability to benchmark against international oil and gas companies, (3) the resultant positive investor outlook, (4) better access to the global capital market, (5) increased fund-raising capability (e.g., bond issuance), and (6) better information for strategic investment decision making (PTTEP: Benefits and Costs for USD Functional Currency Adoption, May 20, 2014, p. 8).

4.2 Aker BP

Aker BP (formerly Det Norske oljeselskap) is an independent oil and gas company from Norway and a subsidiary of BP. In October 2014, it acquired Marathon Oil Norge AS, a subsidiary of the US Marathon Oil Corporation. Following that acquisition, it changed its functional and presentation currencies from the Norwegian krone to the US dollar but the choice of IFRS remained unchanged. Aker BP’s management decided to change its functional and presentation currencies, as they expected significantly increased revenue from petroleum products, which was mainly denominated in US dollars owing to the acquisition of Marathon Oil Norge AS in October 2014 (Det Norske: Annual Report 2014, p. 91).

Originally, oil and gas companies could select their functional currency based on the indicators specified by accounting rules. However, when the functional currency is changed, management’s discretion is limited. PTTEP and Lukoil changed their functional currencies in 2011 and 2015, respectively, while they also changed their accounting rules. Aker BP changed its functional currency after the acquisition of Marathon Oil Norge AS in October 2014. As Mehta and Thapa (1991) pointed out, the management teams of oil and gas exploration and production (E&P) companies sometimes have discretion in selecting their functional currency. However, when the functional currency changes, this discretion becomes limited, and management needs some event—such as a structural change, a change in business circumstances, or a change in accounting principles—as leverage. This indicates merely the exercise of discretionary rights by some companies, because other companies choose not to change their functional currency. For example, Shell chose not to change its functional currency from US dollars when it acquired BG in 2016, whose functional currency was the British pound.
The management of companies changed the functional currency when some events would occur, such as new acquisitions or accounting rule changes. The management of company would change the functional currency because they would like to change it. These events would give the management of company good reasons to change the functional currency.

5. Implication for Japan’s NFOC: Inpex

Inpex adapts to Japanese accounting standards, which lack the functional currency concept (PwC Japan, 2016). All transactions in currencies other than the Japanese yen are considered foreign currency transactions by Japanese accounting standards. This study does not judge whether the absence of a functional currency concept in Japanese accounting standards is positive or negative. However, it is important to recognize the difference, especially at a time of international M&A.
Chapter 5. Impairment losses

1. Introduction: Shale revolution and impairment losses

The 2014 drop in the price of crude oil revealed the close relationship between upstream oil and gas companies and impairment losses. The global consumption of crude oil and gas in 2017 was about 98.2 million barrels per day and about 3,670 billion cubic meters, respectively (BP, 2018). Unless new oil and gas reserves are found and extracted economically, the global supply of hydrocarbons will be insufficient to meet global demand. This scenario, known as the “peak oil theory,” was detailed by Hubbert in 1956 (Kanekiyo et al., 2013). George Mitchell, the founder of Mitchell Energy, changed peak oil thinking through the innovative technology of hydraulic fracking, which broke shale reservoirs using pressured water. With the advent of this technology and the efforts of Devon Energy, Chesapeake, and other companies, hydrocarbons can be extracted from shale reservoirs (Anderson, 2013; Heck and Rogers, 2014; Peach and Adkisson, 2017).

Figure 5-1. Crude oil production in the US since 1981 (thousand barrels per day)

Source: Generated by the author from data provided by the US Energy Information Administration

121 Crude oil production does not include natural gas liquids or condensate, so the production volume in the US differs from the data shown in Figure 1-3.
One of the reasons for the decline in the price of crude oil was the increase in the crude oil supply due to the US shale revolution. As a result, the US became one of the world’s largest oil-producing countries by the mid-2010s. Figure 5-1 shows crude oil production in the US since 1981. The production increase in the US, especially since the mid-2010s, is considered a critical reason for the decline in global crude oil prices.

How long does dependency on crude oil last? According to BP (2018), renewable energy resources, such as solar power, wind power, hydroelectric power, hydrogen, biomass, geothermal, and other new technologies, are attracting more attention due to growing concerns over increasing CO₂ emissions and climate change. In accordance with the Paris Agreement, the global trend now leans toward carbon dioxide-free energy resources. However, many forecasts have suggested that hydrocarbons—crude oil and natural gas—will continue to play an integral role in the energy supply (BP, 2018). Until a carbon-free economy is established, it is essential for the upstream oil and gas industry to play an important role in the energy sector.

Upstream oil and gas projects are exposed to risks, such as crude oil and natural gas price risks. The projects are extremely capital-intensive, with 85% of the 161 upstream projects financed through alliances or JVs (EY, 2015). The global transaction value of upstream oil and gas in 2017 was US$172.2 billion across 970 transactions; this transaction value was nearly 50% of the combined transaction value of the midstream and downstream oil and gas segments (EY, 2018a). The upstream oil and gas business requires investments in upfront timing in order to find hydrocarbon resources underground, such as crude oil and natural gas. The success or failure of exploration activities can be determined only after the investment has been made. Therefore, oil and gas prices need to be high enough for upstream oil and gas companies to perform exploration and production. Without such high prices, these companies would find it difficult to make a profit. Impairment losses are closely related to global hydrocarbon demand as well as the prices of crude oil and natural gas.

2. M&A and project management in upstream oil and gas companies

Some oil and gas companies choose M&A and project management as their growth strategy. Figure 5-2 shows the relationship between how companies can enhance growth using M&A and project management. It also illustrates where they would end up with the impairment of goodwill and long-lived assets from M&A and project management.
Oil and gas companies sometimes incur impairment losses despite using carefully designed growth strategies. M&A and project management can create significant concerns about the impairment of goodwill and long-lived assets. Figure 5-3 shows the relationship between the enterprise value of target companies and the number of M&A deals. As projects evolve from the exploration phase to the development and production phases, the enterprise value of target companies increase as the project’s risk factors decrease. Each phase includes a project-management process, as described in the respective boxes. Generally, the preparation items in Figure 5-3 can be done by desktop studies. Project viability becomes stronger as the process of project management progresses from exploration to production. As project management is carried out, the Project Management results (see Figure 5-3) determine whether the project can proceed to exploration, development, and production.
3. Data survey and analysis

I examined the 2015 financial statements of the top 50 companies to capture the general impairment loss trend in the oil and gas industry. The survey was carried out on 2014 and 2015 data, which were the years when oil and gas firms were exposed to the crude oil price crash. I also selected 13 companies that had incurred impairment losses of more than US$5 billion, including impairments of goodwill, long-lived assets, and other assets.

What are the general tendencies among the group(s) of top-ranked oil and gas companies that incurred significant impairment losses following the oil price crash in 2015? How can oil and gas companies manage the risk of impairment losses that emerge when business circumstances change?
### Table 5-1a. Impairment losses among the top 50 firms: 2015

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Country</th>
<th>Presentation Currency</th>
<th>Impairments including Goodwill (a)</th>
<th>Goodwill Impairment (b)</th>
<th>Revenue (c)</th>
<th>Assets (d)</th>
<th>Balance of Goodwill (b)/(a)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saudi Aramco</td>
<td>Saudi Arabia</td>
<td>USD</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2</td>
<td>NOC</td>
<td>United Kingdom</td>
<td>USD</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>3</td>
<td>CNPC</td>
<td>China</td>
<td>RMB</td>
<td>0.571</td>
<td>1,078,156</td>
<td>1,078,156</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>4</td>
<td>Eni</td>
<td>Italy</td>
<td>EUR</td>
<td>2,472,457</td>
<td>1,078,156</td>
<td>1,078,156</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Note: The above figures are based on the presentation currency, not on the functional currency, because of readability, data availability and avoidance of confusion. These figures do not provide a complete comparison, as the companies use different disclosure policies.

Source: Footnote 122.

Table 5-1b. Impairment losses among the top 50 firms: 2014

<table>
<thead>
<tr>
<th>2012</th>
<th>Name</th>
<th>Country</th>
<th>Presentation Currency</th>
<th>Impairments including Goodwill (a)</th>
<th>Goodwill Impairment (b)</th>
<th>Revenues (c)</th>
<th>Assets (h)</th>
<th>Balance of Goodwill (i) (g) (a) (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BashArazzo</td>
<td>Saudi Arabia</td>
<td>US$</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>2</td>
<td>INOC</td>
<td>Iran, Islamic Rep.</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>3</td>
<td>CNOOC</td>
<td>China</td>
<td>million RMB/year</td>
<td>19,454</td>
<td>2,786,956</td>
<td>4,024,598</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>4</td>
<td>Exxon Mobil</td>
<td>United States</td>
<td>million US$</td>
<td>n.a</td>
<td>141,929</td>
<td>349,433</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>5</td>
<td>Pdv</td>
<td>Venezuela</td>
<td>million US$</td>
<td>6,844</td>
<td>121,895</td>
<td>226,760</td>
<td>49%</td>
<td>6%</td>
</tr>
<tr>
<td>6</td>
<td>Royal Dutch Shell</td>
<td>Netherlands</td>
<td>million US$</td>
<td>56,893</td>
<td>415,944</td>
<td>555,116</td>
<td>5,598</td>
<td>6%</td>
</tr>
<tr>
<td>7</td>
<td>Shell</td>
<td>Netherlands</td>
<td>million US$</td>
<td>8,198</td>
<td>516,656</td>
<td>284,631</td>
<td>11,744</td>
<td>4%</td>
</tr>
<tr>
<td>8</td>
<td>Rosneft</td>
<td>Russian Federation</td>
<td>billion Russian Rubles</td>
<td>2</td>
<td>5,505</td>
<td>8,716</td>
<td>215%</td>
<td>0%</td>
</tr>
<tr>
<td>9</td>
<td>Gazprom</td>
<td>Russian Federation</td>
<td>billion Russian Rubles</td>
<td>124,084</td>
<td>47,620</td>
<td>55,811</td>
<td>15,177</td>
<td>20%</td>
</tr>
<tr>
<td>10</td>
<td>Total</td>
<td>Petros</td>
<td>million US$</td>
<td>7,697</td>
<td>1,030</td>
<td>225,728</td>
<td>516</td>
<td>13%</td>
</tr>
<tr>
<td>11</td>
<td>Chevron</td>
<td>United States</td>
<td>million US$</td>
<td>1,374</td>
<td>231,970</td>
<td>255,036</td>
<td>4,993</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>Petronas</td>
<td>Brazil</td>
<td>million US$</td>
<td>16,625</td>
<td>143,657</td>
<td>258,687</td>
<td>366%</td>
<td>12%</td>
</tr>
<tr>
<td>13</td>
<td>Sanmartrch</td>
<td>Albania</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>14</td>
<td>KPC</td>
<td>Kuwait</td>
<td>thousand KD</td>
<td>247,542</td>
<td>7,044</td>
<td>31,880,944</td>
<td>22,784</td>
<td>103,853</td>
</tr>
<tr>
<td>15</td>
<td>Faince</td>
<td>Mexico</td>
<td>thousand M Peso</td>
<td>22,645,696</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>16</td>
<td>Lekoil</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>91,341</td>
<td>550</td>
<td>5,504,856</td>
<td>4,778,952</td>
<td>32,060</td>
</tr>
<tr>
<td>17</td>
<td>Adnoc</td>
<td>United Arab Emirates</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>18</td>
<td>QP</td>
<td>Qatar</td>
<td>thousand QR</td>
<td>976,503</td>
<td>168,661,173</td>
<td>400,511,640</td>
<td>n.a</td>
<td>1%</td>
</tr>
<tr>
<td>19</td>
<td>Sinopac</td>
<td>China</td>
<td>million RMB</td>
<td>6,839</td>
<td>2,825,814</td>
<td>1,451,368</td>
<td>6,281</td>
<td>0%</td>
</tr>
<tr>
<td>20</td>
<td>Petronas</td>
<td>Malaysia</td>
<td>million RM</td>
<td>23,943</td>
<td>229,148</td>
<td>337,847</td>
<td>5,624</td>
<td>0%</td>
</tr>
<tr>
<td>21</td>
<td>INOC</td>
<td>Nigeria</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>22</td>
<td>Eni</td>
<td>Italy</td>
<td>million Euro</td>
<td>1,531</td>
<td>94,226</td>
<td>146,207</td>
<td>n.a</td>
<td>2%</td>
</tr>
<tr>
<td>23</td>
<td>ENOC</td>
<td>Egypt, Arab Rep.</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>24</td>
<td>Burguntefegas</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>6,148</td>
<td>890,274</td>
<td>3,305,093</td>
<td>3,270</td>
<td>2%</td>
</tr>
<tr>
<td>25</td>
<td>UNGC</td>
<td>India</td>
<td>million Rupee</td>
<td>2,137</td>
<td>1,671,370</td>
<td>3,332,921</td>
<td>201,399</td>
<td>0%</td>
</tr>
<tr>
<td>26</td>
<td>Pertamina</td>
<td>Indonesia</td>
<td>thousand US$</td>
<td>370,840</td>
<td>134,501</td>
<td>69,995,575</td>
<td>20,695,845</td>
<td>506,618</td>
</tr>
<tr>
<td>27</td>
<td>Repsol</td>
<td>Norway</td>
<td>billion NOK</td>
<td>58</td>
<td>4</td>
<td>403</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>28</td>
<td>ConocoPhillips</td>
<td>United States</td>
<td>million US$</td>
<td>856</td>
<td>55,517</td>
<td>116,559</td>
<td>n.a</td>
<td>3%</td>
</tr>
<tr>
<td>29</td>
<td>KazmunayGas</td>
<td>Kazakhstan</td>
<td>million Tenge</td>
<td>356,683</td>
<td>845,770</td>
<td>1,483,848</td>
<td>n.a</td>
<td>30%</td>
</tr>
<tr>
<td>30</td>
<td>Libya NOC</td>
<td>Libya</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>31</td>
<td>CNOOC</td>
<td>China</td>
<td>million RMB</td>
<td>41,114</td>
<td>254,634</td>
<td>665,859</td>
<td>13,000</td>
<td>1%</td>
</tr>
<tr>
<td>32</td>
<td>PDO</td>
<td>Iran</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>33</td>
<td>Novatek</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>-296</td>
<td>557,643</td>
<td>605,192</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>34</td>
<td>Anadarko</td>
<td>United States</td>
<td>million US$</td>
<td>856</td>
<td>18,470</td>
<td>40,647</td>
<td>5,576</td>
<td>0%</td>
</tr>
<tr>
<td>35</td>
<td>Repsol</td>
<td>Colombia</td>
<td>million Colombian Peso</td>
<td>2,304,567</td>
<td>65,971,888</td>
<td>110,923,851</td>
<td>110,923,851</td>
<td>0%</td>
</tr>
<tr>
<td>36</td>
<td>Repsol</td>
<td>Spain</td>
<td>million Euro</td>
<td>588</td>
<td>7</td>
<td>47,282</td>
<td>51,889</td>
<td>498%</td>
</tr>
<tr>
<td>37</td>
<td>Egypt</td>
<td>United Kingdom</td>
<td>million US$</td>
<td>8,956</td>
<td>23</td>
<td>19,049</td>
<td>61,846</td>
<td>0%</td>
</tr>
<tr>
<td>38</td>
<td>Ecopetrol</td>
<td>United States</td>
<td>billion Canadian $</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>39</td>
<td>CNR</td>
<td>Canada</td>
<td>million Canadian $</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>40</td>
<td>Devon Energy</td>
<td>United States</td>
<td>million US$</td>
<td>1,953</td>
<td>1,941</td>
<td>19,566</td>
<td>58,637</td>
<td>99%</td>
</tr>
<tr>
<td>41</td>
<td>Chesapeake</td>
<td>United States</td>
<td>million US$</td>
<td>93</td>
<td>23,125</td>
<td>40,751</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>42</td>
<td>S AFPHO</td>
<td>Australia</td>
<td>million US$</td>
<td>4,024</td>
<td>242</td>
<td>46,839</td>
<td>1,248,260</td>
<td>2,373%</td>
</tr>
<tr>
<td>43</td>
<td>Apache</td>
<td>United States</td>
<td>million US$</td>
<td>1,931</td>
<td>1,266</td>
<td>12,801</td>
<td>25,922</td>
<td>8%</td>
</tr>
<tr>
<td>44</td>
<td>YPF</td>
<td>Argentina</td>
<td>million Pesos</td>
<td>0</td>
<td>141,942</td>
<td>208,204</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>45</td>
<td>BG</td>
<td>United States</td>
<td>thousand US$</td>
<td>743,571</td>
<td>18,035,340</td>
<td>34,702,687</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>46</td>
<td>Occidental</td>
<td>United States</td>
<td>million US$</td>
<td>7,379</td>
<td>21,947</td>
<td>26,229</td>
<td>n.a</td>
<td>34%</td>
</tr>
<tr>
<td>47</td>
<td>Sinopec</td>
<td>Canada</td>
<td>million Canadian $</td>
<td>1,228</td>
<td>0</td>
<td>40,690</td>
<td>79,671</td>
<td>2,752%</td>
</tr>
<tr>
<td>48</td>
<td>Bashneft</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>13,090</td>
<td>67,271</td>
<td>252,691</td>
<td>n.a</td>
<td>0%</td>
</tr>
<tr>
<td>49</td>
<td>Jepco</td>
<td>Japan</td>
<td>million Yen</td>
<td>33,748</td>
<td>6,760</td>
<td>1,111,226</td>
<td>4,499,193</td>
<td>74,600</td>
</tr>
</tbody>
</table>

Note: The above figures are based on the presentation currency, not on the functional currency, because of readability, data availability and avoidance of confusion. These figures do not provide a complete comparison, as the companies use different disclosure policies.

123 Source: Footnote 123.
Table 5-2a. Revenue and asset amounts among the top 50 firms in 2014 and 2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Country</th>
<th>Presentation Currency</th>
<th>Revenue (a)</th>
<th>Assets (b)</th>
<th>Revenue (c)</th>
<th>Assets (d)</th>
<th>Composition 2014-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Saudi Aramco</td>
<td>Saudi Arabia</td>
<td>USD</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2015</td>
<td>NOC</td>
<td>Iran, Islamic Rep.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2016</td>
<td>CNPC</td>
<td>China</td>
<td>million RMB yuan</td>
<td>2,016,757</td>
<td>3,506,095</td>
<td>2,729,095</td>
<td>4,054,098</td>
<td>1,719,200</td>
</tr>
<tr>
<td>2017</td>
<td>Exxon Mobil</td>
<td>United States</td>
<td>million USD</td>
<td>256,500</td>
<td>356,715</td>
<td>311,399</td>
<td>249,899</td>
<td>181,567</td>
</tr>
<tr>
<td>2018</td>
<td>PDV</td>
<td>Venezuela, Rep.</td>
<td>million USD</td>
<td>72,190</td>
<td>201,945</td>
<td>123,935</td>
<td>228,760</td>
<td>49,798</td>
</tr>
<tr>
<td>2019</td>
<td>Royal Dutch Shell</td>
<td>Netherlands</td>
<td>million USD</td>
<td>272,152</td>
<td>340,157</td>
<td>431,344</td>
<td>233,116</td>
<td>159,188</td>
</tr>
<tr>
<td>2020</td>
<td>BP</td>
<td>United Kingdom</td>
<td>million USD</td>
<td>228,894</td>
<td>261,833</td>
<td>358,678</td>
<td>284,704</td>
<td>135,194</td>
</tr>
<tr>
<td>2021</td>
<td>Rosneft</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>3,410</td>
<td>9,639</td>
<td>2,210</td>
<td>7,384</td>
<td>2,049</td>
</tr>
<tr>
<td>2022</td>
<td>Gazprom</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>6,073,118</td>
<td>37,092,046</td>
<td>5,580,811</td>
<td>15,177,470</td>
<td>483,507</td>
</tr>
<tr>
<td>2023</td>
<td>Total</td>
<td>France</td>
<td>million USD</td>
<td>165,257</td>
<td>222,484</td>
<td>236,122</td>
<td>229,794</td>
<td>70,765</td>
</tr>
<tr>
<td>2024</td>
<td>Chevron</td>
<td>United States</td>
<td>million USD</td>
<td>138,077</td>
<td>206,103</td>
<td>211,970</td>
<td>266,026</td>
<td>73,493</td>
</tr>
<tr>
<td>2025</td>
<td>Petrobras</td>
<td>Brazil</td>
<td>million USD</td>
<td>97,314</td>
<td>230,711</td>
<td>145,957</td>
<td>298,887</td>
<td>56,543</td>
</tr>
<tr>
<td>2026</td>
<td>Rosneft</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>7,499,070</td>
<td>5,026,607</td>
<td>5,046,956</td>
<td>4,735,953</td>
<td>244,194</td>
</tr>
<tr>
<td>2027</td>
<td>Adnoc</td>
<td>United Arab Emirates</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2028</td>
<td>Qatar</td>
<td>Qatar</td>
<td>thousand QR</td>
<td>n.a.</td>
<td>684,845</td>
<td>138,341</td>
<td>94,226</td>
<td>138,341</td>
</tr>
<tr>
<td>2029</td>
<td>Sonopio</td>
<td>China</td>
<td>million RMB yuan</td>
<td>2,018,833</td>
<td>1,443,129</td>
<td>2,822,914</td>
<td>1,451,398</td>
<td>807,029</td>
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<tr>
<td>2030</td>
<td>Petrobras</td>
<td>Mexico</td>
<td>thousand Peso</td>
<td>1,166,362,469</td>
<td>1,775,614,200</td>
<td>1,586,727,874</td>
<td>2,128,368,280</td>
<td>4,236,500,405</td>
</tr>
<tr>
<td>2031</td>
<td>Lukoil</td>
<td>Russia</td>
<td>million Russian Rubles</td>
<td>5,749,070</td>
<td>5,026,607</td>
<td>5,046,956</td>
<td>4,735,953</td>
<td>244,194</td>
</tr>
<tr>
<td>2032</td>
<td>Gazprom</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>6,073,118</td>
<td>37,092,046</td>
<td>5,580,811</td>
<td>15,177,470</td>
<td>483,507</td>
</tr>
<tr>
<td>2033</td>
<td>CNOC</td>
<td>China</td>
<td>million RMB yuan</td>
<td>247,657</td>
<td>391,907</td>
<td>529,148</td>
<td>537,485</td>
<td>31,464</td>
</tr>
<tr>
<td>2034</td>
<td>NOC</td>
<td>Libya</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2035</td>
<td>PSO</td>
<td>Oman</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>2036</td>
<td>Novatek</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
<td>475,222</td>
<td>880,024</td>
<td>357,643</td>
<td>699,199</td>
<td>117,682</td>
</tr>
<tr>
<td>2037</td>
<td>Anadarko</td>
<td>United States</td>
<td>million USD</td>
<td>5,89,289</td>
<td>46,414</td>
<td>8,470</td>
<td>60,097</td>
<td>7,972</td>
</tr>
<tr>
<td>2038</td>
<td>Exxon Mobil</td>
<td>United States</td>
<td>million USD</td>
<td>12,754</td>
<td>17,357</td>
<td>23,323</td>
<td>45,751</td>
<td>10,561</td>
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<td>BP</td>
<td>United Kingdom</td>
<td>million USD</td>
<td>48,139</td>
<td>61,953</td>
<td>44,636</td>
<td>124,280</td>
<td>13,724</td>
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<tr>
<td>2040</td>
<td>BHP Billiton</td>
<td>Australia</td>
<td>million USD</td>
<td>30,912</td>
<td>118,953</td>
<td>44,636</td>
<td>124,280</td>
<td>13,724</td>
</tr>
<tr>
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<td>Apache</td>
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<td>million USD</td>
<td>6,366</td>
<td>18,842</td>
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<td>2042</td>
<td>YPF</td>
<td>Argentina</td>
<td>million Pesos</td>
<td>116,395</td>
<td>365,912</td>
<td>141,342</td>
<td>285,914</td>
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<td>2043</td>
<td>TOTAL</td>
<td>United States</td>
<td>million USD</td>
<td>8,577,428</td>
<td>25,975,244</td>
<td>18,555,140</td>
<td>34,762,88</td>
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<tr>
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<td>Occidental</td>
<td>United States</td>
<td>million USD</td>
<td>12,689</td>
<td>43,457</td>
<td>21,947</td>
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</tr>
<tr>
<td>2045</td>
<td>Inpex</td>
<td>Switzerland</td>
<td>million USD</td>
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<td>77,227</td>
<td>40,490</td>
<td>75,671</td>
<td>10,810</td>
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<tr>
<td>2046</td>
<td>Bashneft</td>
<td>Russian Federation</td>
<td>million Russian Rubles</td>
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<td>675,251</td>
<td>622,081</td>
<td>675,251</td>
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<tr>
<td>2047</td>
<td>Inpex</td>
<td>Japan</td>
<td>million Yen</td>
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<td>4,349,841</td>
<td>1,171,926</td>
<td>4,499,152</td>
<td>1,183,662</td>
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Source: Table 5-1a and 5-1b.

### Table 5-2b. Summary of assets and impairment losses in 2015 (US dollar)

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Country</th>
<th>Functional Currency</th>
<th>As of 2015</th>
<th>US dollar conversion (US$ Million)</th>
<th>US GAAP Impairments (b)</th>
<th>IFRS Impairments (b)</th>
<th>Local Impairments (b)</th>
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<tbody>
<tr>
<td>2015</td>
<td>CNPC</td>
<td>China</td>
<td>RMB</td>
<td>432,023</td>
<td>6,500</td>
<td>6,500</td>
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<tr>
<td></td>
<td>ExxonMobil</td>
<td>United States</td>
<td>USD</td>
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<td></td>
<td>PDV</td>
<td>Venezuela, BS</td>
<td>USD</td>
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<td>Netherlands</td>
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<td></td>
<td>Rosneft</td>
<td>Russian Federation</td>
<td>RUB</td>
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<td>98</td>
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<td>0</td>
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<td>RUB</td>
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<td>Total</td>
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<tr>
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<td>Brazilian Real</td>
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<td>Mexican Peso</td>
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<td>Euro</td>
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<td>0</td>
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<tr>
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<td>Statoil</td>
<td>Russia</td>
<td>Russian Federation</td>
<td>RUB</td>
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<td>23</td>
<td>0</td>
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<tr>
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<td>ONGC</td>
<td>India</td>
<td>Rupee</td>
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<td>Russian Federation</td>
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<tr>
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<td>Euro</td>
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<td>Canadian $</td>
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<td>United States</td>
<td>USD</td>
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</tr>
<tr>
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<td>BHP Billiton</td>
<td>Australia</td>
<td>USD</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>Apache</td>
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<td>USD</td>
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<td>9,230</td>
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</tr>
<tr>
<td></td>
<td>YPF</td>
<td>Argentina</td>
<td>USD</td>
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<td>EOG</td>
<td>United States</td>
<td>USD</td>
<td>26,975</td>
<td>6,614</td>
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<tr>
<td></td>
<td>Occidental</td>
<td>United States</td>
<td>USD</td>
<td>43,457</td>
<td>10,239</td>
<td>10,239</td>
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<tr>
<td></td>
<td>Suncor</td>
<td>Canada</td>
<td>Canadian $</td>
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</tr>
<tr>
<td></td>
<td>Buenos Aires</td>
<td>Argentina</td>
<td>USD</td>
<td>60,568</td>
<td>1,249</td>
<td>1,249</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Sachdev</td>
<td>Russia</td>
<td>Russian Federation</td>
<td>RUB</td>
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<tr>
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<td>Japanese Yen</td>
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<td>379</td>
<td>379</td>
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</tr>
</tbody>
</table>

Note 1: The same exchange rates were used for the calculation in Figures 5-4a and 5-5a. Additional exchange rates against the US dollar in 2015 for Japanese yen, Canadian dollar, and Indian rupee were also used.\(^{124}\)

Notes 2: by ranking:

(14\textsuperscript{th}) KPC ends the fiscal year in March 2016.

(16\textsuperscript{th}) Lukoil changed the functional currency from USD to RUB in 2015.

(20\textsuperscript{th}) Petronas Annual Report 2015 explained that they use both IFRS and local rules (p. 176).

(32\textsuperscript{nd}) CNOOC Annual Report 2015 explained the accounting rule changes from local rules to IFRS/global rules (p. 71).

(36\textsuperscript{th}) Ecopetrol SEC Filing 2015 explained their accounting rule changes from local rules to IFRS (p. 3).

(43\textsuperscript{rd}) BHP Billiton ends the fiscal year in June 2016.

(50\textsuperscript{th}) Inpex ends the fiscal year in March 2016.

Source: 5-1a.

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\(^{124}\) Exchange rates against USD 1 in 2015 were as follows: Japanese yen (121.03), Canadian dollar (1.28), and Indian rupee. X-Rates Webpage at: https://www.x-rates.com/average/?from=USD&to=JPY&amount=1&year=2015 (Japanese yen), https://www.x-rates.com/average/?from=USD&to=CAD&amount=1&year=2015 (Canadian dollar), and https://www.x-rates.com/average/?from=USD&to=INR&amount=1&year=2015 (Indian rupee). All accessed on November 10, 2019.
Table 5.3. Impairment losses for firms whose functional currency is Russian ruble

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Country</th>
<th>Presentation Currency</th>
<th>Impairments excluding Goodwill (A)</th>
<th>Goodwill Impairment (B)</th>
<th>Results of 2015</th>
<th>Results of 2016</th>
<th>Comparison 2015 - 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Lukoil</td>
<td>Russian Federation</td>
<td>Russian Ruble</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2016</td>
<td>Gazprom</td>
<td>Russian Federation</td>
<td>Russian Ruble</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>Sibur</td>
<td>Russian Federation</td>
<td>Russian Ruble</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>Tatneft</td>
<td>Russian Federation</td>
<td>Russian Ruble</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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</table>

Source: Tables 5-1a, 5-1b, and 5-2.

Note: Lukoil’s functional currency was US dollars in 2014. In 2015, Lukoil restated financial statements for 2014 retroactively in Russian rubles.

Table 5.4. Impairment losses for firms whose functional currency is US dollars

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Country</th>
<th>Presentation Currency</th>
<th>Impairments excluding Goodwill (A)</th>
<th>Goodwill Impairment (B)</th>
<th>Results of 2015</th>
<th>Results of 2016</th>
<th>Comparison 2015 - 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Saudi Aramco</td>
<td>Saudi Arabia</td>
<td>USD</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2016</td>
<td>ExxonMobil</td>
<td>United States</td>
<td>USD</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>Royal Dutch Shell</td>
<td>Netherlands</td>
<td>USD</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2018</td>
<td>BP</td>
<td>United Kingdom</td>
<td>USD</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2019</td>
<td>Chevron</td>
<td>United States</td>
<td>USD</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>USD</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>Rosneft</td>
<td>Russia</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>ConocoPhillips</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>Anadarko</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>2024</td>
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<tr>
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<td>0</td>
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</tr>
</tbody>
</table>

Source: Tables 5-1a, 5-1b, and 5-2.
Tables 5-1a and 5-1b show impairment losses among the top 50 firms in 2014 and 2015. Table 5-2a shows the revenue and asset amounts among the top 50 firms in 2014 and 2015. Table 5-2b breaks the data down by accounting rule: US GAAP, IFRS, and local. Table 5-3 shows impairment losses for firms whose functional currency is the Russian ruble, and Table 5-4 shows impairment losses for firms whose functional currency is the US dollar. Together with Saudi Arabia, the US and Russia are the major crude oil-supplying countries in the world.

3.1 Analysis by functional currency: US dollars and non-US dollars

Table 5-2b appears to show a high asset-to-impairment losses ratio for US companies. After Lukoil changed its accounting standards from US GAAP to IFRS in 2015, only US companies adopted US GAAP among the PIW Top 50 companies in 2015. This should be understood as impairment losses from companies that are actively engaged in the shale gas business in the US rather than from the differences among accounting standards.

Figure 5-4a shows the relationship between impairment losses and asset amounts in 2015 for firms whose functional currency is the US dollar. As shown in Figure 5-4a, independent companies, such as Devon Energy and Chesapeake in the US, that are active in the shale business were exposed to significant impairment losses in proportion to their asset size. They grew aggressively; once the business environment changed, however, they were defenseless against impairment risks.

All major oil companies (green) seem to be stable: They all incurred impairment losses (with the exception of ExxonMobil), but these were small relative to their asset sizes. For NOCs and NFOCs, they generally fell between major oil companies (green group) and independent companies (blue).
Figure 5-4a. Relationship between impairment losses and asset amounts (USD in million)

Note 1: Company names in green (major oil companies), orange (NOCs), red (NFOCs), and blue (independent).
Note 2: Total’s functional currency is the euro. Petrobras’s functional currency is the Brazilian real. BG’s functional currency is GBP. These companies are categorized here as references because the presentation currency is the US dollar.
Note 3: Exchange rates are used to calculate the impairment loss amounts and asset amounts for Statoil and YPF.

Source: Table 5-4.

One may wonder whether the cases of Devon Energy and Chesapeake were exceptional in 2015, as their impairment figures are not normal for independent companies. Figure 5-4b shows the relationship between impairment losses and asset amounts in 2015 for firms whose functional currency is the US dollar but excluding Devon Energy and Chesapeake; the general tendency is unchanged. All major oil companies were stable, and independent companies were vulnerable to impairment losses. For NOCs and NFOCs, they generally fell between major oil companies (green) and independent companies (blue). Among NOCs (orange) in Figure 5-4a, Statoil, which changed functional currency from the NOK to the US dollar in 2009, incurred the largest impairment losses in 2015.

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125 Exchange rates against USD 1 in 2015 were as follows: Argentine peso (9.24) and NOK (8.06). X-Rates webpage at: (Argentine peso) https://www.x-rates.com/average/?from=USD&to=ARS&amount=1&year=2015 (NOK) https://www.x-rates.com/average/?from=USD&to=NOK&amount=1&year=2015 (accessed on November 10, 2019).
Figure 5-4b. Impairment losses and asset amounts without Devon Energy and Chesapeake (USD in million)

Source: Figure 5-4a.

Figure 5-5a shows the relationship between impairment losses and asset amounts in 2015 for firms whose functional currency is not the US dollar. Their impairment losses and asset amounts were recalculated in US dollars based on the average monthly exchange rates for the respective currencies. Three companies stood out: Pemex in Mexico, CNPC in China, and Novatek in Russia. Pemex, an export-oriented national oil company, incurred impairment losses amounting to US$27,777 million in 2015. According to Pemex’s 2015 financial statements, this amount represented impairments for wells; pipelines; and properties, plant, and equipment. CNPC is an NFOC, and is considered a representative of China. The amount of impairment losses was not shown in their financial statement in 2015. It is therefore not depicted in Figure 5-5a under the assumption that CNPC did not incur any impairment losses in 2015. However, CNPC incurred a loss under the name of “Loss on Depreciation of Assets,” which seems similar to mark-to-market losses for long-term equity investments. The CNPC Annual Report 2015 noted that “At the end of the year, the long-term equity investment is reviewed and the provision for the depreciation of the long-term equity investment is retained against the difference between the recoverable amount and the carrying value” (p. 49). Therefore, there are two dots for CNPC in Figure 5-5a—one for “Loss on Depreciation of Assets” as a reference. Novatek is an independent company in Russia, which reversed its impairment losses in 2014 and 2015.

126 They may combine impairment losses with others and report them as a different category.
Figure 5-5a. Relationship between impairment losses and asset amounts (non-USD; USD in million)

Note 1: Company names in orange (NOCs), red (NFOCs), and blue (independent).
Note 2: Exchange rates are used to calculate the amounts of impairment losses and asset amounts. Exchange rates are the average monthly exchange rates, except for Pemex, which showed unaudited US dollar amounts in its financial statements. 127
Note 3: (CNPC) shows the figures for “Loss on Depreciation of Assets,” which may not be exactly same as impairment.
Source: Tables 5-1a and 5-1b and Figure 4-1 and CNPC Annual Report 2015.

One may wonder if CNPC and Pemex were extreme cases in 2015. Figure 5-5b shows the exact same figure without these two companies. All Russian companies, two from NOCs (Rosneft and Gazprom) and three from independent companies (Lukoil, Surgutneftegas, Novatek), managed their impairment losses relative to their asset sizes. Bashneft was not shown in Figure 5-5b, as their total assets and impairment were too small in 2015,128 and it had already been acquired by Rosneft. Among the six Russian companies (Rosneft, Gazprom, Lukoil, Surgutneftegas, Novatek, and Bashneft), Lukoil—which changed its functional currency from the US dollar to the Russian ruble in 2015—incurred the largest impairment losses in 2015.

127 Exchange rates against USD 1 in 2015 were: Russian ruble (61.20), euro (0.9), Kazakhstan tenge (222.22), Norwegian krone (8.06), Chinese yuan renminbi (6.28), Colombian peso (2,740.97), Malaysian ringgit (3.9), and Kuwaiti dinar (0.3). X-Rates webpage at: https://www.x-rates.com/average/?from=USD&to=RUB&amount=1&year=2015 (RUB) https://www.x-rates.com/average/?from=USD&to=EUR&amount=1&year=2015 (EUR) https://www.x-rates.com/average/?from=USD&to=KZT&amount=1&year=2015 (KZT) https://www.x-rates.com/average/?from=USD&to=NOK&amount=1&year=2015 (NOK) https://www.x-rates.com/average/?from=USD&to=CNY&amount=1&year=2015 (CNY) https://www.x-rates.com/average/?from=USD&to=COP&amount=1&year=2015 (COP) https://www.x-rates.com/average/?from=USD&to=MYR&amount=1&year=2015 (MYR) https://www.x-rates.com/average/?from=USD&to=KWD&amount=1&year=2015 (KWD). All accessed on September 1, 2019

128 Bashneft’s total assets and impairment in 2015 were 502 billion and 518 million Russian ruble, respectively, which were equivalent to US$8.5 billion and US$8 million (see Table 5-3, p. 72).
In chapter 4, Lukoil’s decision to change its functional currency in 2015 from the Russian ruble to the US dollar was seemingly unique because it could take advantage of the ruble’s lower value against the US dollar. Figure 5-6 shows the historical US dollar/Russian ruble exchange rate and WTI crude prices. In March 2014, the European Union, the United States, and a host of other Western industrial countries imposed political and economic sanctions on Russia in opposition to its aggressive activities in Eastern Ukraine and its annexation of Crimea and Savastopol. On December 15, 2014 (which became known as “Red Monday”), the Russian ruble lost more than 10% of its value. The following day, the Bank of Russia quickly increased its bank borrowing rate to 17% from 10.5% (Eitman et al., 2016, pp. 285–286).

Figure 5-6. US dollars/Russian ruble and WTI crude prices

Source: Trading Economics.

Table 5-3 shows the improved revenue performance and asset increases for firms whose functional currency is the Russian ruble compared to firms whose functional currency is the US dollar (with the exception of Bashneft, which was acquired [50.07%] by Rosneft in 2016). As Table 5-3 shows, Bashneft underperformed other Russian companies, with decreasing revenues and assets. One might argue that Bashneft’s performance in 2015 was the reason behind the M&A in 2016. The oil and gas firms whose functional currency was the Russian ruble saw an increase in revenues and total assets, with the exception of Bashneft and Rosneft’s revenues (see Table 5-3, p. 72). In addition, none of the firms whose functional currency was the Russian ruble experienced decreased goodwill value among the five firms that disclosed financial statements. 130 Three companies—Rosneft, Gazprom, and Lukoil—saw increased remaining goodwill values. The reasons for these increases were not well-explained in the financial statements of the three Russian companies. However, Lukoil’s increase was largely due to foreign currency translation differences, as well as M&A.

Conversely, the oil and gas firms whose functional currency was the US dollar did not perform well in comparison to the firms whose functional currency was the Russian ruble. Of the firms whose functional currency was the US dollar, none saw an increase in the value of goodwill. All firms among the top 50 companies saw a decrease in revenues, with the exception of YPF’s revenue and Chevron’s assets. As it is an Argentinian company, some portion of YPF’s expenses (such as taxes, employee salaries, and local procurements) were denominated in Argentine pesos. It was difficult for firms whose functional currency was the US dollar to increase their assets and revenues in 2015, given the oil price crash.

Oil-exporting countries tried to mitigate the impact of the oil price crash. Firms could exercise managerial discretion and change their functional currency from the US dollar to their national currencies. One could argue that Statoil changed its functional currency from the Norwegian krone to the US dollar during a currency depreciation phase in 2009. One can also assume that, if Lukoil had not changed its functional currency from the US dollar to the Russian ruble, it would have had a tough time increasing its assets and revenue. It is not easy to increase revenue when the price of oil has significantly declined unless oil and gas production has significantly increased. Hence, Lukoil’s decision is justifiable, as it not only increased its revenue but also its assets in 2015. When currency depreciation occurs, the functional currency of a firm is determined by its own strategies, as with Lukoil and Statoil.

3.2 Analysis by impairment amount: No or reversal of impairment losses

ExxonMobil in the US and CNPC in China incurred no impairment losses. ExxonMobil is the highest-ranked among the major oil companies, while CNPC is the highest-ranked among national

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130 There is no evidence that Russian firms manipulate their accounting books. If they did, it would be impossible to hide the accounting fraud for long.
flag oil companies. In its 2015 financial statements, ExxonMobil stated “In general, the Corporation does not view temporarily low prices or margins as a trigger event for conducting impairment tests (ExxonMobil Financial Statements 2015, p. 23). Figure 5-7 shows WTI settlement prices and forward prices as of December 31, 2014 and December 31, 2015. Clearly, the forward prices as of December 31, 2015 were lower than those in 2014. The New York Mercantile Exchange (Nymex) WTI settlement prices and the Nymex forward curve of WTI showed a curve on December 31, 2015 that was lower than that on December 31, 2014. New York Attorney General Eric Schneiderman opened an investigation into the accounting practices of ExxonMobil to see why ExxonMobil did not write off its asset value despite the oil price drop. ExxonMobil incurred impairment losses in 2016 of US$2,027 million (ExxonMobil Financial Statements 2016, p. 12). CNPC’s financial statements explained its approach to impairment losses; however, it is unclear if there were impairment losses in 2014 and 2015. CNPC incurred the loss under the name of “Loss on Depreciation of Assets,” which seems similar to mark-to-market losses for long-term equity investments. CNPC Annual Report 2015 stated that “At the end of the year, the long-term equity investment is reviewed and the provision for the depreciation of the long-term equity investment is retained against the difference between the recoverable amount and the carrying value” (p. 49). Novatek reversed its impairment losses with consecutive profits in 2014 and 2015; it was the only company among the top-ranked companies that disclosed impairment losses.

The fact that two companies (ExxonMobil and CNPC) did not incur impairment losses and that one company (Novatek) reversed its impairment losses during the oil price crash illustrate that there is some room for managerial discretion in incurring impairment losses once the decision is supported by their accounting rules.

Figure 5-7. WTI settlement prices and forward prices


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131 New York Attorney General Eric Schneiderman investigated the accounting practices of ExxonMobil to see why ExxonMobil did not write down its assets value despite the oil price drop. Fortune Website: http://fortune.com/2016/09/16/exxon-accounting-practices/ (accessed on September 28, 2018).
3.3 Analysis by impairment loss: More than US$5 billion

Table 5-5 lists 13 companies that incurred impairment losses greater than US$5 billion or the foreign currency equivalent in 2015. All four categories are shown in the list: one major oil company, three NFOCs, three NOCs, and six independent companies. Ten out of 13 companies stated in their financial statements that they were engaged in the US shale business. For example, Devon Energy has been an integral part of the US shale business since its acquisition of Mitchell Energy (Heck and Rogers, 2014). They were exposed to impairment losses, but such losses may also show that they are the risk takers and challengers as regards key innovations.

Table 5-5. Companies that incurred impairment losses greater than US$ 5 billion in 2015

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Country</th>
<th>Impairment losses (million)</th>
<th>Government Ownership (%)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Shell</td>
<td>Netherlands</td>
<td>US$ 9,329[^132]</td>
<td>-</td>
<td>Major</td>
</tr>
<tr>
<td>10</td>
<td>Total</td>
<td>France</td>
<td>US$ 6,877[^133]</td>
<td>-</td>
<td>National Flag</td>
</tr>
<tr>
<td>12</td>
<td>Petrobras</td>
<td>Brazil</td>
<td>US$ 12,299[^134]</td>
<td>28.7</td>
<td>National Flag</td>
</tr>
<tr>
<td>15</td>
<td>Petemex</td>
<td>Mexico</td>
<td>MXN 477,945[^135]</td>
<td>100</td>
<td>NOC</td>
</tr>
<tr>
<td>20</td>
<td>Petronas</td>
<td>Malaysia</td>
<td>RM 21,201[^136]</td>
<td>100</td>
<td>NOC</td>
</tr>
<tr>
<td>23</td>
<td>Eni</td>
<td>Italy</td>
<td>Euro 6,792[^137]</td>
<td>30.1</td>
<td>National Flag</td>
</tr>
<tr>
<td>28</td>
<td>Statoil</td>
<td>Norway</td>
<td>NOK 63,300[^138]</td>
<td>67</td>
<td>NOC</td>
</tr>
<tr>
<td>35</td>
<td>Anadarko</td>
<td>USA</td>
<td>US$ 5,075[^139]</td>
<td>-</td>
<td>Independent</td>
</tr>
<tr>
<td>41</td>
<td>Devon Energy</td>
<td>USA</td>
<td>US$ 20,820[^140]</td>
<td>-</td>
<td>Independent</td>
</tr>
<tr>
<td>42</td>
<td>Chesapeake</td>
<td>USA</td>
<td>US$ 18,485[^141]</td>
<td>-</td>
<td>Independent</td>
</tr>
<tr>
<td>43</td>
<td>BHP Billiton</td>
<td>Australia</td>
<td>US$ 7,395[^142]</td>
<td>-</td>
<td>Independent</td>
</tr>
<tr>
<td>46</td>
<td>EOG</td>
<td>USA</td>
<td>US$ 6,614[^143]</td>
<td>-</td>
<td>Independent</td>
</tr>
<tr>
<td>47</td>
<td>Occidental</td>
<td>USA</td>
<td>US$ 10,239[^144]</td>
<td>-</td>
<td>Independent</td>
</tr>
</tbody>
</table>

Note 1: Selected from the annual reports of the top 50 companies.
Note 2: The impairment losses are not the same, as some are shown as gross amounts, net amounts (reversal of impairment losses), and/or on disposal of assets with a gain/loss.
Note 3: The fiscal year of BHP Billiton ends in June 2016.

3.3.1 Shell (One major oil company)

Shell is a major oil company from the Netherlands. Shell reviewed its long-term oil and gas price outlook in 2015 and identified impairment losses of US$4.4 billion to its upstream North American shale properties. It ceased its Alaskan drilling activities and the Carmon Creek project in Canada, resulting in losses of US$1.8 billion and US$2.2 billion, respectively. Shell utilized the nominal pre-

[^135]: Pemex Consolidated Financial Statements 2015, p. 5. The unaudited figure in USD was US$27,776,985 thousand.
[^140]: Devon Energy 2015 Letter to Shareholders and Form 10-K, p. 79.
[^141]: Chesapeake Energy Corporation 2015 Annual Report, p. 142
[^142]: BHP Billiton Annual Report 2016 (as of June 2016), pp. 68, 78.
tax discount rate of 6% (Shell Annual Report 2015, p. 131). Neither the Alaskan drilling activities nor the Carmon Creek project in Canada showed evidence that these projects were related to past M&A transactions.

3.3.2 Pemex, Petronas, and Statoil (Three export-oriented national oil companies)

Pemex is a Mexican national oil company that incurred approximately US$27,777 million in impairment losses, mainly due to decreased cash flows as a result of the steep decline in crude oil prices and the condition of economic hydrocarbon reserves. As shown in Tables 5-1a and 5-1b, Pemex is unclear if they incurred impairment losses for goodwill in 2014 and 2015. Petronas in Malaysia incurred impairment losses amounting to RM 21,201 million (see Table 5-5, p. 80), of which RM 20,178 million came from their upstream operations (Petronas Annual Report 2015, p. 248). As shown in Tables 5-1a and 5-1b, Petronas did not incur impairment losses for goodwill. Statoil, renamed “Equinor,” is a national oil company from Norway. Statoil changed its functional currency from the Norwegian krone (NOK) to US dollars in January 2009 while retaining the Norwegian krone as its presentation currency¹⁴⁵ (Statoil Annual Report on Form 20-F, 2008). Statoil declared NOK 63.3 billion as net impairment losses. Of this amount, NOK 53.5 billion came from production and development assets, which are long-lived (Statoil Annual Report 2015, p. 171). Statoil acquired Hydro’s oil and gas division on October 2007 (Statoil Annual Report 2015, p. 13). As shown in Tables 5-1a and 5-1b, Statoil incurred impairment losses for goodwill, which were primarily US onshore assets and thus arose from past M&A transactions.

3.3.3 Total, Petrobras, and Eni (Three import-oriented national flag companies)

Total-France is a major oil company (Kanekiyto et al., 2013). Out of US$6,877 million of asset impairment charges, US$6,783 million was associated with Total’s upstream business operations (p. F-26). As shown Tables 5-1a and 5-1b, Total incurred impairment losses for goodwill in 2014 and 2015, which indicated past M&A transaction(s). Petrobras is a national flag company in Brazil, a net energy-importing country. It incurred US$ 12,299 million in impairment losses but did not incur any impairment losses for goodwill. Of these losses, US$ 8,653 million came from producing properties and US$ 1,352 million came from its refinery business (Petrobras financial statement 2015, pp. 45, 77). Eni is a national flag company from Italy. It incurred US$6,792 million in asset impairments in 2015; those due to exploration and production assets amounted to US$4,502 million and those due to the chemical business amounted to US$ 1,393 million (Eni Annual Report 2015, p. 68). As shown in Tables 5-1a and 5-1b, Eni is unclear if they incurred impairment losses for goodwill in 2014 and 2015.

¹⁴⁵ The presentation currency is the currency in which the financial statements are presented (PwC Japan, 2016).
3.3.4 Anadarko, Devon Energy, Chesapeake, EOG, BHP Billiton, and Occidental (Six independent oil companies)

All six companies are US independent companies. Anadarko incurred US$5,075 million in impairment losses in 2015, of which US$3,684 million was from US onshore properties and US$1,039 million was from midstream assets, both of which are long-lived assets (Anadarko Annual Report, p. 101). Anadarko was aggressive in pursuing M&A growth.\textsuperscript{146} Anadarko had approximately US$5.4 billion of goodwill on December 31, 2015, allocating US$4.9 billion to oil and gas exploration and production, US$383 million to WES gathering and processing facilities, US$5 million to WES transportation, and US$62 million to other gathering and processing facilities (Anadarko Annual Report 2015, p. 52). Devon Energy incurred US$20,820 million in impairment losses, of which US$17,992 came from its US oil and gas fields (Devon Energy Annual Report 2015 p. 79). As shown in Tables 5-1a and 5-1b, Devon Energy incurred impairment losses for goodwill in 2014 and 2015. Devon Energy also recorded US$5,032 million as goodwill as of December 31, 2015 (Devon Energy Annual Report 2015 p. 87), which indicated past M&A transactions. Chesapeake incurred impairment losses of US$18,485 million in 2015, which consisted of natural gas properties (US$18,238 million), fixed assets and others (US$194 million), and investments (US$53 million) (Chesapeake Annual Report 2015, p. 147). As shown in Tables 5-1a and 5-1b, Chesapeake did not show goodwill impairment in 2014 and is unclear if they incurred impairment losses for goodwill in 2015. EOG Resources, formerly known as the “Enron Oil & Gas Company,” was one of Enron’s subsidiaries. It became independent from Enron Corp in 1999.\textsuperscript{147} EOG has been active in shale along with Devon Energy and Chesapeake. In 2015, EOG incurred approximately US$6,614 million in impairment losses. EOG is unclear if they incurred impairment losses for goodwill in 2014 and 2015 (see Table 5-1a, b; pp. 68-69). BHP Billiton, one of the world’s major mineral mining companies, also has an upstream oil and gas business that incurred US$7,394 million in impairment losses. Most of these losses were associated with several cash-generating units of the petroleum segment as at their fiscal year-end in June 2016. In August 2011, BHP Billiton acquired Petrohawk Energy Corporation in the US. BHP Billiton did not incur goodwill impairment, with the exception of US$1 million in June 2016. However, it incurred US$542 million in goodwill impairments in June 2015 as a result of onshore US petroleum projects (see Table 5-1b, p. 69). Occidental also incurred impairment losses totaling US$10,239 million, of which US$4,491 million came from the Middle East and North Africa and US$3,686 million came from the United States. Occidental is unclear if they incurred impairment losses of goodwill in 2014 and 2015 (see Table 5-1a, b; pp. 68-69), but the company has been active in the acquisition of new assets. Occidental’s 2014 and 2015 annual reports indicated active

\textsuperscript{146} Among Anadarko’s multiple acquisitions, the biggest was the acquisition of Kerr-McGee in 2006, which amounted to US$16.4 billion (Forbes website: https://www.forbes.com/2006/06/23/anadarko-0623markets06.html#28bf2229e709), (accessed on November 11, 2019). Occidental completed the acquisition of Anadarko on August 8, 2019, in a transaction valued at $55 billion, including the assumption of Anadarko’s debt.

\textsuperscript{147} EOG Resources website: http://www.eogresources.com/about/company_history.html (accessed on October 1, 2018).
acquisitions of overseas assets.\textsuperscript{148}

If a company incurs an impairment to its goodwill, this indicates past M&A activities. If these activities were asset acquisitions instead of company acquisitions, the impairment may be shown as losses for property, plant, and equipment and other intangible assets.

Table 5-6 shows the total assets and impairment losses among the PIW top 50 companies in 2015. It is not a complete comparison table: Some companies did not disclose financial statements in 2015, so the numbers from only 39 companies are available for 2015. These companies adapt to different accounting rules. Some companies show only the net amounts of impairment losses after combining the reversal of impairment losses and do not break these down in detail.

The PIW ranking is not necessarily linked to the companies’ asset size. Some companies have high rankings even though their assets are small. However, all companies in the top 20 have more than US$100 billion, except for Lukoil (16\textsuperscript{th}). Table 5-6 may suggest that, for Inpex to be ranked around 20, it needs to double or triple its asset size.

4. Hedge accounting

Multinational enterprises (MNEs) possess a multitude of cash flows that are sensitive to changes in exchange rates, interest rates, and commodity prices (Eiteman et al., 2016, p. 295). Eiteman et al. (2016) discuss the pros and cons of currency hedging, which also seem to apply to commodity price risks, such as for crude oil and natural gas. They point out that one advantage of reduced risk for future cash flows is the improvement in the firm’s planning capability. If the firm can reduce the risk of future cash flows, the firm can reduce the likelihood that its cash flows will fall below a level sufficient to make debt service payments required for continued operation. Eiteman et al. (2016) also point out that one disadvantage is that management often conducts hedging activities that benefit management at the expense of shareholders. Moreover, they argue that management’s motivation for reducing cash flow variability is sometimes accounting-related: Management may believe that it will be criticized more severely for incurring foreign exchange losses than for incurring even higher cash costs through hedging (p. 297).

Generally, MNEs are sensitive to changes in commodity prices, but some companies are not sensitive enough to apply hedge accounting. None of the 13 companies’ derivative instruments in 2015 is qualified as hedge accounting under their accounting rules. These companies either clearly state that their derivative instruments are not qualified as hedge accounting or are unclear on this point. In general, they do not seem keen to implement hedge accounting, partly because companies like Eni and Statoil believe that their integrated footprints (ranging across upstream, midstream, and downstream operations) have created a natural hedge effect (Eni, p. 89; Statoil, p. 96). A natural hedge

\textsuperscript{148} In December 2014, Occidental spent $1.3 billion on an acquisition in the Permian Basin totaling approximately 100,000 net acres (Occidental Annual Report 2015, p. 53).
is considered a risk-mitigating function embedded in their range of portfolios. When the oil price is high, an upstream business benefits from the elevated oil price environment, as the firm can sell crude oil with a high price. Conversely, when the oil price is low, a downstream business benefits from this price environment, as the firm can buy crude oil at a low price. However, the positions and operations of companies such as Eni and Statoil are not naturally hedged at all.

Table 5-7 shows notes related to hedge accounting in financial statements for the 13 companies that incurred impairment losses greater than US$ 5 billion in 2015.

Table 5-7. Notes related to hedge accounting in financial statements

<table>
<thead>
<tr>
<th>Ranking in 2015</th>
<th>Company</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Shell</td>
<td>“In the course of 2015, Shell purchased sterling cash and forward contracts to hedge the exchange rate exposure of the cash element of the BG acquisition. Management has chosen to apply cash flow hedge accounting using the sterling cash and forward contracts as hedging instruments” (p. 110).</td>
</tr>
<tr>
<td>10</td>
<td>Total</td>
<td>“Financial instruments related to commodity contracts, including crude oil, petroleum products, gas, power, and coal purchase/sales contract derivative instruments, such as energy contracts and forward freight agreements, are used to adjust the Group’s exposure to price fluctuations with global trading limits. According to the industry practice, these instruments are considered as held for trading” (p. F-13).</td>
</tr>
<tr>
<td>12</td>
<td>Petrobras</td>
<td>“The Company mitigates the risk of its results through the use of derivative and non-derivative instruments, some of which qualify for cash flow hedge accounting” (p. 18).</td>
</tr>
<tr>
<td>15</td>
<td>Pemex</td>
<td>“Although PEMEX entered into these contracts with economic hedging purposes, for accounting purposes, these DFIs do not qualify as hedges and were recorded as trading instruments in the financial statements” (p. 70).</td>
</tr>
<tr>
<td>20</td>
<td>Petronas</td>
<td>“MFRS 9 replaces the guidance in MFRS139 Financial Instruments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recognition and Measurement on the classification and measurement of financial assets and financial liabilities, and on hedge accounting. The Group is currently assessing the financial impact that may arise from the adoption of MFRS 9” (p. 277).</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>It seems Petronas did not use hedge accounting.</td>
</tr>
<tr>
<td>23</td>
<td>Eni</td>
<td>“[Also] special items allow to allocate to future reporting periods gains and losses on re-measurement at fair value of certain non-hedging commodity derivatives and exchange rate derivatives relating to commercial exposures, lacking the criteria to be designed as hedges, including the ineffective portion of cash flow hedges and certain derivative financial instruments embedded in the pricing formula of long-term gas supply agreements of the Exploration &amp; Production segment” (p. 67).</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>It seems Eni did not use hedge accounting.</td>
</tr>
<tr>
<td>28</td>
<td>Statoil</td>
<td>“Statoil utilizes correlations between all of the most important market risks, such as oil and natural gas prices, product prices, currencies and interest rates, to calculate the overall market risk and thereby utilize the natural hedges embedded in its portfolio” (p. 96).</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>Their natural hedge does not seem to function properly.</td>
</tr>
<tr>
<td>35</td>
<td>Anadarko</td>
<td>“The company does not apply hedge accounting to any of its derivative instruments” (p. 105).</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>It is clear that Anadarko does not apply hedge accounting.</td>
</tr>
<tr>
<td>41</td>
<td>Devon Energy</td>
<td>“[Because] we have chosen not to qualify our derivatives for hedge accounting treatment, changes in the fair values of derivatives can have a significant impact on our reported results of operations” (p. 50).</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>It is clear the Devon Energy does not apply hedge accounting.</td>
</tr>
<tr>
<td>42</td>
<td>Chesapeake</td>
<td>“[Although] we no longer designate our derivatives as cash flow hedge for accounting purpose” (p. 21).</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>Chesapeake did not use cash flow hedge anymore.</td>
</tr>
<tr>
<td>43</td>
<td>BHP Billiton</td>
<td>“Commodity prices and currency exchange rates are not generally hedged, and wherever possible we take the prevailing market price” (p. 36).</td>
</tr>
<tr>
<td></td>
<td>Comments</td>
<td>BHP Billiton does not seem to use hedge accounting.</td>
</tr>
<tr>
<td>46</td>
<td>EOG</td>
<td>“During the three-year period ended on December 31, 2015, EOG elected not to designate any of its financial commodity derivative instrument as accounting hedges” (p. F-9).</td>
</tr>
</tbody>
</table>
EOG does not seem to use hedge accounting.

"Occidental’s marketing and trading operations, from time to time, store natural gas purchased from third parties at Occidental’s North American leased storage facilities. Derivative instruments are used to fix margins on the future sales of the stored volumes through March 2017” (p. 57).

It can be concluded that these derivatives were not used for their upstream oil and gas operation.

Source: Each company’s financial statements in 2015.

Some of the impairment losses, like goodwill, are non-cash losses (Devon Energy, p. 87); therefore, some of the companies do not prioritize hedge accounting. Once capital expenditure is spent in upstream oil and gas projects, it should be amortized and expensed for a certain period, depending on the accounting rules. However, payments for capital expenditure are recorded as a negative cash flow. Hence, the cash flow is not immediately influenced by impairment losses.

5. Oil and gas price hedging

Financial growth for upstream oil and gas companies requires controlling risk exposure. Derivative instruments are a tool for oil price and currency exchange risk mitigation. Yamaguchi and Fujii (1998) introduced commodity derivatives for the oil and gas business. Figure 5-8 presents an example they used for swap transactions (p. 21), illustrating an upstream oil and gas-producing company that enters into a swap contract to mitigate their production of 500,000 barrels of oil by hedging half of the volume. The figure shows that the company is exposed to the price fluctuation risk of the Dubai crude oil spot prices to swap houses. All 13 oil and gas companies are vulnerable to oil and gas prices in the market, and all of them disclose their derivative usage in their financial statements.

Figure 5-8. Hedge transaction

6. **Contracts in oil and gas upstream business**

Financial growth for upstream oil and gas companies requires the firms to modify their business model to cope with the risk tolerance allocated by management. Kanekiyo et al. (2013) explained that there are generally three types of contracts between upstream oil and gas companies and landowners. The first contract type is the land lease agreement, in which the owner(s) of land or a governmental authority leases the rights to use the land or assigns mineral rights for a limited period. In return, the upstream oil and gas companies pay a royalty to the landowner(s) and/or government. The second type is the production-sharing contract (PSC),\(^{149}\) which was introduced by Indonesia in the 1960s. Under a PSC, the host country’s government retains the decision-making power for important subjects and receives the benefits of technology transfer from international oil companies. The host country’s government is not financially responsible even if the project fails. The third contract type is the service agreement, also known as the “technical service contract” or “risk service contract.” This contract type grants more protection to the host country’s government than the PSC. The operating partner receives only risk fees, which can be more remote than the benefits arising from oil price increases.

Ghandi and Lin (2014) studied the third type, oil and gas service contracts, from 1990–2014 on a global basis, stating that “a service contract is a long-term contractual framework that is used by some host governments to acquire the international oil companies’ expertise and capital without having to hand over the field and production ownership rights to them” (p. 1).\(^{150}\) They further pointed out that “the new interest in service contracts might be explained partially by heightened sovereignty concerns and the political environment on one hand, and the need for international oil companies’ capital and know-how in developing oil and natural gas fields in the host countries on the other” (p. 1). In general, host governments have been more inclined to use the service contract than the lease contract or PSC since the 1960s.

7. **Implication for Japanese upstream oil and gas companies**

Japanese accounting standards allow companies to amortize goodwill, but neither IFRS nor US GAAP allows this. Inpex adopts Japanese accounting standards. Tables 5-1a and 5-1b show the amortized amounts of goodwill for Inpex (ranked 50th in 2015) under Japanese accounting standards. This study does not judge whether this unique allowance in Japanese accounting standards is positive or negative. However, it is important to recognize the difference if companies adopt Japanese accounting standards.

The PIW ranking for 2015 shows that all companies in the top 20 have more than US$100 billion except for Lukoil (16th). If Inpex is to climb up to around 20th in the ranking, it needs to double or triple its asset size. The growth of M&A may allow Inpex to increase their assets quickly.

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\(^{149}\) In Russia, it is called a “Production Sharing Agreement” (PSA).

\(^{150}\) Ghandi and Lin (2014) studied eight major oil- or natural gas-producing countries that have either adopted a variation of a service contract or have shown interest in this framework, such as Iran, Kuwait, Venezuela, Mexico, Bolivia, Ecuador, Iraq,
Eni and Statoil did not seem to build “natural hedge positions” in their operations. One can assume that even a company with an integrated value chain from upstream to downstream will have a hard time achieving natural hedge operations. In chapter 3, I discussed the possibility of a merger between Inpex and Japex, which do not own downstream businesses such as refineries. The expansion of scale through the merger of Inpex and Japex will not create a natural hedging position as long as there is no downstream business. If the merged Inpex and Japex entity would then merge with JX, Cosmo, or Idemitsu refineries, they could eventually become a corporate entity that integrates upstream and downstream operations. However, Eni and Statoil have not been able to achieve a firm natural hedge position. Thus, even if a corporate entity emerges that integrates upstream and downstream operations, it may be difficult to fully achieve a natural hedge. Therefore, the use of derivatives and the adoption of hedge accounting may be important for mitigating fluctuation risks to profitability.
Chapter 6. Conclusion

1. Introduction

This work is an empirical study on multinational oil companies following the 2010 shale revolution in the US. When the purely theoretical concept of firm growth is replaced by the operational and empirical concept of corporate financial growth, several traditional management theories do not function well, because financial growth needs to accommodate the turbulence of financial losses during the growth process. In this study, I stress the financial growth of firms, which is influenced by the selection of functional currencies and impairment losses. While Penrose (1959) discusses the theory of the growth of the firm, this study discusses the financial growth that is implicated in firms’ actual business. I considered and presented a kind of financial growth cycle (see Figure 2-3, p. 24) for upstream oil and gas companies, which is affected by firms’ choices of functional currencies and impairment losses. This is the key research contribution of this study.

The study also contributes to economic policies and management strategies. Regarding management strategies, this study provides insights that Japanese upstream oil and gas companies can use by discussing the debate between the approaches taken by CERA (2006) and Abo et al. (2008). The difference between CERA (2006) and Abo et al. (2008) concerns the selection of operational strategy. This does not seem related to financial growth items. However, core value creation for firm growth is essential in order for companies to achieve financial growth. Hence, this is relevant for the financial growth of firms, especially for Japanese upstream oil and gas companies. Regarding economic policies, this study offers implications for Inpex as a national flag oil company in Japan. I clarified these points in chapters 3, 4, and 5.

2. Japanese upstream oil and gas companies

2.1 Too little for too many

Chapter 3 asks what the Japanese government can do to mitigate the “too little for too many” issue. The chapter clarifies that companies in which the Japanese government owns a stake should benchmark themselves to other countries’ NFOCs.

With the exception of China, no other country has more than two national flag oil companies. Japan has two: Inpex (ranked 43rd in 2016) and Japex (unranked). Studies show that one of the issues for Japan’s upstream oil and gas companies is that there is “too little for too many.” Thus, it seems logical to consider combining Inpex and Japex. Although the government is not keen on this, it may be able to put itself in the right position to facilitate merger discussions between the two companies.

Financial growth in this study is also influenced by financial hedges and hedge accounting; however, these points are briefly discussed.
The government nominates the top executives to the management of both companies, it owns the golden share in Inpex with veto rights, and it owns more than one-third of Japex’s shares.

Another growth opportunity for Japanese upstream oil and gas companies is to acquire overseas oil and gas companies using a Japanese consortium, like how Total S.A., a French NFOC, acquired Petrofina, a Belgium company in 1999 and how Eni, an Italian NFOC, acquired 20% of the ADNOC refinery in 2019. If a strong NFOC is born in Japan, it may be possible to expect growth through various M&As for overseas opportunities with the support of the Japanese government.

This point may not seem directly related to financial growth in this study, which is influenced by currency exposure through the selection of functional currencies and impairment losses. However, it is essential to the core value of strategic entities, such as Inpex, a Japanese national flag oil company.

2.2 Paved or unpaved road

Chapter 3 also asks which growth path Japanese upstream oil and gas companies should pursue for firm growth. It has been more than a decade since CERA (2006) and Abo et al. (2008) advocated two different strategies for a firm’s growth path, yet Japanese oil and gas companies still struggle to become top performers.

Jackson and Hobbs (2006) in CERA recommended that Japanese oil and gas companies acquire more shares at the initial stage of a new upstream project, rather than acquiring fewer shares initially and then increasing their shareholding later. Jackson and Hobbs (2006) gave their recommendation based on an analysis of top performers in other countries in terms of (1) portfolio focus and depth, (2) capital discipline, (3) acquisition strategies, and (4) long-term vision. They also recommended that Japanese oil and gas companies take operatorship and acquire strategic alliances with large independent oil and gas companies. On the other hand, Abo et al. (2008) recommended that Japanese oil and gas companies acquire interests in assets at a later stage of the project life cycle and enhance the recovery ratio of hydrocarbons by using their competitive advantage in different technologies, which has always been a strength of Japanese manufacturers.

Operatorship is important for gaining project management capability, regardless of the strategy followed. I conducted four interviews with experts on Japan’s oil and gas business who have global experience. Two of the experts were from Japan, one was from the US, and one was from Russia. According to them, both strategies are important for Japanese oil and gas companies. However, it is also important to have skilled engineers in upstream oil and gas projects. Developing strategic alliances with foreign oil and gas companies to reinforce technical capabilities is another way to address the weaknesses of Japanese oil and gas companies.

3. Functional Currency

Chapter 4 clarifies issues regarding functional currencies, which measure firm resources. As cross-border M&A grow, it becomes more important to shape the strategies related to functional

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currencies. The RBV theory considers firms’ resources as the origin of managerial services and suggests that some portion of resources should be denominated in monetary values. The functional currency issue is not just about currency translation. The functional currency is also helpful for mitigating oil and gas price crashes if used wisely, just as Lukoil did. Once the functional currency is set, management has limited discretion in the decision to change it, unless the firm can leverage events such as significant M&A and accounting principle changes. If firms can shape their strategy for functional currencies, it would be helpful in choosing JV partners because as much as 85% of upstream investment is financed through alliances or JVs (EY, 2015). The selection of the JV partner may also automatically mean the selection of the functional currency for JVs, unless one has absolute power and authority to change it. It is important to recognize the consequences in minority stake acquisitions obtained via M&A.

3.1 Clear tendencies

All major oil companies use the US dollar as their functional currency. ExxonMobil and Chevron have both adopted US GAAP as their accounting principles, while Royal Dutch Shell and BP use IFRS. NOCs tend to select their national currencies as functional currencies, with the exception of five companies: Saudi Aramco, PDV, Pertamina, Statoil, and YPF. Among the NOCs, Statoil and YPF are the only companies with different functional and presentation currencies (see Table 4-2, p. 50). All 10 national flag oil companies also tend to use their national currencies as functional currencies except three: Total, Petrobras, and BG. Among the independent oil and gas companies, BHP Billiton and Lukoil were the only companies whose functional currency (US dollars) is not their national currency in 2014.

I pointed out in chapter 4 that there is no concept of “functional currency” in the Japanese accounting system. All currencies other than the Japanese yen are considered foreign currencies in Japan. Since Inpex is under the control of the Japanese government, Inpex adopts Japanese accounting rules. This study does not judge whether the absence of the functional currency concept in Japanese accounting rules is positive or negative. However, it is important to recognize the difference from other international accounting rules, such as IFRS and US GAAP.

3.2 US dollars for stabilization and globalization

When operating in a hyperinflationary economy, some national oil companies tend to rely on the US dollar as their functional currency to stabilize their financial performance. Pertamina in Indonesia, PDV in Venezuela, and YPF in Argentina fall into this category. However, when a company operates in a high-inflation but not hyperinflationary environment, their functional currency selection seems to vary. Statoil in Norway changed its functional currency from the Norwegian krone to the US dollar in 2009, while Lukoil changed from the US dollar to the Russian ruble in 2015 (see Figure 4-5, p. 61). When there is currency depreciation (but not hyperinflation), the selection of the functional currency
depends on the firm’s strategies, as with Lukoil and Statoil.

Finally, independent oil and gas companies with a diversified business entering the global stage are more likely to choose the US dollar as its functional currency, as did BHP Billiton.

### 3.3 Discretion is limited

It is unclear whether management’s choice of functional currency is opportunistic or deceptive. However, when oil and gas companies change their functional currencies, their management’s discretion is seemingly limited. PTTEP and Lukoil changed their functional currencies and accounting rules in 2011 and 2015, respectively, while Aker BP changed its functional currency after an M&A (see Table 4-7, p. 61).

The managements of oil and gas exploration and production (E&P) companies have some discretion in choosing their functional currency. However, once the functional currency is changed, management has a limited ability to change it; it then requires events—such as structural changes, changes in business circumstances, or changes in accounting principles—as leverage. It is important to recognize that this merely indicates the exercise of discretionary rights by the companies. Not all companies choose to change their functional currencies.

### 4. Impairment losses

Penrose (1959) stressed that M&A is an effective way for firms to gain new resources. It is not difficult to finalize an M&A if the buyer agrees to pay what the seller asks for. However, if the target company is overvalued, then the buyer will be exposed to impairment losses.

#### 4.1 Impairment losses: Russian ruble vs. US dollars

Though crude oil prices have been decreasing, the oil and gas firms who used the Russian ruble as their functional currency grew in revenues and total assets, with the exception of Bashneft’s and Rosneft’s revenues. Conversely, the oil and gas firms whose functional currency was the US dollar did not increase their revenues or total assets. In addition, none of the firms whose functional currency was the Russian ruble (except for Novatek, which did not disclose its balance of goodwill), experienced decreased balances of goodwill among the five firms (Rosneft, Gazprom, Lukoil, Surgutneftegasa, Bashneft) that disclosed these data in their financial statements. Three companies—Rosneft, Gazprom, and Lukoil—increased their balance. By contrast, none of the firms whose functional currency was the US dollar increased their balance of goodwill.

Lukoil changed its functional currency in 2015 from the US dollar to the Russian ruble to take advantage of the Russian ruble’s lower value against the US dollar. One can assume that, if Lukoil had not changed its functional currency, it would have had a hard time increasing its assets and revenue. It is not easy to increase revenue when the price of oil is significantly low unless oil and gas production increases. Hence, Lukoil’s decision is justified. Their change of functional currency seems to be a
good defense against incurring bigger impairment losses in 2015.

Saudi Aramco did not disclose its financial statements in 2014 and 2015; however, the other 16 firms among the top 50 companies that use the US dollar as their functional currency saw decreased revenues, with the exception of YPF’s revenue and Chevron’s assets. As long as there is no hyperinflation, it appears that currency depreciation by oil-exporting countries can help mitigate oil price decreases in the international market.

### 4.2 Uniquely positioned

ExxonMobil and CNPC did not incur impairment losses. ExxonMobil is the highest-ranked among the major oil companies, while CNPC is the highest-ranked among national flag oil companies. Novatek reversed its impairment losses with consecutive profits in 2014 and 2015 and is the only company among the top-ranked companies to disclose impairment losses. The fact that two companies did not incur impairment losses while one company reversed its impairment losses during the oil price crash in 2014 and 2015 illustrates that there is room for managerial discretion in incurring impairment losses.

Japanese accounting standards allow companies to amortize goodwill, while neither IFRS nor US GAAP allows this. Inpex adopts Japanese accounting standards and amortizes goodwill. This study does not judge whether this unique allowance in Japanese accounting standards is positive or negative. However, it is important to recognize the difference if companies adopt Japanese accounting standards.

### 4.3 Companies that are not keen on using hedge accounting and dysfunction in natural hedging

Though companies expect challenges, they need to control their risk exposures to attain financial growth. One of the risk exposures for upstream oil and gas companies is oil and gas prices. In 2015, among the top 50 companies, 13 had incurred more than US$5 billion in impairment losses. All four groups—major oil companies (Shell), export-oriented national oil companies (Pemex, Petronas, and Statoil), import-oriented national flag companies (Total, Petrobras, and Eni), and independent oil companies (Anadarko, Devon Energy, Chesapeake, EOG, BHP Billiton, and Occidental)—incurred impairment losses, largely to goodwill and long-lived assets. This study also reveals that none of the 13 companies used hedge accounting as a risk management tool. Some companies, like Eni and Statoil, assert that their business is highly integrated, which positions them in a natural hedge. Thus, if crude oil and natural gas prices are high, the upstream business benefits while the downstream struggles due to the higher costs of crude oil and natural gas. Conversely, if crude oil and natural gas prices are low, the upstream business struggles while the downstream business benefits due to the lower cost of crude oil and natural gas. However, their positions are not effectively hedged at all.

I have explained that the PIW top 50 companies can be classified as major oil companies, national flag oil companies, national oil companies, or independent companies. I determined which
companies’ functional currencies have been changed within each classification. I also identified the companies that recorded impairment losses, including impairment of goodwill, and determined the reasons. This study reveals that companies using the Russian ruble as a functional currency outperform companies using the US dollar, despite the political and economic sanctions imposed on Russia by the European Union, the United States, and a host of other Western industrial countries. I have also discussed how Japanese upstream oil and gas companies can grow, shedding new light on their best growth paths.

Regarding firm growth, I stressed the difference between Penrose’s theory of firm growth and the notion of financial growth advanced in this study. Financial growth in this study is influenced by the selection of functional currency and impairment losses. I also stressed that functional currency and impairment losses are integral parts of the growth cycle in M&A and that financial growth includes financial turbulence as a part of the cycle. I also discussed the operational growth path for Japanese upstream oil and gas companies, within the context of a debate between two groups of scholars. This point may seem unrelated to financial growth as understood in this study; however, financial growth does not occur without the growth of a firm’s actual business. It is essential to shape the strategy for firm growth.

By replacing the purely theoretical concept of firm growth with an operational and empirical concept of corporate financial growth, this study helps fill the gap between academic study and actual business operation, particularly from the accounting perspective. It also offers new implications for Japanese upstream oil and gas companies, including Inpex. This study asks how firms grow in the upstream oil and gas industry, especially Japanese upstream oil and gas companies, both financially and operationally. The crude oil price crash induced by the shale revolution reveals how vulnerable some companies are. The implications for Japanese upstream oil and gas companies that adopt Japanese accounting standards, especially Inpex, are unique given Japan’s lack of the “functional currency” concept and amortizable goodwill. It is important for managers to understand their firm’s resources and adapt with the ever-changing business environment. I hope this study will help them to do that.

**Limitation of study**

Finally, the limitations of this study should be addressed. In discussing the growth path for Japanese companies in chapter 3, I used the top energy companies ranked by PIW. However, other rankings by other energy research companies exist and could be used. Moreover, I carried out only four interviews with two Japanese managers, one American manager, and one Russian manager. Ideally, the interviewees should include someone who is knowledgeable about Japanese energy companies as well as French and Italian energy companies, such as Total and Eni, as they are included in the study’s sample. This is left to future research.

In chapter 4 on functional currencies, I did not discuss how the original selection and
subsequent changes of functional currencies by the parent companies in the oil and gas industry, especially the top 50 companies as ranked by PIW, influence functional currencies among their overseas subsidiaries. This study used the top 50 rankings of oil and gas companies issued by PIW in 2016, and most of the financial statements used to identify each company’s functional currency were issued at the end of 2014; some of the data in PIW are not publicly accessible. Additionally, some oil and gas companies were slow to disclose their financial statements. The time discrepancy in the data between PIW’s ranking and financial statements may have impacted the analysis. Moreover, the study could not fully explore issues concerning the functional currencies of overseas subsidiaries, and parent companies rarely disclose their overseas subsidiaries’ functional currencies. Some NOCs also did not disclose their financial statements. Further, I could not take into account the effect of financial growth resulting from the difference between companies that adopt the current rate method and those that adopt the temporal method. Future studies should focus on these points.

In chapter 5 on impairment losses, I could not conduct a data survey of impairment losses before 2013 because of the inability to access sufficient information. For example, Qatar Petroleum disclosed financial statements in 2014 and Saudi Aramco disclosed them in 2018; however, neither company disclosed them for 2015. The difference among various accounting rules also needs special attention. For example, Inpex, a national flag oil company in Japan, depreciates goodwill under Japanese accounting rules, but neither US GAAP nor IFRS allows firms to do so. Additionally, some companies combined impairment losses and impairment reversals together as opposed to separating them. In some cases, it was unclear if there were impairment losses, as the explanations in the financial statements were insufficient and vague. Future studies should examine these points.

In 2019, oil and gas are expected to continue playing an integral role in many industries as fuel sources, raw material for petroleum products, and power sources. However, it is important to embrace renewable energy resources such as solar power, wind power, hydroelectric power, hydrogen, biomass, geothermal energy, and other new technologies. It is essential to advance new technologies to achieve carbon dioxide-free energy systems given the growing concerns over increasing CO₂ emissions and climate change. These renewable and new energy sources are not researched in this study. These are left for future projects.
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**Appendix 1**

**Appendix 2**