COPENHAGEN BUSINESS SCHOOL

2017

The Price Dynamics of the US Pharmaceutical Market

A CASE STUDY OF NOVO NORDISK

Master Thesis in Economics and Business Administration

Accounting, Strategy and Control

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Hand in date: 15. September, 2017

Characters incl. spaces: 173,891

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Abstract

This paper examines the evolving price dynamics of the US pharmaceutical market and its impact on Novo Nordisk's profitability. The study analyses the complex US pharmaceutical market and the market dynamics between the pharmaceutical manufacturers and the Pharmacy Benefit Managers (PBMs), who act as middlemen buyers. In addition, the paper reviews two statistical studies of various variables' impact on the pharmaceutical drug prices. In the second part of this paper, a financial ROIC-analysis of Novo Nordisk is conducted.

This study suggests that the consolidation of PBMs and pharmacies, has been one of the forces behind the changing market dynamics of the US pharmaceutical industry. This paper uses microeconomic theory to imply that this market change has led to a shift in bargaining power from the pharmaceutical manufacturers to the PBMs, which results in increased price pressure on the drug manufacturers. This is reflected by dropping growth rates in prescription drug net prices, while the list prices of the drugs have continued to increase at two-digit growth rates, which shows that the PBMs have negotiated increasingly larger rebates. However, the US patients' insurance premiums are still rising, which indicates that a share of the drug price rebates are not distributed down the value chain to the end consumers.

To assess the impact on profitability of Novo Nordisk, the company's quarterly financial statements were reformulated into analytical income statements and analytical balance sheets. From these analytical statements, the ROIC of Novo Nordisk was calculated to have increased from 99% in 2014, to 135% in 2015 and 145% in 2016. This is extensively above the industry average and the pharmaceutical peers. Novo Nordisk financial performance is partly explained by microeconomics theory, as the company is the market leader of the highly oligopolistic anti-diabetics market, which has a CR4-ratio of 74%. Furthermore, Novo Nordisk faces inelastic (-0.25) consumers and has several active patents that gives monopoly power and increased profitability. While Novo Nordisk has maintained high ROIC rates in 2016, the price pressure has impacted the company through large share price drops and reduced the growth targets of sales and operating profit.

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1. Introduction

1.1 Background

"After year upon year of double-digit growth, market conditions have changed, and volume growth does not always translate into sales growth. As the US healthcare system has transformed over the last few years, so tightening competition and pricing pressure have become flashpoints for the pharmaceutical industry. Novo Nordisk is tackling the situation head on." – Jakob Riis, Executive Vice President, North America Operations (Novo Nordisk Annual Report 2016, p. 34).

As the quote above describes, the US pharmaceutical market has been undergoing large changes the recent years. As a result, the Novo Nordisk stock price fell immensely in the period between august 2016 and onwards well into 2017. The drop in the stock price is said to be a reaction to the increased price pressure in the US from buyers who have got increased bargaining power over the pharmaceutical companies resulting in large medicine rebates. In October 2016, Novo Nordisk consequently lowered their expected sales growth rates of the upcoming years from 10% to 5%.

1.2 Research Question

As mentioned in the background above, the price pressure on the US pharmaceutical manufacturers has increased resulting in lower growth rates in the net prices of prescription drugs on the US market. In the pursuit of getting a deeper understanding of the price dynamics on the complex US pharmaceutical industry, this paper will analyse, why the price pressure has increased on the US market, and how it impacts the Danish pharmaceutical manufacturer Novo Nordisk. This has led to the following research question:

Why is Novo Nordisk experiencing increased price pressure from its prescription drug buyers in the US and how has it impacted the profitability of its operations?

1.3 Delimitations to the Study

This paper focuses on the increased price pressure of the US pharmaceutical market. Multiple parties including the US citizens have been affected by the changing market dynamics, but due to the page number requirement of this paper, it has been necessary to primarily focus on the middlemen and the pharmaceutical drug manufacturers.

The study examines the market conditions of the Pharmacy Benefit Managers, but due to the page number requirement, there is not made an analysis of the development in concentration rate over time. Instead this paper relies on the current concentration rate, quotes from experts as well as a summary of important mergers on PBM market.

To analyze the impact of the changing market dynamics on the pharmaceutical companies, a financial analysis will be made of Novo Nordisk, which is the selected case company. There will be made a ROIC-analysis of the Novo Nordisk's performance between 2011 to 2017 Q2, which is the latest quarterly financial statement available. Since it is a large task to reformulate the financial statements of a company in order to calculate the ROIC, there will not be made ROIC-analyses of Novo Nordisk's competitors. Instead, the development of Novo Nordisk share price will be compared to the share price index of the Novo Nordisk's peers.

2. Methods and Techniques

2.1 Methodology

The overall research approach chosen for this study is the inductive approach, as there has been observed a large increase in pharmaceutical drug prices on the US market in recent years. This has given an interest in deeply examining the price dynamics of the complex US pharmaceutical market, and analysing Novo Nordisk's financial performance during those years of changing market conditions.

In general, the design of this study is constructed as a case study of Novo Nordisk on the basis of the company's presence in the US pharmaceutical market from 2012 to 30. June 2017. A case study is known theoretically as:

"A case study is a study in which (a) one case (single case study) or a small number of cases (comparative case study) in their real life context are selected, and (b) scores obtained from these cases are analysed in a qualitative manner." (Dul and Hak, 2008, p. 4).

The definition captures the unique characteristic of a case study, namely that it is a research strategy that focuses on the object of interest in its real-life context, meaning that the objects in the selected time-period relevant for research is not manipulated in order to alter specific results. Qualitative analysis of obtained scores does not mean that the use of quantitative data is prohibited for a case study. Collection and analysis of data depends on the chosen case and its unique characteristics, and what the researcher is interested in studying based on either qualitative or quantitative data. The important factor that distinguish the case study from a typical statistical analysis is that the researcher collect data from a limited number of cases or a single case at hand, while the statistical study collects a large number of data from an equally large population. Furthermore, the data collected can be both primary and secondary in nature (Dul and Hak, 2008).

The research objective relevant for this study is described on the basis of a practice-oriented research method in relevance to the case study of Novo Nordisk. The objective of the study is to:

"Find the factors that contribute to price pressure of drugs, and evaluate the interplay of price dynamics and its effect on Novo Nordisk's business operations on the US pharmaceutical market".

In addition, the study aims to clarify the complicated price dynamics that surrounds prescription drugs, and which Novo Nordisk experiences in the US. By clarifying the price pressure, this study contributes with knowledge on how the underlying price dynamics occur on the pharmaceutical market and can potentially give advice on how Novo Nordisk can avoid being negatively affected by it in the future. Novo Nordisk is the practitioner that seeks knowledge in a pressured business situation that can potentially threaten the sales and profits on the dominating and important US market. This study can be seen as a practice-oriented research study because it examines the acquired knowledge that the Danish pharmaceutical

company needs in order to operate more effectively in the US pharmaceutical industry. Thus, the study will help Novo Nordisk to bridge the knowledge gap and contribute with clarity and structure to the present chaotic market conditions that have prevailed in recent years amongst companies that operate on the American pharmaceutical market. Unlike a theory oriented research study which focuses on contributing with knowledge in order to further develop a theory, the practice oriented research is focused on providing a chosen practitioner with the knowledge that is needed (Dul and Hak, 2008).

This study does not operate with hypotheses, since it is not thought of as necessary in order to conduct the analysis and make a conclusion. Instead, the study operates with the form of descriptive practice-oriented research which is a subgroup of the practice-oriented research type mentioned above. In order to find the knowledge that is needed, this study will begin with an exploration of the context in which the American pharmaceutical market is a part of, which will give a wide initial knowledge overview that is decluttered down to the most essential knowledge needed for further descriptive research (Dul and Hak, 2008). Descriptive knowledge is covered by data collection, which will be presented and elaborated on in the subsequent subheading.

2.2 Research Method

In order to collect the data needed for the analysis of the research question, the extraction of Novo Nordisk's quarterly financial statements from 2011 until 2017 Q2. Thus, the evidence that has been used as this paper' main data is the quarterly financial statements and not yearly financial statements over the subsequent time period. It was considered more accurate to analyse quarterly financials compared to yearly financials because its more detailed, which is considered important for the depth of this paper and for answering the research question.

The procedure that has been used for the analysis of the financial statements is a financial analysis. The income statements and the balance sheets for the time period have been reformulated into analytical statements in order to do a ROIC- and a DuPont analysis. Furthermore, a stock price analysis and a profitability analysis has been conducted. When the data has been analysed thoroughly, they will be assessed on the background of financial success

since in order to answer the research question about how the price pressure have impacted Novo Nordisk's profitability.

2.2.1 Criticism of Data

It has been of great importance to remain as objective as possible during the course of this paper, which is why every choice that has been made about the interpretation of the financial statements has been discussed and precisely defined so that the reader knows how the author makes decisions. The careful discussion of data gives the results of the financial analysis validity.

Part I – The Pharmaceutical Industry

3. Review of Statistical Studies on Pharmaceutical Pricing

3.1 Selected Literature

The studies selected for this literature review both look at factors that contribute to the change in drug prices. While the first study is concerned with the market factors contributing to high drug prices, the other study selected is focused on factors that affect the price of new prescription drugs entering the pharmaceutical market. In addition, the second study presented is also examining the role of generic drugs in relation to competition amongst drugs.

3.2 Factors Associated with the Pricing of Patented and New Drugs

The cost of prescription drugs is steadily rising and accounting for a large part of the US health care expenditures. A study authored by Kathleen Iacocca, James Sawhill and Yao Zhao from 2013 published in the journal *for Socio-Economic Planning Sciences* explores four different factors, and how these factors influence the high drug prices of patented prescription drugs. The study aims to inform buyers of factors that are effecting the high prices on drugs, and thereby make them more capable of bargaining for favourable drug prices when buying from the manufacturers (Iacocca, Sawhill and Zhao, 2013). The study operates with factors that is believed to affect the price levels of drugs, which is selected by the authors to be; the level of competition, the therapeutic class of the drug, the age of the patented drug meaning the total

number of years since the patent got approved by the FDA and lastly the different manufacturers who produce the different branded drugs. The study's main focus is to analyse which factors that makes an impact on drug pricing, and at the same time find factors that contribute to lower drug prices for branded drugs. The study uses the list price of the drugs as the price measure for the branded drugs, which is equivalent to the Wholesale Acquisition Cost (WAC) (Iacocca et al., 2013).

The data used in the study consisted of 598 patented prescription drugs and their list prices. The sample was extracted out of population of 2000 prescription drugs in total, and the price of the drugs covered 1 month of medicine usage. The large sample was collected from a big retail pharmacy in North America in 2007. The list price is tested and measured against four different factors, and thus acts as the study's dependent variable. Some drugs in the sample had different dosing levels and sometimes also different pricing levels depending on the dosing level, and therefore had to be consolidated in order for a drug not to appear more than one time in the regression model. Controlling for this, the study ended up with having a total of 252 drugs (Iacocca et al., 2013).

The results of the study showed that the WAC of prescription drugs which were both used to treat life-threatening and rare illnesses had a higher price than other drugs. When accounting for the two variables separately, they did not have any effect on the price of drugs, but the two variables combined showed a significant increase in the prices of the drugs. In addition, the number of dosing levels a drug required and the age since the drug entered the US market, was correlated with the price of branded drugs. Furthermore, the study finds that increased competition leads to lower prices on branded drugs. While the study finds a correlation between WAC for drugs and some specific market variables of the authors own choice, it does not have the definite conclusion as to what causes prescription drug prices to change (Iacocca et al., 2013).

Study Examining Factors Affecting the Price of New Drugs

A study by Z. John Lu and William S. Comanor from 1998 published in the journal *Review of Economic and Statistics*, explores the factors which affects the prices of new pharmaceutical drugs. By analysing different factors that have the potential to affect the price of a new

pharmaceutical drug, the study also uptake the question as to which pricing strategy a pharmaceutical manufacturer should initiate in order for success. Success is defined in the study as having continuous demand for the drug in addition to high market share compared to competing drugs (Comanor and Lu, 1998). The authors of the study argue that the demand for a new drug depends on the number of consumers that will find the drug attractive compared to drugs that already exist on the market or that the drug can provide evidence of being more effective than its drug rivals. If a new drug can provide its consumers with this evidence of superior efficiency and quality, then the drug will have the ability to charge a higher initial launch price than other new drugs who don't have the possibility to provide this kind of information (Comanor and Lu, 1998).

In addition, the study explores the price evolution from the initial launch of a new pharmaceutical drug depending on the quality and efficiency compared to drugs that have shown a limited medical advantage. The authors argue that the superior new drugs are in a stronger negotiating position, which makes it easier for these types of drugs to charge a higher initiated price than less superior new drugs. Therefore, the underperforming new drugs will be more inclined to charge a lower initiated launch price to secure demand for the drug, and thereafter slowly increase the price of the drug. The pricing example is called the penetration strategy. The skimming strategy, being the opposite of the penetration strategy is more suitable for health patients with an emergency sickness the authors argue. Patients dealing with illnesses characterized as chronic have a high probability of buying a given drug numerous times and thus establishes a revised purchase pattern. This purchase behaviour is therefore suitable for a penetration pricing strategy the study argues (Comanor and Lu, 1998).

The data which was used to analyse the pricing of new pharmaceutical was collected from two different sources, namely the Food and Drug Administration (FDA) and an independent study on drug lags existing between the US and the United Kingdom written amongst others by Lasagna (1989). There were totally 144 new drugs in the data set that had the status as new molecular entities (NMEs), and they were collected between 1978 and 1987. Due to several criteria, ¼ of the new drugs in the dataset was eliminated in order to get the most adequate base for further analysis purposes. In addition, 130 of the new drugs had branded substitutes on the market while the remaining quantity of the new drugs had no substitutes. Considering

the prices of the new drugs and its substitutes, the study chose to collect the drugs average wholesale prices (AWP) from Truven Health Analytics which is a company that specializes in health data for analytical purposes (Truven Health Analytics, 2017). The company is the author of Drug Topics Red Book, a drug pricing source which the study by Comanor and Lu used to collect the average wholesale prices of the drugs from its sample. The average wholesale prices are based on the drugs individual list prices, exactly as the study by Iacocca et al. (2013). Data on Real Pharmacy Acquisition Costs (PAC) was collected for nine pharmaceutical products and the data was used to measure the correlation with the average wholesale prices (Comanor and Lu, 1998).

The results of the study show a classification of the new drugs in relation to the FDA drug classification system which places new drugs into three different groups depending on the content of the drugs molecules and its level of believed therapeutic effectiveness versus other new drugs that is waiting for drug approval. The classification broadly consists of A, B and C type of drugs; whereas A drugs have a high therapeutic rating (National Center for Biotechnology Information, 2017). The study's conclusions were found to be that a considerable number of new drugs with classification A and B charged high relative prices when first launched compared to new C drugs that were often priced the same or lower than substituting drugs already present on the market. In addition, the study found substantial price differentials between drugs that treats chronic illnesses compared to acute illnesses, which has a maximum length of three months. It was found that the new drugs used to treat acute illnesses was priced relatively higher than the drugs used to treat chronic illnesses (Comanor and Lu, 1998).

Centrally for the study, was the discovery that the general pricing behavior of pharmaceutical drugs was consistent with the theory of price skimming and price penetration presented by the author J. Dean in the article *Pricing Pioneering Products (1969)*. In essence, new drugs with considerable therapeutic value in the form of new innovation, uses the skimming strategy while new generic drugs utilize the penetration strategy in order to increase the demand with its pricing of the drug. The study also concludes that a possible competition from generic drugs are not a direct threat to new drugs. On the other hand, branded drugs pose a threat, but if they themselves are facing competition from generic substitutes or some other form of competition,

then the new drugs can charge a higher launch price than otherwise possible. Looking at the real average price development of new drugs, it was found that the prices of A drugs was reduced only by a small amount, while the price for the C drugs increased by a large amount. The B drugs fell somewhere in between the A and B drugs price developments, meaning that the prices increased rather than decreased as with the A drugs (Comanor and Lu, 1998).

3.3 Conclusion Literature Review

The first study by Iacocca et al. (2013) found that the list price of all prescription drugs correlated with drugs that treats both rear and life-threatening diseases, while the branded prescription drugs' prices also correlated with the number of dosing levels and the age of the drug. Lastly, the study finds that increased market competition lowered the price for branded drugs. The second study by Comanor and Lu (1998) did not oppose the findings from the first study, but focused on newly discovered drugs, and found that several factors affect the prices of those including innovation, generic drug competition, type of drugs and therapeutic rating. However, the pharmaceutical industry has changed a lot in recent years, which will be analysed in the following section.

4. Analysis of the Pharmaceutical Market in the United States

In this chapter, the pharmaceutical market will be examined thoroughly in order to understand the dynamics of market players in the relation to pricing of drugs, competition amongst drug manufacturers, negotiations leading up to drug purchases, business strategies and opinions among buyers and sellers as well as the health care system which serves as the source of the pharmaceutical industry.

4.1 Price Setting Characteristics of the Pharmaceutical Industry

The pharmaceutical industry has several unique characteristics distinguishing it from other sectors. For instance, many pharmaceutical products are only needed by the consumers if they have a certain illness or condition that the specific drug treats. Thus, demand is dependent on the health condition of the consumers and can fluctuate a lot over an individual consumer's lifetime. There are two types of pharmaceutical drugs available to the end-consumers;

prescription drugs and over-the-counter drugs (OTC). The prescription drugs are only available to consumers with a prescription from a physician. Hence, the decision of which product to buy is not entirely up to the consumer like in most other industries, as it is the physician that prescribes the medicine. These physicians do not pay for the prescribed pharmaceutical products themselves and are not always perfect agents for the consumer (Scherer, 2000).

Another unique characteristic of the pharmaceutical industry is that the consumers' prescription drug purchases are typically reimbursed to some extent by insurance companies. Even when the pharmaceutical purchases are not covered by insurance, consumers tend to be willing to pay high prices to achieve the benefits of the pharmaceutical products. For instance, pharmaceutical drugs help patients suffering from chronic illness, acute illness and less severe illness. Having an illness means being dependent on buying drugs that can treat the illness, and some people are dependent on the drugs for their whole life. Most drugs are a necessity and they are almost never prescribed to patients without being a part of the treatment of possible life-threatening illnesses. Therefore, demand will always be present, even as price dynamics prevail in market for prescription drugs. Demand for most pharmaceutical drugs are nearly independent of changes in price, which in order words means that pharmaceutical drugs are price inelastic (Scherer, 2000). This makes the pharmaceutical industry stand out, in the sense that pharmaceutical companies only lose few customers when they increase the prices significantly.

The pharmaceutical industry also has a unique characteristic of its supply side, as the developer of a new drug molecule achieves a patent, which gives the exclusive right to sell the drug. So, in exchange for the publicly disclosure of the drug invention, the innovator is granted a patent that excludes others from producing and selling the drug molecule for a limited time. In the US, the patent expiration date is generally 20 years from the filling date of the first patent application (FDA/CDER SBIA Chronicles, 2015). Thus, the patent holder has a monopoly on selling that specific drug as long as the patent lasts. If there are no other similar medicines in the same drug class then the patent-holder has a pure monopoly. This makes the patent holder able to freely set the drug price that maximises the company's profits without taking competing substitutes into account. If there are no great substitutes to the patented drug, the price that is profit maximizing is often very high, especially if the medication efficiently treats life-

threatening conditions (Scherer, 2000). The monopoly-setting will be further discussed in the next chapter.

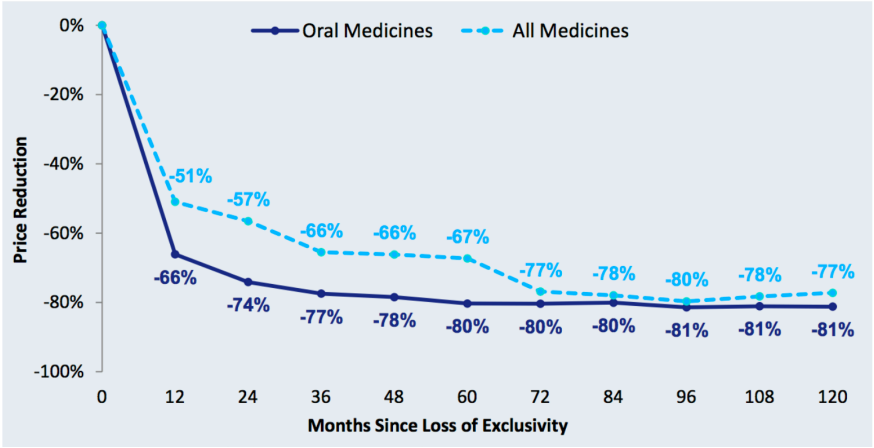
In conclusion, the price-setting of pharmaceutical products is unique in the way that some pharmaceutical companies have monopoly power of their patented products, while the demand side is often characterized by inelastic consumer behaviour. The combination of these two effects of monopoly power on the supply side and relatively inelastic consumers on the demand side, support drug prices that are greatly above the production costs (Scherer, 2000).

4.2 Price Competition of Generic Drugs

As mentioned in the section above, the innovator of drug molecules becomes a patent holder. The patented molecule is typically called a branded drug, which in general has high potential profit value. But the patent does not last forever, and when the patent expires, competing companies are free to develop their own version of the exact same molecule as the patented drug. These products copying the original product are called *generics* and contain the exact same drug molecules, but have different packaging and brand names, and are typically sold at a much lower price. The lower price set on generic drugs are oftentimes a result of a much more cost-effective drug development and trial process for the generic drug than the original patent. Most of the R&D costs including the discovery and testing phases are paid by the original developer of the patented drug. Hence, generic drugs can enter the market at a much faster rate than the original patented ones and have lower developing costs (Scherer, 2000). In a study by Caves et. al (1991) generics entered the market at a 30 to 60 percent lower price than the original drug's price prior to the patent expiry. When more generic competitors were launched on the product market, the price of the generics dropped additionally. When 10 generic competitors had entered the market the generic drug price fell to 29 percent of the original drug price prior to patent expiry, and dropped further down to 17 percent with 20 generic rivals (Caves et. al 1991). A newer study by IMS Health (2016) also found large price declines in the aftermath of branded drugs losing their patent between 2002 and 2014. This report found that the generics lowered he average medicine price of the molecule by 51% during the first year, and by 57% during the second year. However, oral medications had a 66% price decline during the first year, and a staggering 74% decline during the second year,

since oral medicines attract more competitors than injectable drugs as seen on the figure (4.1) below (IMS Health, 2016).

Figure (4.1): Price reductions after Loss of Exclusivity



Source: IMS Health, National Sales Perspectives, March 2015

The study also finds that the pace of which the generics reduce the medicine prices have increased in recent years. In example, the drop in average medicine price after 12 months has increased from 44% between 2002 and 2004 to 79% between 2011 and 2013. The faster price reduction of the average medicine price leads to larger savings for the whole healthcare system as patients and payers get cheaper access to the medicine (IMS Health, 2016).

Interestingly, while it can be seen that the entering of generics greatly lowers the average medicine price of the molecule, there were no remarkable drop in the price of the original branded drug, which could keep a stable price substantially above the generic competitors (Caves et. al 1991). The stable price of the original branded drug, even when generic versions enter the market at the time of patent expiry, can be explained by some patients and physicians who have solid personal preferences for the original branded drug for various causes. Furthermore, the pharmaceutical company behind the branded drug often try to make influence the physicians to keep prescribing their drug (Scherer, 2000). The high, stable price of the original branded drug has been shown by Frank and Salkever (1992) to be the profit-maximising strategy in many scenarios, as the branded drug producer faces two types of consumers with different demand curves. One group is the price inelastic group of consumers,

who are loyal to original branded drug and are willing to pay a high price for the brand name. Meanwhile, other consumers are more price elastic and would rather shift to one of the generic drugs, which have lower prices. The producers of the branded drugs found it more profitable to avoid lowering its price to enter a price war with the generics, but instead maintain the high price and only serve the price inelastic consumers, which on average accounted a 28 percent unit market share in 1992 (Frank and Salkever, 1992).

Moreover, the generic companies compete on being the first generic developer to release the first generic drug of the specific branded drug. Being the first pharmaceutical company to develop a generic version of the drug, in some cases bring the advantage of having the market exclusively for the generic drug for 180 days, when the first generic drug has been submitted for the Abbreviated New Drug Application (ANDA) (FDA, February 2016). After the exclusive period of 180 days has expired, other generic drug developers can make their own version, and thereby securing more competition and lower drug prices.

In conclusion, the market for drugs are changing as patents of branded drugs expire. When a patented drug expires, there is immediate competition among the generic drug developers to be the first generic on the market. The generic drugs greatly lower the average molecule price of the medicine, but the branded drug producer often maintains its high price to serve the price inelastic consumers.

4.3 Price Discrimination

There are numerous pharmaceutical companies that use price strategies in order to produce the highest earnings possible given the market conditions. The pharmaceutical industry consists of many different buyers, some are large insurance companies and hospitals while others are private patients buying over-the counter drugs because they lack the necessary insurance to cover their expenses. The complex buyer market thus makes it hard for the pharmaceutical companies to charge the same price for all buyers, given the buyers great differences in quantity bought and the income level at disposal for buying the company's drugs (The New York Times, 2000).

Given these market conditions, pharmaceutical companies oftentimes indulge in third-degree price discrimination. In this case, third-degree price discrimination means different consumer groups are being charged different prices for the same identical drugs by the pharmaceutical company (Scherer, 2000). These consumer groups are given different amounts of rebates and discounts from the list prices resulting in dissimilar net prices. The size of the reductions in the list price of the drug is often dependent on the size of the specific buyers, which is a consequence of the large-quantities buyers having more bargaining power. As explained earlier in the paper, some Pharmacy Benefit Managers have very large market shares and thus bargaining power, which is a part of the explanation why they succeed in achieving very large sales rebates. For instance, this paper's case company, Novo Nordisk in average gives 59 percentage in sales rebates on the US market according to the CEO, Lars Fruergaard Jørgensen (Berlingske Business, June 2017).

The reason behind the price discrimination behaviour is simply to ensure profit maximization of the developed drug's lifetime. The pharmaceutical companies have high R&D costs connected to drug development, which is extremely expensive and capital intensive, why the drug developer has to choose a profit maximizing strategy. The drugs are initially granted a patent that will secure the intellectual property rights of the drug for the forthcoming years. As mentioned earlier, the patent effectively gives the drug developer a monopoly on the market until the patent expires, after which the branded drug must compete with generics and biosimilars that gradually enter the market (American Enterprise Institute, 2007).

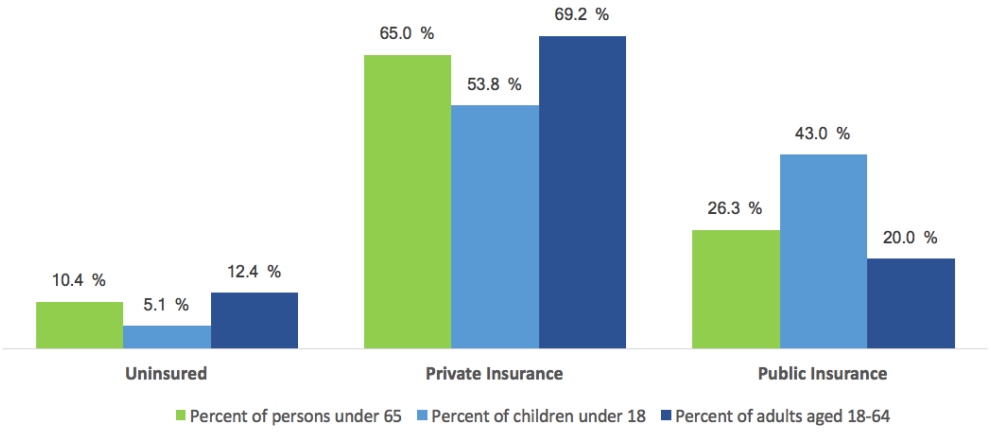
4.4 The Health Care System in the US

Unlike Denmark, where Novo Nordisk is headquartered, the United States' health care system is private, and paying for health care is characterized as being a fee-for-service system (Goldsteen, 2013, p.11). The US government does not provide free health care to its citizens, which is why health care is a cost dependent service that not all Americans have access to.
One of the most important characteristics of the American health care industry is that the US pharmaceutical industry is *market based*. This means that the pharmaceutical companies in general are free to set drug prices as they wish without governmental interference. In other words, the policies and market regulations, which make sure that drug prices are reasonable

priced and affordable in Europe, are generally absent in the United States. Because of the free market, the pharmaceutical companies generally have higher drug price in the US than in more regulated markets. Real drug prices rose by around 47% faster in the US compared to the European Union's drug prices in a recorded period from 1985 to 2004, which gives an example of the high drug prices in the US. Additionally, the European union has long been able to limit the price increase on drugs as to not exceeding the inflation rate, which resulted in an increase in cumulative drug prices of 4% at the scope of 20 years (Golec and Vernon, 2006). Pharmaceutical companies are therefore often drawn to the less regulated American market in search of higher profits, which is also one of the reasons why the US pharmaceutical industry is a highly competitive marketplace. It is believed that R&D activities related to the pharmaceutical industry in the US have the potential to drop in the range of 25% up to 30% if US drugs were to be price-controlled on a large scale similar to countries with a regulated health care system (Golec and Vernon, 2008, p. 43).

The National Center for Health Statistics (NCHS) has reported the number of uninsured, private insured and public insured people in the US as of 31. March 2017, which is shown in figure (4.2) (Centers for Disease Control and Prevention, 2017).

Figure (4.2): Statistics of Health Insurance Coverage Among Citizens of the US 2017



Source: Self-made with data from National Center for Health Statistics, Health Insurance Coverage U.S

4.4.1 The Multipayer System

The US health care system is very complex. In general, the US system is called a multipayer system, since there are multiple payers interested in buying drugs from drug manufacturers. The health care supply chain is large and confusing partly because there are so many different stakeholders tied up to the distribution of health care in the US such as: hospitals, physicians, pharmacies, pharmacy benefit managers, private insurance companies, pharmaceutical companies and public insurance providers such as Medicare and Medicaid (Time Magazine Money, 2017).

The health care system in most European countries can be characterized as providing universal health care coverage. Explicitly, this means that the government provides health care coverage to the whole country's population independent of the citizens diverse income levels, personal health etc. The costs associated with providing extended health care is covered mainly by taxes that incorporates the health care costs which the government must pay for (Forbes, 2013). Generally, the health care systems in Europe have in common that it is the government, who negotiate drug prices and thereby make health care available on behalf of the country and its citizens, which is in strong contrast to the US health care system.

4.4.2 Insurance Companies and Pharmacy Benefit Managers

One of the most significant buyer groups of drugs in the US is the insurance companies. The end-users of the drugs sold to the insurance companies are the insured citizens who pay insurance premiums in order to be insured by the insurance company they choose. Insurance companies differentiate the degree of drug coverage given based on tiers, which means that the citizens insured pay varying degrees of co-payment for drugs depending on which tier the drug belongs to. The most common forms of tiers are tier 1 which usually is for generics, tier 2 branded drugs, tier 3 branded drugs that are not preferred and tier 4 which is for branded drugs that have coinsurance. The lowest tiers such as tier 1 and tier 2 means that the insured citizen pays a smaller share of the original price for the prescription drug, while the higher tiers require the insured to pay a higher co-payment for the prescription drug. Payment method that the insured uses varies according to the type of tier the prescription drug belongs to. For the lower tiers 1-3 the fixed-sum co-payment applies, while for tier 4 and above the coinsurance co-payment applies which is a percentage of a drugs cost and can vary from drug to drug. The

individual insurance companies on the US market can choose which drugs they assign to each tier, and the monthly premiums insured citizens pay in order to receive insurance from the insurance companies also varies (The American Journal of Managed Care, 2014).

It is of great importance to the pharmaceutical companies to appear on these formularies to increase sales volumes. It is in the insurance companies' interests to have cheap and effective prescription drugs on their formularies, as it is expensive to cover the prescription drugs with higher list prices. Thus, the insurance companies have some power over the pharmaceutical companies, since they can decide to shift to cover a cheaper alternative if the pharmaceutical companies rise their prices too much or do not give the required sales rebates (The United States Department of Justice, 2015). However, most of the American insurance companies do not acquire drugs directly from the pharmaceutical companies themselves. Instead, they use middlemen, the so-called Pharmacy Benefit Managers (PBMs), who represents a larger pool of various insurance companies and other clients.

Unlike in Europe, Pharmacy Benefit Managers act as the middlemen between the suppliers of drugs which is the pharmaceutical companies and the buyers of the pharmaceutical products which is dominated by large insurance companies. The Pharmacy Benefit Managers negotiate the price on drugs on behalf of the insurance company they work for, and they can choose which drugs to include on the drug formulary list. Even though the PBMs largely decide what drugs will be on the list, the insurance company can have special requests as to what types of drugs they prefer, i.e. how many generics should be present. Thus, the formulary lists are customized to the specific insurance company (The United States Department of Justice, 2015) The PBMs are companies of different sizes, and their clients comprise of insurance companies, state governments, unions, and other businesses. The three largest PBMs in the US are Express Scripts, CVS Caremark and United Health Care's OptumRx, which together accounts for around 80% market share and administer drugs for more than 180 million Americans (Drug Topics, 2017).

Besides negotiating drug prices and making formularies, The Pharmacy Benefit Managers also make Drug Utilization Reviews and in general has a lot of power in deciding which drugs that the US insurance companies should include in their coverage plans. Thus, the PBMs have large

influence of what drugs the end consumers end up getting through their insurance plans, why the PBMs have been efficient in persuading the pharmaceutical producers to give large price discounts to the insurance companies – of which the PBMs often retains a portion of (Drug Topics, 2017).

The pressure on the pharmaceutical companies to be mentioned on the right drug lists, which will be elaborated later, has made it necessary for most of the pharmaceutical manufacturers to offer increasing rebates to their buyers. These rebates are called a reimbursement contract, which means that the insurance companies pay a price below the official list price of the drug (Morgan, Daw and Thomson, 2013). However, the list prices of the pharmaceutical drugs have also sky-rocketed in the recent years, since pharmaceutical producers expect that the PBMs require increased rebates (Drug Topics, 2017). For instance, in 2016, Novo Nordisk's head of the US, Jakob Riis, provided evidence that even though the list prices of the company's insulin product *Novolog* has increased by 350% since 2001, the net price has only increased by 36%, which is around the same level as the inflation development (Børsen, 2016).

In general, the PBMs try to get as large rebates as possible, which could lower insurance premiums, but since the pharmaceutical sellers also increase the list prices as they expect larger rebates are needed, it is uncertain, whether the end-consumers are actually better off. However, the PBMs can keep a fraction of the sales rebates, and even when the PBMs pay the entire rebate back to their clients, they still have interest advantages of being the middlemen (Drug Topics, 2017).

The size of the rebates that are given to selected insurance companies are confidential information for the public. The reason why the reimbursement contracts are confidential is considered by some to be because the pharmaceutical companies and other drug manufacturers want to secure their profits, and thus only offer rebates to a limited number of payers (Morgan, Daw and Thomson, 2013). In the following, the PBMs' drugs lists, which are part of why the PBMs have so much bargaining power in the drug price negotiations, will be examined.

4.4.3 Increase in Drug Prices and Sales Rebates

The total spending on medicines in the US have increased substantially since 2007. However, as seen on the bar char in appendix (4.1), while the growth in spending were relatively stable from 2007 to 2012, the growth in the total spending started to accelerate a lot in 2013 and peaked with a growth rate in Invoice Spending of 15% 2014. The blue bars on the bar chart in appendix (4.1) shows the net spending, while the orange bars show the discounts, rebates and other price concessions that are subtracted from the invoice price, also known as the list price (QuintilesIMS, 2017). It can be seen from the chart in appendix (4.1) that the orange bars have increased immensely in value since 2014, while the rebates given were more stable from 2007 until 2013. Since the discounts and rebates have increased a lot the recent years, the net medicine spending has been kept relatively stable as seen from the blue bars in the chart.

The chart in appendix (4.2) shows the net price growth rate in addition to the growth rates of the invoice/net price for branded pharmaceutical prescription drugs in the US between 2011 and 2016. The growth rates are averages estimated for the respective years. It can be seen from the orange line on the chart that the estimated net price growth for drugs was at its highest in 2012, and since then it has decreased steadily expect for a small increase in 2014. In 2016 the net price growth was 3.5%, while the brands' invoice price growth was 9.2%, as seen on the blue line in the chart. The drug net price growth rates have been below 5% since 2012. Interestingly, while the net price growth of US drugs has decreased during the period 2011-2016, the invoice price growth (list price growth) have accelerated. The invoice price growth rate was at its highest in 2014, 13.7%, and has since diminished to 9.2% in 2016 (QuintilesIMS, 2017).

While the pharmaceutical drug prices have increased, the US citizens have also experienced rising health care insurance premiums. As seen on appendix (4.3), the US employees' average premium contribution and deductibles as a percentage of the US median income has increased from 6.5% in 2006 to 10.1 in 2015, which means that employees are spending a growing share of their income on health insurance costs. However, this percentage has increased less the last five years compared to the previous years.

4.4.4 Reference Pricing

The amount of co-payment and out of the pocket spending that consumers in the health care industry must pay for drugs depends on the reference price that the insurance provider has agreed to cover for. The reference price system is an essential part of the costs associated with drugs, which especially affects the end users. Drugs that are covered through the reference price system will benefit patients, and reduce their overall health costs associated with higher-costs drugs that are not referenced (The Center for Biosimilars, 2017). When the drugs are grouped together based on special criteria's, the insurance companies will set a reference price or a price cap that they will cover for their customers. If the customer chooses to buy a drug that is priced higher than the reference price, then he or she will have to pay the price difference between the reference price and the excess cost of that particular drug (US National Library of Medicine, 2014).

In extension of reference pricing per definition, a study published in *the New England Journal of Medicine* 17. August 2017 examines the association between spending and drug selection towards reference pricing in the US. This study finds evidence reference pricing being able to significantly affect the spending habits and drug selection of patients who are covered through an employment-based insurance. This means that reference pricing can be used as an incentive to spend less money on high priced drugs, and more on lower priced drugs. Interestingly, the authors expressed the cost-benefits from using a reference-price system since the system had the ability to alter the behaviors of both employers spending as well as for the consumers in the US by buying more low-cost drugs. As a whole, the behavioral influence of reference pricing might make the choice of low-cost drugs more convenient and widespread, and can therefore be used as a cost-lowering instrument in order to make high-cost drugs less profitable for the drug manufacturers (The Center for Biosimilars, 2017).

5. Applying Price Theory and Microeconomics to the Pharmaceutical Industry

In this chapter, the theories of market structure will be presented through the use of microeconomics. Supply and demand will examine how price is formed on different markets, which

is important for this study in order to understand the pharmaceutical market on a theoretical level.

5.1 Fundamentals of Pricing - Supply and Demand[1]

At its core, demand expresses itself in quantity and price from a consumer's perspective on the attractiveness of consumer goods in the market. The consumer can be price sensitive, which can put a cap on volume of goods demanded for purchase while at the same time the individual preferences of consumers' buying behaviour can affect the demand of products at an equal scale. When expressed as a function, demand in general depends on; the price of the good, the income of the consumer, the relative prices of other goods (complementary and substitutes) and the individual preferences and tastes of the consumer. The *law of demand* is a fundamental important concept of microeconomics, which states that consumers are price sensitive in conjunction to all other factors being equal. In other words, consumers will demand less, when the price of a good increases. Likewise, goods that experience price decreases, will experience larger demand according to the law of demand. On the other hand, the supply of goods depends both on manufacturers' available production resources, as well as the monetary motivation towards producing and thereby supplying goods to the market (Guinness and Wiseman, 2011).

The suppliers of prescription drugs in the US experience that their products are either not available or affordable to all US health care consumers, since not all US citizens have health care insurance and some have insurance policies with low coverage and large out-of-pocket expenses. Thus, the demand of the US health care market is complicated by the insurance coverage of the US citizens, which has a large impact on the individual consumer's demand.

Price Elasticity Theory

In general, changes in the variables of the demand function will alter changes in consumer behaviour. This change can be measured by the elasticity of demand. Changes in the price of goods generally affect the volume of goods purchased by consumers, and this relationship is

[1] This section is based on Section 2 of *Introduction to Health Economics*, Lorna Guinness and Virginia Wiseman (2011)

called **price elasticity**. The magnitude of price elasticity can be measured by the percentage change in demand over the price change (Guinness and Wiseman, 2011).

The two extremes cases of price elasticity are *perfectly elastic* and *perfectly inelastic demand*. Perfect elasticity is a theoretical scenario, where even a small increase in product price will decrease demand infinitely, while a price decrease will make the demand rise to infinity. This type of elasticity is seen in a market characterized as perfectly competitive, where there are homogenous products. Perfectly inelastic, on the other hand, is defined as a demand, which is not changed in relation to a change in the product price. Empirically, the closest to this type of demand is present for goods that are necessary in daily life and impossible to substitute. The moderate cases are *price elastic*, which is categorized as when the price elasticity is numerical larger than one, and *price inelastic*, when the elasticity is between 0 and -1. If demand is price elastic, consumers are price sensitive and the demand for products will change by a higher percentage than the change in price. On the other hand, when the consumers are less price sensitive and the demand is characterized as inelastic, demand will change less relatively to the change in price (Guinness and Wiseman, 2011).

Price Elasticity in the Pharmaceutical Industry

As mentioned earlier in this paper, some patients, i.e. those with life-threatening illnesses, will have high demands for specific drugs even though price increases. However, not all Americans are covered by insurance and some low-income groups will not be able to afford the expensive medicines. Several studies have been made examining the price elasticities of prescription drugs.

In a study, Goldman et al. (2004) found small differences in the elasticities for different drug categories. The numerical largest price elasticity was found for NSAIDs (-0.45) while antidiabetics (-0.25) was the most price inelastic drug category. Thus, antidiabetics like the insulin products that Novo Nordisk sells, is *price inelastic* and will have somewhat constant demand levels, when price changes. Using the price elasticity of -0.25 found by Goldman et al. (2004), the demand will only decrease by 2.5% when the price increase by 10.0%. Therefore, one can argue that the law of demand is weak on the pharmaceutical market since drugs represent a necessity, and thereby demand for them will be strong even when price increases.

5.2 Bargaining Power[2]

Bargaining power arises, when a negotiating party has outside options which are favourable in comparison to the offer the supplier or buyer is giving. This is the core of bargaining, and it explains the importance of having different choices and thereby not being overly dependent on the single option presented. Furthermore, companies that are considered large manufacturers compared to other smaller suppliers in a market oftentimes possess more bargaining power. That is, the more concentrated a part of the market is (i.e. the suppliers), the more bargaining power this group has (Dorman, 2014, chapter 14).

An example of a concentrated market form, where only a few parties that repeatedly make interactions with each other and some have extensive bargaining power, is the oligopoly, which will be elaborated later. In the following, different market forms' impact on price and supplier profitability will be analysed.

5.3 Perfect Competition[3]

An essential microeconomic market structure is *perfect competition*, which might be able to help explain the behavior of pharmaceutical companies, when multiple generics have entered the market.

Some of the characteristics of a market with perfect competition are that there is a lot of competing firms and that the goods sold are homogenous, meaning that all the goods are exactly the same. Since the goods are homogenous, the consumers have no preferences towards the products since the products does not vary in design or quality. Furthermore, the information available about supply and demand of the goods are equally known for everyone and there are no barriers to enter the market. The suppliers and buyers have no competitive advantages relative to each other, which also means that no parties can influence the markets total number of goods or the total demand for the goods. The supplier of the goods is

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[2] This section is based on Chapter 14 *Microeconomics*, Peter Dorman (2014)

[3] This section is based on Chapter 5 *Microeconomics*, Hans Jørgen Biede (2016)

indifferent to the origin of the material used in production, while the buyers of the goods produced by the supplier does not have any preference for a specific type of manufacturer, as long as it sells the homogenous product that the buyer wants. The price for the goods sold in a market is the market price, and this price is more or less fixed even though the price for the goods may vary slightly due to potential transaction costs (Biede, 2016).

Companies who operate in a market characterized as having perfect competition, accepts that the market price is fixed, why they are *price takers*. The product price of perfect competition is equal to the companies' marginal costs, which effectively means that there is no economic profit to be made on a market with perfect competition. If a supplier has higher marginal costs than the market competitors, it cannot sell any products, since they are no different than the competing firms' products that are sold at a lower price, which is why the firm with higher marginal costs will exit the market (Biede, 2016).

Comparison to the Pharmaceutical Market

Since pharmaceuticals compete in price, when there are available substitutes, there are some similarities to the perfect competition scenario. However, there are also some striking differences. One of the differences is that the competing original branded drugs have different active molecules and thus have different effects. Furthermore, the original branded drugs are branded extensively and differ in packaging, which is a way of differentiating the drug from the competing products. This is unlike the products of theoretical perfect competition that are homogenous and unbranded. In addition, the prices of the competing prescription drugs offered differ in price and not fixed.

However, when a branded drug's patent expires and multiple competing generics enter the market, a new type of competition arise. The generics all have the same active chemical **ingredients** as the original branded product and are often marketed with no or limited advertising (Scherer, 2000, p. 1321). Thus, there are multiple products that are somewhat homogeneous that primarily compete on price in this scenario, why generic drug competition is closer to perfect competition. As mentioned in the section above, it is not possible to make profits in the long run of perfect competition. Since generic drug competition have some of the characteristics of perfect competition, it is expected that generics generally have lower profits

than the original branded drugs, once they are developed.

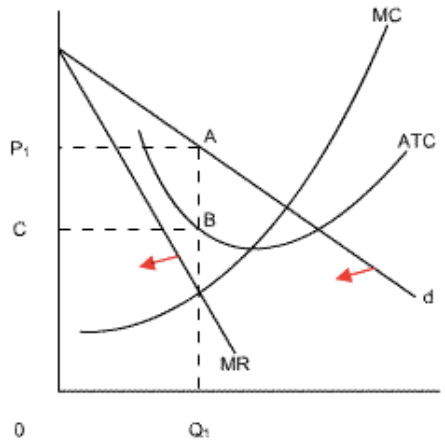
In conclusion, the suppliers on a market with perfect competition are price-takers and not able to generate any supernormal profit. There are little similarities between branded drug competition to the theoretical situation of perfect competition, but generic drug competitions have more comparisons including somewhat homogenous products. Since perfect competition is unable to describe the scenario of a competition environment with differentiated products, the next microeconomic framework that will be examined is the monopolistic competition.

5.4 Monopolistic Competition[4]

A market characterized as having monopolistic competition share some similarities with perfect competition. There are many companies who operate on the market, but unlike perfect competition, the market consists of heterogeneous products and not homogenous products as in perfect competition. The goods produced in this market thus shares similarities, but are still differentiated from each other. Like in perfect competition, there are many suppliers on the market of monopolistic competition, but the suppliers can set the price of their own products unlike perfect competition, where the suppliers are price-takers and cannot differ from the market price. Since the products are heterogeneous, the suppliers compete by differentiating their products and the consumers therefore have the option to substitute one product with another base on product differentials such as price, quality and promotional efforts. There is no dominant market supplier, and the consumers can choose, which supplier to buy from based on individual product preferences. Additionally, in a market of monopolistic competition, suppliers have smooth entry and exit conditions just like perfect competition. The monopolistic competition market can be summarized by figure (5.1) below (Biede, 2016).

[4] This section is based on Chapter 6 *Microeconomics*, Hans Jørgen Biede (2016)

Figure (5.1): Illustration of economic profit in the long-run with monopolistic competition



Source: Analystnotes.com CFA exam Level 1, subject 3 (2017)

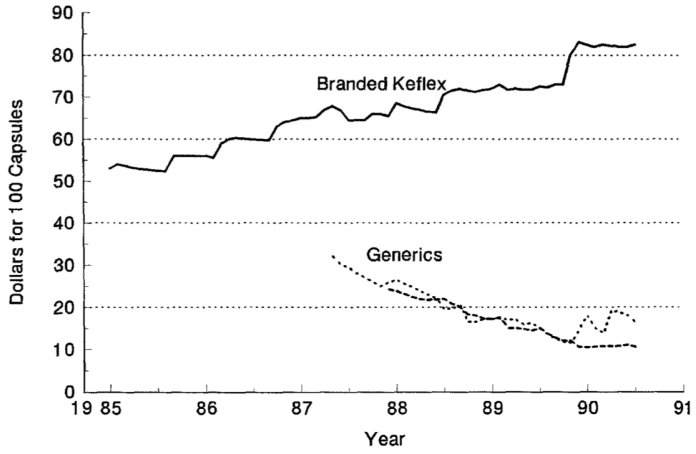
Figure (5.1) shows how price develops under monopolistic competition, and how the demand curve and marginal revenue curves move in the long run. As with monopoly, the point where MR intersects with MC is the optimal situation for profit optimization. In the short run a profit can be obtained usually by decreasing the price to one below the competing products on the market. Furthermore, profit can be achieved as long as average total costs (AC) stays lower than the price P. Even though demand for the individual supplier's product may be high in the short-run, the demand does not stay this way in the long-run due to more suppliers entering the market, since other companies freely can enter and wants to earn an abnormal profit. For this reason, the entry of competing suppliers to the market forces the profitable supplier to share the market with more manufacturers who threatens the company's earnings. The red arrows show how the entering of many new companies affect the already existent company's demand curve negatively by shifting the curve leftwards as the company's market share decreases. Additionally, the intersection between MR and MC decreases the quantity of sellable products which ultimately means that the company have to decrease its price in order to attract buyers. In the long run the continuous entering of new companies will make the market of monopolistic competition non-profitable as both the price and quantity diminishes, which means that there will be zero economic profit as price will eventually equal average total costs (Biede, 2016).

Monopolistic Competition and the US Pharmaceutical Market

Monopolistic competition shares some similarities to the US pharmaceutical market. For instance, on the pre-generic market, there can be substitutes to other pharmaceuticals drug molecules with similar effects, which are differentiated products. When generics enter the market, there are two types of products, the original branded drug and the generics, which have the same active molecule and no or very limited branding (Scherer, 2000, p. 1321). However, as mentioned earlier, the pharmaceutical industry is in general characterized with high entry costs due to the requirement of high R&D costs to launch a pharmaceutical drug.

As mentioned earlier, the developer of the original branded drug often finds it profitable to keep the price at a high level and focus on the inelastic consumers. An example of this, ca be seen from the figure (5.2) below.

Figure (5.2): Trends in cephalexin prices with generic entry



Source: Scherer, 2000, p. 1323

From the figure above, which is a typical example of prices when generics enter, it can be seen that the original branded drug charges a substantial higher price than the generics. Even though, the original braded drug loses some of the price elastic consumers, it can differentiate itself enough to still be preferred by a group of the inelastic consumers, who prefer to stick with the brand (Scherer, 2000, p. 1321-24). In this sense, monopolistic competition has some comparison to the competition between the original branded drug and the group of generics.

However, within the group of generic drugs, products are more homogenous as mentioned above, why they also have prices relatively close to one another. The competition within generics with somewhat homogenous products have more similarities to the perfect competition, where price is the main competing variable. That price is the main competing parameter is reinforced in some scenarios, where the insurance companies only reimburse the full costs of the cheapest functioning generics, which historically has been the case multiple times in both Canada and the US (Scherer, 2000, p. 1324-25). However, the generics are free to set their own product prices, and from the chart above, there are some price differences between the generics, which further indicates that the generic products are not completely homogenous like in the theoretical case of perfect competition.

5.5 Monopoly

Monopoly is in its simplest form, also called pure monopoly, is a market, where a single company supplies the whole market without worrying about competition. Consumers can only buy the specific good from the monopolist, which means that the company is in charge of the market demand. This explicitly means that the market demand curve mirrors the monopoly company's demand curve. In addition, the monopolist's marginal costs curve is the exact same as the market supply curve (Biede, 2016).

Patent Monopoly[5]

One of the most common form of monopolies is patent monopoly, which the pharmaceutical industry is an example of. As described in this study, pharmaceutical company that develops new drug molecules can achieve patents that gives the exclusive intellectual rights to produce, sell and promote the drug without the interference of competition during the patent period. This gives the company a chance to make abnormal profits on the specific drug, which in most cases will diminish substantially after the patent expires. Having monopoly over a specific good sold in the market gives the company a profitable advantage as there is no competing exact substitute, which allows charging a high price. Considerations regarding which price a monopolist should charge for its product in order to maximize profits can be explained by

[5] This section is based on Chapter 13 *Microeconomics*, Peter Dorman (2014)

microeconomics. The general profit-seeking rule states that a monopolist company should raise the price of its good as long as the marginal revenue is higher than the marginal cost associated with production (Dorman, 2014, p.283).

In conclusion, the monopolist has the required monopoly power to set higher prices than in a competitive setting, why the monopolist can earn supernormal profits and the customers face high product prices. This monopoly framework has strong resemblance to pharmaceutical companies on the US market, who have prescription drugs that are protected by a patent and has no close substitutes. The pharmaceutical company with monopoly power would prefer to set the price, where marginal costs are equal to the company's marginal revenue curve. However, the pharmaceuticals companies also face price pressure from its buyers as described in this paper, why they are not able to set true monopoly prices.

5.6 Oligopoly[6]

Unlike monopolistic competition, where there are lots of companies competing, oligopoly is characterized by a limited number of dominating suppliers that are interdependent on each other's actions. The companies monitor each other, and make strategic moves to secure its market share. Strategic wise, the companies compete with pricing, quantities produced, promotional activities, product development as well as many other parameters. Competitive equilibrium is a pricing strategy where the companies try to offer the lowest prices, by pricing its good lower than competing products which hopefully attract consumers. The companies in an oligopoly sometimes escape price wars by preventing to follow each other's price changes so that the goods are priced somewhat the same. However, to be a part of explicit price collaboration between companies is illegal – this is called cartel or sometimes price gauging as mentioned earlier in this paper. Even though there exists no general pricing theory for oligopoly, there are certain equilibrium models based on maximization of either production volume or price (Biede, 2016, chapter 6).

In a Bertrand oligopoly, the companies make decisions simultaneously, and compete on price

[6] This section is based on Chapter 6 *Microeconomics*, Hans Jørgen Biede (2016)

like in perfect competition, why there is no economic profits. However, supernormal profits are achieved in an oligopoly characterized by **Cournot** theory, where the market players compete on the quantity produced. In this setting, the oligopoly players try to anticipate their competitors' production choices, which they include in their production plans (Biede, 2016). There are many other oligopoly scenarios, but in general an oligopoly is in-between a monopoly and a competitive setting, as the product prices and suppliers' profits are larger than in perfect competition, but smaller than in a monopoly setting. Thus, the more concentrated that a market is, the less competitive it is, which leads to the suppliers having more market power and can achieve higher profits (Fellner, 1949).

5.7 Market Structure and Interdependence

To assess, whether the pharmaceutical industry is concentrated enough to be characterized as an oligopoly, it is needed to use one of the common concentration measures.

The Concentration Ratio (CR) is a common measure to calculate the dominance of a few companies in terms of sale of a specific industry, namely the concentration of the market. The ratio shows how the intensity of market share dominance among the few firms, which usually ranges from three and up to five companies. A high concentration ratio means that the market is characterized as being an oligopoly or a monopoly. If the concentration ratio is low, the market is considered to be highly competitive. The concentration ratio is the total percentage number of the individual companies' market shares combined, and the number can range from 0 up to 100%. Another form of measure of market concentration in an industry is the Herfindahl–Hirschman Index (HHI). It can be calculated by taking the square of the individual market shares for the companies. The sum of the numbers is the Herfindahl index. An index number of 10,000 is a monopoly, and zero if it is a market of perfect competition. Low index numbers in general is a sign of a competitive market (The Economic Times, 2017).

Since it is required to have data of market shares of every single company in the pharmaceutical industry to calculate the HHI, the CR4-ratio is instead calcluated, which is the Concentration Ratio of the four largest companies. The figure on appendix (5.1), shows the global market share of the ten largest anti-diabetes product manufacturers in 2016. The four

anti-diabetes companies with the largest global market shares are Novo Nordisk (29.7%), Sanofi (18.4%), Merck & Co (14.1%) & Eli Lilly (11.8%) (Statista, 2016). By taking the sum of these four market shares, the CR4-ratio of the global anti-diabetes market is 0.74 = 74%. There is no definitive rule of how to interpret the concentration ratio, but some suggest that a CR4-ratio above 60% indicates a highly oligopolistic market (Economics Online, 2017). Since the self-calculated CR4-ratio of the global anti-diabetics market is significantly above this threshold, it can be concluded that this market is highly oligopolistic.

The pharmaceutical market operates under differentiated oligopoly rather than oligopoly in its single form, since the drugs are heterogeneous rather than homogenous products. While prescription drugs of different molecules are very differentiated, the generic drugs of the same original branded drug use different ways to stand out. The ways in which the generic drugs differentiate themselves can amongst other things be by package design, quality and price (Henry and Haynes, 1978). Since there are few actors on the differentiated oligopolistic market, the companies are interdependent on each other, meaning that the market behaviour of one company will affect all the other companies to a certain degree. The pharmaceutical companies on the anti-diabetes is concentrated (as the CR4-ratio of 74% showed), which results in the large players having market power. It is typically prices and output that are interdependent.

In conclusion, the global pharmaceutical market for insulin drugs is concentrated amongst a few dominating manufacturers with a CR4-ratio of 74%, why it can be characterized as an oligopoly.

6. Discussion of Part I - Increased Drug Prices and Sales Rebates

The US pharmaceutical market has become known for its price pressure from Pharmacy Benefit Managers towards pharmaceutical companies. They have been able to negotiate increased sales rebates as earlier mentioned and seen on appendix (4.1), which means that they must have got more bargaining power in relation to the drug-makers. This should be beneficial to the end-consumers, if the PBMs are truly negotiating on behalf of the pharmacies and insurance companies, which have the patients as the ultimate costumer. But the insurance premiums have

also increased a lot as seen on appendix (4.3), which could indicate that the sales discounts are not passed all the way down through the chain to the patients. Furthermore, as the sales discounts have increased, the list prices have likewise increased a lot as mentioned earlier and seen on appendix (4.1). So, who is truly better off in this changing market dynamic, and who is to blame for the increased prices?

6.1 Opinions on Drug Pricing and Costs

The US pharmaceutical companies have received a lot of criticism and bad publicity due to the large increases in drug list prices. A justification of the high prices set by the US pharmaceutical companies, is that profits are important to maintain research, innovation and the development of new drugs, which they argue will benefit the society at large in the form of better drug treatments. Even though the pharmaceutical companies have some reasons to justify their profits and high drug prices, there are several counterparts that claim that the pharmaceutical companies simply take advantage of the free market to profit maximize without contributing to the society. One example of this is the fact that several pharmaceutical companies buy the intellectual properties of drugs that are originally discovered by scientists at university labs, which are funded by the public through the National Institute of Health (NIH). This means that many of the prescription drugs sold on the US market is not a product of intense research and innovation by the pharmaceutical companies themselves, but rather bought from public funded research labs, in order bring the drug to the market in the form of marketing and other commercial strategies (The Washington Post, 2015).

Pharmaceutical companies and the Pharmacy Benefit Managers who represent large insurance companies in the US have vastly different opinions regarding how drug prices are set and who "is to blame" for the increasing drug prices in the US. In the following, the opinions will be presented in order to better understand the complexities of the American health care system and the business landscape.

6.2 The Suppliers' Opinion

The reason behind high drug prices have often been explained as necessary for supporting the research and development of the drugs. Unlike other types of consumer products, drugs require

a lot of trials before being considered a safe product. In addition, there are many drugs that fails under trials and thus becomes sunk costs. It is therefore risks associated with the development of drugs for the manufacturers, and the price of the drugs reflect the continuous risks the company takes on in order to be in business and thus invest in continuous drug research for making new drugs. In addition, the Tufts Center for the Study of Drug Development found that the costs associated with the research and development of a drug is around 2.9 billion dollars per new drug (MarketWatch, March 2017).

Although it is costly to develop new drugs, there have been several studies that examines these alleged research and development costs and they conclude that these types of expenses cannot account for the steadily price hikes of prescription drugs list prices. Firstly, Credit Suisse published a report about global pharma in May 2015 that examined the earnings and spending of pharmaceutical companies operating in the US. The report found that costs associated with promotional activities accounted increased by 17% in 2014, and these costs outpaced the companies increase in sales volume for the same period[7]. Essential for the report is the increased price pressure that pharmaceutical companies have experienced from buyers, and the promotional costs illustrate the expenses associated with giving rebates to the pharmacy benefit managers. It is thus costly for pharmaceutical companies to give rebates on their drugs, and especially since the rebates increases to an extend eliminates the sales earnings pharmaceutical companies can receive on increased list price of drugs (CBS News, 2015). Additionally, a study from March 2017 by Nancy Yu, Zachary Helms and Peter Bach published in the journal *Health Affairs* found no connection between costs associated with research and development of new drugs, and the alleged subsequent rise in drug prices on the US market. The study found that top 15 pharmaceutical companies which sold the 20 top selling drugs globally generated 116 billion dollars in sales revenue, but only 76 billion dollars of costs was associated with research and development expenditures in 2015. The high drug prices in the US substantially accounted for the global sales revenue these pharmaceutical companies earned compared to sales in Europe and other places. Furthermore, the authors of the study expressed their opinions on

[7] Credit Suisse Report May 2015 also mentions that regular SG&A costs (sales, general and administrative costs) increased by 4% in 2014. Costs from marketing activities are included in these types of costs.

high drug prices (Health Affairs, March 2017):

> "*This finding counters the claim that the higher prices paid by US patients and taxpayers are necessary to fund research and development.*" (Health Affairs, March 2017).

The pharmaceutical companies are often represented in public by PhRMA (Pharmaceutical Research and Manufacturers of America) to defend the causes of high prescription drug prices. PhRMA actively lobbies for the interests of the pharmaceutical industries, and regularly support governmental policies that will help the development of innovative health care and drugs. In the event of rising prescription drug prices, PhRMA believes that some of the costs for drugs could be reduced if the insurance companies weren't allowed to develop drug formularies that was shewed towards high cost drugs. PhRMA argues that the insurance companies can do more to secure more affordable drugs on the formularies, and thereby prohibit the patients from paying large co-payments or higher premiums for their health insurance (Morningconsult, 2016).

While the insurance companies are often accused of distorting drug prices, the Pharmacy Benefit Managers are also being criticized by the pharmaceutical companies and other representatives of the pharmaceutical industry for being profit conscious, and thereby provide less initiative to reduce high drug prices. In addition, pharmaceutical companies have stated that they believe that the PBM's deliberately want to see drug prices increase since they can then negotiate a larger rebate, and thus make a higher profit from the rebate (CNBC, 2017). As explained earlier in this paper, the PBM's receive a fee for the negotiating services provided to large drug payers, and oftentimes the fee includes a share of the rebate negotiated. It is especially the National Community Pharmacists Association, which represents pharmacists and pharmacy owners, that questions the PBM's intentions. Behaviours such as rebate pumping and spread pricing are though to affect the price of drugs. Rebate pumping means that the PBM's will target drugs with higher costs than less expensive drugs because it will provide them with opportunities to negotiate higher rebates and thereby secure a higher portion of the rebate as earnings. Spread pricing means that the insurance companies and the pharmacies are charged differently by the PBM's, leading to higher costs for the insurance companies which oftentimes

means that the premium they charge the customers becomes larger (STAT, 2016).

Because of the public complaint from patients, health care consumers, hospitals etc. on high drug prices and the continuous price hikes which often results in large price increases during a single year, Brent Saunders who is the CEO of pharmaceutical company Allergan maid a statement in September 2016 saying that the company would hold its drug price increases under 10% during one year and subsequently the price increase can only happen once a year. The reason for the price pledge committed by Saunders was explained as being in line with the social contract pharmaceutical companies have with society at large (FiercePharma, August 2017). The pharmaceutical companies should produce drugs that are available for patients in need, and that will help the society in tackling health problems and diseases. Furthermore, Saunders expressed that pharmaceutical companies that charge to high prices for their drugs or who deliberately increase their drug prices for profit is mistreating the social contract principles (FiercePharma, September 2016).

In the aftermath of the social contract price increase limitation, there have been several pharmaceutical companies that have followed Saunders price pledge, and an analyst for Bernstein told that 92 drugs did not increase in price more than 9.9% since January 2016. Additionally, Novo Nordisk and other specialty pharmaceutical companies was represented among these 92 drugs and they represent a mix of branded and generic drugs. Some pharmaceutical companies have openly agreed to follow the Saunders price pledge, including companies such as Novo Nordisk and Takeda while Sanofi have said that the company will increase its drug prices in line with the official health inflation numbers (FiercePharma, August 2017).

6.3 The Buyers' Opinion

The buyers of pharmaceutical drugs are amongst others the insurance companies, who uses Pharmacy Benefit Managers as middlemen between the sellers and the insurance companies. This group of buyers have a lot of negotiation power as explained earlier in this paper. Through the PBMs, the insurance companies buy large quantities and demand sizeable rebates and reimbursement contracts from the pharmaceutical companies in return of making the acquired

drugs figurate on the national pharmacy benefit managers formulary lists in addition to the insurance list of covered drugs (Berlingske Business, 2017).

As mentioned earlier, the pharmaceutical companies often have the market power to charge the price they want for their drugs, especially during the patent period of exclusivity. This is largely the case of insulin drugs, since a large share of the insulin drugs available on the market have non-expired patents, and it is a concentrated market with inelastic consumers, as found earlier. A consequence of the many branded insulin drugs is that they make it hard for generic to enter the market, and thus the insulin market has stayed highly profitable due to less competition from lower priced equivalents. The high drug prices are partly a reason why the insurance companies in the US are charging higher premiums, or equally decreasing the insurance coverage on some of the very expensive drugs that have no equivalent or cheaper drug alternative available on the market. In this case, even the insured health care consumer will end up paying higher out-of-pocket costs for drugs (Consumer Reports, 2016).

The second largest payer of prescription drugs in the US is Medicare, while private insurance counts for the largest payer. In 2016, it was registered that Medicare covered 29% of all prescription drugs sold, while the private insurance programs accounted for 43% of prescription drugs sold on the market (State of Reform, 2016). Medicare is run by the US government, as is therefore a national social insurance program. The program is available for people at age 65 or older in addition to a number of younger people who are socially challenged (Medicare.gov, 2017). Unlike other health care payers, Medicare is not allowed to negotiate drug prices with drug manufacturers, and it has been up to debate whether they should be allowed to negotiate directly with pharmaceutical companies on prescription drug prices in order to save costs. By including the government in the drug price negotiating processes, the US might gain advantages similar to that of other countries such as the single-payer market as mentioned earlier in this paper (The New York Times, 2017).
The price hikes on drugs have not gone unnoticed by the government and Congress, and even though there are no price regulations that can restrict the price hikes, there have been investigations following forceful price hikes of four different pharmaceutical companies in 2016. The companies were obligated to provide documents that explained the price hikes and thereby showing that the price hikes was not an act of illegal price gauging behaviour

(Consumer Reports, 2016).

Pharmacy benefit managers have been accused of being the cause of increasing drug prices in the US. They argue that this statement is incorrect, and that they work to bring down drug prices. Furthermore, the Pharmaceutical Care Management Association (PCMA) who represents all the pharmacy benefit managers in the US, published a study 19. April 2017 which shows that there exists no correlation between drug prices and rebates. The study collected data from the period of 2011-2016, and the authors wrote that pharmaceutical companies have stated that this correlation exists. The study was concluded with the following statement *(CNBC, 2017)*:

"Based on this analysis, it is clear that rebates reduce plan and consumer costs and that there is no causal relationship between the prices manufacturers set and the rebates they negotiate with PBMs."

- PCMA (CNBC, 2017).

6.4 Increased Buying Power of the PBMs

One important reason behind the bargaining power of the Pharmacy Benefit Managers is the need for the pharmaceutical companies to be on the formularies of the insurance companies and the preferred drug lists mentioned above. The pharmaceutical companies know how important it is to be on the formularies and preferred drug lists to be seen in the marketplace and sell enough quantities to meet their expected sales targets. There is a large price pressure on the pharmaceutical companies, since there are little chances to be on the preferred drug list and the formularies, if no or only small rebates are given (The United States Department of Justice, 2015). The Pharmacy Benefit Managers know how much the pharmaceutical companies depend on sales from being on these lists, and use this information to their advantage to negotiate big rebates and thus provide successful reimbursement contracts that will meet the criteria of the insurance companies.

6.4.1 Consolidation of the Pharmacies and Pharmacy Benefit Managers

As mentioned earlier, the insurance companies negotiate through the PBMs, who pool the bargaining power of all their clients. The three largest PBMs are dominating and in 2016, they controlled around 78% of the market and cover more than 180 million US citizens (Quartz, 2016). This corresponds to a 3-company concentration ratio (CR3) of 78% among PBMs, which means that the PBM market in the US is highly concentrated and oligopolistic.

A high concentration leads to increased bargaining power as explained earlier in the microeconomic section. In this case, since there are only three PBMs, who now control such a large share of the US health care consumers, the pharmaceutical drug developers will lose a very large share of its potential sales, if it does not get its products on the PBMs formularies. Thus, the pharmaceutical companies cannot afford not to make a deal with the PBMs, why the PBMs are successful in getting very large sales rebates. However, the following shows that there has been a large change in the market structure of the PBMs.

6.4.2 Original Role of PBMs and Mergers with Drug-Producers

Pharmacy Benefit Managers have historically played an important role in keeping the drug prices on the free US pharmaceutical market at an affordable level. The firsts PBMs were founded in 1968, and has since used the bargaining power of their pool of insurance companies and other clients to negotiate drug discounts with the pharmaceutical suppliers. The PBMs started out as independent players that had incentives to pay rebates back to the patients through their health plan sponsors (Quartz, 2016). However, there was an acquisition wave in the 1990s, where pharmaceutical companies acquired PBMs, which resulted in conflicts of interests. For instance, Eli Lilly acquired the PBM called PCS Health Systems in 1994. The US Federal Trade Commission assessed that these mergers made the drug-developers able to coordinate prices and use the acquired PBMs to favor their own developed products over the competing drugs, why the FTC acted to stop these vertical mergers. As a result of the FTC actions, the market of pharmacies and PBMs got less concentrated again as the pharmaceutical companies sold the PBMs. However, the PBM *Diversified Pharmaceutical Services*, which was at first acquired by a drug-maker in 1994, was sold in 1999 to Express Scripts, which today is the largest PBM (Quartz, 2016).

6.4.3 Consolidation of the PBMs

While the vertical mergers of drug-makers and PBMs were only going on for a limited number of years, a new 'Pharmacy era' begun in 2007, as CVS, a chain of Pharmacy drug stores, acquired the PBM, *Caremark* for no less than USD 26.5 billion. A professor named, Bob Zebroski, at the St. Louis College of Pharmacy has described this type of merger as "*a sweetheart deal*", since the pharmacy and the PBM no longer have any incentive to negotiate against each other (Quartz, 2016). Instead, they can influence the patients to use a certain drugstore and give preferences to its products, as explained by this quote:

"The PBM combined with a drugstore "can steer plan members to its affiliated pharmacies, rather than contracting with as many drugstores as possible on the basis of location, convenience, and care for its patients." – Patric Danzon, Wharton Professor (Quartz, 2016).[i]

Thus, these mergers of PBMs and pharmacies lead to increased conflicts of interests and the PBMs being less independent. CVS went on and acquired the PBM, Omnicare in May 2015 for USD 12.7 billion (Quartz, 2016). CVS is now the largest pharmacy company with a 23.4% market share of prescription revenue in 2016 (DrugTopics, 2017).[ii] In addition to this, the largest PBM at the time, *Express Scripts*, merged with the second-largest PBM, *Medco,* and two pharmacy companies in 2012. A full timeline of the largest PBM mergers can be seen in Appendix (6.1).

Doug Langa who in 2016 was the SVP of Market Access in the US on behalf of Novo Nordisk, has also noticed the consolidation of the PBMs, which is called payers in the following quote:

"We continue to see consolidation, especially at the payer level. There used to be over a dozen major payers; today that number has been cut in half. Transversely, more competitors are developing more medicines, including biosimilars, today, especially in the diabetes area. This translates to greater bargaining power for payers and pricing pressure on pharmaceutical companies. We're also seeing more exclusive contracts, which potentially means less choice for patients and prescribers."
- Doug Langa (Novo Nordisk Annual Report, 2016, p. 34).

6.4.4 Shift in Bargaining Power

As seen on the full list of PBM mergers in appendix (6.1), several billion-dollar mergers between PBMs and pharmacies as well as with other PBMs have taken place since 2000. This had made the industry of PBMs more concentrated during this period. A more concentrated market with less competition should give the PBMs more bargaining power as explained in a previous section. However, the pharmaceutical companies also increased the list prices as well, but assessed from the growth rates in the net drug prices seen on appendix (4.2), the drug-makers have increased the net prices less in 2013-2016 than in the previous years. While the growth rates in net drug prices were 8.8% and 9.1% in 2011 and 2012 respectively, the growth rates have been reduced to in between 2.5% and 4.8% in the four succeeding years. This indicates that there has been a shift of bargaining power from the pharmaceutical companies to the more concentrated PBM buyers, which has resulted in smaller growth rates in the net prices of pharmaceutical drugs.

The fact that the PBMs have got more bargaining power and been able to keep the growth in net drug prices under control, should be beneficial to the end-consumers. But the PBMs have also become less independent, since there have been many mergers between pharmacies and PBMs in the recent years as shown on appendix (6.1). Originally, the role of the pharmacy benefit mangers was to make sure the transactions between the supplier and the buyer was operated efficiently. It was thus in the interest of the Pharmacy Benefit Managers to provide fair and less costly medicines, and by that, operate under the favourable condition of justifiable drug prices for both public and private health care (Newsweek, 2017).

Today, the Pharmacy Benefit Managers are increasingly making high profits by keeping a portion of the rebates, which are growing every year. There are large sums of money that transfers between the insurance companies and these middlemen, and there is an ongoing debate about the intentions of these middlemen and the effectiveness of the system for setting drug prices that the American citizens are paying in the end (Drug Topics, 2017). Some suggest that the system with the middlemen is outdated and inefficient, and that the US should adopt the European systems for negotiating drug prices. This will lead to lower medicine prices and overall be more effective argues many democrats and former president candidate Bernie Sanders (The Atlantic, 2017). Since the reimbursement contracts are confidential, there are a

lot of unknown information regarding the payments the middlemen receive for their work, why the system is not transparent to the public. Creating more transparency to the system could potentially benefit the end-consumers, and put more pressure on the active parties in the transaction of money and medicine from the pharmaceutical companies (Business Insider, March 2017). Since the middlemen has increased buying power, the pharmaceutical companies are forced to provide the rebates, and for many companies, the consequence of the rebate pressure, is that they increase the list price of their drugs, so that the rebates will not affect the company's profits in a harmful way, and thus be a threat to their projected earnings (Financial Times, 2017). In the light of this behaviour, the role of the middlemen becomes less reliable and credential than they were originally intended for, namely to make the medicine prices less costly for Americans (The American Prospect, 2017).

6.5 Conclusion

In conclusion, the consolidation of the Pharmacy Benefit Managers and pharmacies has been one of the forces behind the changing market dynamics of the pharmaceutical industry. The pharmaceutical companies on the US market face increased pricing pressure, due to the more consolidated market of PBMs that require larger rebates in return of getting their drugs on the buyers' important formularies of covered drugs (Berlingske Business, 2017). While the increased bargaining power of the PBMs help keep the growth in net drug prices under control, the list prices are still growing around 10% every year.

Both the market of pharmaceutical suppliers and PBMs are highly oligopolistic, as found by calculating their concentration ratios; the insulin drug-developers were found to have a CR4-ratio of 74%, while the PBMs were found to have a 78% CR3-ratio. Thus, both parties have much market power and should be able to make significant profits. However, the US patients seem like the weak part, as their middlemen have got increasing conflicts of interests due to the mergers between pharmacies and PBMs. Furthermore, the patients are affected by the increasing list prices, as they are often asked to pay a share of the list price instead of the net price – that is patients rarely get part of the growing sales rebates negotiated by the PBM (Forbes, May 2017). The shift in bargaining power from the pharmaceutical companies to the PBMs has prevented the drug-makers from rising the net price as much as previously, which is

expected to impact the pharmaceutical companies' profitability and profit growth targets. Likewise, this analysis suggests that profitability of the PBMs have increased, which could be interesting to examine closer.

In the next part, a case study will be made of Novo Nordisk to assess how the increased price pressure has impacted its profitability.

Part II – Case Study of Novo Nordisk

6. Case Introduction to Novo Nordisk

This section presents Novo Nordisk and the pharmaceutical company's presence in the US pharmaceutical market. Furthermore, recent changes in the competitive landscape and thus the market position of Novo Nordisk has had numerous consequences for the company.

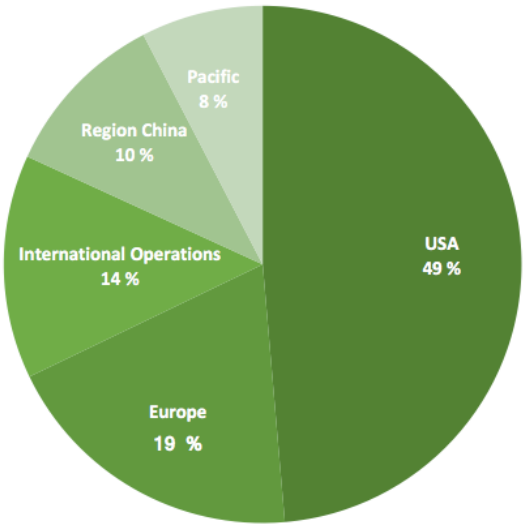
6.1 Company Profile

Novo Nordisk is a Danish healthcare company, founded in 1923, that is operating on a global scale. The company approximately has 42,000 employees globally as of March 2017, and has offices in 77 different countries. Novo Nordisk has over 90 years of development experience of diabetes care products and is headquartered in Bagsvaerd, Denmark. In addition to diabetes care, the company also has four other product areas. These includes obesity and weight management, haemophilia management, growth hormone therapy and hormone replacement therapy. The company's business segments can be divided into diabetes and obesity care, and biopharmaceuticals (Novo Nordisk, 2017). As seen on the bar chart in appendix (5.1), Nordisk had a global market share of 29.7% in 2016 in the business segment of anti-diabetic drugs. The graph illustrates Novo Nordisk's dominance in diabetes drug supply globally. The quantity of insulin supplied by Novo Nordisk almost covers half of the world's consumed insulin. The company therefore has a strong presence in the diabetes industry, and the competing pharmaceutical companies have substantial lower global market shares (Novo Nordisk Backgrounder, 2017).

6.2 Sales Overview

The US is Novo Nordisk's biggest market, and the country accounts for the largest sales earnings. In 2016, sales in the US was DKK 33,398 million, which is a lot compared to other geographical segments such as Europe and China that earned Novo Nordisk DKK 13,197 million and DKK 7,234 million respectively in 2016 (Novo Nordisk, Annual Report, 2016 p.116). Looking at the different geographical segments in percent of total sales, the US is clearly distinguished from the other geographical segments and accounted for almost 50% of total sales in 2016. This indicates that the US pharmaceutical market is of high importance for Novo Nordisk in regards to sales, and should thus be handled with caution.

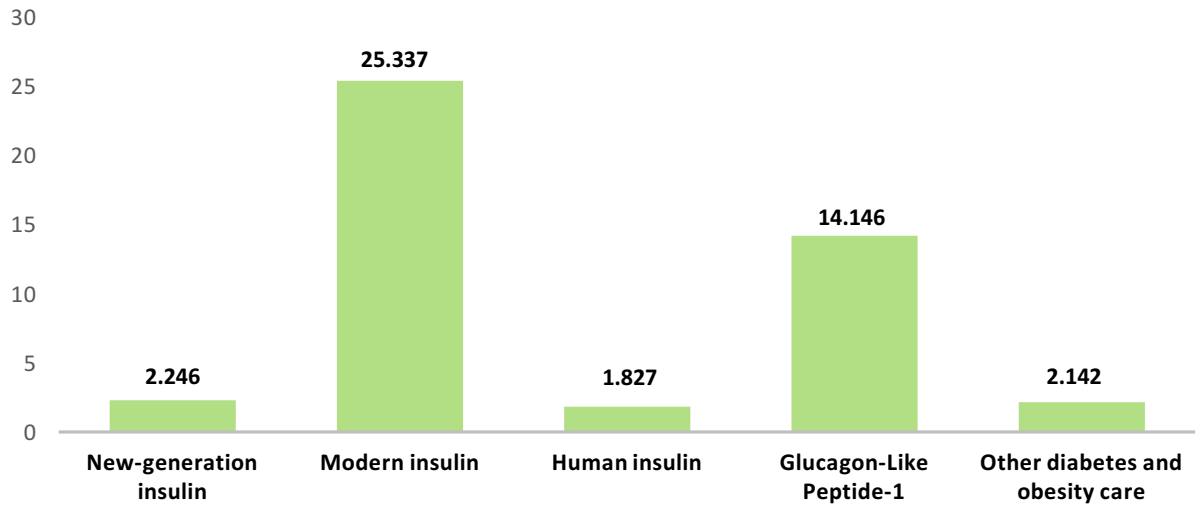
Figure (6.1): Sales by Geographical Segment in Percent of Total Sales, 2016



Source: Self-made based on numbers from Novo Nordisk Annual Report 2016, p. 116

Compared to Novo Nordisk sales numbers in 2015 which was DKK 32,234 million, the company had a decrease in earnings of almost 2% (1.164%) in 12 months. The reduction in sales is a direct consequence of the increasing buying power of Pharmacy Benefit Managers and the insurance companies, that forced Novo Nordisk to increase the rebates offered. The revenue from US mainly comes from diabetes and obesity care.

Figure (6.2): Novo Nordisk's US Sales by Business Segment (DKK billion), 2016



Source: Self-made using sales numbers from Novo Nordisk Annual Report 2016, p. 68

Looking at figure (6.2), it can be seen that modern insulin is the most sold diabetes product type and accounts for the branded product names of NovoLog, Levemir and NovoMix. Modern insulin is followed by glucagon-like peptide-1, which is on the rise in popularity due to the drugs ability to imitate a gut hormone that produces insulin when the type 2 patients eat food. The release of insulin will make sure that the blood glucose levels stay stable. The branded product under this category is called Victoza (European Medicines Agency, 2016).

6.3 From List Price to Net Price

The list price set by Novo Nordisk goes through numerous different entities in the supply chain, which will impact the net price. The net price is the realised price that Novo Nordisk can account for as earnings from selling the drug on the US market. This chain of actions is illustrated in the figure (6.3) below.

Figure (6.3): The Steps from the Initial List Price to Net Price

Source: Self-made. Novo Nordisk Annual Report 2016, p. 33

As demonstrated in the figure (6.3) above, the initial list price is set by the manufacturer of the drug. The manufacturers supply the drugs to the public, and like most types of developers of consumer goods, the company sets a list price which they set on the basis of different factors that has affected the manufacturing process. The consumers who are exposed to the list price is health care patients who doesn't have a health insurance and patients with insurance that don't necessarily cover the specific drug or other causes such as Medicare coverage gap. After the initial list price has been set, there are numerous negotiating parties that are granted rebates and discounts for the purchase of large quantities of the manufacturers drug. As mentioned earlier in this paper, these parties are called Pharmacy Benefit Managers and big insurance companies that they oftentimes work for in order to reduce the overall costs the insurance companies are exposed to when providing health care coverage for their customers. The negotiating process is largely fuelled by the chance of the manufacturers drugs being given a place on the drug formularies, which is crucial for securing a strong market presence compared to competitors. In addition, government public insurance programs such as Medicaid also requires discounts on a mandated basis. The list price is further decreased by fees that has to be paid by the manufacturers to the wholesaler, who distribute the company's drugs to different parties who has bought drugs and needs to have the drugs delivered to them. The wholesaler is in the possession of supply chain networks that will transport the drugs to the right place. The place can for example be hospitals and pharmacies scattered over the country, and thus requiring complex distribution systems.

In addition to the rebates and discounts that the drug manufacturer oftentimes gives to its large customers, there are often also additional price reductions on the basis of governmental concessions that grants different groups of patients with coupons and co-payment assistance. In addition, the price concessions can be administrative in nature, requiring Pharmacy Benefit Managers and other drug purchasing organisations to be paid a fee from the drug manufacturer. After all the price reductions have been accounted for, the manufacturer can get the net price, which is the realised price for the product. The net price is lower than the list price, and the net price is required through American governmental programs such as Medicaid and Medicare for the use of Novo Nordisk's drugs. In addition, the net price has the chance of providing broad access to the company's drugs, and thus makes it easier for patients to pay for the medicines. The net price therefore makes the drugs more accessible for a large number of

American citizens (Annual Report, 2016).

6.4 Competition

Novo Nordisk has two main competitors in the pharmaceutical industry in the US, and they are Sanofi and Eli Lilly. Sanofi is French, while Eli Lilly is American. Sanofi has had a long-time success with its diabetic drug Lantus, but due to patent expiry in February 2015. Because of the patent expiration of Lantus in 2015, Sanofi lowered the price by about 15% the same year in order to make the drug more attractive on the market. The drastic drop in price for Lantus made the insulin industry in the US more challenging for the other pharmaceutical companies, and it was the beginning of a price war that affected Novo Nordisk badly. In order to retain control in the US market, and thus especially among the powerful pharmacy benefit managers, the price decrease for Lantus was seen as necessary in the hopes of Lantus not being excluded or replaced by the possibilities of the entering of generic rivals priced significantly lower than Lantus (Berlingske Business, August 2017).

The threat to Lantus, in the form of a generic version of the drug launched by the name of Basaglar 15. December 2016. It is the first biosimilar insulin that has ever been launched, and it is a product of Eli Lilly together with the Danish pharmaceutical company Boehringer Ingelheim. Eli Lilly and Boehringer Ingelheim formed a diabetes alliance in 2011, to combine its strengths of research and innovation in the diabetic field. As a generic insulin drug, Basaglar has a lot of similarities to Lantus but has the advantage of being sold at a lower list price than the patented insulin drugs (diaTribe, 2016). Basaglar was priced 15% lower than Lantus, 21% lower than Novo Nordisk's Levemir and 28% less than Tresiba list prices when it launched in December 2016. The reason Basaglar is not called a generic insulin, is because insulin is a biologic product and thus requires more advanced production methods and processes to make the end-product. In addition, unlike regular generic drugs, Basaglar had to complete clinical trials just like patented insulin drugs are obligated to do. Because of these differences, the biosimilar insulin is still priced relatively high compared to patented insulin drugs like Tresiba and Levemir (Business Insider, December 2016).

Sanofi's insulin drug Lantus and Toujeo was taken off the formulary list and replaced by Basaglar in April 2017 by the Pharmacy Benefit Manager named CVS Health. The reason for the shift from Lantus to Basaglar was cost related, and was thus considered as a cost-effective insulin drug that many insurance companies demand for their customers as explained earlier in this paper (Diabetes Daily, 2017). CVS's chief medical officer call this shift from branded insulin to biosimilar insulin a hyperinflation strategy, which means that the company replaces price inflated drugs with less costly equivalent drug options. The company believes this strategy will be competitive in price because the manufacturers of biosimilar drugs will offer large rebates in order to expand the market share, and the branded originals will want to do the same in order to secure the market share they already possess (Bloomberg, 2016). In addition, CVS Health gave an additional statement about the exclusion of drugs from its preferred drug list:

> *"We anticipate significant savings for many clients and members, as the removal of higher cost products will enable near-term value, with additional future opportunities for savings resulting from market competition as more new products are launched."*
>
> - CVS Health (MedWatch, August 2016).

The statement from CVS Health explains that the company is price conscious, and want to provide cost savings for its customers, and additionally foster more competition in the market which can bring down drug prices in addition to the development of more generics. Prior to the replacement of Lantus with Basaglar in April 2017, Lantus had been under considerable pressure in the US. As mentioned earlier, the price of Lantus was not comparable to the price of Basaglar and thus made Basaglar highly attractive for buyers. At the same time, the significantly cheaper price of Basaglar was a threat to comparable insulin drugs and to the drug industry as a whole. It made the industry more price competitive, which inevitably pressured Novo Nordisk to give large rebates to the Pharmacy Benefit Managers in order to keep the spot on the preferred list. It was especially during the negotiations for 2017 that Novo Nordisk experienced the price pressure up close and as explained earlier, the consequences were a reduced expected operating profit target for 2017 (Berlingske Business, August 2017). Like Sanofi, Novo Nordisk have also experienced rejection from one of the pharmacy benefit

managers, namely Express Scripts for its insulin drug Victoza for the year 2017 (MedWatch, August 2016).

It is expected that the market conditions will be just as tough for Novo Nordisk in 2018, as it has been since it started to affect the company's financial reports in 2016. JP Morgan has made forecasts for the upcoming year of 2018, and considers the US pharmaceutical market to be just as difficult as it has been the last couple of years in the light of price pressure on drugs and influential buyers increasing power. The exact market price pressure will affect Novo Nordisk with a 5% decrease in its drugs prices, the company argues while Alm. Brand Markets argues that the price pressure on Novo Nordisk's drugs will resurface as an estimated 3% drop in price for 2018. Novo Nordisk have strong products in their drug portfolio, and some of the drugs have shown superior data compared to competing drug manufacturers Alm. Brand Markets explains. This may be a benefit for Novo Nordisk, even though the company are pressured to offer large rebates and discounts for the Pharmacy Benefit Managers and other buyers (Berlingske Business, August 2017).

Sanofi is believed to be Novo Nordisk largest current competitor in the US, and the company's drug Lantus has threatened their market position to such an extent that JP Morgan argues that Sanofi will offer rebates on price by more than 15% for 2018. This is why Sanofi is considered as the main driver behind the price pressure that Novo Nordisk continues to be affected by, and thus makes Novo more vulnerable to further increase the rebates in prices in order to keep its market position and avoid Sanofi to take market share from the company (Berlingske Business, August 2017).

As a competitive strategy mechanisms against the treat of biosimilars such as Sanofi, Novo Nordisk have a new diabetes drug which has been filed for approval in several countries, and got approval in Europe and Canada back in January 2017. Novo Nordisk's new drug have the potential to compete with Sanofi because like Sanofi, the drug is an insulin which is injected before a meal once daily while additionally being able to offer the flexibility of injection 20 minutes after the initial meal started as opposed to before the meal only (US National Library of Medicine, 2016). The drugs branded name is called Fiasb, and is a fast acting insulin aspart

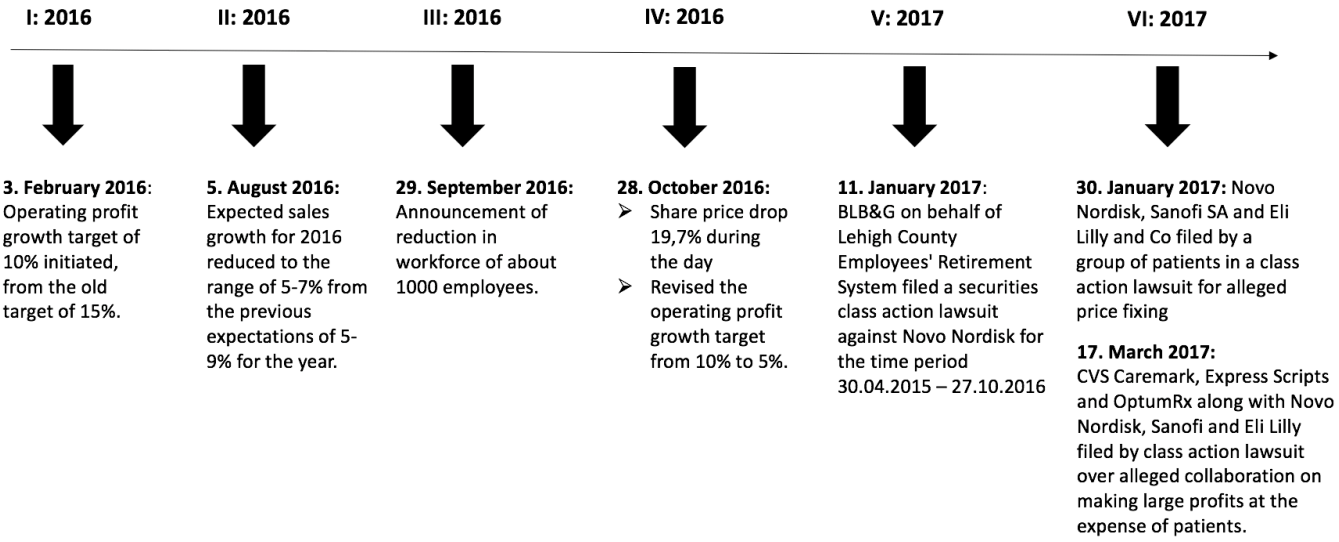
which is similar to Novo Nordisk's drug NovoLog. Fiasb has been developed in order to provide faster absorption in the body, in addition it is a new generation mealtime insulin which will provide the patients with innovative body insulin response mechanisms that can help in lowering the glucose levels after a meal intake (Diabetes Daily, 2017). In a company announcement in March 2017, Novo Nordisk explained that they expect to hear from FDA about whether Fiasb gets approved and can launch in the US. If so, the launch will be a possibility in the end of 2017 or in 2018 (Novo Nordisk, 29. March 2017).

6.5 Explanation of Timeline Events

In the following, the timeline shown in figure (6.4) will be presented in detail in order to understand the recent changes in Novo Nordisk's business and the reason behind it in relation to the changing business landscape of the American pharmaceutical industry.

6.6 Timeline

Figure (6.4): Overview of events related to Novo Nordisk from 2016 to 2017



Source: Self-made timeline of important historical dates

6.6.1 New Growth Target Initiated (I)

Lars Rebien Sørensen announced that Novo Nordisk was having more complicated corporate relationships with the stakeholders at hand in the US, and therefore the shareholders should not rely on future growth in profit margin. In addition to pressure from the insurance

companies and the middlemen, the company also made this statement explicit by lowering its expected growth in operating profit from 15% to 10%. Sørensen explained the implications of the US pharmaceutical market with the following statement (Financial Times, February 2016):

"Market access has been changed by bigger PBMs and bigger insurance companies having more leverage when they negotiate with suppliers." – Lars Rebien Sørensen (Financial Times, February 2016).

The insurance companies and the middlemen have got increased leverage, which means that the potential to increase the prices on Novo Nordisk's products is restrictive and could harm the relationship with the buyers in the US, effectively lowering profits. In regards to increased market pressure for pharmaceuticals, the problem also concerns the whole efficiency of the industry, where government have gotten more involved and concerned with the high drug prices. Democratic presidential candidates Hillary Clinton and Bernie Sanders were both occupied with the pharmaceutical industry and its practices, and this largely increased the changing market conditions that Novo Nordisk amongst others faced at this time. To sustain and minimize future financial losses in the US market, Sørensen further explained that it was important for Novo Nordisk to focus on producing and selling products that possess higher quality than their current portfolio of medicines, and thereby the company can have the ability to offer high quality products and charge a higher list price once on the market (Financial Times, February 2016).

6.6.2 Expected Sales Growth Reduced (II)

Novo Nordisk made a company announcement August 5th, 2016 to inform the public about certain financial adjustments that they had made based on changes in the market. They clearly state that they expect the prices on their products to be reasonable lower in the US in 2017, partly because of more intense competition with other basal and fast-acting insulin manufacturers and because of tough negotiating processes and equivalently higher rebates to access the formulary lists. Overall, they state that the pricing pressure in the US is difficult (Novo Nordisk, August 2016).

6.6.3 Layoffs (III)

Novo Nordisk public announced that the company had to let go of 1,000 employees, as a result of the expected tough market conditions in the US The employees that were to be affected by this decision was global, even though half of the employees was stationed at the headquarters in Bagsværd and Denmark at whole. Reducing employee wages was therefore seen as a necessary action in regard to lowering the company' operating costs to prepare for the possibility of reduced sales earnings in 2017 (Novo Nordisk, November 2016). Former CEO of Novo Nordisk, Lars Rebien Sørensen had this to say about the layoffs:

"However, we have concluded that it's needed in order for us to have a sustainable balance between income and costs. In the current situation, we have to prioritise investments in key product launches that will bring innovation to patients and drive our future growth."

- Lars Rebien Sørensen (Novo Nordisk, November 2016, slide 8)

6.6.4 Share Price Drop and Revised Growth Target (IV)

Novo Nordisk released an investor presentation on the 28. October, 2016. The report sums up the first nine months of 2016, and is of great importance to the company's shareholders and can give them insights into the current financial health and outlook. Shareholders sold their shares in a massive scale, which resulting in Novo Nordisk's share price to drop 19.7% at the most during the day when the report was released (Financial Times, October 2016). The reason behind the tremendous number, was because Novo Nordisk had stated in the report that they had revised their projected operating profit growth target from 10% to 5% (Novo Nordisk, October 2016). The shareholders of Novo Nordisk showed concern for the future economic outlook for the company, especially since the pharmaceutical market in the US was described as being tougher to handle and as a result the expected profits came under pressure. The combined pressure from politicians, pharmacy benefit managers and insurance companies to lower the prices on medicine made the US market very challenging for Novo Nordisk to operate in. Lars Rebien Sørensen stated that the price pressure could continue until year 2019, and thus shouldn't be seen as an incidental problem for the company to handle (Financial Times, October 2016).

6.6.5 Class Action Lawsuits (V+VI)

As stated in the timeline in figure (6.4), the law firm BLB&G filed a class action securities law suit 11. January 2017. The class action law suit was filed by the wishes of Lehigh County Employees' Retirement System, which is an American pension fund that invest on behalf of its members to secure pension income to employees upon retirement. The lawsuit claims that Novo Nordisk intentionally tried to hide and provide false information regarding the importance of price pressure from middlemen, in which the magnitude of the problem was much worse in reality. In addition to a lack of information transparency, the lawsuit further accuses Novo Nordisk of providing wrongful growth forecast in profit and actual earnings during the period of 30. April 2015 until 27. October 2016, and thereby represent the company financials in an overly positive way that convinced the investors that their stocks in the company was in good hands. Novo Nordisk has thus been claimed to engage in several behaviours of deceptive nature against their shareholders, and has a hold under the SEA of 1934 and Novo Nordisk shareholders with their B-shares under the regulations of owning ARB in the US financial market (PR Newswire, January 2017).

The next class action lawsuit against Novo Nordisk was filed on the 30. January 2017 in Massachusetts. Novo Nordisk along with two other big pharmaceutical companies, Sanofi and Eli Lilly, was accused of price collusion that have been affecting the company's patients negatively, since they have paid high costs for the insulin drugs produced by them. The alleged price collusion states that the three pharmaceutical companies coordinated the prices on insulin together in order to charge the patients by higher amounts of money and thus make a higher yearly profit in the US (STAT, January 2017). The class action lawsuit is not only directed against Novo Nordisk's pricing of two of their insulin products Levemir and Novolog, but also three Pharmacy Benefit Managers who allegedly knew about the inflated pricing of the insulin and took profitable advantage of the situation. In exchange for large rebates, Novo Nordisk secured Levemir and Novolog a place on the formulary list. The products thus were given favourable recommendation for use as well as often preferred over other similar products, in exchange for rebates. In addition, it is stated that Novo Nordisk did not possess qualified justifications for raising the insulin products prices such as increased production costs related to the products at hand (Berman, 2017). Concretely, the lawsuit additionally explains that Novo Nordisk and the two other pharmaceutical companies have increased the list price of the insulin

products by 150%. This colluded price increase is believed to have started five years ago (hbsslaw, 2017). The problematic relationship with pharmaceutical companies and middlemen that is the core of the price fixing is explained in the lawsuit in the following way:

"Increased benchmark prices are the result of a scheme and enterprise among each defendant and several bulk drug distributors. In this scheme, the defendant drug companies set two different prices for their insulin treatments: a publicly-reported, benchmark price and a lower, real price that they offer to certain bulk drug distributors (..) The drug manufacturer with the largest spread between benchmark and real price is more likely to secure a PBM's preferred formulary position, and, as a result, the business of that PBM's client."

(hbsslaw, 2017).

The allegations against the Pharmacy Benefit Managers is in prolongation to the class action lawsuit filed in January 2017. There was filed an additional class action lawsuit on 17. March 2017 in New Jersey on behalf of Diabetes 1 Defense Foundation and four individual prosecutors. The tree PBMs involved in the lawsuit are CVS Caremark, Express Scripts and OptumRx in addition to the original three pharmaceutical companies. The Pharmacy Benefit Managers have allegedly made large profits from the high insulin prices charged by the three pharmaceutical companies since they earn a portion of the rebates they negotiate for the insurance companies. At the core of the New Jersey lawsuit lies the allegations of deliberate collaboration between Novo Nordisk, Sanofi and Eli Lilly together with the three large Pharmacy Benefit Managers in the US, in which the high list prices of drugs yielded profits that was shared as sales earnings through product sales for the manufacturers and the increased rebates earnings to the middlemen (The Center for Biosimilars, March 2017).

6.7 New Policy on Pricing Transparency

On the 15. June 2017 the republican governor Brian Sandoval in Nevada signed a new bill that specifically targets pharmaceutical companies who develops diabetic drugs and sells them on the American market. The bill states that manufacturers of drugs for the treatment of diabetes must publish detailed descriptions of how they price their drugs in terms of list price in addition to full transparency of the rebates given to large drug buyers such as the pharmacy benefit

managers. When the bill will become effective and it will be costly for pharmaceutical companies that do not comply with this law. Novo Nordisk can risk a fine of more than 30,000 DKK everyday if the company does not follow the new rule of drug price transparency. Additionally, sales earnings for every kind of diabetic drug needs to be transparent and increases in drugs must be explained in a written statement if the price increase exceeds the forgone 1 year's inflation rate. Full price transparency may become the new normal in the American pharmaceutical industry because other US states are thinking about inducing similar laws as that of the Nevada bill in the future (Berlingske Business, June 2017).[8]

Novo Nordisk does not need to comply with the new Nevada law until April 2018. The company has publicly stated the total value of combined rebates given to large drug buyers in the US, but Novo Nordisk have deliberately chosen not to display the exact rebate given based on the company's individual products. Christian Kanstrup explained that Novo Nordisk does not want to reveal Novo Nordisk's negotiating relationships with the company's competitors since it can harm the strength of it, making rebates a bigger threat to earnings (Berlingske Business, June 2017).

6.8 Pay for Performance

Pay for performance is a system that is based on the principles of drug buyers paying for health care, based on the effectiveness of the products such as patient satisfaction with the drugs and the degree of successful disease treatment. Effectiveness of drugs are rewarded with higher earnings because the buyers willing to pay more for products that work. Additionally, products that perform badly or not as effective as promised will affect the manufacturer negatively which means they will receive a lower payment (Modern Healthcare, 2016). A precise definition of pay for performance was published in an article in the American Journal of Medical Quality in 2009, as one of the very first of its kind:

"One of the newest methods of medical compensation, combining reimbursement with quality improvement. Health care providers receive a base payment and, with the achievement of certain

[8] A drug price increase which exceeds twice the inflation rate sum of two foregone years must also be explained by the pharmaceutical companies

quality benchmarks for process measures (care provided) or outcome measures (result of patient care), providers receive certain rewards."
(Greene SE, 2009).

It is clear from the above examination of the concept of pay for performance that it can be used as a tool to give pharmaceutical companies incentives to develop high performing drugs that performs exceptionally well in order to gain earnings advantages that the pricing method gives to effective drugs. In addition, the drugs that receive acceptance from the pay for performance system as being effective can gain a differentiation effect on the market based on quality compared to similar drugs on the market. One of the biggest drawbacks of pay for performance is the requirement of data the system requires in order to take informed decisions about the effectiveness of drugs. Knowing what to measure in order to get this information is difficult including the chance of being able to directly measure the result of taking a drug, which may not be as notable for every kind of drug. Furthermore, the storage and processing of the data is time consuming, and will require more administrative costs to operate. Besides from possessing some operative challenges, pay for performance is also considered as a cost advantage, especially for the American insurance companies. University of Michigan has a center that focuses on pay for performance in the insurance industry called the Center of Value-Based Insurance Design. Director for the center is Dr. Mark Fendrick, and he explains that pay for performance have the ability to benefit consumers financially because the price system can help the payers, and therefore the insurance companies to keep the costs at bay. As a consequence, the premiums on insurance can be kept stable which will make insurance more affordable for health care patients. In addition, the quality of the drugs that insurance companies choose to cover may additionally provide better quality of care for patients (Modern Healthcare, 2016).

Former Vice President of North American Operations for Novo Nordisk, Jakob Riis, explained in mid-February 2017 that the company wanted to initiate pay for performance as the company's new price model for the US market. Pay for performance is seen as a more sustainable price model that will reward Novo Nordisk with payment from its payers on the basis of a contract between the manufacturer and the buyer on the background the effectiveness of Novo Nordisk's products. The response from the pharmacy benefit manager Express Scripts has not been

positive, because they believe that pay for performance is time consuming, and will lead to large administrative costs (Berlingske Business, April 2017).

7. Financial Analysis of Novo Nordisk

The increased price pressure has greatly impacted the drug prices. But how much has the increased price pressure by the Pharmacy Benefit Managers impacted the profitability of the pharmaceutical manufacturers? To examine the effects of the increased price pressure on the pharmaceutical companies operating in the US, a financial analysis of Novo Nordisk will be conducted. Novo Nordisk is one of the pharmaceutical companies that have been deeply impacted by the increased price pressure in the US. No less than 49% of Novo Nordisk's total sales globally are on the US market, and Novo Nordisk has experienced large stock price drops in 2016 as earlier mentioned (Annual Report 2016, p 116). The financial analysis will consist of a short stock price analysis and a more thorough ROIC-analysis.

7.1 Stock Price Analysis

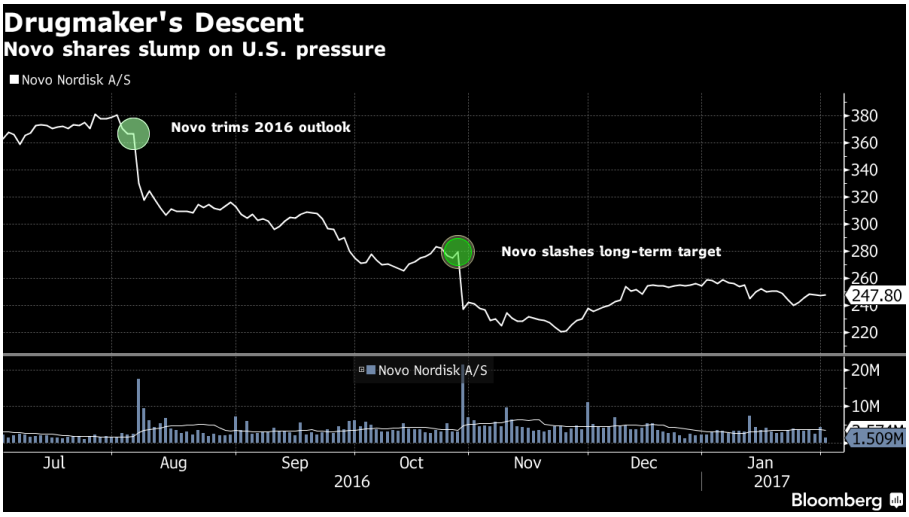
A simple way to assess the impact is to examine the shareholders' reaction to the changing situation in the US by analysing the share price evolution of the Novo Nordisk stock. For many years, Novo Nordisk has been one of the most successful stocks on the Danish stock exchange. As it is seen on the chart below, the Novo Nordisk stock has experienced an eightfold increase in stock price from 50.10 DKK per share on March 23, 2009 to 401.30 DKK on July 17th in 2015.

Figure (7.1): Novo Nordisk A/S (CPH:NOVO-B) STOCK PRICE

Source: Google Finance

However, when looking at the more recent years, it is seen that the stock price plumped a lot during the second half of 2016 in response to the US price pressure. As seen on the Bloomberg stock chart below, in the beginning of August the Novo Nordisk stock price started to drop from 379.10 DKK to 220.07 DKK on November 23. This corresponds to a 42.1% stock price drop in less than four months. When considering that the US price pressure only impacts the Novo Nordisk's US operations (49% of sales in 2016), this 42.1% stock price drop is remarkable and it could indicate that a large part of the Novo Nordisk's market value was attributed to the future growth expectations of the US market.

Figure (7.2): Novo Nordisk share price development 2016-2017



Source: Bloomberg

To get a deeper understanding of this loss in share value, a profitability analysis of Novo Nordisk actual financial results will be conducted in the following.

7.2 Profitability Analysis

In order to make the best profitability analysis, the income statements and balance sheets Novo Nordisk are reformulated into analytical statements. The analytical statements separate accounting items into operating and financial items to analyze the operating profitability. On the other hand, the financial activities are not part of the core activities and can be copied by others by creating a replicating portfolio. By separating operating and financial items, it is

possible to calculate the **return on invested capital (ROIC)**, which is defined by the net operating profit after tax (NOPAT) divided by the net operating assets, which is also called the invested capital (Petersen, 2012).

$$ROIC = \frac{Net\ operating\ profit\ after\ tax\ (NOPAT)}{Invested\ captail}$$

ROIC is a ratio that measures the profitability of the company's operations. ROIC is unlike some other profitability measures not dependent on the financial leverage of the company, why it is often assessed as a great measure for operating profitability.

When assessing whether each accounting item should be classified as operating or financial, there is no clear-cut answer, why two analysts may have differences in their analytical statements. Thus, it is needed to discuss the chosen classification of the accounting item and assess it from the available information in the annual report. Moreover, it is important to classify the accounting items consistently in the income statement and the balance sheet (Petersen, 2012, p. 68-78).

Since one of the goals of the financial analysis of Novo Nordisk is to assess the development of operating profitability and individual accounting items over time, it is decided to reformulate the quarterly statements of Novo Nordisk instead of the annual reports. This enables us to more accurately examine i.e. when Novo Nordisk has been impacted by the price pressure on the US market as there are four times as many data points. The quarterly income statements from 2012 to 2017 Q2 have been merged to one large table showing each item in the income statement. The merged actual income statement table can be seen in appendix (7.1).

Before classifying the accounting items, it is worth noting that both net sales and the reported operating profit (EBIT) have increased significantly during the years. The development can be seen on the chart in appendix (7.2). The chart shows that the reported operating profit has had a larger increase in percentage than sales, which is due to an increase in the operating margin from 36% in 2012 Q1 to 47% in 2017 Q2. Thus, the reported income statements indicate that

Novo Nordisk has been able to profitably grow its operations, but the analytical statements are needed to examine the after-tax return on the capital invested in the firm's operations.

7.3 Analytical Income Statement

The quarterly financial income statements are reformulated into an analytical income statements. This will separate Novo Nordisk's operating income from financial income and lead to Net Operating Profit After Tax (NOPAT). The quarterly statements from 2012 to 2017 Q2, which are obtained from Novo Nordisk's official website, will be reformulated. Luckily, it can be seen from Novo Nordisk's quarterly statement, that the company has kept the same accounting practises with no significant changes in accounting items in the income statement. In the following, the accounting items in Novo Nordisk statements that require more consideration will be discussed.

Classifying the Accounting Items of the Income Statement

Most items in the income statement are easy to classify as part of operations or financial activities, since Novo Nordisk has already separated most items in the income statement into of operations and financial activities. For instance, the actual quarterly income statements report an Operating profit before tax, EBIT & Financial items (net) as seen on appendix (7.1). Obviously, Net sales is a part of core operations and should therefore be classified accordingly. The same applies for the Sales and distribution costs, R&D costs and Administrative costs. However, the accounting item *Other operating income* requires more examination and the income tax is not separated into financial and operating tax.

EBITDA

Analytical statements often contain EBITDA, which is the Earnings Before Interest Tax Depreciation & Amortization. EBITDA is simply calculated as the reported EBIT plus the reported Depreciation and amortization of the quarter. The EBITDA can be seen in the analytical income statement in appendix (7.3).

Special Items

In Q1 2015, *other operating income* was over 10 times higher than the previous quarter, which is due to the initial public offering of NNIT A/S. To assess, whether this should be included or not in the NOPAT calculation, the annual report is closer examined. On page 7, the partial divestment is described as a non-recurring income, why it can be viewed as a special item. Since Novo Nordisk, in the 2015 Annual Report, notes that its accounting policy is to recognize the return of the *investments in associated companies* as financial items rather than operating profit (Annual Report 2015, p. 87), this special income is treated as a financial item.

Tax on Adjusted EBIT

While the operating profit before tax (EBIT) is disclosed in annual reports, NOPAT is not reported, why it is needed to deduct taxes from EBIT, which is not straight-forward as the net financial expenses also impact the taxes. Companies having positive net financial expenses have a tax advantage, since the net financial expenses are tax-deductible. This tax-advantage from financial expenses is called the tax shield. To calculate NOPAT, the tax should be calculated only from operating activities, excluding any potential tax shield (Petersen, 2012, p. 71-73). The tax shield can be calculated as:

$$Tax\ shield\ (benefits) = Net\ financial\ expenses * Tax\ rate$$

However, it is uncertain which tax rate should be applied. In theory, the tax shield is based on the *marginal tax rate*, but Novo Nordisk has activities all-over the world, why the tax rate is likely affected by borrowings through a subsidiary in a foreign country, where another marginal tax rate applies (Petersen, 2012, p. 76). As an outside-analyst, there is no such information to be found in the annual report, why it is decided to use the effective tax rate, which is the weighted average of all the tax rates of the company's tax paid. Using the effective tax rate is also an assumption that the same tax applies to both operations and financial activities. Nevertheless, it is assessed as the best tax estimation with the information given. Below is seen a table of the last 2.5 years, which shows, how the effective tax rate is calculated and applied to the adjusted EBIT and the net financial expenses of the last 2.5 years.

Figure (7.3): Tax on Adjusted EBIT

Actual quarterly income statement	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017
Profit before income taxes, EBT	12,485	10,548	10,136	10,314	11,953	12,602	12,301	10,942	13,004	12,643
Income taxes	2,609	2,205	1,753	2,056	2,498	2,634	2,498	2,243	2,848	2,692
Net profit	**9,876**	**8,343**	**8,383**	**8,258**	**9,455**	**9,968**	**9,803**	**8,699**	**10,156**	**9,951**

Analytical income statement	2015				2016				2017	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
EBITDA	**14,520**	**13,130**	**12,613**	**12,140**	**12,933**	**13,214**	**13,156**	**12,322**	**14,198**	**14,249**
Depreciation, amortisation and impairm	663	648	633	1,015	624	717	736	1,116	708	863
EBIT, Operating profit as reported	**13,857**	**12,482**	**11,980**	**11,125**	**12,309**	**12,497**	**12,420**	**11,206**	**13,490**	**13,386**
Special items (non-current financial)	2,376									
EBIT, Adjusted	**11,481**	**12,482**	**11,980**	**11,125**	**12,309**	**12,497**	**12,420**	**11,206**	**13,490**	**13,386**
Tax on adj. EBIT	2,399	2,609	2,072	2,218	2,572	2,612	2,522	2,297	2,954	2,850
NOPAT	**9,082**	**9,873**	**9,908**	**8,907**	**9,737**	**9,885**	**9,898**	**8,909**	**10,536**	**10,536**
Effective tax rate	*20.9%*	*20.9%*	*17.3%*	*19.9%*	*20.9%*	*20.9%*	*20.3%*	*20.5%*	*21.9%*	*21.3%*
Financial income	285	(227)	9	18	23	93	(3)	(21)	258	421
Special items (financial income)	2,376									
Financial expenses	1,657	1,707	1,853	829	379	(12)	116	243	744	1,164
Net financial items, before tax	**1,004**	**(1,934)**	**(1,844)**	**(811)**	**(356)**	**105**	**(119)**	**(264)**	**(486)**	**(743)**
Tax shield from financial activities	(210)	404	319	162	74	(22)	24	54	106	158
Net financial items, after tax	**794**	**(1,530)**	**(1,525)**	**(649)**	**(282)**	**83**	**(95)**	**(210)**	**(380)**	**(585)**
Profit of the quarter, check	*9,876*	*8,343*	*8,383*	*8,258*	*9,455*	*9,968*	*9,803*	*8,699*	*10,156*	*9,951*
Taxes of the quarter, check	*2,609*	*2,205*	*1,753*	*2,056*	*2,498*	*2,634*	*2,498*	*2,243*	*2,848*	*2,692*

Source: Self-made, Financial Statements Quarterly

The full analytical income statement containing all quarters from 2012, can be seen in appendix (7.3). The effective tax rate is simply calculated as the income tax of the quarter divided by the EBT of the quarter. From figure (7.3) above, it is seen that the effective tax rate varies between 17.3% and 21.9%, which is lower than the Danish marginal Corporation tax of 22% (23.5% in 2015 & 24.5% in 2014).[9] This shows that Novo Nordisk does pay corporation tax in other countries as Denmark.

The taxes of the quarters are distributed into tax related to operations and tax savings/expenses from debt financing by using the effective tax rate. As seen on the table above and on the complete analytical income statement in appendix (7.3), Novo Nordisk has a positive tax shield in most quarters, since the financial expenses are larger than the financial income. When there is a positive tax shield from financing, the taxes on the operations are larger than the total taxes of the quarter.

[9] Numbers are collected from Skatteministeriet, 2017. See reference list for further details.

The taxes are deducted from the adjusted EBIT, which is excluding special items that is assessed as part of financial activity. This results in NOPAT, the *Net operating profit after tax*, which is one of the two key components in calculating ROIC.

7.4 Analytical Balance Sheet

Like with the Analytical Income Statement, the balance sheet also should be divided into operating and financial activities to obtain the Analytical Balance Sheet. The actual report balance sheets have been merged into one large table, which can be seen in appendix (7.4).

Operating Assets and Liabilities

Some accounting items are straight-forward to classify as part of operations. For instance, *Inventories* and *Trade receivables* are an unquestionable part of Novo Nordisk core operations of producing pharmaceutical products (building up inventories) and selling them on credit (trade receivables). Likewise, *Trade payables* is a liability to Novo Nordisk's suppliers, which is also an operating activity. The *intangible assets* of Novo Nordisk include computer software, acquired patents and licenses for ongoing Research and development projects, which is also assessed as part of operations in this financial analysis (Annual Report 2016, p. 74).

A relatively large part of Novo Nordisk total assets is the non-current asset item; *Property, plant and equipment*. While production plants and equipment is a certain operating asset, it is more uncertain whether the property owned by Novo Nordisk is a part of core operations. If the property is owned solely for real-estate purposes, i.e. to generate an economic return without using the buildings itself, then it could be argued that property is a financial investment. However, Novo Nordisk only mentions production plants and business-related facilities in the note to the accounting item in the latest annual report (Annual Report 2016, p. 75), why it is decided that the whole accounting item should be classified as an operating asset.

Financial Assets and Liabilities

Novo Nordisk have multiple assets items that can be easily be classified as financial. These financial assets include *Other financial assets*, *Marketable securities* and *Derivate financial instruments*. Novo Nordisk has remarkably little long-term loans. In fact, Novo has not had any non-current loans on the balance sheet since Q4 2012 as seen in appendix (7.4). However,

there is some interest-bearing *Current debt*, which is obviously a financial liability that should be included in the net-interest-bearing debt. Furthermore, *Derivative financial instruments*, which is used for hedging financial risks (Annual Report 2016, p. 85) is a part of financial activities and will be classified accordingly. Other potential financial assets and liabilities will be discussed in greater details in the following.

7.4.1 Balance Items Requiring More Consideration

There are several asset and liability items in the balance sheet, that should be carefully considered before deciding, whether it should be classified as part of operations or net-interest-bearing debt. To closer examine these accounting items, the notes and descriptions in Novo Nordisk annual reports are used to get a deeper understanding of the accounting item.

Note (1) - Investments in Associated Company

In the quarterly balance sheets, it is seen that Novo Nordisk has had investments in associated companies in Q1-Q3 of 2012 and from the beginning of 2015 up to the latest statement in 2017 Q2. If these investments in associated companies are a part of the core operations of Novo Nordisk, then it should be classified as operations and included in invested capital according to Petersen & Plenborg (2012).

Simply by looking at the quarterly statements in Excel, it is not possible to interpret if these investments are part of core operations or not, why the annual reports are looked into. In the 2015 Annual Report, Novo Nordisk notes that its accounting policy is to recognize the return of the *investments in associated companies* as financial items and not as operating profit (Novo Nordisk Annual Report 2015, p. 87). This suggests, that the asset Investment in associate company should not be recognized as a part of Novo Nordisk core operations. Furthermore, it is seen that the *investment in associated company* is the remaining 25.5% share of NNIT A/S, which Novo Nordisk made a 74.5% divestment of on 6 March 2015 (Annual Report, 2015, p. 107). In the analytical income statement, the divestment of NNIT is treated as a special-item, that is not included in NOPAT, so to be consistent, the *investment in associated company* is also classified as a financial item that is subtracted in the calculations of net-interest-bearing debt.

Note (2) – Tax Assets and Liabilities

While *Income tax* is the single tax item in the income statement of Novo Nordisk, there are four tax items in the balance sheet; *Deferred income tax assets*, *Tax receivables*, *Deferred income tax liabilities* and *Tax payables*. Since taxes are related to both operating and financial activities, the income tax was spitted into operating tax and a tax shield from financial activities in the analytical income statement. However, it is not possible to make such a separation of the balance items as Novo Nordisk does not provide information that can link the deferred tax items to financing or operations. Petersen & Plenborg (2012) describes that deferred tax assets generally "*arise from tax loss carry forwards or assets (liabilities) that are recognised at a lower (higher) value in the balance sheet than for tax purposes*" (Petersen & Plenborg, 2012, p. 88). Novo Nordisk mentions in the 2016 annual report, the company is subject to income taxes around the world and is required to make estimations of uncertain tax positions (Novo Nordisk Annual Report 2016, p. 72). From the annual report 2016, it seems that the deferred tax assets and liabilities of Novo Nordisk are due to differences in tax judgements and actual tax payments. Since Petersen & Plenborg (2012) argues that tax assets are related to operations in most cases and not further information is given from the notes of the Novo Nordisk annual reports, all the tax items on the balance sheet are classified as operations in this analytical balance sheet.

Note (3) – Other Receivables and Prepayments

Simply by looking at the name of the accounting item, it is unknown, whether *Other receivable and prepayments* is an operating or financial asset. However, it is seen in the newest Novo Nordisk annual report, that *Available-for-sale financial assets* are included in Other receivable and prepayments (Annual Report 2016, p. 87). Furthermore, the annual report describes this accounting item in section 4, which is called *Capital Structure and Financing Items*. This leaves no doubt, that the Other receivables and prepayments should be classified as a financial asset that will be deducted from the net-interest-bearing debt.

Note (4) – Cash at Bank

The reported cash at bank can be viewed as either excess cash or cash that are needed in the daily operations. Most firms need some cash at bank to be able to pay salaries, invoices and expenses when its needed. The cash needed for operations should be classified as operating

cash, while the excess cash that is not needed in operations should be viewed as a financial asset and deducted in the net-interest-bearing debt. Nevertheless, Novo Nordisk does not distinguish between excess and operating cash, why it is not possible to precisely separate operating cash from excess cash. Petersen & Plenborg (2012) suggest that the cash can be viewed as excess cash if the cash position remains stable over time. However, Novo Nordisk cash at bank has fluctuated relatively much from quarter to quarter, i.e. it was DKK 4.8 billion at the end of the first quarter of 2015 and DKK 13.2 billion only three month later. It is hard for an outside analyst to determine how much cash is needed to run daily operations. A widely-used rule of thumb to distinguish operating and excess cash is to define operating cash to be 2% of revenues (Damodaran, 2016). This rule of thumb is often too simple if a valuation is made, as it does not take the specific industry or company size into account. Nevertheless, it is decided to follow the rule of thumb define Novo Nordisk' operating cash as 8% of the quarterly revenue, which corresponds to 2% of the annual revenue.

Note 5 – Retirement Benefit Obligations

The retirement benefit obligation on Novo Nordisk' balance sheet could be classified both as a financial liability or as part of operations dependent on the individual analyst. On one hand, retirement benefit plans are a part of total employee costs, but has simply not been paid out yet. Staff expenses are a part of the core operations of a firm, and thus it could be argued that this liability should be deducted in the operating invested capital. On the other hand, it is seen in the annual report of 2016, that there are interest costs associated with the retirement obligation. In example, the retirement benefit obligation was 2,268 DKK million in the beginning of 2016, which led to 51 DKK million in interest costs during 2016 corresponding to around 2.25% in interest rate. Since Novo Nordisk also has some assets of the retirement plan, the net retirement obligation was 1,451 DKK million at the end of 2016 (Annual Report, 2016, p. 78).

In Novo Nordisk's Annual Report 2016, the retirement benefit obligation is classified as an operating liability in section 3 (Annual Report, 2016). But the fact that the retirement benefit obligation is a non-current liability that is interest-bearing, suggests that it should be part of the net-interest-bearing debt rather than invested capital according to Petersen & Plenborg (2012). Even though, the retirement benefit obligation is a direct result from core operations, it is now

an interest-bearing liability like other financial debt, why it is chosen to treat the retirement benefit as a financial liability in our analytical balance sheet.

Note 6 – Provisions

The provisions in the balance sheet of Novo Nordisk are interesting to this paper, as the provisions primarily comprise of provisions for sales rebates granted to its customers (Annual Report 2016, p. 79). From the previous analysis of the pharmaceutical market, it is known that the price pressure from PBM results in large rebates on the US market. The provisions and sales rebates will be further analysed in a later section of this paper. For the profitability analysis, the important matter is that provisions only comprise of operational activities, why they are classified as operating liabilities that impact the invested capital.

Note 7 - Other Liabilities

The *Other liabilities* could be part of both operational and financial activities, but from the annual report, it is seen that the other liabilities are mainly employee costs payable, accruals, sales rebates payables, outstanding VAT (Annual Report 2016, p. 80). All these activities are part of operations, and the item other liabilities is therefore classified as operational liabilities, which reduce the invested capital.

7.4.2 Invested Capital

Now that all items in the balance sheet have been classified as operating or financial, Novo Nordisk's combined investments in its operating activities can be calculated, which is denoted as *Invested Capital*. The Invested capital equals the sum of the operating assets minus the sum of the operating liabilities, why it is sometimes called the net operating assets (Petersen, 2012, p. 73). Petersen & Plenborg (2012) define the invested capital as the *"amount a firm has invested in its operating activities and which requires a return"* (Petersen, 2012, p. 74). The invested capital can also be calculated as the sum of Net-interest-bearing debt and total equity, which corresponds as the funds used to finance the operations.

The calculations of Operating assets, operating liabilities, net-interest-bearing debt and the invested capital is seen on the full analytical balance sheet in appendix (7.5). Of the seven accounting items classified as operating assets, the Property, plant and equipment, Trade

receivables and Inventories are the largest items of the operating assets. While operating assets are substantial larger than operating liabilities as expected, the interest-bearing assets are much larger than the interest-bearing debt, which is unusual. This effectively means that Novo Nordisk does not have any debt – in fact, the company has a negative NIBD as it has more financial assets than obtained interest-bearing debt.

As seen on the line chart in appendix (7.6) the operating assets have increased significantly; from around DKK 45 billion in the beginning of 2012 to around DKK 72 billion as of 30th June 2017. However, the increase in operating assets is almost completely offset by a similar increase in operating liabilities, which effectively means that the invested capital has been kept relatively stable and only increased from DKK 21 billion to around DKK 26 billion during the same time.

The increase in operating liabilities is mainly driven by a large increase in current provisions as seen on the waterfall chart in appendix (7.7). As mentioned above, the current provisions mainly comprise of sales rebates granted to the buyers. These sales rebates are due to the increased price pressure on the US market, why this accounting item is interesting to analyse. The current provisions have increased by DKK 13,930 million, which corresponds to 65% of the total increase in operating liabilities in this 5.5-years-period. Thus, the current provisions containing the given sales rebates on the US market has a very large impact on the Invested Capital used in the ROIC-calculations.

In order to analyse the increase in current provisions, the development in this balance sheet item is graphed on the line chart in appendix (7.8). On the chart, it is seen that the current provisions were relatively stable from 2011 to mid-2014. However, the current provisions climbed sharply from DKK 7,924 million in 2014 Q1 to DKK 21,861 million at the end of 2017 Q1. This is an 176% increase in as a little as 3 years. This indicates that Novo Nordisk has been heavily impacted by the increased price pressure on the American market, which is in line with expectations. As seen on the analytical balance sheet in appendix (7.5), Novo Nordisk had DKK 26,057 million in invested capital, which is the amount invested in operations and that requires a return.

7. 5 ROIC-Analysis

Since the income statement and the balance sheet have been reformulated into analytical statements, it is now possible to advance and calculate the ROIC of Novo Nordisk. ROIC is calculated using NOPAT from the analytical income statement and Invested Capital from the balance sheet. Usually, ROIC is a measure used on a yearly basis, why the NOPAT from the quarterly income statement should be annualized to make ROIC more comparable to other companies. To do so, the quarterly NOPAT is simply multiplied by 4 to reach an estimated yearly NOPAT. However, this could be biased if there is seasonally in the operational earnings of Novo Nordisk. Therefor there will be made a quick seasonality check of NOPAT by graphing the quarterly development as seen on the chart in appendix (7.9). As seen in appendix (7.9), there is clearly a positive trend, which makes it slightly harder to assess seasonality. The fourth quarters of each year are marked by the orange dots and looks like a quarter of the year with lower NOPATs than the surrounding quarters – especially in 2015 and 2016. Furthermore, the second quarter of the year are higher than the surrounding quarters in 2013 and 2014. However, it is assessed that there is no consistent strong seasonality, but that the ROIC of a specific quarter should take surrounding quarters into account.

The invested capital is a constructed sum of other balance sheet items, why it should not be annualized like the NOPAT. However, it should in theory be an average of every point of time in the quarter that the NOPAT was achieved. Though it is impossible to calculate the exact average over the quarter, a practical approximation can be made by taking the average of the primo and ultimo of the quarter. I.e. the annualized ROIC of 2017 Q1 should be calculated as following:

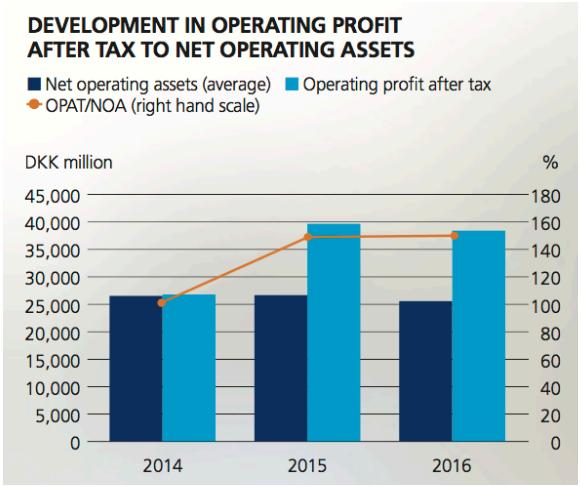
$$ROIC_{2017,Q1}(annualized) = \frac{NOPAT_{2017,Q1} * 4}{Inv.Capital_{31.12.2016} * 0.5 + Inv.Capital_{31.03.2017} * 0.5}$$

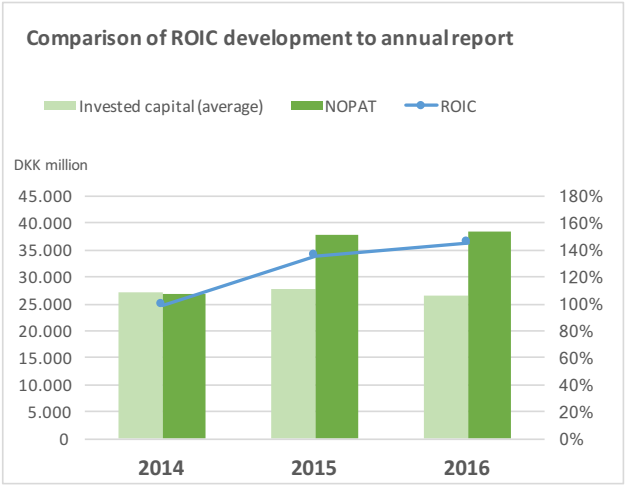
The table containing the results of the quarterly ROIC calculations can be viewed in appendix (7.10). On the chart in appendix (7.10), it is seen that ROIC has increased a lot during the last 5.5 years.

7.5.1 Comparison to Novo Nordisk's Own Analytical Profitability Measure

As mentioned earlier, Novo Nordisk has presented its own view of invested capital in the latest annual report. Novo Nordisk uses the terminologies Net Operating Assets instead of Invested Capital and OPAT instead of NOPAT. The OPAT/NOA illustrated by the orange line on the figure (7.4) seen below.

Figure (7.4): Novo Nordisk's own calculations of Invested capital, NOPAT & ROIC





From analytical statements. In DKKm	2012	2013	2014	2015	2016
Invested capital (average)	20,656	23,865	27,072	27,890	26,446
NOPAT	22,713	24,374	26,791	37,770	38,428
ROIC	110%	102%	99%	135%	145%

Source: Annual Report 2016 p. 74 and self-made based on quarterly financial statements

One of the main difference in Invested capital from the self-made analytical balance sheet to the one in the annual report is that Retirement benefit obligations is classified as interest-bearing debt in the self-made analytical balance sheet since the liability is interest-bearing, while the accounting item it is a part of operating liabilities in the annual report (Annual Report, 2016, p. 78). Furthermore, cash is separated to operating and excess cash in the analytical statement, while cash looks like it is solely treated as a financial asset in the annual report (Annual Report, 2016, p. 86). Even though, there are some differences in some of the individual accounting items, it is seen on figure (7.4), that the invested capital from our analytical balance sheet is only slightly above the reported Net operating assets in the annual report. I.e. this leads to ROIC being slightly below 100% in 2014 in the analytical statements,

while it can be seen on the figure from the annual report that OPAT was larger than NOA in 2014 and that ROIC thus is above 100%. The largest difference, however, is in 2015, where NOPAT in the analytical statement is substantial lower than the comparable OPAT reported in the annual report, which leads to around 10 percentage points difference in ROIC. This is because the divestment of NNIT A/S was assessed as a non-recurring and financial, special item in the analytical income statement, while Novo Nordisk treats this as regular operating profit.

7.5.2 Decomposition of ROIC (DuPont Analysis)

From the analysis above, it was seen how much ROIC has increased from 2012 to 2017, but to be able to better explain where this improved return on invested capital arsis from, a decomposition of ROIC is needed. This is done by splitting ROIC into the operating profit after tax margin and the turnover rate of invested capital.

$$ROIC = NOPAT_{margin} * Turnover\ rate\ of\ invested\ capital$$

The turnover rate of invested capital is defined as the Net Revenue divided by the Invested Capital average (Petersen, 2012, p. 107-109). Again, since the turnover rate is a combination of income statement- and balance sheet items, it is usually interpreted on a yearly basis, why the turnover rate will be annualized by multiplying the quarterly revenue by 4.

The calculated NOPAT-margin and Turnover rate of Invested capital from 2014-2017 can be seen in figure (7.5) below. The full table and a visualizing chart can be seen in appendix (7.11).

Figure (7.5): Calculated NOPAT-Margin and Turnover Rate of Invested Capital 2014-2017

	2014				2015				2016				2017	
DuPont calculations	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
NOPAT	6,250	6,795	6,588	7,158	9,082	9,873	9,908	8,907	9,737	9,885	9,898	8,909	10,536	10,536
Net sales	20,343	21,629	22,249	24,585	25,200	27,059	26,792	28,876	27,212	27,459	27,537	29,572	28,452	28,638
NOPAT margin	**30.7%**	**31.4%**	**29.6%**	**29.1%**	**36.0%**	**36.5%**	**37.0%**	**30.8%**	**35.8%**	**36.0%**	**35.9%**	**30.1%**	**37.0%**	**36.8%**
Net sales, annualized	81,372	86,516	88,996	98,340	100,800	108,236	107,168	115,504	108,848	109,836	110,148	118,288	113,808	114,552
Invested capital - mid average	26,592	28,170	27,551	26,404	28,690	29,495	27,164	26,692	27,226	26,943	25,862	25,300	24,825	24,981
Turnover rate of invested capital	**3.06**	**3.07**	**3.23**	**3.72**	**3.51**	**3.67**	**3.95**	**4.33**	**4.00**	**4.08**	**4.26**	**4.68**	**4.58**	**4.59**
ROIC, annualized (check)	94.0%	96.5%	95.7%	108.4%	126.6%	133.9%	145.9%	133.5%	143.1%	146.8%	153.1%	140.8%	169.8%	168.7%

Source: Self-made, Financial Statements Quarterly

Impressively, Novo Nordisk has achieved quarterly NOPAT-margins above 30% in 18 of the last 22 quarters. Over the last five years, the after-tax operating profit margin has increased by 33.7% (9.3 percentage points) from 27.7% in Q1 2012 to 37.0% in Q1 2017. The increase in NOPAT-margin has a large positive impact on ROIC, but the Turnover rate of Invested capital looks like it has increased about the same amount. From 2012 Q1 to 2017 Q1, the Turnover rate of invested capital has increased from 3.48x to 4.58x, which corresponds to a 31.9% increase. Thus, the increase in ROIC can almost equally be attributed the increase in NOPAT-margin and Turnover-rate.

The increase in Turnover rate of Invested capital is a result of Novo Nordisk being able to increase its Net revenue while Invested capital has been kept at a low level. As mentioned earlier, Novo Nordisk has experienced a large increase in operating liabilities primarily due to the increase in current provisions, which are a result of sales rebates given to customers. This impacts the invested capital in a negative direction, which in turn increases ROIC. Thus, the increase in current provisions 'act' as financing for Novo Nordisk's operations.

8 Discussion of Part II

In the profitability analysis above from the analytical statements, the ROIC of Novo Nordisk is calculated to be 135% in 2015 and 145% in 2016. In comparison, McKinsey analysed that the median ROIC across 7,000 publicly listed non-financial US firms from 1995 to 2004 was 12.2% (McKinsey & Company, 2006). However, as seen on appendix (7.12), the pharmaceutical industry was the highest performing industry of all with a median ROIC level around 26% in 1995-2004. Still, the ROIC levels calculated in this profitability analysis is 4-5 times higher than this median ROIC level, which explains why Novo Nordisk is assessed as an extremely high preforming company profitability wise.

To compare Novo Nordisk profitability with other pharmaceutical companies, it is found necessary to rely on external data for this purpose, as it is out of the scope of this paper to reformulate the financial statements of all competitors. As seen on appendix (7.13), Novo Nordisk is by far the most profitable company with a ROIC of 82.2% in 2016, according to Statista (Statista, 2016). This ROIC level of Novo Nordisk is very different from our calculated

ROIC and the comparable measure in the Novo Nordisk annual report, which makes the Statista data seem less credible. Still, the chart in appendix (7.13) shows that Novo Nordisk is far beyond the competing pharmaceutical companies in terms of profitability.

So Why is Novo Nordisk the Top-Performing Pharmaceutical Company?

In Part I of this paper, it was found that the global anti-diabetes market, is a highly oligopolistic market with a four-company concentration ratio of 74%. The microeconomics section of this study showed that more concentrated markets like an oligopoly typically result in more profitable markets than competitive markets. In addition, Novo Nordisk has some monopoly power, since their primary products are patented. A monopoly is even more profitable than an oligopoly according to the microeconomic theory. Furthermore, Novo Nordisk faces inelastic health consumers, as the price elasticity of the antidiabetics market has been found to be -0.25 in a study by Goldman et al. in 2004, which makes high prices more profitable. Hence, there are very lucrative market conditions on the antidiabetics market. Of course, there are also other large pharmaceutical companies on the anti-diabetes market, but Novo Nordisk is by far the global market leader with its 29.7% global market share, as seen in appendix (5.1).

In conclusion, Novo Nordisk's profitability is based on ideal market conditions, but it is hard to say how large a share of the profitability that can be traced back to the market power of the company. Other factors such as managerial talent and lucrative patent-protected products (i.e. Victoza) also impacts the profitability, and the market of anti-diabetics has grown by around 12% annually over the last 10 years (Forbes, March 2016).

Impact of PBMs' Increased Buying Power

The increased price pressure from the PBMs has stagnated Novo Nordisk's growth in net sales on the US market in 2016 and first half of 2017. As seen on appendix (7.14), the Compound Quarterly Growth Rate (CQGR) in net sales on the American market, which is dominated by the US, was 4.16% between the first quarters of 2011 and 2016, but the CQGR has dropped down to 1.04% from 2016 Q1 to 2017 Q2. This is partly due to the PBMs having been successful in negotiating larger rebates from Novo Nordisk. The sales rebates amounted to 59% of gross sales in the US in 2016, while it was 56% in 2015 and only 48% in 2014 (Annual Report 2016, p. 66).

While the increased price pressure has slowed down the net sales growth in the US, and thus the potential to increase operating profit, the increased list prices and sales rebates also has an opposite effect that has improved the ROIC-measure. This is due to Novo Nordisk often initially receive the full list price and afterwards pay the agreed rebates back to the payer. This means that Novo Nordisk holds on to a share of the rebates that are increasing in size, which leads to Novo having larger provisions and thus operating liabilities as seen on appendix (7.6) and appendix (7.16). The increasing provisions is free financing of the operating activities, and the provisions effectively decreases Novo Nordisk's invested capital, which improves the ROIC-measure.

Share Price Performance and Lawsuits Against Novo Nordisk

The increased price pressure lead Novo Nordisk to dropping its expected sales growth target for 2016 to 5%, while Novo also decreased its operating income growth target twice during 2016 as shown by the timeline in the previous section. Thus, Novo Nordisk and its shareholders were initially expecting larger growth rates in revenue and operating income, but the realization of the increased price pressure on the US market made it necessary for the company to lower its financial targets, which in turn made the stock prices plummet. In the hindsight, Novo Nordisk did not reach its revised operating growth target of 5%. Actually, they experienced a negative operating profit growth of 2%, but when adjusting for the divestment of NNIT in 2015, the adjusting operating profit growth was 3.9%, which is also below the revised target (Annual Report 2016, p. 9).

As mentioned earlier, there is an ongoing lawsuit, accusing Novo Nordisk for intentionally hiding or providing false information regarding the price pressure of the PBMs. As seen on appendix (7.15), Novo Nordisk share price took a large drop in the second half of 2016, while the average of Novo Nordisk's pharmaceutical industry peers was relatively stable during the same period. The share price index of the Pharmaceutical industry peers, which comprise of some of Novo Nordisk largest competitors as seen on the appendix (7.15), has unlike Novo Nordisk, not had any sudden drops in the share price around this period. In fact, Novo Nordisk has been having higher share prices than its peers in 2015 most of 2016, but the sudden drop in Novo's share price means that it ended 2016 with a lower share price than its peer average. This could indicate that Novo Nordisk and its investors have been overly optimistic during this

period, and that its peers were better able to avoid share price volatility perhaps by including the changing market dynamics in its forecasts and the published growth rate targets. However, the average share price of a peer group comprising of multiple companies will be less volatile than a single stock due to diversification, but nevertheless, the effect of the increased market price pressure has not impacted the peer group's share prices nearly as much as the case of Novo Nordisk.

Further research

The pharmaceutical industry is undergoing large changes, and it will be interesting to see how the price pressure impacts the profitability of the US pharmaceutical manufacturers in the future. Novo Nordisk previous CEO, Lars Rebien believes that the price pressure from the PBMs will result in lower net prices in 2017 due to larger rebates:

> *"In 2017, we will see lower net prices in the US as we had to increase the rebates we offer the pharmaceutical benefit managers (PBMs) in order to ensure broad market access for our products."*
>
> – Lars Rebien, Novo Nordisk CEO (Annual Report 2016, p. 2).

While this study focuses on the price pressure's impact on the profitability of the drug manufacturers, it would be equally as interesting to perform a financial analysis of the PBMs. In particular, it would be relevant for further research to examine the relationship between the development in concentration ratio of the PBM-market with the profitability of the PBMs. Furthermore, it would be thrilling to follow whether the sparkling debate among US politicians will result in significant new policies that will change the market dynamics and power balance.

9. Conclusion

This paper has examined the evolving price dynamics of the US pharmaceutical market and its impact on Novo Nordisk's profitability. The pharmaceutical industry has many unique markets characteristics including inelastic consumers and patent protection of newly developed pharmaceutical drugs, which simulates a monopoly setting and high profitability if there are no close substitutes.

The pharmaceutical market in the US is particularly complex, as the industry is market-based and subject to limited governmental interference. Around 69% of the US adults rely on private health care insurance, and the insured US patients get their prescription drug costs fully or partly covered, if the acquired drug is on the health care plan provider's formulary. Therefore, the pharmaceutical manufacturers are dependent on appearing on the formularies and preferred drug lists to make their prescription drugs accessible and affordable for the US patients.

On the US market, Pharmacy Benefit Managers (PBMs) act as middlemen and buy medicines from the pharmaceutical companies on behalf of its clients, which include pharmacies and insurance companies. The PBMs pool the buying power of its network of clients and determine the important drug formularies, which is why the PBMs have bargaining power to demand sales discounts and rebates that reduce the list prices of the prescription drugs.

Since 2007, there has been multiple billion-dollar mergers consolidating the US industry of PBMs. Besides merging with each other, PBMs have also merged with pharmacies, which has led to less independent PBMs and a more concentrated buyer market with three dominating PBMs controlling 78% of the PBM-market in 2016. As found in the microeconomics section of this paper, as a market gets more concentrated and less competitive, the market players get more bargaining power and can generate higher profits. Thus, there has been a shift in bargaining power from the pharmaceutical manufacturers to the PBMs, which has led to increase price pressure on the drug prices. This is reflected by the growth rates in net prices, which has dropped from 8.8% and 9.1% in 2011 and 2012 down to between 2.5% and 4.8% in the four succeeding years. At the same time, the list prices of the drugs have continued to increase at two-digit growth rates, which shows that the PBMs have negotiated increasingly high rebates. However, the US patients are facing increasingly expensive insurance premiums, since a large share of the drug price rebates are not distributed down the value chain to the end consumers.

To assess the impact on profitability of Novo Nordisk, the company's quarterly financial statements were reformulated into analytical income statements and analytical balance sheets. From these analytical statements, the ROIC of Novo Nordisk was calculated to have increased

from 99% in 2014, to 135% in 2015 and 145% in 2016. Compared to other companies, Novo Nordisk has achieved a substantial higher ROIC than its industry average. The microeconomics section of this paper can partly explain the high profitability of Novo Nordisk, as the company is the market leader of the highly oligopolistic anti-diabetics market, which has a CR4-ratio of 74%. Furthermore, the law of demand is weak on the anti-diabetics market, since this market has the most inelastic (-0.25) consumers out of several branches of pharmaceutical industries, according to a study by Goldman et al. in 2004. In addition, Novo Nordisk have several active patents that gives monopoly power and increased profitability.

The increased price pressure by the PBMs has stagnated the growth rates in net sales and operating profits of Novo Nordisk, which have resulted in revised growth targets and large share price drops in the second half of 2016. However, ROIC has surprisingly increased from 2015 to 2016 according to the performed profitability analysis. This is primarily due to the increased current provisions, which are a direct result of the larger sales rebates. Until the sales rebates are settled and paid out to the buyers, they figure as an operating liability on the balance sheet and reduces the invested capital, which in turn increases ROIC. In addition, the financial analysis of Novo Nordisk showed that the company experienced an operating profit growth of 3.9% in 2016 and thereby did not meet its operating profit growth rate target, even though this target initially was 15% and then revised twice to 10% and eventually 5%. Furthermore, Novo Nordisk's pharmaceutical industry peers have not experienced a share price drop similar to the one Novo Nordisk had in the second half of 2016, which indicates that the peers might have been better in anticipating and adjusting their financial targets to the increased price pressure of the US market. Related to this, Novo Nordisk is now facing lawsuit allegations of having been overly optimistic and falsely informing its shareholders.

In conclusion, this paper suggests that the consolidation of the Pharmacy Benefit Managers have made a shift in bargaining power and has changed the US pharmaceutical industry and the profitability of the drug manufacturers. Perhaps, the US pharmaceutical industry is on the verge of a fundamental change, as the increased list prices and pricing power of the PBMs have ignited the political debate that demand changes that are beneficial to the US patients.

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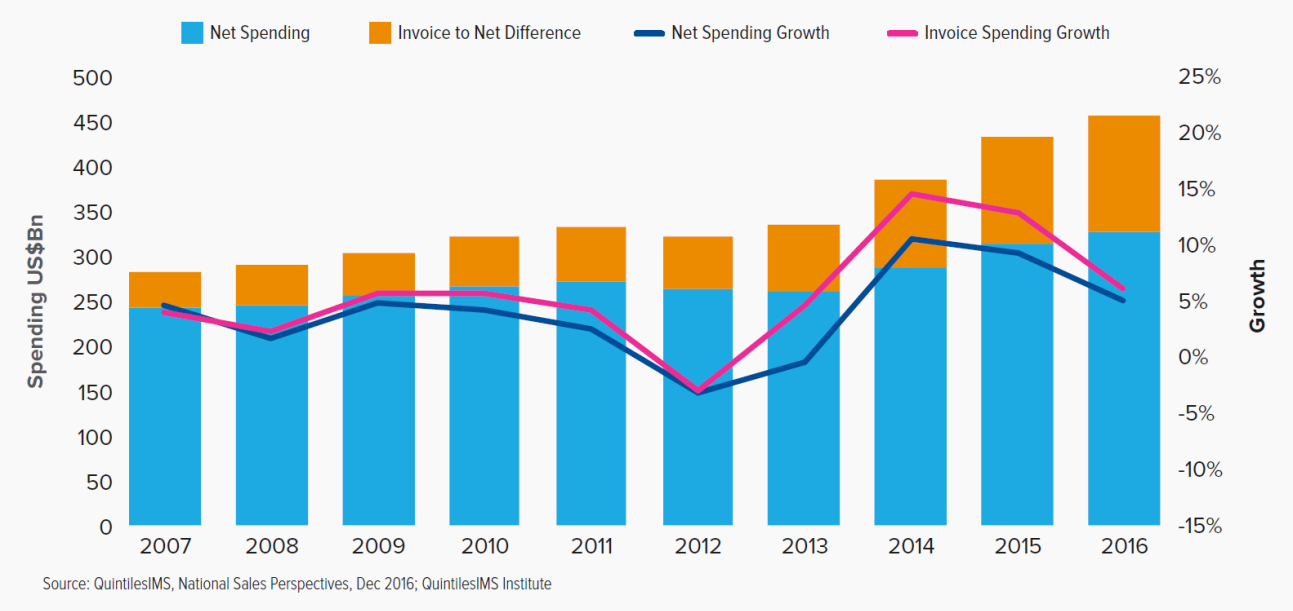
Appendices

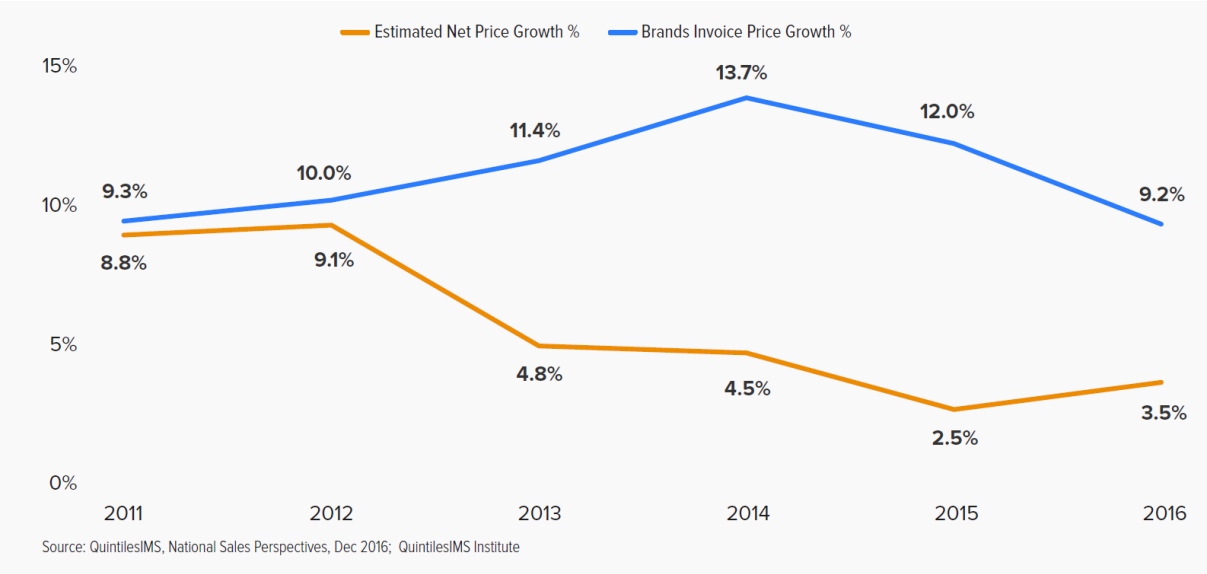
Appendix

Appendix 4.1 – US Total Medicines Spending 2007-2016



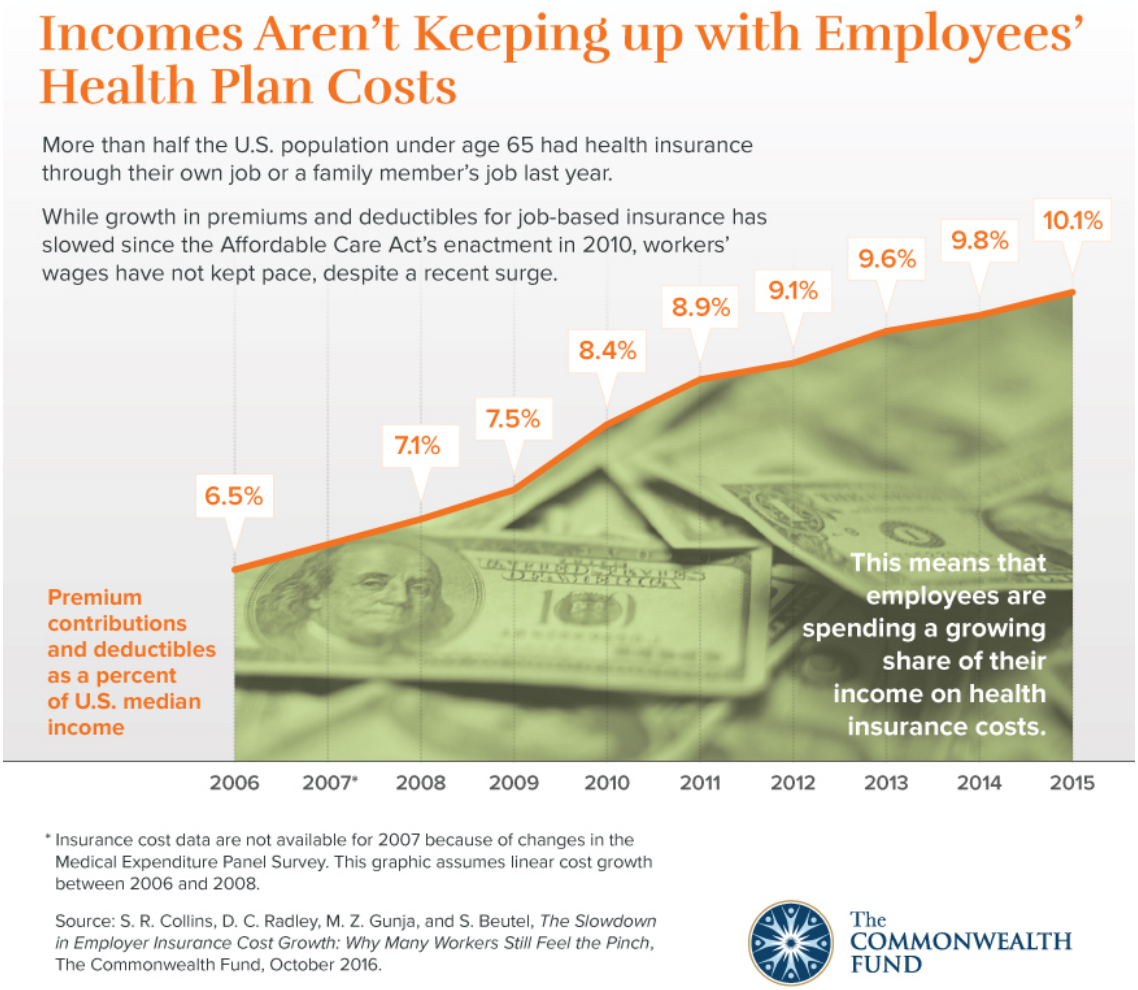
Source: QuantilesIMS Insitute, National Sales Perspective December 2016

Appendix 4.2 – Growth Rates of US Drug Prices



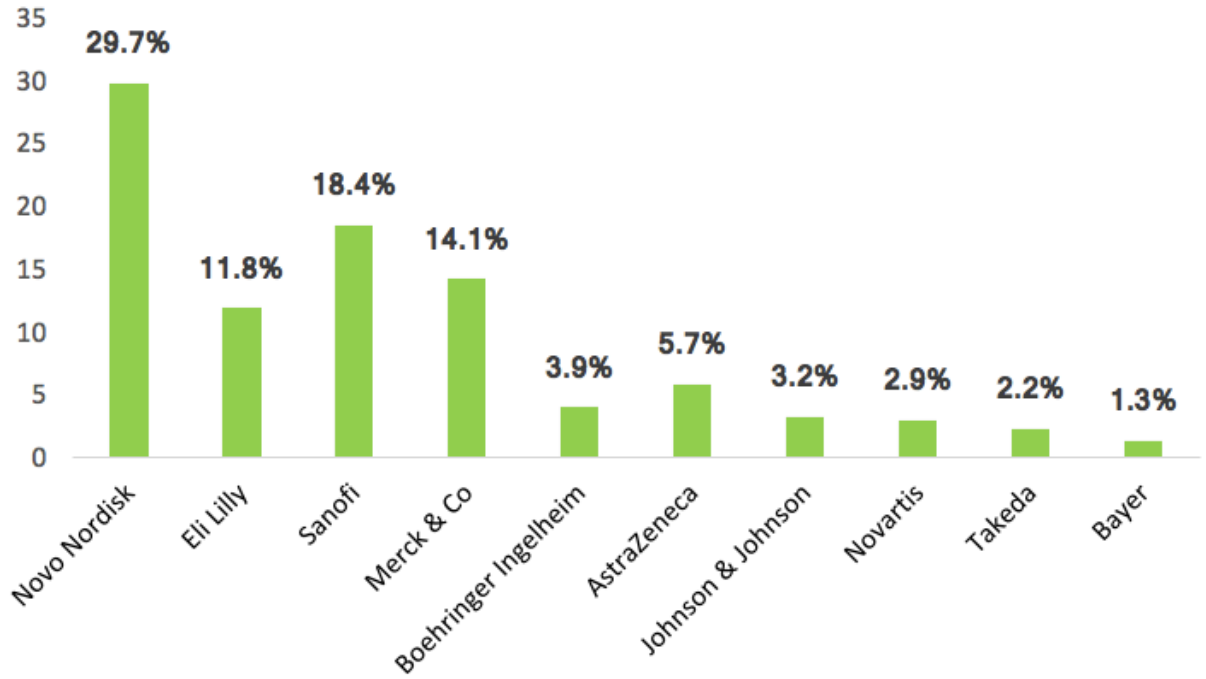
Source: QuantilesIMS Insitute, National Sales Perspective December 2016

Appendix 4.3 – Development of US Insurance Premiums Compared to Income Level



Source: http://www.ncsl.org/research/health/health-insurance-premiums.aspx

Appendix 5.1 - Global Market Share in % of Top 10 Pharmaceutical Companies, Anti-Diabetic Market Revenue (market share) 2016



Source: Statista – Evaluate (EvaluatePharma) ID 309730

Appendix 6.1 – Timeline of Key PBM Deals

	Timeline of key PBM deals
Key	Drug firm Pharmacy Pharmacy benefit managers
	Pharmacy era: Mergers between PBMs, and of PBMs with pharmacy chains
2000	Advance Paradigm purchases PCS for $1 billion, and becomes AdvancePCS
2003	Caremark purchases AdvancePCS for $5.6 billion
2007	CVS Purchases Caremark for $26.5 billion
2012	Express Scripts merges with Medco for $29 billion (combination of largest and second-largest PBMs). Also acquires Accredo speciality pharmacy from Medco, and merges it with its CuraScript pharmacy
Feb. 2015	Rite Aid purchases EnvisionRx for $2 billion. (EnvisionRx owns a subsidiary PBM, MedTrak, which itself owns the PBMs Connect Health Solutions and Smith Premier Services)
March 2015	OptumRx purchases Catamaran for $12.8 billion (combination of third and fourth-largest PBMs)
May 2015	CVS purchases Omnicare for $12.7 billion
Oct. 2015	Walgreens announces intention to acquire Rite Aid for $17.2 billion

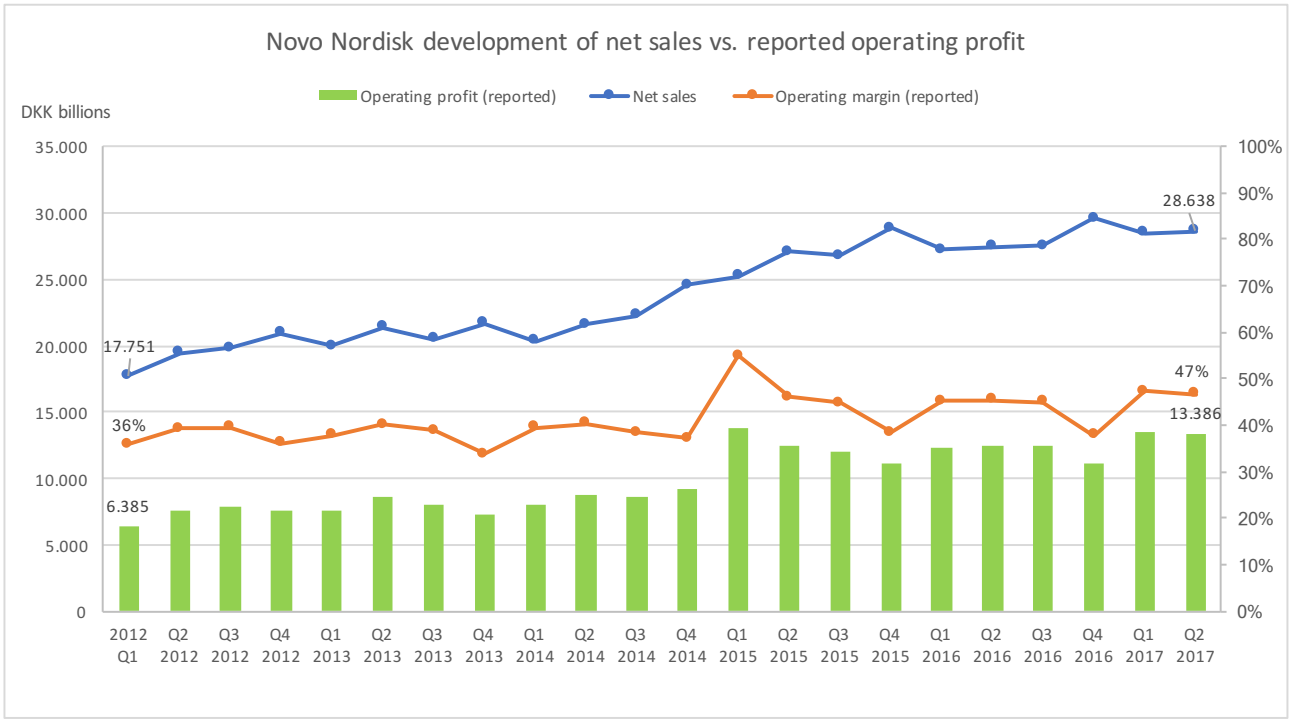
Source: Quartz, 2016

https://qz.com/636823/big-pharmacies-are-dismantling-the-industry-that-keeps-us-drug-costs-even-sort-of-under-control/

Appendix 7.1 – Table Containing Novo Nordisk Actual Income Statements – Quarterly Statements From 2012 to 2017 Q2

Actual quarterly income statement	2012				2013				2014				2015				2016				2017	
Amounts in DKK million	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Net sales	**17.751**	**19.468**	**19.845**	**20.962**	**19.983**	**21.380**	**20.511**	**21.698**	**20.343**	**21.629**	**22.249**	**24.585**	**25.200**	**27.059**	**26.792**	**28.876**	**27.212**	**27.459**	**27.537**	**29.572**	**28.452**	**28.638**
Gross profit	14.348	16.044	16.360	17.809	16.374	17.774	16.986	18.298	16.877	17.958	18.823	20.586	21.326	23.200	22.945	24.268	22.978	23.414	23.551	24.654	24.201	24.229
Gross margin	*80,8%*	*82,4%*	*82,4%*	*85,0%*	*81,9%*	*83,1%*	*82,8%*	*84,3%*	*83,0%*	*83,0%*	*84,6%*	*83,7%*	*84,6%*	*85,7%*	*85,6%*	*84,0%*	*84,4%*	*85,3%*	*85,5%*	*83,4%*	*85,1%*	*84,6%*
Sales and distribution costs	4.850	5.203	5.299	6.192	5.530	5.834	5.529	6.487	5.086	5.559	5.899	6.679	6.147	7.175	6.951	8.039	6.741	6.867	6.860	7.909	6.787	6.761
Percentage of sales	*27,3%*	*26,7%*	*26,7%*	*29,5%*	*27,7%*	*27,3%*	*27,0%*	*29,9%*	*25,0%*	*25,7%*	*26,5%*	*27,2%*	*24,4%*	*26,5%*	*25,9%*	*27,8%*	*24,8%*	*25,0%*	*24,9%*	*26,7%*	*23,9%*	*23,6%*
Research and development costs	2.507	2.563	2.617	3.210	2.657	2.715	2.795	3.566	3.168	3.075	3.654	3.865	3.250	3.035	3.289	4.034	3.304	3.331	3.458	4.470	3.289	3.414
Percentage of sales	*14,1%*	*13,2%*	*13,2%*	*15,3%*	*13,3%*	*12,7%*	*13,6%*	*16,4%*	*15,6%*	*14,2%*	*16,4%*	*15,7%*	*12,9%*	*11,2%*	*12,3%*	*14,0%*	*12,1%*	*12,1%*	*12,6%*	*15,1%*	*11,6%*	*11,9%*
Administrative costs	776	779	766	991	801	815	822	1.070	805	795	870	1.067	854	887	952	1.164	908	873	1.015	1.166	913	857
Percentage of sales	*4,4%*	*4,0%*	*3,9%*	*4,7%*	*4,0%*	*3,8%*	*4,0%*	*4,9%*	*4,0%*	*3,7%*	*3,9%*	*4,3%*	*3,4%*	*3,3%*	*3,6%*	*4,0%*	*3,3%*	*3,2%*	*3,7%*	*3,9%*	*3,2%*	*3,0%*
Other operating income, net	170	154	186	156	176	175	152	179	215	204	169	182	2.782	379	227	94	284	154	202	97	278	189
Operating profit	**6.385**	**7.653**	**7.864**	**7.572**	**7.562**	**8.585**	**7.992**	**7.354**	**8.033**	**8.733**	**8.569**	**9.157**	**13.857**	**12.482**	**11.980**	**11.125**	**12.309**	**12.497**	**12.420**	**11.206**	**13.490**	**13.386**
Operating margin					*37,8%*	*40,2%*	*39,0%*	*33,9%*	*39,5%*	*40,4%*	*38,5%*	*37,2%*	*55,0%*	*46,1%*	*44,7%*	*38,5%*	*45,2%*	*45,5%*	*45,1%*	*37,9%*	*47,4%*	*46,7%*
Financial income	47	146	(85)	17	315	363	418	606	586	396	326	(1.141)	285	(227)	9	18	23	93	(3)	(21)	258	421
Financial expenses	375	856	420	137	108	267	111	170	318	140	441	(336)	1.657	1.707	1.853	829	379	(12)	116	243	744	1.164
Financial items (net)	(328)	(710)	(505)	(120)	207	96	307	436	268	256	(115)	(805)	(1.372)	(1.934)	(1.844)	(811)	(356)	105	(119)	(264)	(486)	(743)
Profit before income taxes	6.057	6.943	7.359	7.452	7.769	8.681	8.299	7.790	8.301	8.989	8.454	8.352	12.485	10.548	10.136	10.314	11.953	12.602	12.301	10.942	13.004	12.643
Income taxes	1.393	1.597	1.692	1.697	1.787	1.947	1.884	1.737	1.843	1.995	1.954	1.823	2.609	2.205	1.753	2.056	2.498	2.634	2.498	2.243	2.848	2.692
Net profit	**4.664**	**5.346**	**5.667**	**5.755**	**5.982**	**6.734**	**6.415**	**6.053**	**6.458**	**6.994**	**6.500**	**6.529**	**9.876**	**8.343**	**8.383**	**8.258**	**9.455**	**9.968**	**9.803**	**8.699**	**10.156**	**9.951**

Appendix 7.2 – Novo Nordisk – Development of Net Sales and Reported Operating Profit



Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

Appendix 7.3 – Analytical Income Statement of Novo Nordisk

Analytical income statement	2012				2013				2014				2015				2016				2017	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Net sales	**17,751**	**19,468**	**19,845**	**20,962**	**19,983**	**21,380**	**20,511**	**21,698**	**20,343**	**21,629**	**22,249**	**24,585**	**25,200**	**27,059**	**26,792**	**28,876**	**27,212**	**27,459**	**27,537**	**29,572**	**28,452**	**28,638**
Gross profit	14,348	16,044	16,360	17,809	16,374	17,774	16,986	18,298	16,877	17,958	18,823	20,586	21,326	23,200	22,945	24,268	22,978	23,414	23,551	24,654	24,201	24,229
Gross margin	*80.8%*	*82.4%*	*82.4%*	*85.0%*	*81.9%*	*83.1%*	*82.8%*	*84.3%*	*83.0%*	*83.0%*	*84.6%*	*83.7%*	*84.6%*	*85.7%*	*85.6%*	*84.0%*	*84.4%*	*85.3%*	*85.5%*	*83.4%*	*85.1%*	*84.6%*
Sales and distribution costs	4,850	5,203	5,299	6,192	5,530	5,834	5,529	6,487	5,086	5,559	5,899	6,679	6,147	7,175	6,951	8,039	6,741	6,867	6,860	7,909	6,787	6,761
Research and development costs	2,507	2,563	2,617	3,210	2,657	2,715	2,795	3,566	3,168	3,075	3,654	3,865	3,250	3,035	3,289	4,034	3,304	3,331	3,458	4,470	3,289	3,414
Administrative costs	776	779	766	991	801	815	822	1,070	805	795	870	1,067	854	887	952	1,164	908	873	1,015	1,166	913	857
Other operating income, net	170	154	186	156	176	175	152	179	215	204	169	182	2,782	379	227	94	284	154	202	97	278	189
EBITDA	**7,023**	**8,309**	**8,508**	**8,327**	**8,253**	**9,261**	**8,635**	**8,143**	**8,690**	**9,400**	**9,752**	**10,085**	**14,520**	**13,130**	**12,613**	**12,140**	**12,933**	**13,214**	**13,156**	**12,322**	**14,198**	**14,249**
Depreciation, amortisation and impairment	638	656	644	755	691	676	643	789	657	667	1,183	928	663	648	633	1,015	624	717	736	1,116	708	863
EBIT, Operating profit as reported	**6,385**	**7,653**	**7,864**	**7,572**	**7,562**	**8,585**	**7,992**	**7,354**	**8,033**	**8,733**	**8,569**	**9,157**	**13,857**	**12,482**	**11,980**	**11,125**	**12,309**	**12,497**	**12,420**	**11,206**	**13,490**	**13,386**
Special items (non-current financial)													2,376									
EBIT, Adjusted	**6,385**	**7,653**	**7,864**	**7,572**	**7,562**	**8,585**	**7,992**	**7,354**	**8,033**	**8,733**	**8,569**	**9,157**	**11,481**	**12,482**	**11,980**	**11,125**	**12,309**	**12,497**	**12,420**	**11,206**	**13,490**	**13,386**
Tax on adj. EBIT	1,468	1,760	1,808	1,724	1,739	1,925	1,814	1,640	1,783	1,938	1,981	1,999	2,399	2,609	2,072	2,218	2,572	2,612	2,522	2,297	2,954	2,850
NOPAT	**4,917**	**5,893**	**6,056**	**5,848**	**5,823**	**6,660**	**6,178**	**5,714**	**6,250**	**6,795**	**6,588**	**7,158**	**9,082**	**9,873**	**9,908**	**8,907**	**9,737**	**9,885**	**9,898**	**8,909**	**10,536**	**10,536**
Effective tax rate	*23.0%*	*23.0%*	*23.0%*	*22.8%*	*23.0%*	*22.4%*	*22.7%*	*22.3%*	*22.2%*	*22.2%*	*23.1%*	*21.8%*	*20.9%*	*20.9%*	*17.3%*	*19.9%*	*20.9%*	*20.9%*	*20.3%*	*20.5%*	*21.9%*	*21.3%*
Financial income	47	146	(85)	17	315	363	418	606	586	396	326	(1,141)	285	(227)	9	18	23	93	(3)	(21)	258	421
Special items (financial income)													2,376									
Financial expenses	375	856	420	137	108	267	111	170	318	140	441	(336)	1,657	1,707	1,853	829	379	(12)	116	243	744	1,164
Net financial items, before tax	**(328)**	**(710)**	**(505)**	**(120)**	**207**	**96**	**307**	**436**	**268**	**256**	**(115)**	**(805)**	**1,004**	**(1,934)**	**(1,844)**	**(811)**	**(356)**	**105**	**(119)**	**(264)**	**(486)**	**(743**
Tax shield from financial activities	75	163	116	27	(48)	(22)	(70)	(97)	(60)	(57)	27	176	(210)	404	319	162	74	(22)	24	54	106	158
Net financial items, after tax	**(253)**	**(547)**	**(389)**	**(93)**	**159**	**74**	**237**	**339**	**208**	**199**	**(88)**	**(629)**	**794**	**(1,530)**	**(1,525)**	**(649)**	**(282)**	**83**	**(95)**	**(210)**	**(380)**	**(585**
Profit of the quarter, check	*4,664*	*5,346*	*5,667*	*5,755*	*5,982*	*6,734*	*6,415*	*6,053*	*6,458*	*6,994*	*6,500*	*6,529*	*9,876*	*8,343*	*8,383*	*8,258*	*9,455*	*9,968*	*9,803*	*8,699*	*10,156*	*9,951*
Taxes of the quarter, check	*1,393*	*1,597*	*1,692*	*1,697*	*1,787*	*1,947*	*1,884*	*1,737*	*1,843*	*1,995*	*1,954*	*1,823*	*2,609*	*2,205*	*1,753*	*2,056*	*2,498*	*2,634*	*2,498*	*2,243*	*2,848*	*2,692*
Margins																						
EBITDA margin	*39.6%*	*42.7%*	*42.9%*	*39.7%*	*41.3%*	*43.3%*	*42.1%*	*37.5%*	*42.7%*	*43.5%*	*43.8%*	*41.0%*	*57.6%*	*48.5%*	*47.1%*	*42.0%*	*47.5%*	*48.1%*	*47.8%*	*41.7%*	*49.9%*	*49.8%*
NOPAT margin	*27.7%*	*30.3%*	*30.5%*	*27.9%*	*29.1%*	*31.1%*	*30.1%*	*26.3%*	*30.7%*	*31.4%*	*29.6%*	*29.1%*	*36.0%*	*36.5%*	*37.0%*	*30.8%*	*35.8%*	*36.0%*	*35.9%*	*30.1%*	*37.0%*	*36.8%*
Key Figures (reported)																						
Depreciation, amortisation and impairment	638	656	644	755	691	676	643	789	657	667	1,183	928	663	648	633	1,015	624	717	736	1,116	708	863
Capital expenditure (net)	516	855	942	1,006	782	778	908	739	693	802	986	1,505	764	1,018	1,246	2,181	1,091	1,684	1,784	2,502	1,604	1,934

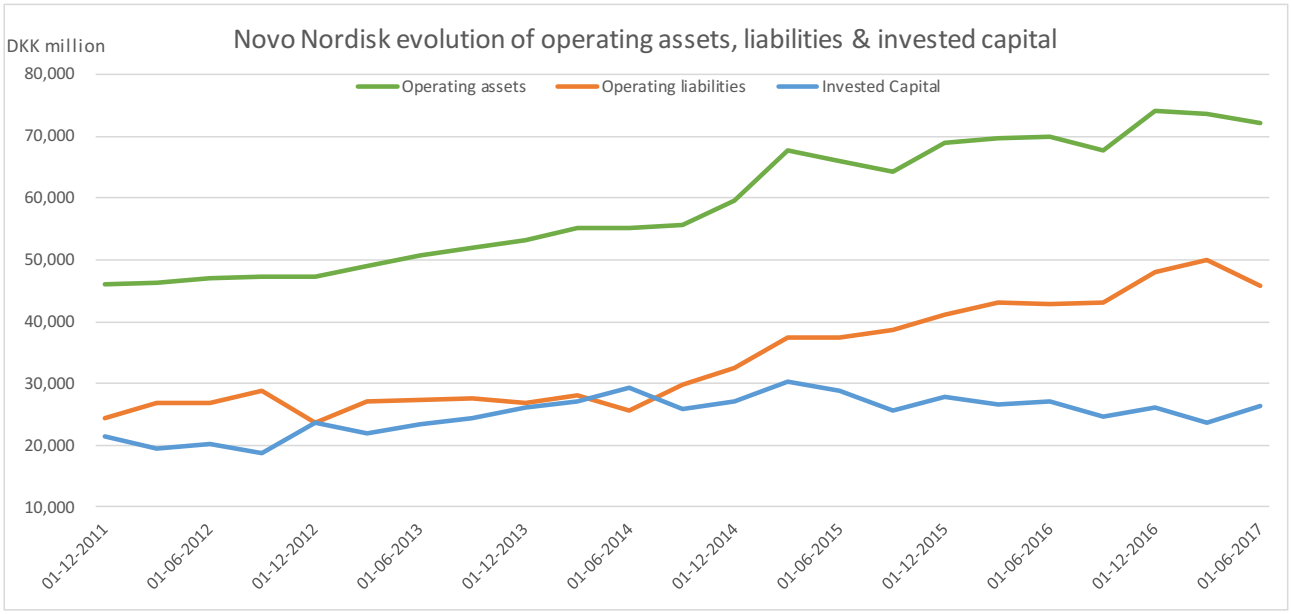
Appendix 7.4 – Actual Quarterly Balance Sheets - Novo Nordisk

	Balance sheet (actual)	2011	2012			2013				2014				2015				2016				2017	
	DKK million	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun
Classification	**ASSETS**																						
Operations	Intangible assets	1,489	1,470	1,449	1,472	1,495	1,565	1,633	1,682	1,615	1,684	1,709	1,398	1,378	1,372	1,460	1,465	2,158	2,157	2,109	2,849	2,714	2,771	2,647
Operations	Property, plant and equipment	20,931	20,731	21,085	21,323	21,539	21,838	21,751	21,870	21,882	21,905	22,168	22,612	23,136	23,464	23,632	23,977	25,545	25,863	27,125	28,223	30,179	31,096	31,888
Financial	Investment in associated company		40	40	41										798	802	806	811	796	801	805	809	785	789
Operations	Deferred income tax assets	2,414	2,353	2,285	2,669	2,244	3,002	4,179	3,471	4,231	4,397	4,818	5,277	5,399	7,317	6,661	6,185	6,806	6,009	4,461	2,691	2,683	2,658	2,314
Financial	Other financial assets	273	263	201	220	228	243	201	204	551	749	771	825	856	1,045	1,421	1,274	1,339	1,162	1,147	1,196	1,388	1,255	1,213
	TOTAL NON-CURRENT ASSETS	**25,107**	**24,857**	**25,060**	**25,725**	**25,506**	**26,648**	**27,764**	**27,227**	**28,279**	**28,735**	**29,466**	**30,112**	**30,769**	**33,996**	**33,976**	**33,707**	**36,659**	**35,987**	**35,643**	**35,764**	**37,773**	**38,565**	**38,851**
Operations	Inventories	9,433	9,546	9,431	9,414	9,543	9,593	9,660	9,340	9,552	10,299	10,699	11,285	11,357	12,288	12,825	12,762	12,758	12,995	13,635	14,252	14,341	15,044	15,028
Operations	Trade receivables	9,349	9,578	9,923	9,691	9,639	10,580	10,995	9,721	10,907	10,481	11,515	10,813	13,041	14,648	14,209	13,565	15,485	16,502	15,756	16,233	20,234	17,012	17,366
Operations	Tax receivables	883	1,227	1,236	1,227	1,240	830	728	4,220	3,155	4,685	2,416	2,449	3,210	6,623	5,063	4,240	3,871	3,990	4,683	1,220	1,552	2,656	659
financial	Other receivables and prepayments	2,376	2,612	2,911	2,913	2,705	3,015	3,155	2,963	2,454	2,931	2,846	2,996	2,750	2,460	3,022	2,826	2,257	2,627	2,740	2,734	**2,411**	2,868	2,830
Financial	Marketable securities	4,094	4,871	3,322	4,063	4,552	4,039	3,053	4,054	3,741	2,528	1,522	1,516	1,509	1,204	3	2,024	3,542	4,032	2,053	2,042	2,009	1,003	3
Financial	Derivative financial instruments	48	87	27	105	931	558	864	1,181	1,521	942	216	8	30	254	379	587	304	1,417	592	558	529	302	1,761
O/F	Cash at bank	13,408	8,432	9,068	13,482	11,553	7,184	8,070	9,428	10,728	2,640	5,001	12,104	14,396	5,984	11,836	15,484	16,923	4,818	13,167	14,537	18,690	16,763	21,327
	TOTAL CURRENT ASSETS	**39,591**	**36,353**	**35,918**	**40,895**	**40,163**	**35,799**	**36,525**	**40,907**	**42,058**	**34,506**	**34,215**	**41,171**	**46,293**	**43,461**	**47,337**	**51,488**	**55,140**	**46,381**	**52,626**	**51,576**	**59,766**	**55,648**	**58,974**
	TOTAL ASSETS	**64,698**	**61,210**	**60,978**	**66,620**	**65,669**	**62,447**	**64,289**	**68,134**	**70,337**	**63,241**	**63,681**	**71,283**	**77,062**	**77,457**	**81,313**	**85,195**	**91,799**	**82,368**	**88,269**	**87,340**	**97,539**	**94,213**	**97,825**
	EQUITY AND LIABILITIES																							
	Share capital	580	580	560	560	560	560	550	550	550	550	530	530	530	530	520	520	520	520	510	510	510	510	500
	Treasury shares	(24)	(27)	(14)	(16)	(17)	(19)	(14)	(17)	(21)	(23)	(6)	(9)	(11)	(13)	(6)	(8)	(10)	(12)	(4)	(6)	(9)	(13)	(5)
	Retained earnings	37,111	31,287	30,839	34,607	39,001	32,508	34,130	37,818	41,137	32,365	36,105	38,743	41,277	34,790	39,353	42,797	46,816	36,070	42,510	41,056	46,111	40,739	47,014
	Other reserves	(219)	518	(51)	509	1,088	752	691	774	903	691	32	(1,297)	(1,502)	(3,199)	(756)	(200)	(357)	706	(431)	(233)	(1,343)	(935)	927
	TOTAL EQUITY	**37,448**	**32,358**	**31,334**	**35,660**	**40,632**	**33,801**	**35,357**	**39,125**	**42,569**	**33,583**	**36,661**	**37,967**	**40,294**	**32,108**	**39,111**	**43,109**	**46,969**	**37,284**	**42,585**	**41,327**	**45,269**	**40,301**	**48,436**
Financial	Loans	502	511	502	503	-																		
Operations	Deferred income tax liabilities	3,206	3,779	2,808	1,824	732	410	813	448	672	517	442	9	7	42	19	11	6	13	12	10	13	13	569
Financial	Retirement benefit obligations	439	440	474	481	760	770	820	748	688	746	842	984	1,031	1,280	1,199	1,160	**1,186**	1,281	1,362	1,537	**1,451**	1,382	1,359
Operations	Provisions	2,324	2,129	2,007	1,926	1,907	1,840	1,879	2,154	2,183	1,998	1,988	2,292	2,041	2,038	2,391	2,392	2,765	2,716	2,782	2,874	3,370	3,614	3,637
	Total non-current liabilities	**6,471**	**6,859**	**5,791**	**4,734**	**3,399**	**3,020**	**3,512**	**3,350**	**3,543**	**3,261**	**3,272**	**3,285**	**3,079**	**3,360**	**3,609**	**3,563**	**3,957**	**4,010**	**4,156**	**4,421**	**4,834**	**5,009**	**5,565**
Financial	Current debt	351	383	388	588	500	300	716	670	215	804	406	284	720	594	736	630	1,073	406	406	456	229	613	1,683
Operations	Trade payables	3,291	2,560	2,642	2,689	3,859	3,079	2,901	2,931	4,092	3,490	2,988	2,988	4,950	4,014	3,932	3,845	4,927	3,740	5,333	4,462	6,011	3,782	4,257
Operations	Tax payables	1,171	2,435	2,492	5,359	593	2,096	4,329	4,956	2,222	2,508	1,513	3,166	2,771	3,232	3,234	3,313	3,777	4,861	4,587	5,223	3,976	4,354	3,706
Operations	Other liabilities	8,534	9,178	8,554	9,130	8,982	11,039	9,748	9,336	9,386	11,671	10,030	10,564	11,051	14,051	12,249	12,418	12,655	15,092	12,955	12,556	14,181	16,295	13,787
Financial	Derivative financial instruments	1,492	570	1,488	601	48	386	33	1	-	-	87	2,165	2,607	6,050	2,940	1,598	1,382	411	1,130	893	2,578	1,998	521
Operations	Provisions	5,940	6,867	8,289	7,859	7,656	8,726	7,693	7,765	8,310	7,924	8,724	10,864	11,590	14,048	15,502	16,719	17,059	16,564	17,117	18,002	20,461	21,861	19,870
	Total current liabilities	**20,779**	**21,993**	**23,853**	**26,226**	**21,638**	**25,626**	**25,420**	**25,659**	**24,225**	**26,397**	**23,748**	**30,031**	**33,689**	**41,989**	**38,593**	**38,523**	**40,873**	**41,074**	**41,528**	**41,592**	**47,436**	**48,903**	**43,824**
	TOTAL LIABILITIES	**27,250**	**28,852**	**29,644**	**30,960**	**25,037**	**28,646**	**28,932**	**29,009**	**27,768**	**29,658**	**27,020**	**33,316**	**36,768**	**45,349**	**42,202**	**42,086**	**44,830**	**45,084**	**45,684**	**46,013**	**52,270**	**53,912**	**49,389**
	TOTAL EQUITY AND LIABILITIES	**64,698**	**61,210**	**60,978**	**66,620**	**65,669**	**62,447**	**64,289**	**68,134**	**70,337**	**63,241**	**63,681**	**71,283**	**77,062**	**77,457**	**81,313**	**85,195**	**91,799**	**82,368**	**88,269**	**87,340**	**97,539**	**94,213**	**97,825**

Appendix 7.5 – Analytical Quarterly Balance Sheets – Novo Nordisk

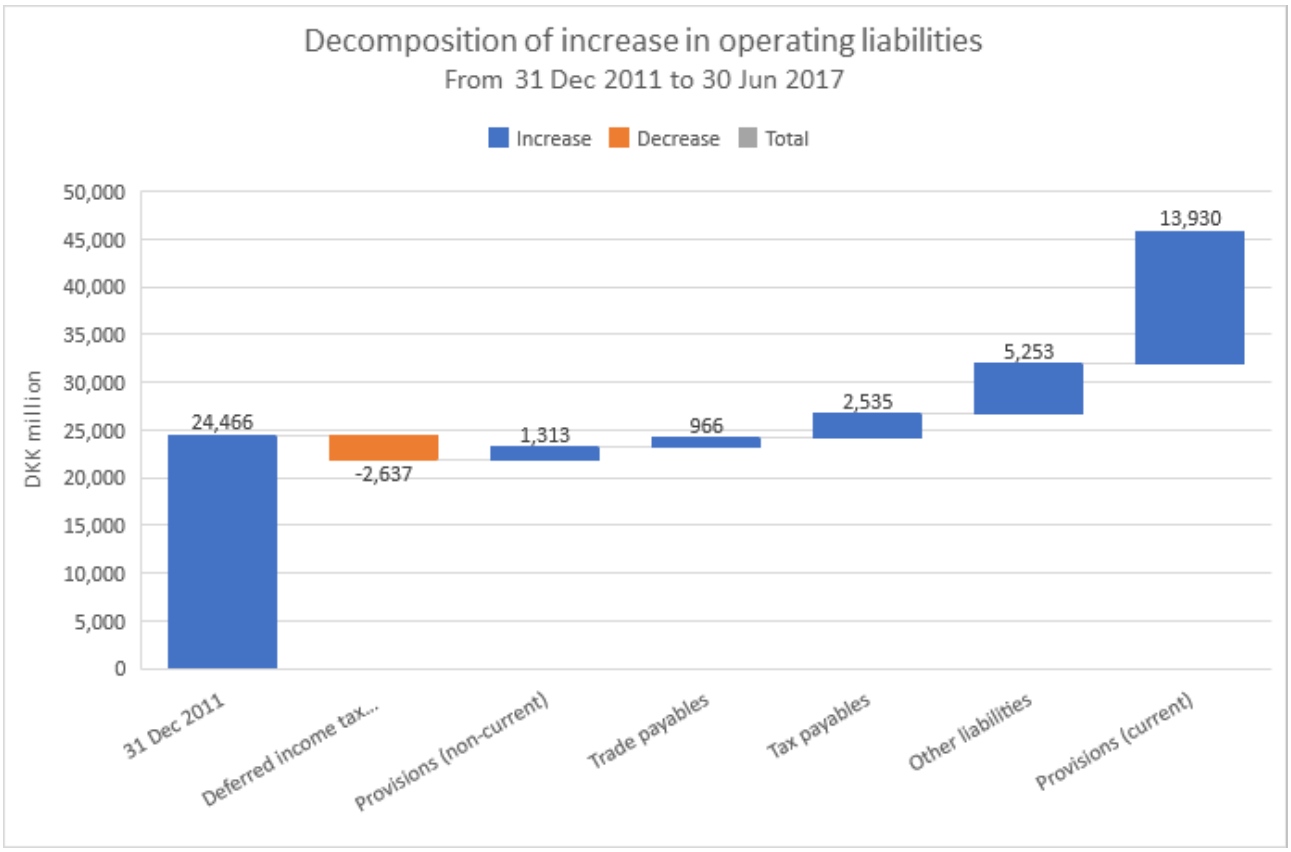
Analytical Balance sheet	2011	2012				2013				2014				2015				2016				2017	
DKK million	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun	30 Sep	31 Dec	31 Mar	30 Jun
Intangible assets	1,489	1,470	1,449	1,472	1,495	1,565	1,633	1,682	1,615	1,684	1,709	1,398	1,378	1,372	1,460	1,465	2,158	2,157	2,109	2,849	2,714	2,771	2,647
Property, plant and equipment	20,931	20,731	21,085	21,323	21,539	21,838	21,751	21,870	21,882	21,905	22,168	22,612	23,136	23,464	23,632	23,977	25,545	25,863	27,125	28,223	30,179	31,096	31,888
Deferred income tax assets	2,414	2,353	2,285	2,669	2,244	3,002	4,179	3,471	4,231	4,397	4,818	5,277	5,399	7,317	6,661	6,185	6,806	6,009	4,461	2,691	2,683	2,658	2,314
Inventories	9,433	9,546	9,431	9,414	9,543	9,593	9,660	9,340	9,552	10,299	10,699	11,285	11,357	12,288	12,825	12,762	12,758	12,995	13,635	14,252	14,341	15,044	15,028
Trade receivables	9,349	9,578	9,923	9,691	9,639	10,580	10,995	9,721	10,907	10,481	11,515	10,813	13,041	14,648	14,209	13,565	15,485	16,502	15,756	16,233	20,234	17,012	17,366
Tax receivables	883	1,227	1,236	1,227	1,240	830	728	4,220	3,155	4,685	2,416	2,449	3,210	6,623	5,063	4,240	3,871	3,990	4,683	1,220	1,552	2,656	659
Operating cash	1,450	1,420	1,557	1,588	1,677	1,599	1,710	1,641	1,736	1,627	1,730	1,780	1,967	2,016	2,165	2,143	2,310	2,177	2,197	2,203	2,366	2,276	2,291
Operating assets	**45,949**	**46,325**	**46,966**	**47,384**	**47,377**	**49,007**	**50,656**	**51,945**	**53,078**	**55,078**	**55,055**	**55,614**	**59,488**	**67,728**	**66,015**	**64,337**	**68,933**	**69,693**	**69,966**	**67,671**	**74,069**	**73,513**	**72,193**
Deferred income tax liabilities	3,206	3,779	2,808	1,824	732	410	813	448	672	517	442	9	7	42	19	11	6	13	12	10	13	13	569
Provisions (non-current)	2,324	2,129	2,007	1,926	1,907	1,840	1,879	2,154	2,183	1,998	1,988	2,292	2,041	2,038	2,391	2,392	2,765	2,716	2,782	2,874	3,370	3,614	3,637
Trade payables	3,291	2,560	2,642	2,689	3,859	3,079	2,901	2,931	4,092	3,490	2,988	2,988	4,950	4,014	3,932	3,845	4,927	3,740	5,333	4,462	6,011	3,782	4,257
Tax payables	1,171	2,435	2,492	5,359	593	2,096	4,329	4,956	2,222	2,508	1,513	3,166	2,771	3,232	3,234	3,313	3,777	4,861	4,587	5,223	3,976	4,354	3,706
Other liabilities	8,534	9,178	8,554	9,130	8,982	11,039	9,748	9,336	9,386	11,671	10,030	10,564	11,051	14,051	12,249	12,418	12,655	15,092	12,955	12,556	14,181	16,295	13,787
Provisions (current)	5,940	6,867	8,289	7,859	7,656	8,726	7,693	7,765	8,310	7,924	8,724	10,864	11,590	14,048	15,502	16,719	17,059	16,564	17,117	18,002	20,461	21,861	19,870
Operating liabilities	**24,466**	**26,948**	**26,792**	**28,787**	**23,729**	**27,190**	**27,363**	**27,590**	**26,865**	**28,108**	**25,685**	**29,883**	**32,410**	**37,425**	**37,327**	**38,698**	**41,189**	**42,986**	**42,786**	**43,127**	**48,012**	**49,919**	**45,826**
Net operating assets (invested capital)	**21,483**	**19,377**	**20,174**	**18,597**	**23,648**	**21,817**	**23,293**	**24,355**	**26,213**	**26,970**	**29,370**	**25,731**	**27,078**	**30,303**	**28,688**	**25,639**	**27,744**	**26,707**	**27,180**	**24,544**	**26,057**	**23,594**	**26,367**
Loans	502	511	502	503	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Current debt	351	383	388	588	500	300	716	670	215	804	406	284	720	594	736	630	1,073	406	406	456	229	613	1,683
Retirement benefit obligations	439	440	474	481	760	770	820	748	688	746	842	984	1,031	1,280	1,199	1,160	1,186	1,281	1,362	1,537	1,451	1,382	1,359
Derivative financial instruments	1,492	570	1,488	601	48	386	33	1	-	87	2,165	2,607	6,050	2,940	1,598	1,382	411	1,130	893	2,578	1,998	521	
Interest-bearing debt	**2,784**	**1,904**	**2,852**	**2,173**	**1,308**	**1,456**	**1,569**	**1,419**	**903**	**1,550**	**1,335**	**3,433**	**4,358**	**7,924**	**4,875**	**3,388**	**3,641**	**2,098**	**2,898**	**2,886**	**4,258**	**3,993**	**3,563**
Investment in associated company	-	40	40	41	-	-	-	-	-	-	-	-	-	798	802	806	811	796	801	805	809	785	789
Other financial assets	273	263	201	220	228	243	201	204	551	749	771	825	856	1,045	1,421	1,274	1,339	1,162	1,147	1,196	1,388	1,255	1,213
Other receivables and prepayments	2,376	2,612	2,911	2,913	2,705	3,015	3,155	2,963	2,454	2,931	2,846	2,996	2,750	2,460	3,022	2,826	2,257	2,627	2,740	2,734	2,411	2,868	2,830
Marketable securities	4,094	4,871	3,322	4,063	4,552	4,039	3,053	4,054	3,741	2,528	1,522	1,516	1,509	1,204	3	2,024	3,542	4,032	2,053	2,042	2,009	1,003	3
Derivative financial instruments	48	87	27	105	931	558	864	1,181	1,521	942	216	8	30	254	379	587	304	1,417	592	558	529	302	1,761
Excess cash	11,958	7,012	7,511	11,894	9,876	5,585	6,360	7,787	8,992	1,013	3,271	10,324	12,429	3,968	9,671	13,341	14,613	2,641	10,970	12,334	16,324	14,487	19,036
Interest-bearing assets	**18,749**	**14,885**	**14,012**	**19,236**	**18,292**	**13,440**	**13,633**	**16,189**	**17,259**	**8,163**	**8,626**	**15,669**	**17,574**	**9,729**	**15,298**	**20,858**	**22,866**	**12,675**	**18,303**	**19,669**	**23,470**	**20,700**	**25,632**
NIBD	**(15,965)**	**(12,981)**	**(11,160)**	**(17,063)**	**(16,984)**	**(11,984)**	**(12,064)**	**(14,770)**	**(16,356)**	**(6,613)**	**(7,291)**	**(12,236)**	**(13,216)**	**(1,805)**	**(10,423)**	**(17,470)**	**(19,225)**	**(10,577)**	**(15,405)**	**(16,783)**	**(19,212)**	**(16,707)**	**(22,069)**
Total Equity	37,448	32,358	31,334	35,660	40,632	33,801	35,357	39,125	42,569	33,583	36,661	37,967	40,294	32,108	39,111	43,109	46,969	37,284	42,585	41,327	45,269	40,301	48,436
Invested capital (from financing)	**21,483**	**19,377**	**20,174**	**18,597**	**23,648**	**21,817**	**23,293**	**24,355**	**26,213**	**26,970**	**29,370**	**25,731**	**27,078**	**30,303**	**28,688**	**25,639**	**27,744**	**26,707**	**27,180**	**24,544**	**26,057**	**23,594**	**26,367**

Appendix 7.6 – Novo Nordisk Evolution of Operating Assets, Liabilities & Invested Capital



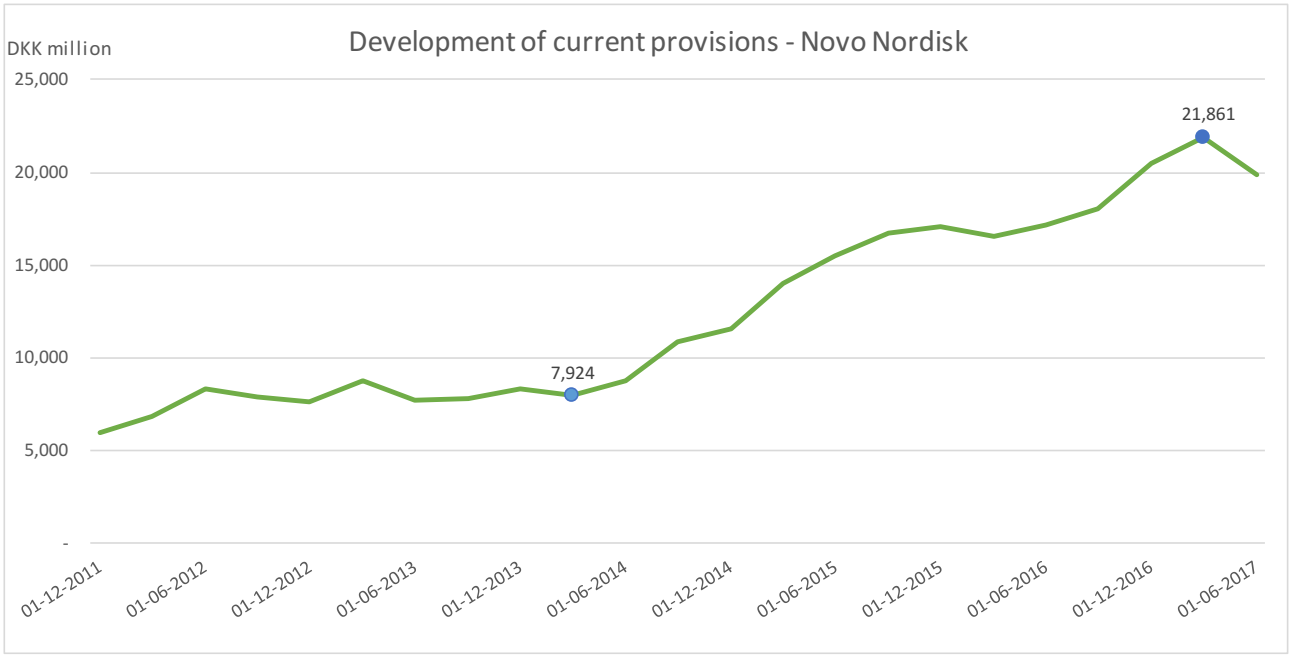
Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

Appendix 7.7 – Decomposition of Increase in Operating Liabilities



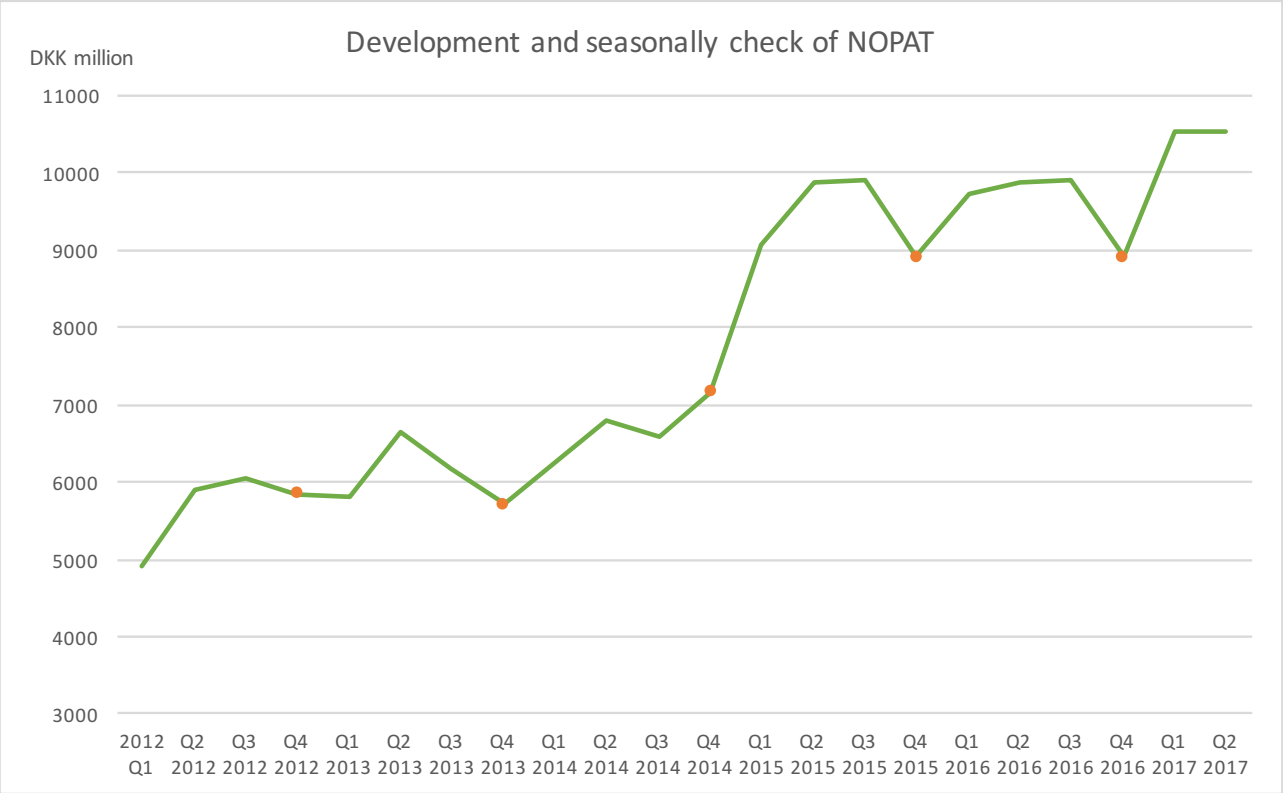
Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

Appendix 7.8 – Development of Current Provisions – Novo Nordisk



Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

Appendix 7.9 – Development and Seasonality Check of Quarterly NOPAT



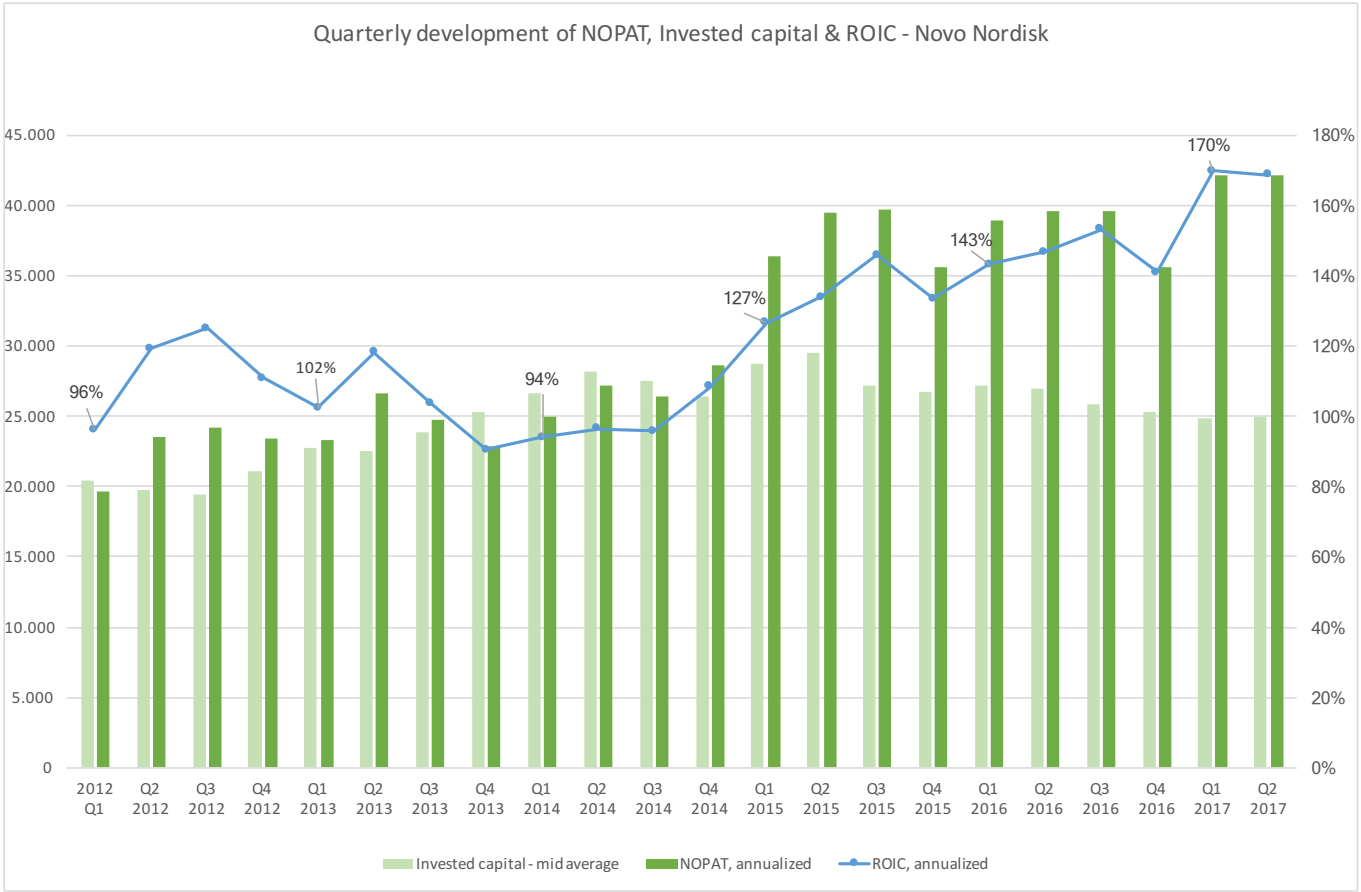
Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

Appendix 7.10 – ROIC Calculations Table and Chart

Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

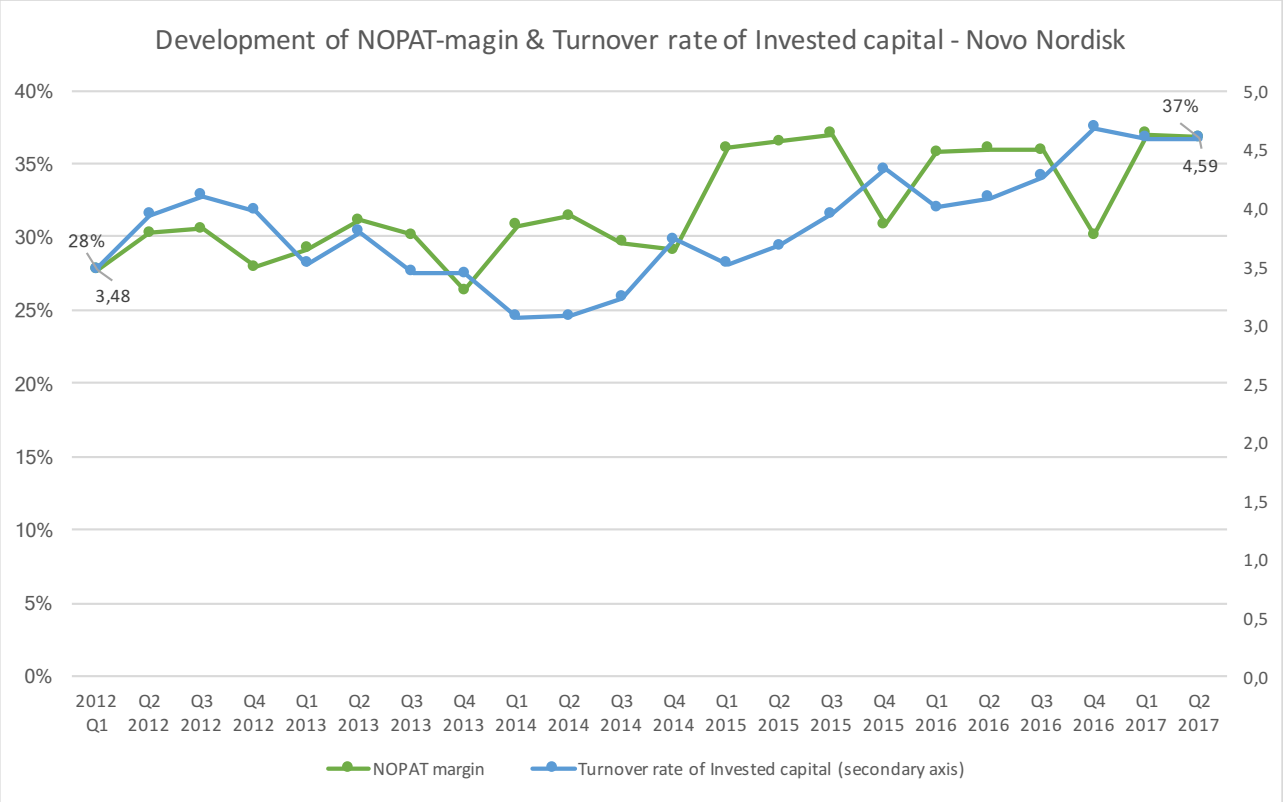
ROIC Calculations	2011	2012				2013				2014			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Invested capital - ultimo	21,483	19,377	20,174	18,597	23,648	21,817	23,293	24,355	26,213	26,970	29,370	25,731	27,078
Invested capital - mid average		20,430	19,776	19,386	21,122	22,732	22,555	23,824	25,284	26,592	28,170	27,551	26,404
NOPAT		4,917	5,893	6,056	5,848	5,823	6,660	6,178	5,714	6,250	6,795	6,588	7,158
ROIC, quarterly		**24.1%**	**29.8%**	**31.2%**	**27.7%**	**25.6%**	**29.5%**	**25.9%**	**22.6%**	**23.5%**	**24.1%**	**23.9%**	**27.1%**
Invested capital - mid average		20,430	19,776	19,386	21,122	22,732	22,555	23,824	25,284	26,592	28,170	27,551	26,404
NOPAT, annualized		19,666	23,571	24,224	23,391	23,290	26,638	24,711	22,857	24,998	27,179	26,354	28,633
ROIC, annualized		**96.3%**	**119.2%**	**125.0%**	**110.7%**	**102.5%**	**118.1%**	**103.7%**	**90.4%**	**94.0%**	**96.5%**	**95.7%**	**108.4%**

ROIC Calculations	2015				2016				2017	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Invested capital - ultimo	30,303	28,688	25,639	27,744	26,707	27,180	24,544	26,057	23,594	26,367
Invested capital - mid average	28,690	29,495	27,164	26,692	27,226	26,943	25,862	25,300	24,825	24,981
NOPAT	9,082	9,873	9,908	8,907	9,737	9,885	9,898	8,909	10,536	10,536
ROIC, quarterly	**31.7%**	**33.5%**	**36.5%**	**33.4%**	**35.8%**	**36.7%**	**38.3%**	**35.2%**	**42.4%**	**42.2%**
Invested capital - mid average	28,690	29,495	27,164	26,692	27,226	26,943	25,862	25,300	24,825	24,981
NOPAT, annualized	36,327	39,491	39,632	35,629	38,946	39,540	39,591	35,636	42,142	42,143
ROIC, annualized	**126.6%**	**133.9%**	**145.9%**	**133.5%**	**143.1%**	**146.8%**	**153.1%**	**140.8%**	**169.8%**	**168.7%**



Appendix 7.11 – Development of NOPAT-Margin & Turnover Rate of Invested Capital – Novo Nordisk

Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

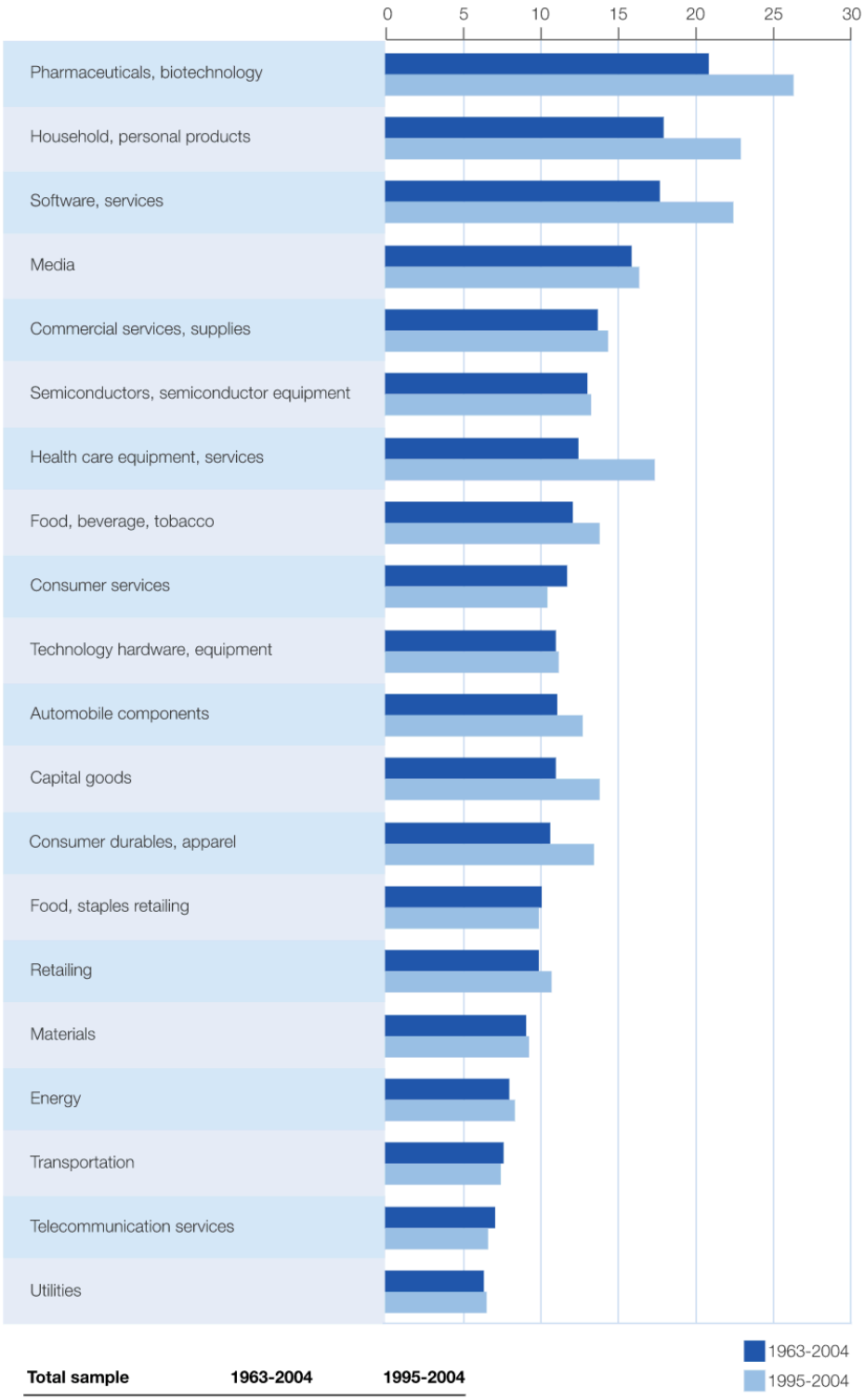


DuPont calculations	2012 Q1	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4
NOPAT	4,917	5,893	6,056	5,848	5,823	6,660	6,178	5,714	6,250	6,795	6,588	7,158
Net sales	17,751	19,468	19,845	20,962	19,983	21,380	20,511	21,698	20,343	21,629	22,249	24,585
NOPAT margin	**27.7%**	**30.3%**	**30.5%**	**27.9%**	**29.1%**	**31.1%**	**30.1%**	**26.3%**	**30.7%**	**31.4%**	**29.6%**	**29.1%**
Net sales, annualized	71,004	77,872	79,380	83,848	79,932	85,520	82,044	86,792	81,372	86,516	88,996	98,340
Invested capital - mid average	20,430	19,776	19,386	21,122	22,732	22,555	23,824	25,284	26,592	28,170	27,551	26,404
Turnover rate of invested capital	**3.48**	**3.94**	**4.09**	**3.97**	**3.52**	**3.79**	**3.44**	**3.43**	**3.06**	**3.07**	**3.23**	**3.72**
ROIC, annualized (check)	96.3%	119.2%	125.0%	110.7%	102.5%	118.1%	103.7%	90.4%	94.0%	96.5%	95.7%	108.4%

DuPont calculations	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2
NOPAT	9,082	9,873	9,908	8,907	9,737	9,885	9,898	8,909	10,536	10,536
Net sales	25,200	27,059	26,792	28,876	27,212	27,459	27,537	29,572	28,452	28,638
NOPAT margin	**36.0%**	**36.5%**	**37.0%**	**30.8%**	**35.8%**	**36.0%**	**35.9%**	**30.1%**	**37.0%**	**36.8%**
Net sales, annualized	100,800	108,236	107,168	115,504	108,848	109,836	110,148	118,288	113,808	114,552
Invested capital - mid average	28,690	29,495	27,164	26,692	27,226	26,943	25,862	25,300	24,825	24,981
Turnover rate of invested capital	**3.51**	**3.67**	**3.95**	**4.33**	**4.00**	**4.08**	**4.26**	**4.68**	**4.58**	**4.59**
ROIC, annualized (check)	126.6%	133.9%	145.9%	133.5%	143.1%	146.8%	153.1%	140.8%	169.8%	168.7%

Appendix 7.12 – Median Annual ROIC, Excluding Goodwill %

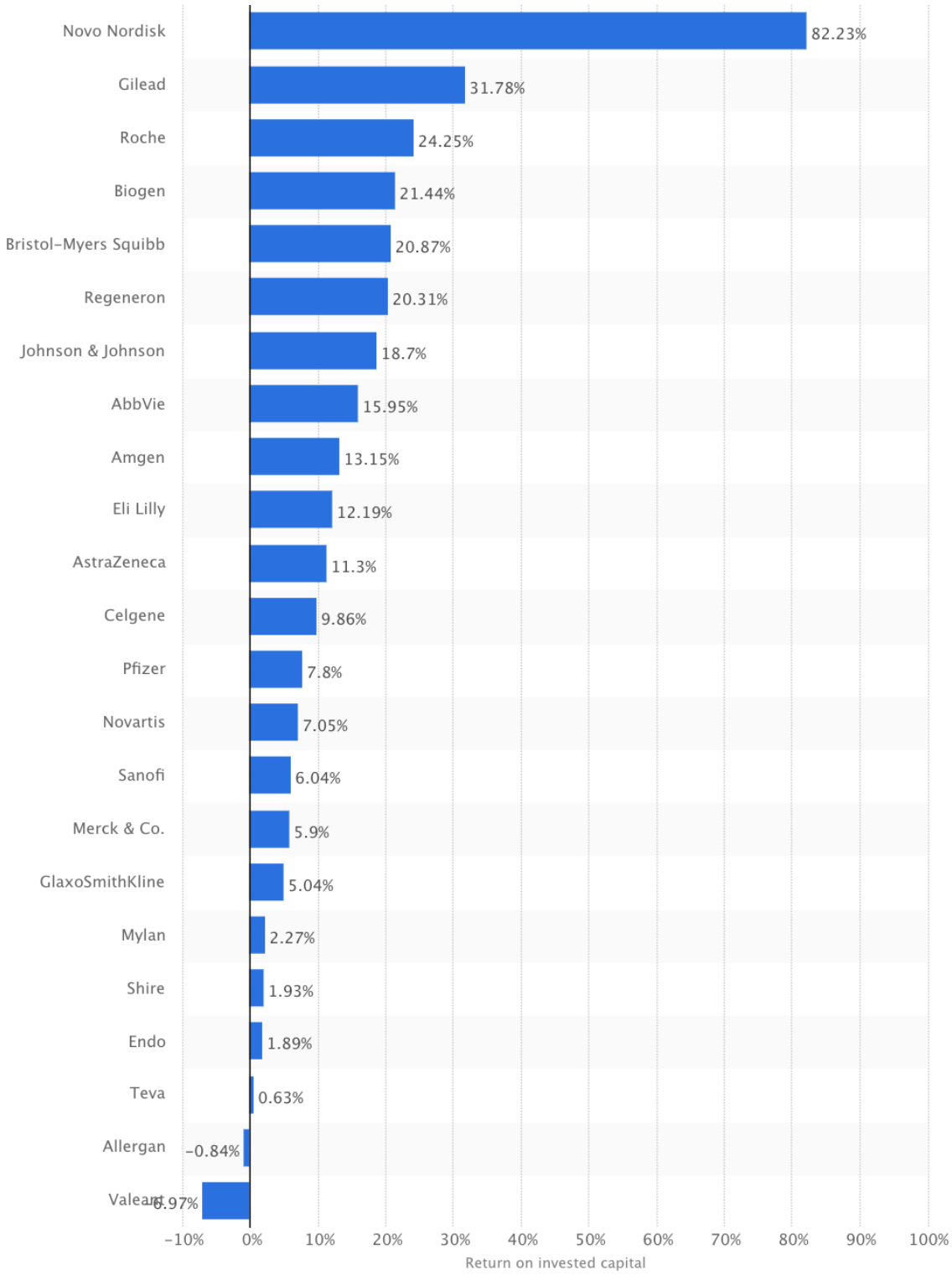
Median annual ROIC, excluding goodwill,[1] %



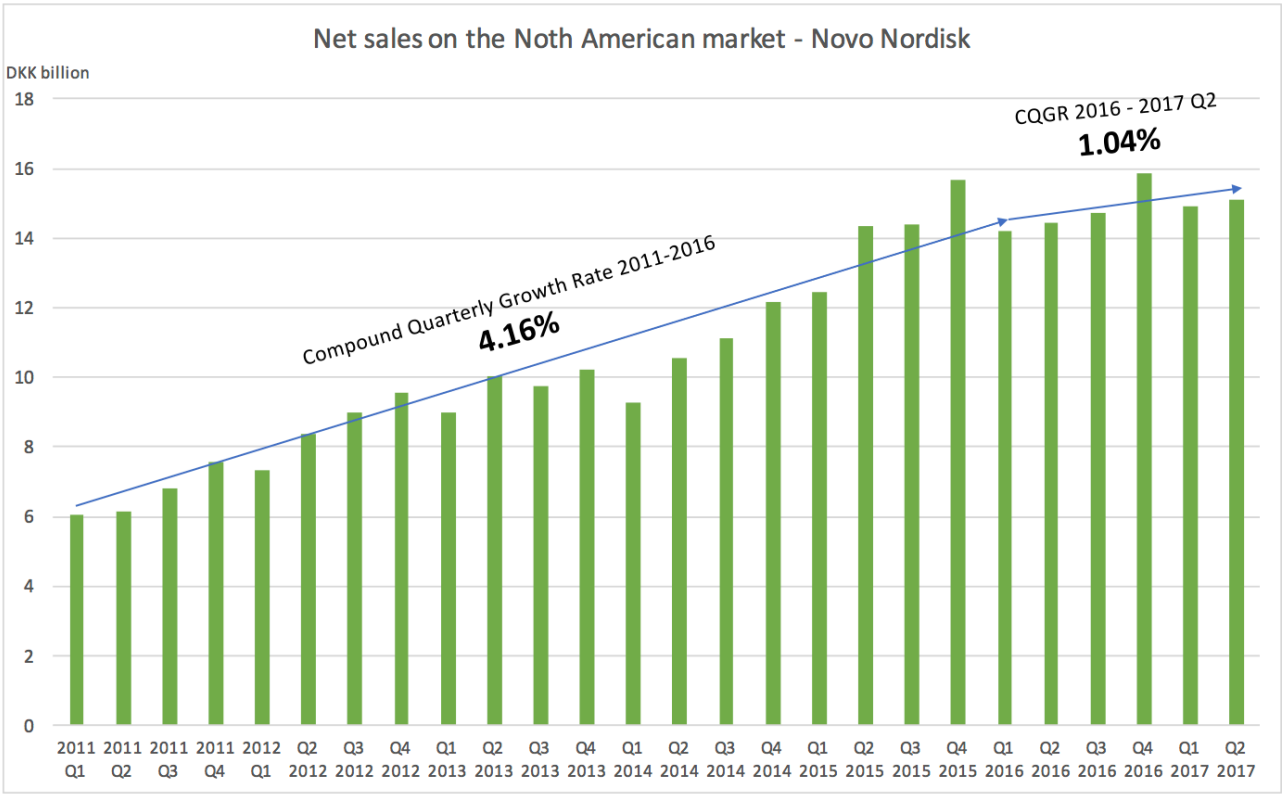
Total sample	1963-2004	1995-2004
75th percentile	17.9	22.2
Median	11.1	12.2
25th percentile	6.4	5.6

Appendix 7.13 – Return on invested capital of top pharmaceutical companies worldwide in 2016

Source: Statista. https://www.statista.com/statistics/473544/top-global-pharmaceutical-companies-return-on-invested-capital/

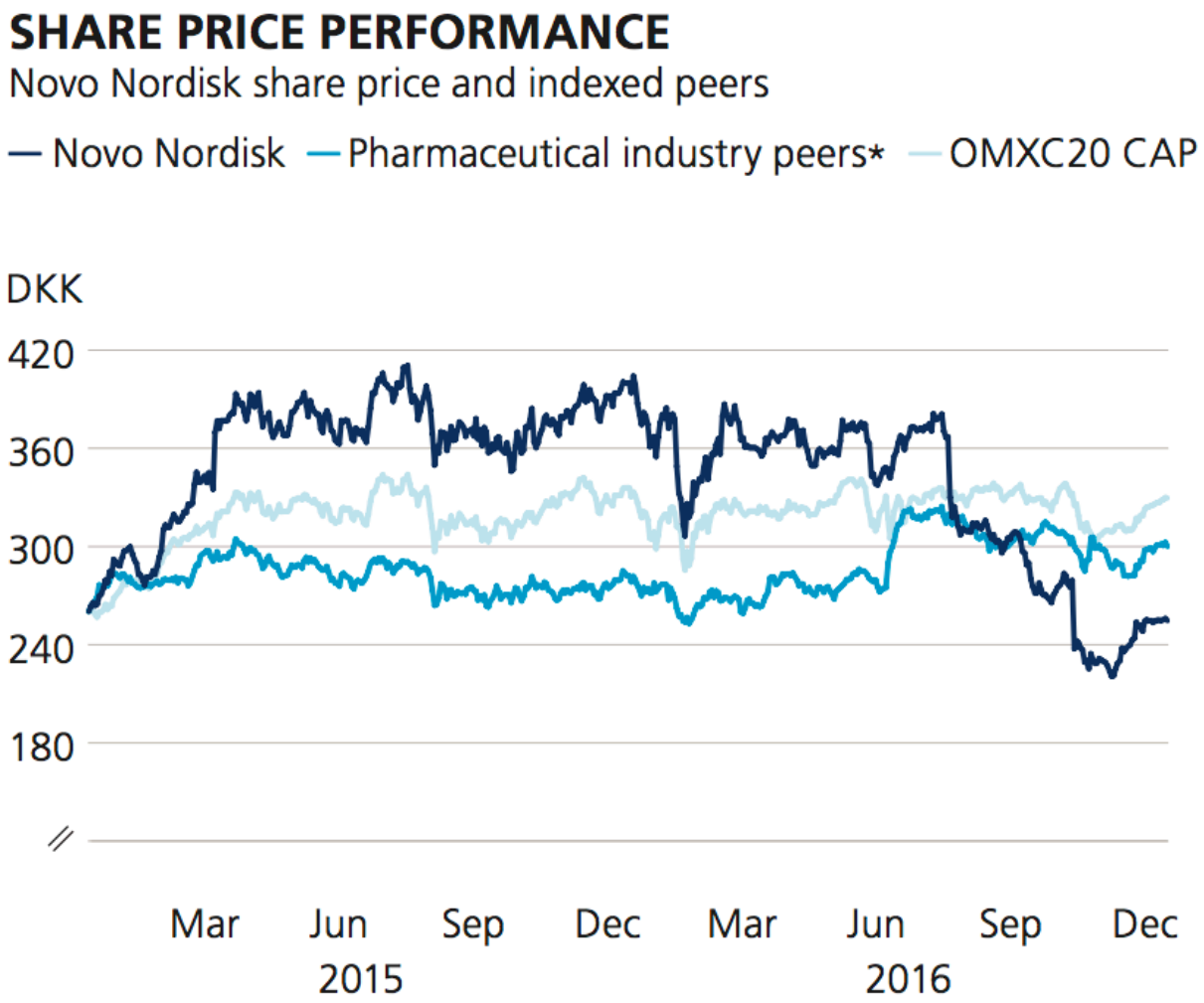


Appendix 7.14 – Novo Nordisk's Net Sales on the North American market



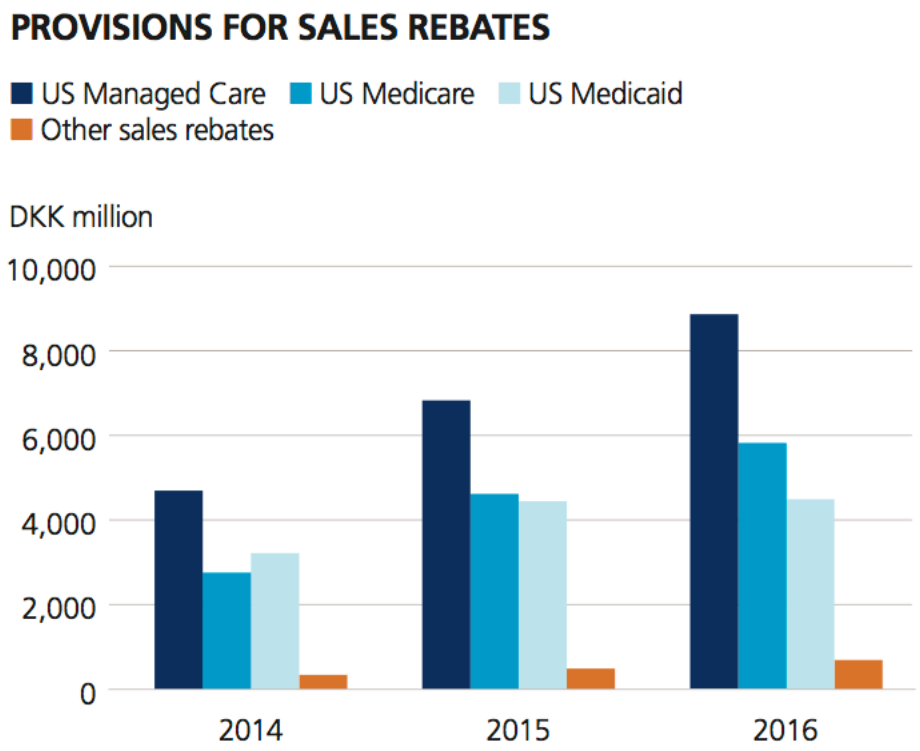
Source: Self-made. Data from Novo Nordisk quarterly financial statements 2011-2017

Appendix 7.15 – Novo Nordisk Share Price Performance



Source: Novo Nordisk Annual Report 2016

Appendix 7.16 – Provisions For Sales Rebates



Source: Novo Nordisk Annual Report 2016