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MASTER THESIS

**ACCOUNTING FOR INVENTORY UNDER US GAAP: IS LIFO
STILL USED BY COMPANIES?**

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Declaration of Authorship

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Abstract

As globalization progresses and international economic dependency increases, the need for global accounting system becomes more apparent. With this matter US lawmakers are willing to converge with international accounting standards. However, there are many challenges facing them, one important would be the repeal of LIFO inventory costing method. Although, the LIFO costing method was under pressure of SEC's Roadmap toward IFRS and Obama administration's budget proposals 2012, which contained a provision to elimination of LIFO for tax purposes. The method is still used by firms and the repeal did not happen yet. This study investigates into the current situation of firms using the LIFO and provides the most recent facts of LIFO repeal.

Key words: Inventory valuation, LIFO, FIFO, adoption of IFRS, LIFO removal

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Abbreviations

AICPA	American Institute of Certified Public Accountants
ASC	Accounting standards codification
COGS	Cost of goods sold
FASB	Financial accounting standards board
FIFO	First-in-first-out
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IASC	International Accounting Standards Committee
IASCF	International Accounting Standards Committee Foundation
IFRS	International financial reporting standards
IN	Inventory
IRC	Internal revenue code
LIFO	Last-In-First-Out
LR	LIFO reserve
NAICS	North American Industry Classification System
SEC	The Securities and Exchange Commission
TA	Total asset
US GAAP	United States Generally Accepted Accounting Principles

1. INTRODUCTION

The force of globalization is growing fast, with this matter the need of one common international accounting standards raised as well. Thus, accounting standards in the United States are converging toward international standards. If convergence continues, and there are proponents and detractors, then the U.S. system of accounting, called Generally Accepted Accounting Principles (GAAP), will be replaced by International Financial Reporting Standards (IFRS). Convergence has profound implications for publicly traded companies and their many stakeholders such as investors, lenders, government agencies, and employees. “The FASB believes that seeking more comparable global accounting standards—improving the quality of accounting standards used around the world while reducing differences among those standards—is consistent with its core mission. Investors, companies, auditors, and other participants in the U.S. financial reporting system benefit from the increased comparability that can result from the closer alignment of standards used internationally. More comparable standards have the potential to reduce costs for both users and preparers of financial statements and make worldwide capital markets more efficient. The Securities and Exchange Commission (SEC) expects the FASB to consider, in developing standards, the extent to which international comparability is necessary or appropriate in the public interest and for the protection of investors” (*Comparability in International Accounting Standards*, 2019).

In November of 2008, the SEC published the *Roadmap for the Potential Use of Financial Statements Prepared in Accordance with International Financial Reporting Standards by U.S. Issuers*. One large implication made by this Roadmap was the shift in focus from accepting IFRS prepared statements by foreign companies in the US markets, to the focus on the idea of requiring US companies to prepare their statements in accordance with IFRS (Cheng, 2009).

Standard-setting bodies have been historically uneasy about compromising on the strictness and complexities of GAAP. Among the reasons why GAAP is so complex and rule-heavy are the legal and political currents at work. GAAP has been modified and amended as needed throughout the years due to corporate scandals, loopholes, and some convoluted bookkeeping. Because of efforts to make GAAP as airtight as possible, some of the methods have become unwieldy in day-to-day situations. The construction of the Roadmap to convergence suggests that the SEC is doubtful that the FASB will give up its independence and convert whole-heartedly to IFRS (Cheng, 2009).

One of the issues facing accounting standard-setters is the treatment of inventory valuation, an area in which US GAAP and IFRS differ. Because international financial reporting standards (IFRS) do not allow the use of the LIFO inventory method, whereas US GAAP does. LIFO allows companies to match current income with the current higher cost of inventory, industries that often

experience rising inventory costs typically use LIFO as the inventory accounting method. As a result, the LIFO method enables businesses to avoid phantom profits caused by inflation. On the other side, under the period of decreasing prices LIFO may result in overstated profits.

However, LIFO has been long accepted under both standards, due to the revision of IAS 2 in 2003, LIFO was expressly prohibited as a method of inventory valuation under IFRS. This was in response to the shift of IFRS from an income statement focus to a balance sheet focus. While an income statement approach focuses on end-period amounts, a balance sheet approach focuses on account balances on a day-to-day basis. Therefore, one step towards to convergence could be the elimination of the use of LIFO in the U.S GAAP. But the repeal of LIFO will have the biggest impact on American companies' financial statements particularly on their reported tax obligations. The IRS requires companies using LIFO for tax purposes to have to use LIFO for income measurement in financial accounting as well IRC Sec. 472(c), which is called ***LIFO conformity rule***. The repeal of LIFO has been proposed in the past five U.S. budgets. Recently, the FY2014 budget projected that a repeal of LIFO would reduce the U.S. deficit by \$80.8 billion over the next 10 years. (Anon., n.d.).

The potential repeal of LIFO has sparked a heated debate. On the one hand, opponents of LIFO characterize LIFO as a “massive tax holiday” (Kleinbard, Plesko and Goodman, 2006) On the other hand, proponents assert that LIFO is a sound accounting inventory method and is not only used exclusively by big oil and other large corporations but also by hundreds of thousands of smaller companies (LIFO Coalition, 2010). LIFO coalition strongly expresses that “Repeal of LIFO would hurt American businesses. It would significantly hinder the competitiveness of U.S. businesses in the worldwide marketplace by placing a significantly increased tax liability on those companies that use LIFO”. (Anon., 2019).

The firms using the LIFO method during the past 10 years decreased more than 100 comparing to the latest study conducted by (Vitale, 2010). However, prior studies relied on various sides of LIFO repeal and its' financial and economic consequences, majority of them focused only tax burden after removal of LIFO in certain industries or in all industries. Some of the study making conclusion that tax advantages is the one of the significant reasons behind the firms' choices on LIFO valuation method as costing method. This thesis differs by making statistical analysis on firms' level and providing the most recent situation of LIFO users¹ as well as LIFO repeal. Thus, the purpose of this paper is to review recent research into the firms using LIFO and the reason behind decrease in the count of firms using this method. Therefore, the main question for the thesis is:

¹ Firms using the LIFO costing method

Is LIFO still used by companies?

There are several sub-questions related to this matter:

1. Which industry sector dominates in firms using the LIFO?
2. How many firms use the LIFO method over period 2010 to 2017?
3. What are the reasons behind the changes of costing method (LIFO to another)?
4. What are the possible financial consequences on current LIFO users after its repeal?

To answer these questions, qualitative and quantitative methods were employed. Based on retrieved data and sampled population hypotheses were developed.

In 2017, there were only 6.4 % of public companies used LIFO method based on sum of LIFO reserve in industry. This percentage varied enormously by industry. Manufacturing industry was leading with 58% amongst all sectors with the count of the firms using as well as total amount of LIFO reserve. The lowest share of users in industry were Information with only 0.16%.

To the extent of the public companies, during the year between 2010 and 2017 the sum of LIFO reserve lost its half. The highest was in year 2011, which is \$105 billion and the lowest is \$37 billion by year 2015. Further, the result of the analysis presents the highest amount of LIFO reserve is connected to the Petroleum and Coal product manufacturing industry, which was also one that leading between these years. Looking to the detail on firms' level, EXXON MOBIL CORP solely occupies 40% of total LIFO reserve in industry. This corporation was one of the strongest opponents of LIFO repeal. The corporation responded multiple fronts including issuing press releases, placing advertisements in selected newspapers and lobbying against repeal.

A descriptive statistical analysis was made to investigate the current situation of firms using LIFO. By the year 2017, there were recognized two hundred thirty-six companies as users of LIFO based on their LIFO reserve. The result in statistical analysis showed the highest LIFO reserve over its total asset is 18%, which is associated with the firm GLOBAL BRASS & COPPER HLDGS. If GLOBAL BRASS & COPPER HLDGS was to change to this date LIFO method to another, it's total asset would increase by 18% and their return on asset would change as well. On the other hand, the firm with the highest return on asset (44%) is TREX CO INC, their LIFO reserve over its total asset is 6% higher than the average. Comparing their size TREX CO INC is medium sized and the other one is larger. Investigating to this argument the next hypothesis was made.

(Comiskey, 2008) investigated in how the shift from LIFO to FIFO will affect the largest 30 companies in US. They interpreted their result into 5 different consequences which is related to key balance sheet items. This study was also analyzing the firms, but those with high LIFO

reserves. Thus, further analysis was made and showing the result that 25% of companies will have more than \$500 million one-time increase in tax liability. Average tax bill showed \$493 million, the highest is \$3996 million and the lowest one is \$53 million. LIFO reserve influences to current ratio 14% on average.

(Gray, 2013) used in his study a survey from AICPA to assess the count of firms using LIFO, which was showing between the years from 2004 and 2011 one hundred thirty-seven companies voluntarily stopped using the LIFO method. And only four firms used LIFO method fully, sixty-six firms used LIFO on 50% of their inventories. In his study, he did not mention the type of entity, thus the count of firms may include private firms as well. In my study, there were three hundred thirty-nine firms counted as users of LIFO between the year 2010 and 2017. During this period there are 102 firms stopped report LIFO reserve or reported “0” LIFO reserve. To observe the reason behind decrease, I went through every individual firms’ financial statements. Categorization is made on results as firms stopped using LIFO (changed into another), firms became inactive and firms that still using the LIFO.

In order to grasp the full background in this paper, one has to focus on the importance of the correct valuation of inventory for businesses. Section 2. clarifies the theoretical background about inventory accounting and key differences of two major standards, and literature review on LIFO repeal. Section 3. Introduces the data and sampling and used methodology. Section 4. presents the results and discussion. Section 5. presents the conclusion of the thesis.

2. BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 The importance of inventory for businesses

“If you want a good read on a company’s prospects, then check the storeroom. Businesses of all kinds — retail, technology, housing, autos — live and die by their inventory”.

- Jim Gramer, Mad Money.

Inventory is significant, that it can predict a turnaround in an industry. Due to the fact, while an excess of product indicates a slowing business, empty shelves often point to one that’s ready to take off. Inventory is the goods that a business has on its premises or on consignment. The essential role of inventory is to act as a buffer, allowing for the smooth functioning of the production and order fulfillment processes. An inventory account typically consists of four separate categories:

- Raw materials – the source material for a company's manufacturing process. It can literally be "raw" materials that require considerable reconfiguration to become a product (such as wood) or it can be components purchased from a supplier, and which can simply be bolted onto a product that is being assembled.
- Work in process – the raw materials that are in the process of being transformed into finished products through a manufacturing process. This can be quite a small amount if the manufacturing process is short, or a massive amount if the product being created requires months of work (such as an airliner or a satellite).
- Finished goods – the products that have successfully completed the manufacturing process and are ready for sale.
- Merchandise – the finished goods that have been purchased from a supplier, and which are ready for immediate resale.

Inventory differs industry by industry. For example: Manufacturing companies convert **raw materials** into final products, which are often sold to merchandising companies. Manufacturing companies have three types of inventory: raw materials, work-in-process, and finished goods. The U.S. government in its Industry Classification System further defines manufacturing as the "mechanical, physical, or chemical transformation of materials, substances, or components into new products." There are a wide range of companies and industries that engage in this type of activity. While, merchandiser is defined as a company that purchases **products for resale**, such as apparel, food items, clothing, or electronics.

2.2. Accounting for inventory under IFRS and US GAAP

Inventory accounting is highly important to a firm because inventories can form a considerable asset to the firm both in absolute size and proportion to all of the firm's other assets. In addition, selling inventories more than its cost price represents the main source of a firm's sustainable income.

The basic inventory accounting consists of determining the goods available for sale and the cost of goods sold. The goods available for sale is obtained by adding the beginning inventory to the inventory purchases and the cost of goods sold is determined by subtracting the ending inventory from the goods available for sale. Even though the basic inventory accounting seems to be simple, in actual business inventory accounting is more complex and enclose various issues such as determining the physical quantities in inventory, the items to be included in the ending inventory, the costs to be included in the inventory purchases, the cost flow assumptions to be used, valuation of inventories, all of which affects the quality of a company's financial statement (Revsine et al., 2015).

The physical quantities in inventory are determined by two different methods, perpetual and periodic. In periodic inventory system, upon acquisition, a purchase account is debited and inventory quantities are determined periodically thereafter by physical count. Cost of goods sold is residual amount, computed by adding beginning inventory and net purchases and subtracting ending inventory. While, a perpetual inventory system keeps a running total of the quantity of inventory on hand by maintaining subsidiary inventory records that reflect all sales and purchases as they occur. When inventory is purchased, inventory is debited. When inventory is sold, the cost of goods sold and corresponding reduction of inventory are recorded (Flood Joanne, 2018). The primary basis of accounting for inventories is cost. Cost is defined as the sum of the applicable expenditures and charges directly or indirectly incurred in bringing an article to its existing condition and location (ASC 330-10-30-1). This definition allows for a wide interpretation of the cost to be included in inventory. Right valuation of inventory is key matter to the company as its decision making is dependent on it.

2.2.1 The difference between IFRS and US GAAP systems

People in every walk of life are affected by business reporting, the cornerstone on which our process of capital allocation is built. An effective allocation process is critical to a healthy economy that promotes productivity, encourages innovation, and provides an efficient and liquid market for buying and selling securities and obtaining and granting credit. Conversely, a flawed allocation process supports unproductive practices, denies cost-effective capital to companies that may offer innovative products and services that add value, and undermines the securities market...Reporting standards play an important role in helping the market mechanism work effectively for the benefit of companies, users, and public (AICPA, 1994).

Financial statements prepared and presented by an entity typically follow an external standard that specifically guides their preparation. These standards vary across the world and are typically overseen by some combination of the private accounting profession in that specific nation and the government regulators. There are two major standards that used most globally. One is IFRS that is developed by International Accounting Standards Board (IASB) and the other is US GAAP, which is issued by Financial Accounting Standard Board. US GAAP is focused on the practices of the U.S companies. The main objective of the accounting standard is to ensure transparency, reliability, consistency, and comparability of the financial statements. As the result of this the transactions of the all companies will be recorded in a similar manner by following these standards.

The most significant difference between IFRS and US GAAP for a practitioner is the role that the underlying concepts play in day-to-day accounting and reporting. In simple terms, effective practice of US GAAP compels the user to find the best paragraph that fits a transaction or balance. Under IFRS, users are expected to apply the principles in a way that faithfully represents economic reality.

The IFRS system was founded by International Accounting Standards Committee (IASC) in 1973 in London and was the first international standards-setting body. The IASC was founded as a result of an agreement between accountancy bodies in nine countries². As (Doupnik, 2009) said in their study that the main objective of this body is to set and develop standards that could be used in world-wide. They pointed out the IASC activities were perceived as lacking legitimacy: There was inadequate support for its founders; IASC was not sufficiently independent; some committee members were believed to lack required expertise. The committee was responsible for developing the International Accounting standards (IAS) and promoting the use and application of these standard with the intend to harmonization of the standards globally.

² Australia, Canada, France, Germany, Japan, Mexico, the Netherlands, the United Kingdom/Ireland, the United states

After careful consideration, IASC became International Accounting Standards Board (IASB) in 2001 and the standards developed by this entity were also given a new name – International Financial Reporting Standard (IFRS). The objectives of IASB are “To develop, in the public interest, a single high set of high quality, understandable, enforceable and globally accepted financial reporting standard based upon clearly articulated principles” (Deloitte., 2019). To meet this goal, the IASB has issued principle-based standards and taken steps to remove allowable accounting alternatives and to require accounting measurements that better reflect a firm economic position and performance. IFRS have been adopted by the European Union, leaving the United States, Japan (voluntary adoption is allowed) and China (working towards IFRS) as the only major capital markets without an IFRS mandate. As 2018, one hundred forty-four jurisdictions require the use of IFRS for all or most publicly listed companies and twelve jurisdictions permit its use. Since the IFRS is not owned by any one country, the IASB is top-level authoritative body for IFRS standards.

On the other hand, the US GAAP, rules-based standard, refer to a common set of accepted accounting principles, standards and procedures that companies and their accountants must follow when they compile their financial statements. The Financial Accounting Setting Board (FASB) creates and maintains US GAAP Codification and, the Securities and Exchange Commission (SEC) delegates its day-to-day rule-making authority to the FASB. The SEC also supersede the US GAAP for public companies. Rules-based standards typically provide very detailed guidance with bright-line tests. The accounting principles and standard setting process in United States have started in 1930, right after the crash of the stock market in 1929 and the subsequent Great Depression, which were believed to be at least partially caused by less than forthright financial reporting practices by some publicly traded companies (Epstein, Nach and Bragg, 2009). The federal government began working with professional accounting groups to establish standards and practices for consistent and accurate financial reporting. US GAAP began to be established with legislation such as the Securities Act of 1933 and the Securities Exchange Act of 1934. Since then it has gradually evolved, based on established concepts and standard, as well as on the best practices that have come to be commonly accepted across different industries. According to (Van der Meulen, 2007) US GAAP consist of specific criteria and restrictions compared to the IFRS, and it is very prescriptive than principle-based standard. The standard setting bodies employ rigorous process in forming standards. Both have position papers, exposure drafts, and specific instructions and the timing of transition from prior standards. In fact, the two bodies have been jointly developing standards since the 2002 Norwalk Agreement, which creates a roadmap to convergence. The broad outline of the plan is that the two boards converge standards where they have mutual interests. Its objective does not include the synchronization of every standard.

However, the two boards have jointly produced standards and issued statements, there is still have differences.

2.2.2 Inventory under IFRS and US GAAP

The purpose of accounting standards is to solve following issues:

- Recognition that clarifies when the item should be recognized
- Measurement that clarifies the value at the recognition date and at balance sheet date
- Derecognition that clarifies when to be expensed

Engaged with these issues, accounting for inventory is intended to accurately reflect the asset value to be shown on balance sheet as well as cost expensed by an entity. It should also provide investors a basis with what to determine expected profit. IFRS aimed to provide guidance on “the amount of cost to be recognized as an asset and carried forward until the related revenues are recognized.” International Accounting Standards (IAS 2-1). “Similarly, GAAP requires companies to record inventories at cost when first recognized. Accounting Standards Codification” (ASC 330).

The accounting and reporting for inventory are very similar under IFRS and US GAAP. It has the same definition and, in most cases, the same basis. The cost of inventory is sold is matched to revenues, and obsolete or slow-moving inventories are written down. However, IFRS requires inventories that are held for trading and used in agriculture to be carried at fair value. Disclosures for IFRS and US GAAP for inventory are similar. Since inventory write-downs cannot be restored in a subsequent annual period under US GAAP, annual statements under US GAAP do not include disclosure for write-ups of inventory. Both standards require disclosures of cost flow and inventories carried at other historical cost. The very first difference may arise in the definition of assets between that standards. In US GAAP assets are probable future economic benefits obtained or controlled by a particular entity as a result of past transactions or events. On the other hand, in IFRS asset is resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity. The table below shows the key inventory accounting differences.

Table 1. Overview of key inventory accounting differences in standards

IFRS – IAS 2	US GAAP – ASC 330
Inventories are generally measured at lower of cost and net realizable value.	Inventories whose cost are based on last-in-first-out (LIFO) and retail methods are measured at lower of cost and market value. Others are measured same as it in IFRS.
Decommissioning and restoration costs incurred through the production of inventory are included in the cost of that inventory.	Asset retirement obligations incurred through the production of inventory are added to the carrying amount of the related item of property, plant and equipment.
The cost of inventory is determined using FIFO (first-in-first-out) or weighted average cost methods.	The cost of inventory may be determined using LIFO (last-in-first-out), FIFO (first-in-first-out) or weighted average cost methods.
The same cost formula is applied to all inventories having a similar nature and use to the entity.	The same cost formula needs to be applied to all inventories having a similar nature and use to the entity.
Inventories are written down to net realizable value when net realizable ³ value is less than cost.	Inventories whose cost are based on last-in-first-out (LIFO) and retail methods are written down to market value ⁴ when market value is less than cost. Other inventories are written down to net realizable value when net realizable value is less than cost.
If the net realizable value of an item that has been written down subsequently increases, then the write-down is reversed.	A write-down of inventory to net realizable value (or market) is not reversed for subsequent recoveries in value unless it relates to changes in exchange rate.

(Source: KPMG LLP, 2015. *Inventories*)

³ NRV is the estimated selling price less the estimated costs of completion and sale

⁴ Market value is current replacement cost limited by net realizable value (ceiling) and net realizable value less a normal profit margin (floor).

2.2.3 Comparing major costing methods of Inventory

❖ First-in-first-out (FIFO) costing method

FIFO is a valuation method of inventories allowed under both IFRS and US GAAP. This method assumes that the first goods purchased will be the first goods to be used or sold, regardless of the actual physical flow. This method is thought to parallel most closely the physical flow of the units for most industries having moderate to rapid turnover of goods. The strength of this cost flow assumption lies in the inventory amount reported in the statement of the financial position. Because the earliest goods purchased are the first removed from the inventory account, the remaining balance is composed of items acquired closer to period end, at most recent cost. This yields result similar to those obtained under current cost accounting in the statement of financial position, and helps in achieving the goal of reporting assets at amounts approximating current values. However, this method does not necessarily reflect the most accurate or decision-relevant income figure when viewed from the perspective of underlying economic performance, as older historical costs being matched against current revenues. Depending on the rate of inventory turnover and the speed with which general and specific prices are changing, this mismatching could potentially have a material distorting effect on reported income. At the extreme, if the reported earnings are fully distributed to owners as dividends, the enterprise could be left without sufficient resources to replenish its inventory stocks due to the impact of changing prices (Epstein and Jermakowicz, 2008). Further, a decreased cost of goods sold (COGS) will result higher net income and tax obligation than if the LIFO was used. Therefore, during the inflations the earliest purchased inventories causes the low COGS. On the other hand, during the periods of decreasing prices, FIFO will lead to higher expenses that the earliest purchased products costs high and flows as COGS, whereas the latest products cost lower and valued as inventories. The higher price produces lower profit and lower income tax obligations (Bragg, 2004).

❖ Last-in-first out (LIFO) costing method

LIFO is an inventory valuation method that is allowed by US GAAP, but not by IFRS. Under this cost flow method, the most recent purchases are assumed to be the first goods sold; thus, ending inventory is assumed to be composed of the oldest goods. Therefore, the COGS contains relatively current cost. LIFO smooths out fluctuations in the income stream relative to FIFO because it matches current cost with current revenue (Whittington and Delaney, 2010). LIFO does not usually follow the physical flow of merchandise or materials. However, the matching of physical flow with cost flow is not an objective of accounting for inventories. LIFO is actually an income tax concept. LIFO was not accepted valuation method from the beginning (1930) according to the

verdict from the Supreme court in U.S. Although later in 1939 it was changed due to the Revenue act, where LIFO was allowed with the necessity that taxpayers electing to use LIFO for income tax purposes must also use it for financial accounting purposes (Hoffman & McKenzie, 2009 a). Experts in accounting sector were divided into two groups, where one believes that LIFO does not present actual economic value of a company's inventory and other group disputed that LIFO is the best valuation method, which better matches the revenue and cost. The problem was due to the comparison of financial statements between users⁵ of LIFO and non-users of LIFO (Hoffman & McKenzie, 2009 a). Later on, American companies started to report different financial statements due to the distinct methods (LIFO/FIFO) thus, AICPA planned a rule concerning to the usage of LIFO. Thereupon, user of LIFO required to provide additional information about their inventory as if it was valued under FIFO method. Consequently, investors were able to compare two method easily. The Regulation S-X, rule 5-02 requires firms using LIFO to show the LIFO reserve in disclosures or directly on the balance sheet. The LIFO reserve is the difference between FIFO valuation and LIFO valuation of inventory. (Hoffman & McKenzie, 2009 a) describes that the LIFO reserve is fundamental value of calculation for investors and other stakeholders to compare two methods, therefore it is important to be clear. Contrary to the FIFO method, during the inflation period LIFO method produces higher cost of goods sold and vice versa in deflation times according to (Comiskey, 2008) and (Bragg, 2004). Whereas ending inventory is valued in opposite way that the earlier purchased items remain in the ending periods, which generates lower inventory on balance sheet.

The section below shows the example of a fictive company in United States that uses both method (LIFO/FIFO) for its inventory valuation during the year 2019. Over this period, it is assumed to follow normal price increases, which means there will not exist any abnormal price changes. Exhibit 1 shows number of transactions occurred during the financial period that is related to the inventory. The following Exhibit 2 presents the calculation of inventory costing by two different standards (according to LIFO and FIFO). Income statement and Balance sheet of fictive company are showed in Exhibit 3 and 4 to clarify how the two methods affect the company's financial profile.

⁵ Users are those who uses LIFO as their inventory valuation method

As it is shown on Exhibit 1, there are no products in the beginning balance of the year 2019. The purchasing and selling transactions occurred during the period results in an ending balance of 2019 of 355 remaining. All the numbers that shown on Exhibit 1 creates a basis of further calculation of cost of goods sold and ending inventory.

Exhibit 1. Transactions during the year 2019.

Purchased/sold products, 2019						
Date	No. of products		Price per product	Total cost	Total sale	No. of products in inventory
	purchase	sale				
						Beginning Bal. = 0
January, 4	2000		\$ 100	\$ 200,000		2000
April, 28	500		\$ 103	\$ 51,500		2500
July, 17,		1750	\$ 150		\$262,500	750
October, 5	1600		\$ 104	\$ 166,400		2350
December, 9		1995	\$ 150		\$299,250	355
			Total:	\$ 417,900	\$561,750	Ending Bal. = 355

Source: own calculation

In Exhibit 2, the COGS is described according to LIFO. The COGS of 1750 products in July, is calculated as follows: $500 \text{ (the latest purchased products as of April 28th)} * \$103 + 1250 * \$100 = \$176,500$. Subsequently, there remains products purchased on 4th of January. Another transaction happened on 9th of December includes 1995 products. To find out COGS for this transaction, we should see at latest purchase cost and number of products, it's $1600 * \$104 + 395 \text{ (remaining of 1995)} * \$100 \text{ (from January 4th)} = \$205,900$, in total COGS during the year is \$382,400.

On the contrary, COGS is calculated opposite way by FIFO costing method. Following transaction according to the date, the first transaction of sale is calculated from the first purchase, it is $1750 * \$100 = \$175,000$. The next transaction of sale consists of the purchase from April 28th and the last purchase, which reflects to $500 * \$103 + 1445 * \$104 = \$205,980$, as a result total amount of COGS for year 2019 is \$380,980.

Exhibit 2. Valuation of inventory under LIFO and FIFO.

Valuation of inventory: December, 31 2019			
Calculation of LIFO	LIFO	Calculation of FIFO	FIFO
500*103+1250*100	\$176,500	1750*100	\$175,000
1600*104+395*100	\$205,900	250*100+500*103+1245*104	\$205,980
COGS:	\$382,400	COGS:	\$380,980
Inventory:	\$ 35,500	Inventory:	\$ 36,920
LIFO reserve:	\$ 1,420		
Control:	\$417,900	Control:	\$417,900

Source: own calculation

The Exhibit 3 and 4 present the effect of different valuation methods of inventory on income statement and Balance sheet of fictive company. From these table it can seen that the two methods also provide different key ratios. For example: Return on asset under LIFO is 46.2% whereas under FIFO it is 46.4%, surely the numbers are assumed and does not provide such difference, but the difference would vary in reality. Here, it can be confirmed that under FIFO method the financial statements would look better than costing under LIFO. Moreover, tax obligations would be \$37664 under LIFO and \$37962 under FIFO with tax rate 21%⁶. The tax savings under LIFO is \$298. This amount can be easily checked using alternative calculation with LIFO reserve: $\$1420 \times 21\% = \298 .

Exhibit 3. Income statement

Income statement December, 31 2019		
	LIFO	FIFO
SALE	\$561,750	\$561,750
COGS	\$382,400	\$380,980
Net profit	\$179,350	\$180,770

Source: own calculation

⁶ A new corporate tax rate after reform in US

Exhibit 4. Balance sheet according to LIFO and FIFO.

Balance sheet: December, 31 2019			
LIFO			
Current asset:	\$388,300	Shareholder's equity	\$179,350
- Cash	\$352,800		
- Inventory	\$35,500		
- Inventory	\$36,920	Total liability	\$208,950
- LIFO reserve	\$(1,420)		
Total asset	\$388,300	Total shareholder's equity and liability	\$388,300
Balance sheet: December, 31 2019			
FIFO			
Current asset:	\$389,720	Shareholder's equity	\$180,770
- Cash	\$352,800		
- Inventory	\$36,920	Total liability	\$208,950
Total asset	\$389,720	Total shareholder's equity and liability	\$389,720

Source: own calculation

Disadvantage of LIFO

A primary disadvantage of LIFO is that it results in inventory decreases because earlier, lower valued layers are not included in the cost of goods sold. This is generally known as a LIFO liquidation. Companies generally carry a certain minimum amount of inventory on hand to facilitate operations, and under the LIFO method, this unsold inventory is carried on the books at the oldest prices. If a company chooses not to engage in a LIFO liquidation, balance sheet inventory accounts can be vastly understated, as they will be valued based on inventory prices that are in some cases several decades old. Equally concerning is that management can take advantage of this situation and generate a nonrecurring gain by decreasing strategically its inventory levels to sell off portions of this older-priced stock. The sale will show greater than average profits, as the associated cost of goods sold will be abnormally low. Though it is required that LIFO liquidations be disclosed in the footnotes to the financial statements, they still enable managers to manipulate income. Another is the cost involved in maintaining separate LIFO records for each item in inventory. When a company uses LIFO for external reporting purposes and another inventory method for internal purposes, a LIFO reserve account is used to reduce inventory from

the internal valuation to the LIFO valuation. Analysts and investors can use this figure, which is required to be disclosed in the footnotes of a company's financial statements, to convert a LIFO company's data to what it would be under FIFO. This facilitates the comparison of LIFO companies with FIFO companies. While requiring the disclosure of this information is assuredly beneficial, calculating and using the LIFO reserve consumes additional financial and personnel resources from both the originating company and from users of financial statements. The method also involves sophisticated record keeping and calculations. For example, companies that are expecting to switch to LIFO may reduce their tax liability, but it could also depress current earnings and reduce the value of inventories on balance sheet, thus giving the appearance of a weaker financial position (Drake *et al.*, 2018).

2.3 Literature review

Much of the current literature on convergence of accounting for inventory pays particular attention to LIFO repeal. Previous studies relied on two general categories: examining factors influencing inventory accounting policy choice and potential financial and economic consequences of LIFO repeal.

2.3.1 The factors influencing inventory accounting policy

(Biddle, 1980) examines the properties of year-end inventories and document that choices between LIFO and FIFO are influenced by managers' forecasts of associated future cash flows. He also finds that managers' decisions regarding year-end inventory levels are influenced by the tax-related cash-flow incentives provided by the LIFO and FIFO. Consistent with the findings from prior studies, (Biddle and Lindahl, 1982) find that larger LIFO tax savings are found to be associated with larger cumulative excess returns over the year to which a LIFO adoption first applied. Similarly, by focusing on firm-level analyses, (Dopuch and Pincus, 1988) find evidence that inventory choice is highly correlated to firm's tax saving. They also find that the characteristics of firms' operating, investment, and financing decisions affects the choice of accounting methods. (Hughes and Schwartz, 1988) studied LIFO/FIFO choice issue, where it uses signaling model that explaining why some firms choose FIFO and other LIFO. In the model the firm manager has private information about firm quality, where quality is linked to the distribution of the future cash flows and therefore to the likelihood of bankruptcy. Firms with better prospects signals high quality by choosing FIFO, where it increases the current market value of good firms. In this way FIFO is a rational choice for the management of good firms however tax advantages are linked to the LIFO. They concluded that good firms with relatively higher expected cash flows will choose FIFO because FIFO must be more costly for low-quality firms than for high-quality firms. Further, (Cushing and LeClere, 1992) find that anticipated tax savings is the key reason

firms use LIFO. The larger the estimated tax saving, the more likely the firm adopts LIFO. They also provide evidence regarding the choice of LIFO and leverage. Firms with higher leverage are less likely to use LIFO method. (Gul, 2001) examines Jensen's free cash flow hypothesis in managers' choice of LIFO and FIFO. He finds that firms with high free cash flow and high debt are less likely to choose FIFO than firms with high free cash flow and low debt.

Recently, the study conducted by (Zhang *et al.*, 2014) provided the paper that focused on LIFO determinants and interaction with inventory management. According to them one of the key determinants of LIFO choice was tax incentives, where they partially prove the prior studies that tax saving is one of the most significant factors involved into the inventory accounting choice.

2.3.2 Potential financial and economic consequences of LIFO repeal

There are plenty of researchers that studied about the consequences of LIFO repeal right after SEC's Roadmap release. Earlier studies were concentrating the causes of company's LIFO choice for valuation despite tax benefits and their exposure after switch from FIFO to LIFO, whereas modern studies concentrated on tax obligations of companies that using the LIFO arose from its repeal. The studies conducted by (Hoffman & McKenzie, 2009 a), (Satin, 2009), (Hughes and Schwartz, 1988) and (Comiskey, 2008) were reviewed extensively based on the study of (Lexell & Lindstedt, 2010).

Afterward the acceptance of LIFO as an alternative method of inventory valuation, there were plenty of firms switching from FIFO to LIFO. Just as firms started to switch their methods, the researchers also became interested in the causes of the changes. One example is (Hughes and Schwartz, 1988) examined the effects of the switch from FIFO to LIFO to solve the different conclusions of various authors about the switch that were studied in earlier times. Their basis of the model was the information asymmetry between managers and investors. Managers know more about their firm's future prospects and they credibly signal their private information through the choices of LIFO/FIFO. Therefore, managers were eligible to decide whether to switch to LIFO valuation method, while recognizing that his compensation depends both current and future market prices. They concluded that the switch from FIFO to LIFO depends on industry specific and times that some industries did not switch while some switched almost wholly.

Right after SEC's proposal about the full adoption of IFRS, there started to volley many studies that shows financial and economic consequences of LIFO repeal. (Comiskey, 2008) investigated in the consequences of LIFO repeal regarding to the convergence of IFRS and US GAAP. They studied how the LIFO repeal would affect to income, balance sheet, cashflow and tax obligations. They examined sample of thirty companies with the greatest LIFO exposure. They found that if LIFO were used in 2007 by these firms, pre-tax and net income would be higher by 11.97% and

7.42% respectively, the current ratio and shareholder's equity would be higher 26.2% and 34.2% higher respectively. Also, they mentioned that there is no significant research that proves the weaknesses of using LIFO.

Further, (Satin, 2009) investigated in the thinking of the professional accounting community. They asked a question "Will the US ask for carve-out to allow the use of LIFO once the IFRS are adopted?" practitioners and accounting professors in California, United States. The research showed that practitioners were split evenly with 50% expecting US firms to ask carve-out and other 50% expecting IFRS to be adopted as it is. Further, the research showed that the current trend in inventory valuation is to move from LIFO to average. Participants also strongly stated that whatever happens to the LIFO's fate, it should be taught to allow students to understand the differences in valuation methods, LIFO may still be used by smaller firms not bound by SEC rules.

(Mock and Simon, 2009) discuss that it is strange that SEC suggests a shift from a rule-based system to a principle-based system considering the effects of the financial crises in the late 2008. This is since most companies that use the LIFO method are oil, gas and manufacturing companies, which are vulnerable to inflation. These companies tend to use LIFO because it values the last purchased item in inventory and therefore delay the effect of inflation of the inventory. (Mock and Simon, 2009) find that the LIFO valuation method is more accurate during inflations since the COGS is valued to the last purchased items which reflects the reality better. They also explain that the petroleum and natural gas industries' inventory have the largest part amongst all under LIFO valuation method. Almost 64% of all LIFO reserve in US comes from these industries. They concluded that the repeal of LIFO will cause higher tax obligations and the companies that uses LIFO further will be required to present their inventory under both methods. They stated that LIFO repeal will occur but not in near future. (Bloom, 2009) have showed in their article how the LIFO removal will affect US companies that using the LIFO in terms of taxation. They examined the effects from the perspective of relevant regulations and accounting standards. In their article they showed that according to the GAAP guidance, changes in inventory costing method should be applied retrospectively to the prior financial statements presented in annual reports, unless it is impracticable to do so. The entity reflects a change from LIFO to FIFO in the same manner, which will result: (1) an increase in inventory, (2) an increase in current income taxes due to the effective increase in income, (3) an adjustment to retained earnings for the effect of the increase in net income. As consequences of this leads to the need of showing Deferred tax liability for the temporary differences between the accounting and tax bases for the inventory change. Under IRC § 481 (a) permits an entity to deduct the entire change in the year of the change if the adjustment is favorable to the entity. If cumulative effect of change increases the entity's liability, instead of

crediting for the total tax bill, only one-fourth of the tax would be treated as a current liability. Further, they explain that if the entity follows it properly and if the LIFO reserve was not created in short time, a four-year adjustment period will normally be permitted. If not, the entities will be forced to pay the total amount during the first year. They concluded summarizing different possibilities regarding to LIFO, which are (1) removing LIFO conformity rule and allow LIFO for tax purposes; (2) extend the time period of tax obligation due; (3) different reporting standards could be used for larger versus smaller companies and stating that in any cases the LIFO is on its deathbed. Same explanation could be seen from article of (Hoffman & McKenzie, 2009 a), which is explaining that companies using LIFO valuation method now are reluctant to move to IFRS. The main idea of adoption to IFRS is promote better comparability and reliability. According to them allowing to choose US companies whether adopt IFRS or not creates incomparable situations. Further, they mention debate between proponents and opponents of LIFO repeal. One of the representative of proponents George R. Husband described LIFO as manipulation of income, which should be removed and proposed on President Obama's 2010 budget plan through US government. On the other hand, one of the opponents former SEC Chairman Harold M. Williams argues that the method is the most accurate, which includes the inflation in the valuation of the inventory. (Hoffman & McKenzie, 2009 a) see the debate as it is an issue about money, where companies want to decrease tax obligations whereas government wants to increase revenue from taxes to decrease deficit. The authors suggest few options regarding to full adoption of IFRS that allow LIFO with requirement to disclose with comparison of allowed alternative method or modify adoption of IFRS, where it clearly specifies all the requirements of LIFO. As consequences of this make easier adoption of IFRS for American companies (Hoffman & McKenzie, 2009 a). Another article of (Hoffman & McKenzie, 2009 b) examines LIFO conformity requirements and whether the convergence of US GAAP and IFRS will remove completely the LIFO method. They explain that if the convergence of GAAP results in LIFO no longer accepted accounting practice, the LIFO conformity rule under Sec. 472(c.) becomes problematic. They presented the reason of the convergence for global comparability as it will help investors understand investment opportunities outside the United States more clearly and with greater comparability than if those issuers disclosed their financial results under a multiplicity of national accounting standards, and it will enable issuers to access capital markets worldwide at a lower cost. . (Hoffman & McKenzie, 2009 b) specified that although with this purpose, for over a decade, FASB and the IASB have had an ongoing agenda of projects, i.e. over the period 2006-2008, numerous convergence-related issues were identified, issues related to LIFO method and inventory valuation in general not included. They mentioned that the both boards includes in agenda comparability as an important characteristic of useful accounting information and unlike the international standards adoption

process is most other countries, FASB is negotiating with the IASB on an issue-by-issue basis. Accordingly, the convergence process likely will result in changes to both US GAAP and IFRS. They are questioning if the full adoption of one set of accounting standards can be jeopardized by the rule of permitting the use of LIFO in United States and remark that disallowance of the use of LIFO for tax purposes would result in a large current tax bill for many of the users of LIFO in United States, which leads to negative economic impact such case as cashflows of LIFO users will be negatively affected and many of them will have to borrow to pay the additional tax. It is very likely, businesses will reduce capital investment and jobs will be lost. Marginal firms will be driven out of business. Further they suggested that since the LIFO conformity is a tax rule and not a financial accounting rule, the problem arose due to adoption of IFRS could be eliminated if Congress modify or terminate the LIFO conformity requirements. Otherwise, allowance of special rule only for LIFO users in US will cause opposition to both FASB's and IASB's objectives of comparability. They conclude their article that communicating with one's legislators, either directly or via interested organizations, to make clear where one stands on the LIFO issue is important. Another point of LIFO is studied by (Coffee, Roig, Rirely & Little, 2009) that how LIFO is making accounting distortions on liquidity measures. They studied three hundred thirty-five active companies with a positive LIFO reserve and their find significant balance sheet distortions in areas of inventory turnover, current ratio, and working capital across different company sizes and different industries. Later on, another study conducted by (Coffee, Roig, Rirely & Little, 2009) presented the industries that benefit most from using LIFO inventory valuation method. They focused on 22 energy companies that represent slightly more than 5% of four hundred six energy US companies and they document a material LIFO impact for some of the LIFO users. They showed an evidence that LIFO method produces material accounting distortions for energy companies both in absolute dollar amounts and in amounts relative to other assets and liabilities. These studies address LIFO users that will have real hardship after the repeal the most.

(Reineking *et al.*, 2013) examined the inventory costing convergence under US GAAP and IFRS. They stated that a majority of companies that have been reporting under LIFO are continuing to report, despite the knowledge that convergence with IFRS will eliminate it. The greatest impediment to these companies changing from LIFO is the tax implications. Not only will the cessation of LIFO cause the individual tax burden on companies to rise, but the costs of changing to another method and costs of accounting for prior years' reports are substantial. The dramatic increase in gross income for a company shifting from LIFO to another method would be a one-time occurrence. The Treasury Department's proposal has taken this into account and has provided that this increase could be taken into taxable income systematically over eight taxable years. They

concluded that the shift from LIFO to an IFRS-supported method would have a significant financial impact including lower reported ending inventory, higher net income and higher tax liability. Further, as a result of their findings showed a change in inventory costing methods will affect all firms, but have a bigger proportionate effect on retailing firms than on manufacturing and service firms.

(Sharma S.B., 2010) investigated in the impact of adoption of IFRS on the legal profession and explains that to fully understand the consequences of transition on legal system it is important to see the impacts from the perspective of taxation. The author specifies that there is problem such called LIFO conformity rule, which IRC allows the use of LIFO method for taxable income if it is only used in the financial statement. If the convergence happens the very first result would be repeal of LIFO according to the rule, which causes increased income tax provisions for the companies using the LIFO in United States. (Sharma S.B., 2010) further explains that the increased income tax provisions are creating a negative image towards the use of IFRS as the accounting standards system in the United States instead of US GAAP. As a conclusion, she clarifies that a law that will permit the use of LIFO for tax purposes in the United States should be approved to receive and maintain the support for IFRS as the one set accounting standards system in the world. (Sedki, Smith and Strickland, 2014) say that usually companies using LIFO have lower tax expenses and lower financial income. Operating results and cash flows might be significantly different for American companies currently using LIFO and wish to incorporate IFRS. Requiring American companies to switch from LIFO to First-in-First-out (FIFO) in a short and abrupt amount of time can have detrimental effects life of these companies and volatility of the economy.

In the article of (Leone, 2010), mention that Moody's Cuomo argued, the elimination of LIFO "is a cash-flow issue,". In his report, which examined 176 companies rated by Moody's that use LIFO, points out that larger companies with strong cash flows likely will whether the one-time charge of converting from LIFO to FIFO or another methodology without much problem. That's because for the largest companies, the charge represents a small percentage of their annual cash flow. However, smaller companies with high LIFO reserves and low cash flows could run into problems.

The study by (Vitale, 2010) provides a descriptive analysis of LIFO repeal based on data between year 2004 and 2008. Key findings of the study were (1) The Food & Beverage Stores industry contained the most LIFO users⁷, at 42.12% of the industry, followed by the Wholesale Trade industry (33.33%) and the Petroleum & Coal Products Manufacturing industry (30.36%). (2) over 30% of the Petroleum & Coal Products Manufacturing industry uses LIFO and the average LIFO

⁷ LIFO users: firms using the LIFO

reserve for the industry is over \$1.5 billion, the companies in this industry, and thus the industry overall, will actually see a relatively small change financially as a result of LIFO repeal. The average LIFO reserve in the Petroleum & Coal Products Manufacturing industry is relatively small compared to the size of the average company in the industry. (3) the other area where LIFO users will see changes from LIFO repeal is on their tax return. As conclusion, (Vitale, 2010) said the majority of LIFO-using firms would not face financial hardships as a result of LIFO repeal. Certain industries, such as the Petroleum & Coal Products Manufacturing industry, the Merchant Wholesalers - Durable Goods industry, the Primary Metal and Fabricated Metal Product Manufacturing industries, the Textile Product Mills industry, and the Printing & Related Support Activities industry could see a significant portion of their operating cash flow tied up in the payment of the tax owed as a result of conversion to FIFO or another non-LIFO method of inventory accounting.

2.4. Hypothesis development

There were plenty of studies investigated in LIFO repeal. Generally, the papers concentrated on two matters that involving all industries. The first point of view is about tax savings of firms that using the LIFO method and the effect after its repeal in general. The second thing is the debate between proponents and opponents of LIFO. There is however little research on sectors level as well individual firms' level and it can be said that the situation of LIFO repeal is disappeared from the year 2016. The hypotheses developed in this section are therefore designed to fit that research gap, with the count of firms using LIFO as the empirical setting.

H1. Industries with high number of LIFO users have higher LIFO reserve on average.

(Vitale, 2010) in their study showed that there is no relation between the number of LIFO users in industry and amount of LIFO reserve on average, but statistical analysis was very little to fully explain the argument. Therefore, this hypothesis is developed to fill this gap.

H2. The reduce in count of firms using LIFO causes decrease in average of LIFO reserve.

Logically, it is certain that if companies stopped to use LIFO method the LIFO reserve should decrease in industry in absolute terms. This hypothesis is aiming to clarify if the LIFO reserve fully represents the firms using LIFO method.

H3. Large companies have high dollar value of LIFO reserve than small firms

LIFO reserve is difference between LIFO valuation and FIFO valuation of inventory. Size of the company could be reason of high demand of inventory that resulting high dollar value of LIFO reserve. The hypothesis is developed in order to confirm this argument.

3. DATA COLLECTION AND METHODOLOGY

3.1. Data collection and sampling

The data was collected from Standard & Poor's Compustat database, which was accessed through University of Pennsylvania's Wharton Research Data Services (WRDS). The majority of data analyzed was for the 2017 fiscal year, as data for the 2018 fiscal year was still incomplete as of the time of analysis. Time series data was analyzed for the fiscal years of 2010 through 2017. The entire Compustat database contains accounting and financial data items on more than 25000 publicly held companies. Thus, certain exclusion had to be made to get the final sample. The final list of firms in this study consists of those with information primarily about the domestic public firms with stockownership code⁸ "0". Variables (LIFO reserve, Total asset, Inventory, EBIT, EAT, COGS, Net sales, Long term debt, Stockholders equity in total and Market value) were chosen according to the hypotheses needs. The initial sample contains 41134 firm-years⁹ over the period 2010 to 2017 with certain financial statement items and LIFO reserve. Observations were eliminated if LIFO was not used for some portion of sectors' inventory or if other required data were not available on Compustat. The final sample is 30220 firm-years. Inserting the LIFO reserve by individual firms and year into pivot-tables in Microsoft Excel®, three hundred thirty-nine (339) companies are identified as businesses used LIFO valuation method at least once during the period. LIFO reserve is the most relevant identifier of businesses using LIFO since they are obliged to disclose it in their financial statements under IRC §472. The number of firms in the sample ranges from 291 in 2010 to 236 in 2017¹⁰. Based on their LIFO reserve new LIFO users and users, who stopped using LIFO method are filtered. Industries were divided using both two-digit and three-digit codes assigned by the North American Industry Classification System (NAICS).

3.2. Methodology

Different authors have measured the consequences of LIFO repeal in a variety of ways. Each had its advantages and drawbacks. This paper utilizes a research approach that can be describes as hypothetical deductive. Hypothetical deductive methods can be briefly described in five main steps. First, a research question with testable hypotheses is established. Second, predictions from the hypotheses are formulated. Third, after hypotheses development, data with respect to each variable in hypothesis need to be collected. Fourth, in order to test the predictions, experiments or empirical analysis are employed. Fifth, the process of arriving at conclusion by interpreting the meaning of the result of empirical analysis.

⁸ stockownership code "0"- Publicly traded company, includes NYSE, ASE, NASDAQ, and OTC BB.

⁹ The firms are double counted year by year.

¹⁰ The sample includes firms from both the active and inactive Compustat database.

For the empirical analysis, I use a combination of quantitative and qualitative approaches. Each of them is explained below:

3.2.1 Quantitative approach

To understand the current situation of firms using the LIFO, a descriptive statistical analysis has been used and the key financial ratios are calculated based on company financial items.

Descriptive statistics

Descriptive statistics is a summary statistic that quantitatively describes or summarizes features of collection of information. It aims to provide simple summaries about the sample and about the observations that have been made (Nick, 2007).

- **Sample maximum and minimum**

The sample maximum and minimum, also called the largest observation and smallest observation, are the values of the greatest and least elements of a sample (Underhill and Bradfield, 1996).

- **Mean**

The arithmetic mean is the most common measure of central tendency. The mean is the only common measure in which all the values play an equal role. The mean serves as a „balance point“ in a set of data. The symbol \bar{X} , called X-bar, is used to represent the mean of the sample. For a sample containing n values, the equation for the mean of sample is written as:

$$\bar{X} = \frac{\text{sum of values}}{\text{number of values}}$$

- **Median**

The median is the middle value in an ordered array of data that has been ranked from smallest to largest. Half the values are smaller than or equal to the media, and half the values are larger than or equal to the median. The median is not affected by extreme values.

$$\text{Median} = \frac{n + 1}{2} \text{ranked value}$$

- **Standard deviation**

The standard deviation is a measure that is used to quantify the amount of variation or dispersion of a set of data values. A low standard deviation indicates that the data points tend to be close to the mean (also called the expected value) of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values.

$$\sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n - 1}}$$

Pearson's correlation coefficient

It is a statistical measure of the strength of a linear relationship between paired data. In a sample it is denoted by r and is by design constrained as follows:

$$-1 \leq r \leq 1$$

Furthermore:

- Positive values denote positive linear correlation;
- Negative values denote negative linear correlation;
- A value of 0 denotes no linear correlation;
- The closer is to 1 or -1, the stronger the linear correlation.

Assumptions:

- Independent of case
- Linear relationship
- Homoscedasticity

Formula:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

For this paper the Pearson's correlation coefficient is computed by using Data analysis program in Microsoft Excel®.

There are three correlation coefficients in the analysis: *Correlation 1 (C1)*, *Correlation 2 (C2)*, *Correlation 3 (C3)*. In *C1*, dependent variable is average LIFO reserve in industry and independent variable is count of firms using LIFO in industry. Average LIFO reserve is measured by dividing total LIFO reserve in 2017 by all public firms in industry. In *C2*, dependent variable reflects to average LIFO reserve per firm and independent variable reflects to number of firms using LIFO over period 2010 to 2017. Here, average LIFO reserve evaluated by dividing total LIFO reserve by number of firms using the LIFO. Finally, in *C3* dependent variable is dollar value of LIFO reserve and independent variable is net sales. The size of the firms was split into three categories such as large, medium and small based on their NAICS code, net sales and employee number. Each firm's size was determined individually based on relevant information. A dollar value of LIFO reserve is calculated by dividing total LIFO reserve of each firms by its total asset. Data related to each correlation is introduced in corresponding hypotheses result.

Key ratios and other calculations

Following calculations are employed for analysis:

- Tax liability in case of LIFO repeal
- The employee number, net sales and NAICS code were used to find out firms' size.
- **Return on asset (ROA)**
It measures the amount of profit the company generates as a percentage of the value of its total assets. The formula is: $ROA = EBIT^{11} / \text{TOTAL ASSET}$
- **Return on equity (ROE)**
A measure of profitability that calculates how many dollars of profit a company generates with each dollar of shareholders' equity. The formula is: $ROE = EAT^{12} / \text{Shareholders' equity}$
- **Debt-to equity ratio**
A measure of the relationship between the capital contributed by creditors and capital contributed by shareholders. It also shows the extend to which shareholders' equity can fulfill a company's obligations to creditors in the event of liquidation.
- LIFO reserve over its total asset, inventory, sales and EBIT
- Tax liability based on LIFO reserve of top twenty firms over its operating cashflow

3.2.2 Qualitative approach

Qualitative research is a scientific method of observation to gather non-numerical data. This type of research refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and description of things” and not to their “counts or measures. This research answers why and how a certain phenomenon may occur rather than how often.

By employing qualitative modes of enquiry, I attempt to determine the reason of reduce of firms using LIFO I choose those stopped to report or reported “0” LIFO reserve on their fiscal year statements. I observed their fiscal year filings individually, particularly in year they stopped to report LIFO reserve. Individual firms' interactive data were analyzed through the access of EDGAR research tool with more than 21 million filings access on U.S. Securities and Exchange Commission website.

¹¹ Earnings before interest and tax

¹² Earnings after tax

4. RESULTS AND DISCUSSION

4.1. Understanding the current situation of firms using LIFO valuation method

First of all, it is important to understand how the LIFO reserve has changed during the period from 2010 to 2017. The table 2 below presents the number of users in each year and the average amount of LIFO reserve per firm as percentage of its' total asset.

Table 2. The number of LIFO users and the average amount of LIFO reserve per firm as percentage of its' total asset by year

	2010	2011	2012	2013	2014	2015	2016	2017
1*	291	288	286	280	271	257	249	236
2*	93313	104704	86355	83839	54143	37012	39606	47251
3*	321	364	302	299	200	144	159	200
4*	4291648	4479517	4618746	4792982	4719804	4620029	3926180	3592259
5*	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.01%

Table 2. 1*Number of LIFO users by year, 2* Total amount of LIFO reserve (in million USD), 3* Average LIFO reserve per firm (in million USD), 4*Total asset (in million USD), 5*The average amount of LIFO reserve per firm using LIFO as percentage of Total asset.

Table 3. Comparison of top 20 firms with highest LIFO reserve by 2010 and 2017

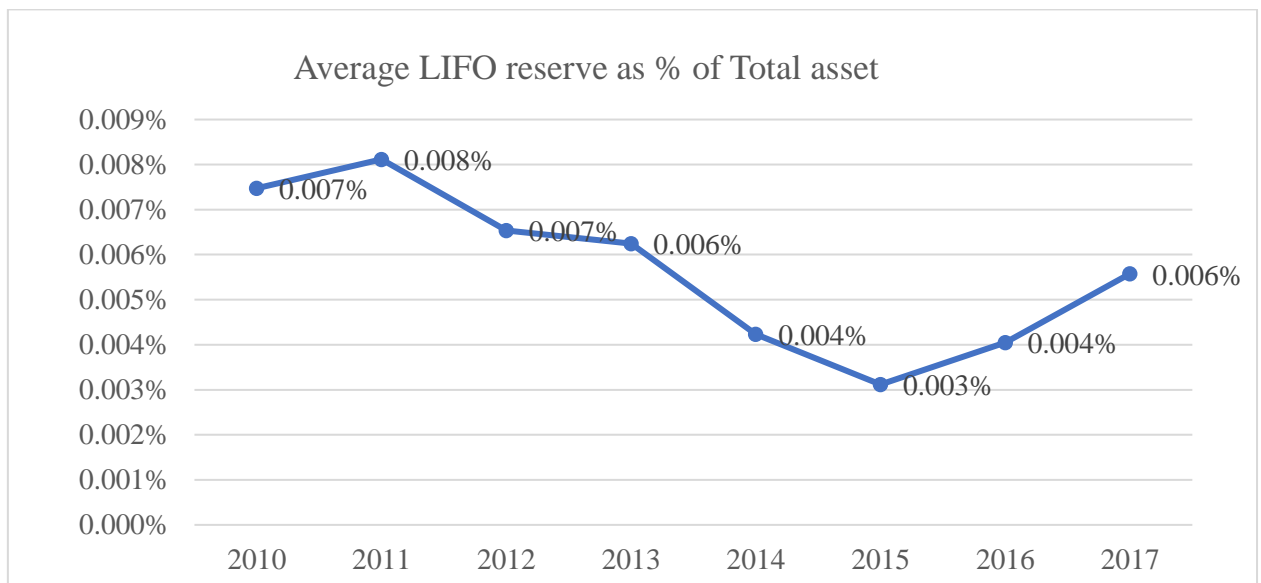
Firms - 2010	LIFO reserve		Firms - 2017	LIFO reserve
	Active	Inactive		
EXXON MOBIL CORP	21300		EXXON MOBIL CORP	10800
PHILLIPS 66	7000		PHILLIPS 66	4300
CHEVRON CORP	6975		CHEVRON CORP	3937
CONOCOPHILLIPS	6794		WALGREENS BOOTS ALLIANCE INC	3000
VALERO ENERGY CORP	6100		CATERPILLAR INC	1934
MARATHON OIL CORP	4166		AMERISOURCEBERGEN CORP	1467
MARATHON PETROLEUM CORP	4119		DEERE & CO	1461
SUNOCO INC		3119	KROGER CO	1248
CATERPILLAR INC	2575		MARATHON PETROLEUM CORP	1210
ANDEAVOR	1400		LYONDELLBASELL INDUSTRIES NV	1194
DEERE & CO	1398		MCKESSON CORP	906

WALGREENS BOOTS ALLIANCE INC	1379		FORD MOTOR CO	899
DOWDUPONT INC	1003		UNITED STATES STEEL CORP	802
HESS CORP	995		ANDEAVOR	703
UNITED STATES STEEL CORP	885		ALTRIA GROUP INC	700
RITE AID CORP	875		RITE AID CORP	581
FORD MOTOR CO	865		ARCONIC INC	481
KROGER CO	827		TEXTRON INC	452
ALCOA INC		742	GENUINE PARTS CO	441
MURPHY OIL CORP	735		AUTOZONE INC	415

Source: created by author.

The following chart is developed based on the average amount of LIFO reserve per firm using LIFO as percentage of its total asset.

Figure 1. Average LIFO reserve per firm as percentage of Total asset



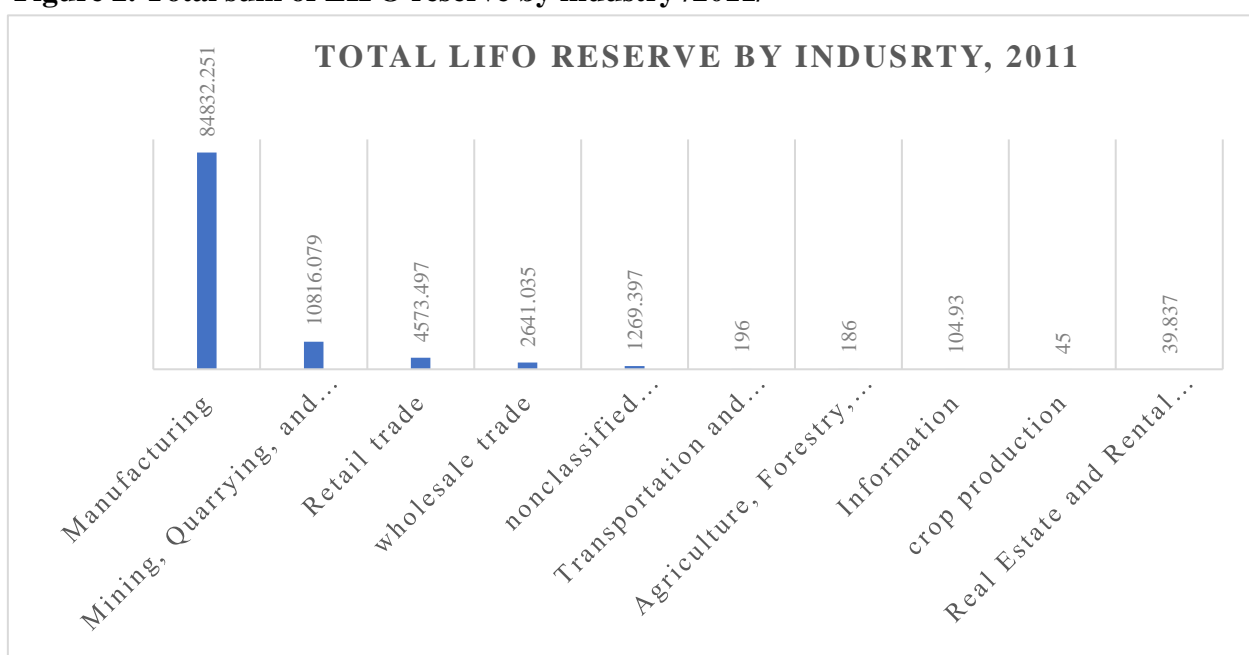
Source: own calculations

Figure 1 provides that the highest LIFO reserve were in 2011 and since then it continuously dropped to almost 60% of it until the year 2015. The result of the investigation behind this decrease could be explained the dramatic drop in crude oil price in year 2014. Because, to the related date, some of the firms in Petroleum & coal mining industry and Oil & Gas industry had to hedge against crude oil price drop, as the result of hedging their LIFO reserve decreased, in some cases even become below zero. (Depersio, 2019) wrote in his article, there are plenty of reasons behind the drop in crude oil, but the most influential one is drop in demand due to rapid changes of large emerging economies such as China, Russia and India. Explaining that rapid growth in economy

during the first decade, followed by much slower growth after 2010. The same countries that pushed up the price of oil in 2008 with their ravenous demand helped bring oil prices down in 2014 by demanding much less of it.

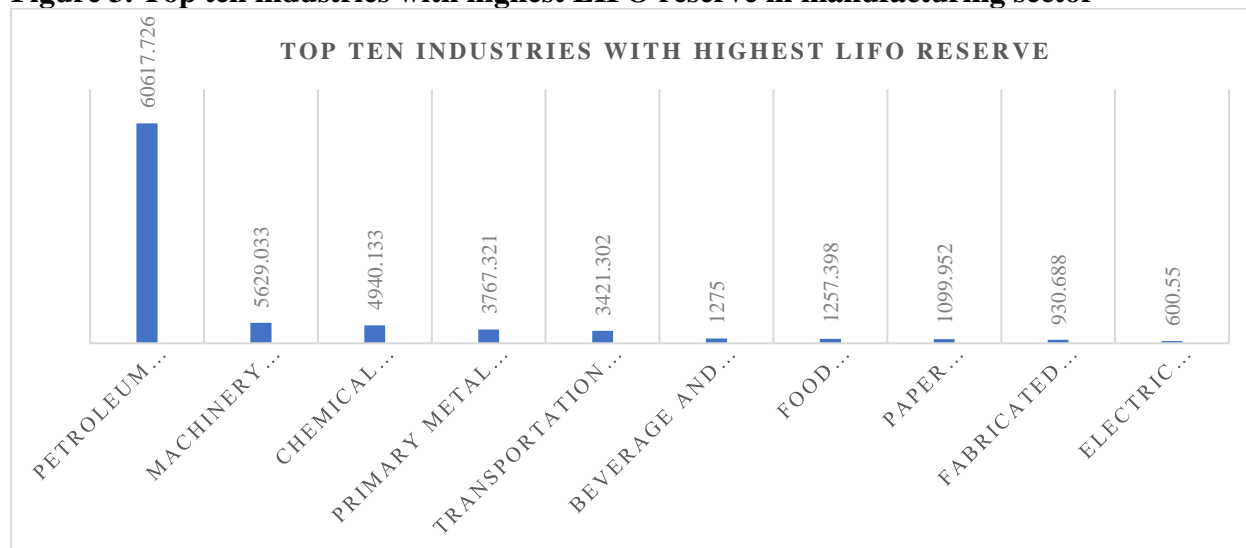
The Figure 2 shows industries with total sum of LIFO reserves in 2011. Manufacturing sector solely takes 81% of total sum. Thus, the sector is expanded using NAICS 3-digit code. Next figure presents the top ten industries out of twenty with its' sum of LIFO reserve in manufacturing sector. Petroleum and Coal product manufacturing is the highest one amongst all and over period 2010 to 2017 this was the leading industry with highest amount of LIFO reserve. The table 4 provides fluctuation of its LIFO reserve.

Figure 2. Total sum of LIFO reserve by industry /2011/



Source: own calculations.

Figure 3. Top ten industries with highest LIFO reserve in manufacturing sector



Source: own calculations.

Table 4. Petroleum refineries industry – fluctuations of LIFO reserve

<i>(in millions, except count of company)</i>	Fiscal year							
Petroleum & Coal product manufacturing	2010	2011	2012	2013	2014	2015	2016	2017
LIFO reserve	\$51,261	\$60,617	\$51,618	\$51,347	\$23,410	\$10,659	\$14,172	\$20,937
Count of company	17	15	14	14	11	10	11	8
Average for a firm	\$3,015	\$4,041	\$3,687	\$3,668	\$2,128	\$1,066	\$1,288	\$2,617

Source: own calculations.

However, LIFO reserve of Petroleum industry has decreased during the period, the industry still remains as leader and it also proves that Petroleum industry would have the hardest hit after removal of LIFO.

Table 5 shows top ten companies with the highest LIFO reserve in 2011 including inactive firms. EXXON MOBIL CORP is leading with \$26 billion LIFO reserve amongst all firms and also one that is the largest portion of the Petroleum refineries industry. This was the largest LIFO reserve of any publicly traded company to date. EXXON greatly reduces its taxable liability by utilizing LIFO. While LIFO is keeping Exxon's financial income relatively high, the real cost will come with the adjustment to the company's cost of goods sold. If EXXON was to change from LIFO in 2011, cost of goods sold would have decreased by roughly \$26 billion. With an effective tax rate of about 46%¹³, the company was looking at paying a tax bill of approximately \$11.96 billion. With the decrease in oil prices in 2015, the tax cost to eliminate LIFO has dropped to \$2.07 billion.

Table 5. Top 10 companies with the highest LIFO reserves & status of activeness by 2011

LIFO Reserve-2011	Status of activeness	
Name of the company	Active	Inactive
EXXON MOBIL CORP	25600	
CHEVRON CORP	9025	
PHILLIPS 66	8600	
CONOCOPHILLIPS	8400	
VALERO ENERGY CORP	6800	
MARATHON PETROLEUM CORP	5015	
SUNOCO INC		2920
CATERPILLAR INC	2422	
ANDEAVOR	1700	
WALGREENS BOOTS ALLIANCE INC	1587	

Source: own calculations.

¹³ Average effective tax rate based on years of 2008 to 2010

Second important thing to understand is which industries will be affected the most after the repeal. In 2017, there were only 6.4 % of public companies used LIFO method based on sum of LIFO reserve in industry. Certain industries have much higher number of firms using LIFO. Manufacturing industry was leading with 58% amongst all sectors with the count of the firms using as well as total amount of LIFO reserve. The lowest share of users in industry were Information with only 0.16%.

Table 7 compares the beginning and ending period for the study. As it is shown, Crop production and Transportation & Warehousing sectors' firms stopped using the LIFO costing method, on the other hand in Construction sector started to use. This could be the first sign, which can be observed how the firms changing their characteristics of costing method. Next thing that can be observed is the total amount of LIFO reserve, between these years almost 50% of the total amount of LIFO reserve dropped.

Naturally, the changes in amount of LIFO reserve should be linear with changes in count of the company in industry. However, in (Vitale, 2010) study the LIFO reserve does not depend on the count in users of LIFO method, the study is based on a descriptive statistical analysis, which does not fully explain in statistical way. Second thing is they used 3-digit NAICS code for classifications of industries. To confirm this argument, the first hypothesis (H1) is tested.

Table 6. Number of firms using LIFO and Average LIFO reserve by industry sector

Industry by 2017	Number of firms using LIFO (<i>in millions USD</i>) (X)	Average LIFO reserve in industry (<i>in millions USD</i>) (Y)
Agriculture, Forestry, Fishing and Hunting	1	12
Construction	1	4.934
Information	3	0.004
Manufacturing	181	117.77
Mining, Quarrying, and Oil and Gas Extraction	6	6.27
Non-classified establishment	3	-1.620
Real Estate and Rental and Leasing	2	0.239
Retail trade	15	31.943
Wholesale trade	24	38.246

Source: Own calculation

Table 7. Share of LIFO users and average LIFO reserve in industry

Sectors	Number of LIFO users		Number of firms		Share of LIFO users		Total LIFO reserve for industry (in millions USD)		Average LIFO reserve in industry (in millions USD)	
	2010	2017	2010	2017	2010	2017	2010	2017	2010	2017
Agriculture, Forestry, Fishing and Hunting	1	1	16	12	6.25%	8.33%	111	144	6.94	12.00
Construction	0	1	59	61	-	1.64%	-	301	-	4.93
crop production	1	0	516	-	0.19%	-	55	-	0.11	-
Information	5	3	1796	1869	0.28%	0.16%	96.542	7	0.05	0.004
Manufacturing	222	181	288	313	77.08%	57.83%	73181	36862	254.10	117.77
Mining, Quarrying, and Oil and Gas Extraction	10	6	17	74	58.82%	8.11%	13095	464	770.30	6.27
Non-classified establishment	3	3	266	298	1.13%	1.01%	1065.1	-484	4.00	-1.62
Real Estate and Rental and Leasing	3	2	184	163	1.63%	1.23%	43.052	39	0.23	0.24
Retail trade	24	15	156	174	15.38%	8.62%	3373.5	5558	21.62	31.94
Transportation and Warehousing	1	0	116	-	0.86%	-	166	-	1.43	-
Wholesale trade	21	24	120	114	17.50%	21.05%	2127.1	4360	17.73	38.25
Total	291	236	3534	3078	8.2%	7.7%	93313	47251	26.40	15.35

Source: own calculations

H1. Industries with high number of LIFO users have higher average of LIFO reserve.

Based on the table 6 Pearson's correlation is calculated. Summary output shows very strong relationship between two variables, which 97% of average LIFO reserve can be explained by the number of LIFO users in industry and vice versa. Overall is model significant at 0.00 level. Thus, the firms' choice of LIFO costing method can be explained by industry they enter.

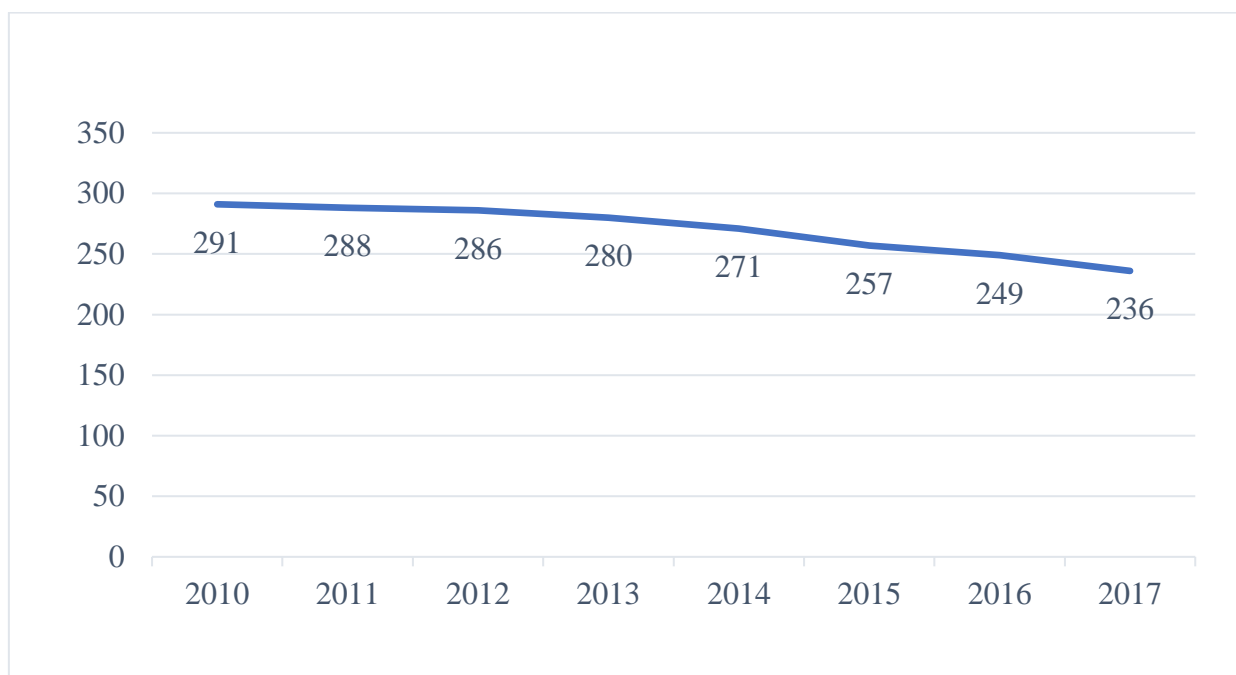
Exhibit 5. Output of Correlation 1

	<i>Number of firms using LIFO</i>	<i>Average LIFO reserve in industry</i>
Number of firms using LIFO	1	
Average LIFO reserve in industry	0.97	1

Source: own calculation

In Figure 4 below there is a clear trend of decreasing number of firms using LIFO method over the period 2010 to 2017. Relatively same trend can be seen from the Figure 1.

Figure 4. Firms using LIFO method



Source: based on own calculation

Comparing the count of firms using LIFO between the year 2010 and 2017, it has decreased by 55. Hence, one of the reasons behind the decrease in LIFO reserve could be count of the reduced firm. Consequently, the next hypothesis is analyzed to confirm this pattern.

H2. The reduce in count of firms using LIFO causes decrease in average of LIFO reserve

The summary output shows strong relationship between two variables, which 84% of average LIFO reserve can be explained by the number of LIFO users. Overall model is significant at 0.01 level. In this case, the reduce of firms over the period causes decrease in LIFO reserve. Plenty of firms are becoming more larger and broaden their business across the world, thus they want to align costing method as it will ease their workflow as well as save administrative expenses. The data related to the analysis is shown on the table below.

Exhibit 6 . Output of Correlation 2

	Average LIFO reserve	Count of firms using the LIFO
Average LIFO reserve	1	
Count of firms using the LIFO	0.84	1

Source: own calculation

Table 8. Average LIFO reserve and count of firms using LIFO by year

Time	Average LIFO reserve	Count of firms using the LIFO
	(in millions USD)	
2010	321	291
2011	364	288
2012	302	286
2013	299	280
2014	200	271
2015	144	257
2016	159	249
2017	200	236

Source: Own calculation

From Figure 4 it can be seen two hundred thirty-six companies listed as users of LIFO by year 2017. Based on their employee number, total sales amount and NAICS code they are categorized: 79% of these are large, 16% of medium and only 5% of it are small. Table 9 provides an output of statistical analysis of firms using LIFO. Out of 236 companies average LIFO reserve is \$216 million, the highest one has \$10.8 billion reflecting to the EXXON MOBILE CORP. This corporation solely occupies 50% of total LIFO reserve in Petroleum and Coal product manufacturing industry. Moreover, it was one of the strongest opponents of LIFO repeal. The corporation responded multiple fronts including issuing press releases, placing advertisements in selected newspapers and lobbying against repeal in the past. Additionally, the audit report on their financial statement was catching my attention with audit report number “4”¹⁴. Further, in the statistical analysis shows that the average profitability amongst LIFO users is 9% and the average efficiency amongst them is 36%. The market value would be the confirmation of how firms differ from each other related to their size that the difference between the highest and lowest show \$354 billion. The most he highest LIFO reserve over its total asset is 18%, which is associated with the firm GLOBAL BRASS & COPPER HLDGS. If GLOBAL BRASS & COPPER HLDGS was to change to this date LIFO method to another, it’s total asset would increase by 18% and their return on asset would change as well. On the other hand, the firm with the highest return on asset (44%) is TREX CO INC, their LIFO reserve over its total asset is 6% higher than the average. Comparing their size TREX CO INC is medium sized and the other one is larger. This could be proof of the

¹⁴ “Unqualified with additional language” - The auditing firm's opinion is unqualified, but explanatory language has been added to the standard report.

Hypothesis 3, which notes that the large companies have high dollar value of LIFO reserve. Further, only 9 companies were using LIFO method predominantly as their costing method and majority of firms using it just for specific part of their inventory and the highest LIFO reserve over its inventory from the table above is 127% reflecting to the company PHILLIPS 66, showing higher LIFO reserves than its inventory. PHILLIPS 66's LIFO reserve was two times higher than its EBIT, indicating that this firm is that much saving their tax obligation. (Cushing and LeClere, 1992) stated in their study that the firms with higher leverage are less likely to use LIFO method, however, the average leverage amongst the LIFO users is 1.8 and it differs vastly amongst firms. The debt-to-equity ratio differ depending on the industry because some industries tend to use more debt financing than others. In this sample it differs significantly that the highest and the smallest are just like sky and ground.

Table 9. A descriptive statistical analysis on firms using LIFO by year 2017

	MAX	MIN	MEAN	MEDIAN	ST. ERR	ST. DEV
ROA	0.438	-0.276	0.091	0.085	0.005	0.076
ROE	16.099	-14.878	0.365	0.206	0.121	1.858
LIFO/TOTAL ASSET	0.180	-0.041	0.024	0.014	0.002	0.032
LIFO/INVENTORY	1.267	-0.115	0.152	0.109	0.011	0.176
LIFO/SALES	0.157	-0.022	0.019	0.013	0.002	0.024
MARKET VALUE	354550	12	15462	3028	2418	37146
DEBT-EQUITY-RATIO	51.165	-232.34	1.771	1.536	1.089	16.732
LIFO reserve	10800	-516	200.217	30	55.203	848.04

Table 8 presents descriptive statistics for the LIFO users by the year 2017. ROA is measured as the ratio of operating profit or loss to total asset, ROE is measured as the ratio of the operating profit or loss to total equity. Market value is shown in millions USD. Source: Own calculations

In previous study investigated by (Vitale, 2010) noted that specific industries do not show high dollar value of LIFO reserve and the size of the LIFO reserve is not sufficient indicator. To confirm this argument, the relationship between the size of the company and average dollar value of LIFO is tested below on last hypothesis.

H3. Large companies have high dollar value of LIFO reserve on average than smaller ones

The sample for this hypothesis is two hundred thirty-six firm, which is the number of firms using the LIFO by 2017. Correlation between average dollar amount of LIFO reserve and average net sales is tested. Overall, there is a negative relationship with 5% and the model is insignificant at 0.35 level. However, a dollar value of LIFO reserve is not dependent on the company's size, there is a strong relationship between absolute amount of LIFO reserve and net sales with 69%. Thus, the larger companies may have higher amount of LIFO reserve in total than smaller ones.

Exhibit 7. Output on Correlation 3

	<i>LIFO reserve/Total asset</i>	<i>Net sales</i>	<i>LIFO reserve</i>
LIFO reserve/ Total asset	1		
Net sales	-0.052	1	
LIFO reserve	0.096	0.685	1

Source: own calculation

Table 10. The average net sales & average dollar amount of LIFO reserve by size

	Average dollar amount of LIFO reserve	Average net sales	Count of firms
Large	0.020	16287.158	186
Medium	0.034	594.626	38
Small	0.051	209.328	12

Source: own calculation

One-time tax increase based on LIFO reserve

The next analysis is developed based on firms' effective tax rate¹⁵, operating cashflow¹⁶ and LIFO reserve by year 2017. The analysis shows possible tax liability increase due the LIFO reserve and tax liability as percentages of its' operating cashflow, if the LIFO removal occurs. Next Table 11 presents the result of the analysis. The highest tax liability as percentage of operating cashflow linked to the company RITE AID CORP with 71%, if the LIFO removal happens, this firm will face with financial struggles. This percentages vary vastly between the firms, but most of them are below 10%. Thus, the LIFO removal will not let majority of firms go into real trouble. Additionally, U.S. Congress working hard to reduce deficit, thus in 2013 they enabled another choice to the firms using FIFO to change their costing method into Lower of cost or market value¹⁷. The act became effective from January 2014. This allowed firms chance to not use LIFO, which means LIFO users would be able to switch to that option.

Out of these twenty firms, five is Petroleum and Refineries industry and their LIFO reserve sums \$20.9 billion, which is 99% of total sum of LIFO reserve in industry. Thereafter, two in Healthcare and personal care store industry with \$3.5 billion in total, two of them are Machinery Manufacturing with \$3.4 billion LIFO reserves in total and two in in Merchant wholesalers of non-durable goods with \$2.4 billion LIFO reserve in total. All others' LIFO reserve totaled below \$2 billion and corresponding industries were Merchant wholesaler of durable goods, Chemical manufacturing, Food & Beverage stores, Transportation equipment manufacturing, Primary metal manufacturing and Beverage & Tobacco manufacturing based on the three-digit NAICS code. The one interesting thing in analysis is 50% of total LIFO reserve reflecting to the industry Petroleum and Refining industry, more precisely there are just five big corporations predominantly using LIFO method and those corporations are also great opponents of LIFO removal. Thus, this eye-catching matter reveals LIFO removal issue is no longer relates to all of LIFO users, but it is relevant only to those large corporations.

¹⁵ Effective tax rate= Total tax/ Earnings before taxes

¹⁶ OCF refers to the amount of cash a company generates from the revenues it brings in, excluding costs associated with long-term investment on capital items or investment in securities.

¹⁷ Instead of assessing their end-of-year inventory at cost, they can assess that inventory on the basis of its market value and use that valuation if it is lower than the cost. (*Option for Reducing the Deficit, U.S. Congress, 2013*)

Table 11. Tax liability as percentage of its operating cashflow & one-time increase in tax liability

Firms	<i>in million USD</i>			<i>in percentages</i>	
	LIFO reserve	OCF	Increase in TL due to LIFO reserve	ETR	TL as percentage of its OCF
EXXON MOBIL CORP	10800	30066	3996	37	13
PHILLIPS 66	4300	3648	907	21	25
CHEVRON CORP	3937	20515	1094	28	5
WALGREENS BOOTS ALLIANCE INC	3000	7251	501	17	7
CATERPILLAR INC	1934	5702	420	22	7
AMERISOURCEBERGEN CORP	1467	1504	546	37	36
DEERE & CO	1461	2200	340	23	15
KROGER CO	1248	3413	282	23	8
MARATHON PETROLEUM CORP	1210	6609	254	21	4
LYONDELLBASELL INDUSTRIES NV	1194	5206	137	12	3
MCKESSON CORP	906	4345	201	22	5
FORD MOTOR CO	899	18096	135	15	1
UNITED STATES STEEL CORP	802	802	168	21	21
ANDEAVOR	703	1630	148	21	9
ALTRIA GROUP INC	700	4922	172	25	3
RITE AID CORP	581	266	189	33	71
ARCONIC INC	481	701	125	26	18
TEXTRON INC	452	953	53	12	6
GENUINE PARTS CO	441	815	110	25	14
AUTOZONE INC	415	1571	76	18	5

Table. 5 *OCF – Operating cash flow, ETR – effective tax rate, TL- tax liability. Increase in tax liability is calculated by multiplying LIFO reserve and effective tax rate. Tax liability as percentage of operating cashflow is measured by dividing increase in tax liability over operating cashflow.

4.2. The reason behind the decrease in count of firms using the LIFO

There are one hundred two firms identified as not users of LIFO method during the analysis. The following table presents the development of LIFO users over years, including the totals of new LIFO firms and firms. To determine the reason behind the reduce in count of firms between the years 2010 and 2017, I went through their fiscal years' filings, in which they are stopped using the LIFO or started to report "0" LIFO reserve. The result is categorized into three different group such as firms stopped using LIFO due to mergers and acquisition, firms stopped using LIFO and change to another and firms still using but not reported.

Table 12. LIFO users' development

	New LIFO users	LIFO stopped	Number of LIFO
2010	Not relevant	Not relevant	291
2011	12	15	288
2012	8	10	286
2013	8	14	280
2014	10	19	271
2015	1	15	257
2016	6	14	249
2017	2	15	236
Total	47	102	Not relevant

Source: created by author

There is a difference between total number of firms (339) and count firms in Figure 3. The reason behind the inequality is due to the new firms starting to use LIFO and old bodies that are changing to another method as shown on Table 6 above.

First group of firms became inactive¹⁸ during the period. Fifty-nine firms stopped their operation out of one hundred two firms due to Mergers and Acquisition¹⁹. Most common acquisitions were leveraged buyout and asset purchase. Leveraged buyout (LBO) is type of acquisition where a significant part of the purchase price is funded in debt. Whereas, an asset purchase agreement (APA) is an agreement between buyer and seller that finalizes and conditions related to the purchase and sale of a company's asset. This proves that firms are expanding their businesses by combining or acquiring one another to become more powerful, more efficient and valuable on the market. The fact is that, when company acquired or merged one to another, they tend to change accounting policy according to their merged or acquired company, if those are predominant for

¹⁸ The common reasons of inactivation are codified in Compustat and showed on Appendix 1.

¹⁹ Acquisition is an activity by which acquiring firms can control more than 50% of the equity of target firms, whereas in a merger at least two firms are combined with each other to form a "new" legal entity.

them. One case from the observation can be illustration of this. The company that is acquired by large corporation had to change their LIFO costing method to align with corporation's inventory costing method to better presentation of financial statement. Therefore, this would be one of the reasons of reduce in count of the firms using LIFO.

Second group of the firms are stopped using LIFO valuation method and changed to another. It can be seen from the following table that the majority of firms explain their reasons of choosing another costing method as follows:

1. It provides uniformity across the Company's operations with respect to the method of inventory accounting,
2. It better reflects the current value of inventories on the consolidated balance sheets,
3. It aligns the accounting with the physical flow of inventory, and better matches revenues with associated expenses.
4. Due to the fluctuations of price change some of the firms had to bear huge amount of tax loss
5. It eliminates the manual LIFO calculation and quarterly LIFO estimation process resulting in greater precision in determining quarterly cost of goods sold and inventory balances and reducing the administrative burden to report inventories because the information systems calculate inventory using the weighted average cost or the specific identification methods,
6. It improves comparability with the Company's peers.

Some of the firms explain that due to merger and acquisition, there were need of time to align and gradually let adopt their accounting policy. And, the materiality of LIFO reserve was not significant at all to report on statements. Only few of them did not provided specific reason. The Table 13 below presents listings of firms stopped using LIFO and their explanation of change.

Table 13. Listings of firms stopped using LIFO due to changes into another method.

Firms	Date	Reasons
ALTRA INDUSTRIAL MOTION CORP	2016	Only their subsidiary used, which is immaterial and after year 2016 they fully changed to FIFO.
APOGEE ENTERPRISES INC	2014	During the fourth quarter of fiscal 2015, the Company changed its method of accounting for those inventories which were accounted for under the last-in, first-out (“LIFO”) method (53 percent of total fiscal 2014 inventories) to the FIFO method. The Company believes that this change is preferable as it provides uniformity across the Company's operations with respect to the method of inventory accounting, better reflects the current value of inventories on the consolidated balance sheets, aligns the accounting with the physical flow of inventory, and better matches revenues with associated expenses.
APTARGROUP INC	2016	During the second quarter of 2015, the Company changed its inventory valuation method for certain operating entities in its North American business to the first-in first-out (FIFO) method from the last-in first-out (LIFO) method.
CLEARWATER PAPER CORP	2011	One of the inventories were determined using LIFO and its price fluctuated a lot in 2011 to 2014, causing huge amount of tax loss. From 2015 they stopped use and continued to use average cost method.

COMMERCIAL METALS	2016	(1) results in better matching of revenues and expenses and better reflects the current value of inventory in the Company's consolidated balance sheet, (2) more closely aligns with the physical flow of these inventories, (3) are the methods the Company uses to monitor the financial results of these segments and this division for operational and financial planning, (4) eliminates the manual LIFO calculation and quarterly LIFO estimation process resulting in greater precision in determining quarterly cost of goods sold and inventory balances and reducing the administrative burden to report inventories because the information systems calculate inventory using the weighted average cost or the specific identification methods, and (5) improves comparability with the Company's peers. The cumulative effect of these accounting changes resulted in a \$124.2 million increase in retained earnings as of September 1, 2014.
EATON CORP PLC	2017	Changed to method to FIFO- The FIFO method of accounting for inventory is preferable because it conforms the Company's entire inventory to a single method of accounting and improves comparability with the Company's peers. All prior periods presented in the financial statements have been retrospectively adjusted to apply the new method of FIFO accounting for certain U.S. inventory. The cumulative effect of this change on periods prior to those presented herein resulted in an increase in Retained earnings of \$70 as of January 1, 2015.
FRANKLIN ELECTRIC CO INC	2011	Effective January 2, 2011, the Company elected to change its accounting principle of valuing all of its inventories that used the LIFO method to the FIFO method
MANITOWOC CO	2016	FIFO method is preferable as it results in uniformity across its global operations, aligns with how the Company internally manages inventory, provides better matching of revenues and expenses and improves comparability with its peers.

MARATHON OIL CORP	2015	New method provides consistent application of the cost basis for all categories of inventories across our worldwide portfolio, more accurately reflects the current value of inventory which provides for a better matching of expenses to revenues, and enhances comparability to our peers.
NUCOR CORP	2016	The Company believes that the FIFO method is preferable as it improves comparability with our most similar peers, it more closely resembles the physical flow of our inventory, it better matches revenue with expenses and it aligns with how the Company internally monitors the performance of our businesses.
PACKAGING CORP OF AMERICA	2013	Better reflects the current value of inventory on the consolidated balance sheets, more closely aligns with how we manage inventory, and conforms the inventory costing methods to be more consistent within the Company.
PRAXAIR INC	2014	The Company believes the change is preferable because it will better reflect the impact of current costs in both the consolidated balance sheets and consolidated statements of income.
ROGERS CORP	2015	This change in accounting method was deemed preferable because this change causes inventory to be valued on a consistent basis throughout the entire Company and on a more comparable basis with industry peer companies.
STONERIDGE INC	2011	The Company believes the change is preferable because it will better reflect the impact of current costs in both the consolidated balance sheets and consolidated statements of income.
TITAN INTERNATIONAL INC	2017	New method will improve financial reporting by better reflecting the current value of inventory, more closely aligning the flow of physical inventory with the accounting for the inventory and providing better matching of revenues and expenses.
TRECORA RESOURCES	2014	The Company believes the change is preferable because it will better reflect the impact of current costs in both the consolidated balance sheets and consolidated statements of income.

XYLEM INC	2011	The Company believes that this change is preferable as it provides uniformity across the Company's operations with respect to the method of inventory accounting, better reflects the current value of inventories on the Consolidated Balance Sheet, aligns the flow of physical inventory with the accounting, better matches revenues with associated expenses, and improves comparability with the Company's peers.
ALLEGION PLC	2014	No detailed information
JOHNSON CONTROLS INTL PLC	2013	No detailed information
MURPHY OIL CORP	2014	No detailed information
NACCO INDUSTRIES	2012	No detailed information
STRYKER CORP	2011	No detailed information
TUPPERWARE BRANDS CORP	2011	No detailed information

Source: created by author.

In general, accounting policies are not changed, since doing so alters the comparability of accounting transactions over time. Only change a policy when the update is required by the applicable accounting framework, *or when the change will result more reliable and relevant information*. If the initial application of an accounting standard mandates that a business changes an accounting policy, account for the change under the transition requirements stated in the new standard. When there are no transition requirements that accompany an accounting standard, apply the change retrospectively. *Retrospective application* means that the accounting records be adjusted as though the new accounting policy had always been in place, so that the opening equity balance of all periods presented incorporates the effect of the change.

The following table shows the case of COMMERCIAL METALS CO's process of adjustment after changing into another costing method retrospectively. Prior to the accounting method change, 51% of the Company's total net inventories were valued using LIFO. The

Company applied this change in accounting principle retrospectively to all prior periods presented. The cumulative effect of these accounting changes resulted in a \$124.2 million increase in retained earnings as of 2014. As a result of the retrospective application of the change in accounting principle from LIFO to weighted average cost or specific identification, certain financial statement line items in the Company's consolidated balance sheet as of xxx, 2015 and its consolidated statements of earnings and consolidated statement of cash flows for the 2015 and 2014 fiscal years were adjusted.

Table 14. The case of COMMERCIAL METALS CO's adjustments after changing costing method

<i>(in thousands, except share data)</i>	As originally reported	Effect of Change	As Adjusted
Consolidated Statement of Earnings for the year ended xxx, 2015:			
Cost of goods sold	\$ 5,213,203	98,553	5,311,756
Income taxes	83,206	(36,362)	46,844
Earnings from continuing operations	161,322	(62,191)	99,131
Net earnings attributable to CMC	141,634	(62,191)	79,443
Basic earnings per share attributable to CMC:			
Earnings from continuing operations	\$ 1.39	(0.54)	0.85
Net earnings	1.22	(0.54)	0.68
Diluted earnings per share attributable to CMC:			
Earnings from continuing operations	\$ 1.37	(0.53)	0.84
Net earnings	1.2	(0.53)	0.67
Consolidated Statement of Earnings for the year ended xxx, 2014:			
Cost of goods sold	\$ 6,109,338	(13,142)	6,096,196
Income taxes	42,724	4,627	47,351
Earnings from continuing operations	109,091	8,515	117,606
Net earnings attributable to CMC	115,551	(2,308)	113,243
Basic earnings per share attributable to CMC:			
Earnings from continuing operations	\$ 0.93	0.07	1.00
Net earnings	0.98	(0.02)	0.96
Diluted earnings per share attributable to CMC:			
Earnings from continuing operations	\$ 0.92	0.07	0.99
Net earnings	0.97	(0.02)	0.95

(Source: www.sec.gov/Archives/edgar/data/)

Consolidated Balance Sheet as of xxx, 2015:				
Inventories, net	\$	781,371	99,113	880,484
Current deferred tax assets		29,137	(25,827)	3,310
Accrued expenses and other payables		279,415	11,262	290,677
Retained earnings				
Consolidated statement of Cash Flows as for the year ended, xxx, 2015:				
Net earnings	\$	141,634	(62,191)	79,443
Deferred income taxes		23,291	(36,362)	(13,071)
Write-downs of inventories		15,935	21,717	37,652
Inventories working capital change		50,747	76,836	127,583
Consolidated statement of Cash Flows as for the year ended, xxx, 2014:				
Net earnings	\$	115,552	(2,308)	113,244
Deferred income taxes		32,348	(2,205)	30,143
Net gain on sale of a subsidiary, cost method investment and other		(31,356)	17,523	(13,833)
Write-downs of inventories		4,000	1,015	5,015
Inventories working capital change		(177,331)	(14,025)	(191,356)

(Source: www.sec.gov/Archives/edgar/data/)

Surprisingly, the last group of firms still using LIFO method. Some of the firms explain that inventories valued under LIFO method were insignificant or immaterial to report on financial statements. However, there were plenty of reasons to not providing LIFO reserve, majority of firms disclosed in their notes. Hence, this result also proves that LIFO reserve does not fully represent the firms using LIFO method.

Table 15. The firms that are still users of LIFO method.

Firms	Stopped to report LIFO reserve	Reasons
60. ALON USA PARTNERS LP	2013	The fair value of the hedged item designated in fair value hedge reduced the carrying value of consigned inventory valued at LIFO below zero at December 31, 2015.
61. AMERICAN GREETINGS-CL A	2013	No detailed information. They use LIFO method only for certain domestic inventory and it is approximately 58% of total LIFO inventory.
62. AXALTA COATING SYSTEMS LTD	2013	Reestablished in 2015 and inventory predecessor is valued by LIFO method.
63. BARNES & NOBLE EDUCATION INC	2014	Textbook and trade book inventories are valued by LIFO, but the amount of LIFO reserve is not material to record.

64. BERKSHIRE HATHAWAY	2016	The difference between costs determined under LIFO and current costs was not material as of December 31, 2017.
65. BWX TECHNOLOGIES INC	2015	No detailed information
66. CNX RESOURCES CORPORATION	2014	Uses all three major methods, no detailed information.
67. COSTCO WHOLESALE CORP	2016	At the end of 2017 and 2016, the cumulative impact of the LIFO valuation on merchandise inventories was zero and immaterial, respectively.
68. DANAHER CORP	2011	Primary they use FIFO method, only small part of the inventory is valued by LIFO.
69. HESS CORP	2014	For refined petroleum product inventories valued at cost, the Corporation uses principally the last-in, first-out (LIFO) inventory method.
70. HOLLYFRONTIER CORP	2014	Incomplete data in Compustat.
71. LOUISIANA-PACIFIC CORP	2014	Only minority of the inventories use this method
72. NEW YORK TIMES CO	2013	No detailed information
73. MIDDLEBY CORP	2012	The amount is not material to present.
74. OWENS-ILLINOIS INC	2012	The Company values most U.S. inventories at the lower of last-in, first-out (LIFO) cost or market. No detailed information
75. PBF ENERGY INC	2014	Presenting adjustment Lower of cost or market adjustment*.
76. PRECISION CASTPARTS CORP	2016	Incomplete data in Compustat.
77. SEARS HOMETOWN & OUTLET STR	2017	If we had used the first-in, first-out, or "FIFO" method of inventory valuation instead of the LIFO method, merchandise inventories would have been insignificantly higher at February 3, 2018 and January 28, 2017.
78. SUNOCO LOGISTICS PARTNERS LP	2014	Decline in market price of crude oil.
79. VALERO ENERGY CORP	2017	No detailed information

* This company is could be categorized as stopped user of LIFO because, of the new act. Instead of assessing their end-of-year inventory at cost, they can assess that inventory on the basis of its market value and use that valuation if it is lower than the cost. (*Option for Reducing the Deficit, U.S. Congress, 2013*)

Since, the majority firms conclude the LIFO reserve is immaterial, the financial consequences on these firms are likely to be tiny after the repeal of LIFO. And they could be the future reduction of the counts in LIFO users.

4.3. The reason behind the new LIFO users

There are forty-seven firms determined as new LIFO users over the period 2010 to 2017 based on the LIFO reserve. The observation was made to determine their reason to choosing the LIFO costing method. Each firms' individual listings were tested using the relevant data that is available on U.S. Securities and Exchange Commission's website. The table below provides the listings of firms determined as new users of LIFO.

Twenty-seven firms determined as not new users. A majority of them were using the LIFO method formerly, however due to the structural changes such as Mergers and Acquisition, Separation and more, they appear to be new establishment. The companies using LIFO method fully or partially ranging from 9%-51% on their inventory valuation. Just little part of the firms' information was not incomplete on Compustat and they appeared to be new. The one reason behind is that if the firms' LIFO reserve does not have material impact on financial statement then they usually do not present. Interesting cases during the observation were:

- Due to price deflation on the Company's merchandise purchases, the Company has exhausted its LIFO reserve balance. The Company's policy is to not write up inventory in excess of replacement cost. The difference between LIFO cost and replacement cost, which will be reduced upon experiencing price inflation on the Company's merchandise purchases, was \$414.9 million at August 26, 2017, and \$364.1 million at August 27, 2016.
- The Department of the Treasury's "General Explanations of the Administration's Fiscal Year 2012 Revenue Proposals" contains a proposal to repeal the election to use the LIFO method for U.S. Federal income tax purposes. According to the proposal, taxpayers that currently use the LIFO method would be required to revalue their beginning LIFO inventory to its first-in, first-out ("FIFO") value in the first taxable year beginning after December 31, 2012. As of June 30, 2011, if the FIFO method had been used instead of the LIFO method, our inventories would have been \$215.9 million higher than the value reflected in our June 30, 2011 balance sheet. This increase in the carrying value of inventory would result in a

one-time increase in taxable income of \$144.3 million after taking into consideration total current differences in book-to-tax valuations of inventory, which would be taken into account ratably over ten years, beginning with the first taxable year beginning after December 31, 2012. The repeal of the election to use the LIFO method could result in a substantial cash tax liability, which could adversely impact our liquidity and financial condition. Furthermore, a transition to the FIFO method could result in an increase in the volatility of our earnings, a greater disparity between our earnings and net sales in our financial statements, and an increase in the costs associated with our derivative transactions to mitigate metal price fluctuations.

- The Company records inventories at the lower of cost or market using the last-in, first-out (“LIFO”) method. The base year values of beginning and ending inventories are determined using the inventory price index computation method. This “links” current costs to original costs in the base year when the Company adopted LIFO. During 2014, inventory quantities were reduced resulting in the liquidation of certain quantities carried at lower costs in prior years. As a result of this LIFO liquidation, cost of sales decreased \$7 million in 2014. There were no LIFO inventory liquidations in 2016 and 2015. At December 31, 2016 and January 2, 2016, the LIFO balance sheet reserves were \$116 million and \$134 million, respectively. As a result of net changes in LIFO reserves, cost of goods sold decreased \$18 million and \$74 million in fiscal years 2016 and 2015 and increased \$60 million in fiscal year 2014, respectively. The \$60 million increase in cost of goods sold in 2014 is net of the \$7 million decrease in cost of goods sold resulting from the LIFO liquidation.

The next six firms were new establishments. They choose LIFO method because of better matching of revenues and expenses and better reflects the current value of inventory in the Company's consolidated balance sheet and more closely aligns with the physical flow of these inventories.

Last group consists of fourteen firms and there were no data related to the certain dates, which they started to report LIFO reserve. Some firms were already reestablished or some became inactive due to the structural changes.

Table 16. Listings of new users of LIFO

Company	Started date	Reasons
ADVANSIX INC	2014	Not new
ALBERTSONS COS INC -REDH	2013	Not new
ALCOA CORP	2014	Not new
ALLEGION PLC	2011	Not new
APERGY CORP	2016	New established
ARCONIC INC	2015	INCOMPLETE information
ARMSTRONG FLOORING INC	2014	New established
ATKORE INTL GROUP INC	2014	New established
AUTOZONE INC	2016	Not new
AVANOS MEDICAL INC	2012	No information available related to the date
AXALTA COATING SYSTEMS LTD	2012	No information available related to the date
BABCOCK & WILCOX ENTERPRISES	2013	No information available related to the date
BARNES & NOBLE EDUCATION INC	2012	No information available related to the date
CHEMOURS CO	2012	No information available related to the date
CST BRANDS INC	2011	No information available related to the date
CSW INDUSTRIALS INC	2013	No information available related to the date
ELANCO ANIMAL HLTH INC - REDH	2016	No information available related to the date
FAIRMOUNT SANTROL HOLDINGS	2012	Not new - mergers
GLOBAL BRASS & COPPER HLDGS	2011	Not new- mergers
HYSTER-YALE MATERIALS HNDLNG	2012	Not new - leveraged buyout

INGEVITY CORP	2014	Not new - separation
ITT INC	2011	Incomplete information- immaterial amount of LIFO reserve
KAISER ALUMINUM CORP	2011	Not new
LANDS' END INC	2011	INCOMPLETE information
LIVENT CORP -REDH	2016	Acquired
LSC COMMUNICATIONS INC	2014	Acquired -2016
MURPHY USA INC	2011	Acquired -2013
NORTHERN TIER ENERGY LP	2013	New established
OLYMPIC STEEL INC	2013	New established
PERFORMANCE FOOD GROUP CO	2014	Acquired
PQ GROUP HOLDINGS INC	2016	Business combination
SPX FLOW INC	2013	Not new - M&A - immaterial amount of LIFO reserve
STANDARD DIVERSIFIED INC	2017	Business combination
STEEL PARTNERS HOLDINGS LP	2011	New established
TECHNIPFMC PLC	2017	Not new - mergers
TIMKENSTEEL CORP	2011	No detailed information related to date
TRONC INC	2012	No detailed information related to date
TURNING POINT BRANDS INC	2014	Acquired
US FOODS HOLDING CORP	2013	Not new- mergers
VALVOLINE INC	2014	No detailed information related to date
VERITIV CORP	2011	No detailed information related to date
VERSUM MATERIALS INC	2014	No detailed information related to date
VWR CORP	2012	No detailed information related to date
WABCO HOLDINGS INC	2016	Not new - Primarily use LIFO
WELBILT INC	2013	Not new - Business combination

Source: created by author.

5. CONCLUSION

This thesis has investigated in existence of firms using the LIFO and provided the latest update of the LIFO repeal. The very first conclusion to this paper is the probability of the repeal of LIFO as an acceptable accounting method is very unlikely any time in the foreseeable future. In my opinion, the method will not be addressed in the indefinite future or until next presidential election, since it's repeal died with the Obama's administrative budget plan in 2016.

The most significant difference arise in two major accounting standards is an effective practice of US GAAP compels the user to find the best paragraph that fits a transaction or balance. Under IFRS, users are expected to apply the principles in a way that faithfully represents economic reality. US GAAP is very perspective compared to with IFRS. Basis of accounting is largely consistent between IFRS and US GAAP, except in certain instances of measurement. Both rely on historical cost and fair value as a core basis, although IFRS uses fair value more that US GAAP. The accounting and reporting for inventory are very similar under both standards. Inventory is generally initially recognized on historical costs basis. One of the key differences in inventory is inventory valuation method that under US GAAP allowed LIFO costing method whereas under IFRS is restricted. Under this cost flow method, the most recent purchases are assumed to be the first goods sold; thus, ending inventory is assumed to be composed of the oldest goods. Therefore, the COGS contains relatively current cost. LIFO does not usually follow the physical flow of merchandise or materials. Since the COGS contains relatively current cost it usually being higher amount than under other costing methods, which makes lower tax obligation. This is said to be one of the most demanding reason of firms to choose for their inventory valuation. SEC and US policymakers would like to converge into IFRS, which is internationally accepted standard. LIFO costing method is used by many firms in US and the most of them were not willing to let repeal the method due to convergence and government budget deficit. There were flaming debate between proponents and opponents of LIFO repeal. Many large corporations in US write a letter to SEC to think about it and they were lobbying some of the congress members to stop it. Now, it seems like the opponents win in debate, US congress found another way to reduce deficit while not repealing the LIFO method. They protect firms to use LIFO costing method and instead the firms, which are using the FIFO can change their method into Lower of cost or market costing method.

The analysis was tested on US firms that are the fully or partially use the LIFO inventory valuation method and there are identified three hundred thirty-nine public firms. Hypothesis were tested using Pearson's correlation coefficient and two of them were confirmed with very strong relationship and one turned out to be negative. The findings conclude that the firms using LIFO

method are dependent on the industry they enter and the reasons behind decrease in count of firms using LIFO are due to business combinations and changing into another method. The reason of changing method to another is due to comparability and alignment of costing method inside the company. The next thing is LIFO reserve does not fully represent company as user of LIFO costing method. There were firms that still uses LIFO method on little portion of their inventory and did not present in financial statement due to immateriality. However, this had impact on the decrease of firms, it can be indicator of these firms that they are likely to stop using LIFO in the future. That means they would not get in trouble, if LIFO repeal happens. The interesting thing during the analysis was only few large corporations predominantly using the LIFO method. The study conducted by (Bloom, 2009) is double confirmed with this thesis that If the companies will apply FIFO correctly, the total tax payment can be paid with one-fourth the first year, while the rest can be located in Deferred Tax Liability Account. An incorrect applied FIFO method will force the companies to pay the tax debt with the full amount during the first year.

There are several research limitations in this paper, and some have already been discussed. It is important to point out to the weakness of the population that was used in the paper. Only public firms with “0” stock ownership code, were used in the population. Firms that are private or with other stock ownership code were not used in the population. This may have caused completeness in count of firms using LIFO method, which is an issue that could be addressed in the future. This paper is focusing only LIFO costing method as it is the one of the three major inventory valuation methods. The other methods (dollar value LIFO, retail costing method etc.) that are related to the LIFO costing method and other related terminologies (LIFO layers, LIFO liquidation) are not considered.

This thesis also suggest that the future research should focus on other costing methods as mentioned in before and areas related to the costing methods, especially in LCM (lower of cost or market) and the LIFO liquidations.

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APPENDICES

Appendix 1. Reasons behind the inactivation

Inactivation Code	Reason for Deletion
01	Acquisition or merger
02	Bankruptcy
03	Liquidation
04	Reverse acquisition (1983 forward)
05	No longer fits original format (1978 forward)
06	Leveraged buyout (1982 forward)
07	Other (no longer files with SEC among other possible reasons), but pricing continues
09	Now a private company
10	Other (no longer files with SEC among other reasons)
11	Agency governing settlement of securities' trading inactivated the issue's Local Settlement Code because the issue matured, expired or was called. No successor settlement code was established.
12	Agency governing settlement of securities' trading inactivated the issue's Local Settlement Code. A successor settlement code was established; issue was changed for another, as in a par value change.
13	Price source for the SEDOL was no longer available. Issue now identified under different SEDOL.
14	Fully paid issue was replaced or partly paid issue was replaced by a subsequent installment. Successor settlement code was established.
20	Other (issue-level activity; company remains active on the file)

Appendix 2. Listings of firms stopped using LIFO due to mergers and acquisition.

Firms	Stopped to report LIFO reserve	Reason	Additional information
1. AEP INDUSTRIES INC	2017	Mergers Acquisition	Inactive
2. AIRGAS INC	2011	Mergers Acquisition	Inactive
3. ALBERTSONS COS INC -REDH	2015	Mergers Acquisition	Inactive
4. ALCOA INC	2016	Mergers Acquisition	Inactive
5. ALON USA ENERGY INC	2017	Mergers Acquisition	Inactive
6. AMERON INTERNATIONAL CORP	2011	Mergers Acquisition	inactive
7. ARCH CHEMICALS INC	2011	Mergers Acquisition	inactive
8. ARDEN GROUP INC -CL A	2013	Mergers Acquisition	inactive
9. BOOKS-A-MILLION INC	2015	Mergers Acquisition	inactive
10. CAMERON INTERNATIONAL CORP	2016	Mergers Acquisition	Inactive
11. CHIQUITA BRANDS INTL INC	2014	Mergers Acquisition	Inactive

12. COOPER INDUSTRIES PLC	2012	Mergers Acquisition	Inactive
13. COSTA INC -CL A	2012	Mergers Acquisition	Inactive
14. COURIER CORP	2015	Mergers Acquisition	Inactive
15. CST BRANDS INC	2017	Mergers Acquisition	Inactive
16. DU PONT (E I) DE NEMOURS	2017	Mergers Acquisition	The status of firm is active and the amount of the LIFO valued inventory is immaterial, which is not necessary to present
17. FLEXSTEEL INDUSTRIES INC	2016	Mergers Acquisition	Status of the company is active they stopped using the LIFO from the year 2018
18. FMC TECHNOLOGIES INC	2016	Mergers Acquisition	Inactive
19. FRESH MARKET INC	2016	Mergers Acquisition	Inactive
20. FRONTIER OIL CORP	2011	Business combination	Inactive
21. GOODRICH CORP	2012	Mergers Acquisition	Inactive
22. HANDY & HARMAN LTD	2017	Mergers Acquisition	Inactive
23. HARRIS TEETER SUPERMARKETS	2014	Mergers Acquisition	Inactive
24. HESS RETAIL CORP -SPN	2013	Registration failed	Registered in 2012 and then withdraw registration application in 2013
25. IMPERIAL SUGAR CO	2012	Mergers Acquisition	Inactive
26. LORILLARD INC	2015	Mergers Acquisition	Inactive
27. LUBRIZOL CORP	2011	Mergers Acquisition	Inactive
28. LUFKIN INDUSTRIES INC	2013	Mergers Acquisition	Inactive
29. MEADWESTVACO CORP	2015	Business combination	Inactive
30. MET-PRO CORP	2013	Mergers Acquisition	Inactive
31. NALCO HOLDING CO	2011	Mergers Acquisition	Inactive
32. NASH FINCH CO	2013	Mergers Acquisition	Inactive
33. NORTEK INC	2016	Mergers Acquisition	Inactive
34. NORTHERN TIER ENERGY LP	2016	Mergers Acquisition	Inactive
35. PANTRY INC	2015	Mergers Acquisition	Inactive
36. PEP BOYS-MANNY MOE & JACK	2015	Mergers Acquisition	Inactive
37. REYNOLDS AMERICAN INC	2017	Business combination	Inactive
38. ROBBINS & MYERS INC	2013	Mergers Acquisition	Inactive
39. ROUNDY'S INC	2015	Mergers Acquisition	Inactive
40. RTI INTL METALS INC	2015	Mergers Acquisition	Inactive
41. SAFEWAY INC	2014	Mergers Acquisition	Inactive
42. SAUER-DANFOSS INC	2013	Mergers Acquisition	Inactive
43. SCHAWK INC -CL A	2013	Mergers Acquisition	Inactive
44. SEALED AIR CORP	2014	Mergers Acquisition	Inactive
45. SIGMA-ALDRICH CORP	2012	Mergers Acquisition	Inactive
46. SL INDUSTRIES INC	2015	Mergers Acquisition	Inactive

47. SMURFIT-STONE CONTAINER CORP	2011	Mergers Acquisition	Inactive
48. SUNOCO INC	2012	Mergers Acquisition	Inactive
49. TEXAS INDUSTRIES INC	2013	Business combination	Inactive
50. TOYOTA MOTOR CORP	2017	Business combination	Inactive
51. TRONC INC	2013	null	Inactive
52. VALSPAR CORP	2017	Mergers Acquisition	Inactive
53. VWR CORP	2017	Mergers Acquisition	Inactive
54. WAUSAU PAPER CORP	2015	Mergers Acquisition	Inactive
55. WESCO FINANCIAL CORP	2010	Mergers Acquisition	Inactive
56. WESTERN REFINING INC	2017	Business combination	Inactive
57. WHOLE FOODS MARKET INC	2017	Mergers Acquisition	Inactive
58. WINN-DIXIE STORES INC	2011	Mergers Acquisition	Inactive
59. ZALE CORP	2013	Mergers Acquisition	Inactive

Appendix 3. Individual company's variables for descriptive analysis

Company	ROA	ROE	LIFO/TOTAL ASSET	LIFO/INVENTORY	LIFO/SALES	MARKET VALUE	LEVERAGE	LIFO reserve
ACTUANT CORP -CL A	0.054	0.164	0.003	0.027	0.004	1437.252	2.031	4
ADVANCE AUTO PARTS INC	0.077	0.192	-0.024	-0.049	-0.022	7370.680	1.484	-203
ADVANSIX INC	0.146	0.408	0.027	0.219	0.019	1282.420	1.791	28
AIR PRODUCTS & CHEMICALS INC	0.090	0.163	0.001	0.055	0.003	33018.282	0.813	23
AK STEEL HOLDING CORP	0.066	2.187	0.063	0.235	0.044	1782.249	32.252	270
ALAMO GROUP INC	0.140	0.199	0.012	0.051	0.009	1301.843	0.424	8
ALBEMARLE CORP	0.088	0.178	0.004	0.056	0.011	14137.856	1.030	33
ALCOA CORP	0.090	0.231	0.018	0.211	0.026	9976.778	1.566	306
ALLEGHENY TECHNOLOGIES INC	0.038	0.106	-0.008	-0.037	-0.012	3038.188	1.811	-43
ALLIED HEALTHCARE PRODS INC	0.104	0.127	0.126	0.290	0.074	11.601	0.213	2
ALTRIA GROUP INC	0.225	0.632	0.016	0.315	0.036	135768.905	1.809	700
AMERCO	0.052	0.163	0.002	0.179	0.004	6766.721	2.153	16
AMERICAN WOODMARK CORP	0.077	0.218	0.010	0.152	0.013	1438.829	1.829	16
AMERISOURCEBERGEN CORP	0.057	0.978	0.042	0.128	0.010	18039.004	16.107	1467
AMETEK INC	0.120	0.233	0.003	0.042	0.005	16754.629	0.936	23

AMPCO-PITTSBURGH CORP	- 0.01 8	- 0.06 4	0.028	0.149	0.037	153.276	2.497	16
ANDEAVOR	0.06 1	0.12 9	0.025	0.194	0.021	17526.7 21	1.130	703
APERGY CORP	0.05 6	0.06 5	0.006	0.053	0.010		0.161	11
APPLIED INDUSTRIAL TECH INC	0.12 5	0.23 2	0.099	0.399	0.053	2305.37 1	0.862	138
ARCHER-DANIELS- MIDLAND CO	0.03 8	0.08 3	0.002	0.008	0.001	22324.5 60	1.181	73
ARCONIC INC	0.07 0	0.26 5	0.026	0.194	0.037	13118.6 13	2.801	481
ARMSTRONG FLOORING INC	0.00 0	- 0.00 1	0.000	0.001	0.000	435.419	0.599	0
ARMSTRONG WORLD INDUSTRIES	0.10 2	0.45 6	0.004	0.152	0.009	3195.34 5	3.468	8
ASHLAND GLOBAL HOLDINGS INC	0.03 0	0.07 6	0.003	0.046	0.009	4054.18 0	1.530	29
ATKORE INTL GROUP INC	0.14 1	0.47 4	0.004	0.025	0.003	1235.08 1	2.367	5
AUTOZONE INC	0.22 5	- 1.45 6	0.045	0.107	0.038	14708.0 71	-7.483	415
AVANOS MEDICAL INC	- 0.00 7	- 0.01 3	0.006	0.143	0.021	2161.40 9	0.807	13
BABCOCK & WILCOX ENTERPRISES	- 0.12 6	- 0.87 1	0.005	0.029	0.004	250.289	5.933	7
BASSETT FURNITURE INDS	0.09 3	0.14 3	0.028	0.149	0.018	412.339	0.534	8
BORGWARNER INC	0.12 5	0.31 9	0.001	0.017	0.001	10770.4 36	1.558	13
BRADY CORP	0.12 5	0.18 7	0.006	0.064	0.006	1704.92 0	0.500	7
BRIGGS & STRATTON	0.05 9	0.15 4	0.043	0.168	0.035	1030.99 8	1.594	63
BROWN FORMAN CORP	0.22 0	0.83 1	0.058	0.210	0.089	26503.9 01	2.781	290
BRUNSWICK CORP	0.14 9	0.33 8	0.037	0.163	0.028	4833.79 3	1.265	125
CABOT CORP	0.10 2	0.20 8	0.011	0.093	0.014	3453.12 7	1.036	37
CALERES INC	0.10 1	0.20 8	0.003	0.007	0.001	1275.46 9	1.072	4
CALUMET SPECIALTY PRODS -LP	0.04 8	1.07 8	-0.002	-0.015	-0.001	591.275	21.425	-5
CARDINAL HEALTH INC	0.05 9	0.34 6	-0.001	-0.004	0.000	24622.7 20	4.875	-46
CARPENTER TECHNOLOGY CORP	0.03 5	0.08 4	0.037	0.154	0.059	1749.96 5	1.401	106
CASEYS GENERAL STORES INC	0.07 6	0.20 9	0.021	0.304	0.010	3562.02 8	1.730	73
CATERPILLAR INC	0.08 5	0.47 4	0.025	0.193	0.043	94173.9 05	4.591	1934
CHEMOURS CO	0.15 0	1.26 4	0.026	0.203	0.031	9158.82 7	7.431	190
CHEVRON CORP	0.01 0	0.01 7	0.016	0.705	0.031	238449. 643	0.700	3937

CHURCH & DWIGHT INC	0.12 9	0.35 0	0.001	0.012	0.001	12423.5 97	1.712	4
CLEVELAND-CLIFFS INC	0.13 7	- 0.91 4	0.033	0.347	0.041	2144.26 1	-7.650	96
CLOROX CO/DE	0.24 4	2.06 1	0.006	0.057	0.004	17189.8 25	7.437	26
COLGATE-PALMOLIVE CO	0.30 9	16.0 99	0.005	0.052	0.004	65996.1 91	51.165	63
COLUMBUS MCKINNON CORP	0.07 0	0.19 7	0.013	0.099	0.018	825.933	1.799	15
CONOCOPHILLIPS	0.02 5	0.06 0	0.002	0.117	0.004	64611.4 03	1.382	124
CONTINENTAL MATERIALS CORP	0.03 5	0.05 3	0.081	0.328	0.044	31.958	0.519	7
COOPER TIRE & RUBBER CO	0.10 4	0.22 9	0.034	0.172	0.031	1800.80 0	1.199	88
CORE MARK HOLDING CO INC	0.03 2	0.10 2	0.085	0.220	0.012	1457.89 1	2.211	152
CRANE CO	0.11 8	0.31 3	0.004	0.039	0.005	5300.73 9	1.665	14
CSS INDUSTRIES INC	0.03 8	0.05 4	0.001	0.005	0.001	159.600	0.439	1
CSW INDUSTRIALS INC	0.15 0	0.19 2	0.016	0.128	0.017	715.259	0.282	6
CUMMINS INC	0.11 0	0.24 3	0.007	0.040	0.006	29180.9 28	1.214	128
DEERE & CO	0.04 3	0.29 9	0.022	0.374	0.051	42766.2 32	5.881	1461
DELEK US HOLDINGS INC	0.04 1	0.12 5	0.002	0.011	0.001	2822.13 9	2.022	9
DENTSPLY SIRONA INC	0.05 3	0.08 2	0.001	0.017	0.003	14930.2 44	0.565	11
DIXIE GROUP INC	0.01 6	0.05 8	0.054	0.135	0.037	62.143	2.568	15
DOLLAR GENERAL CORP	0.16 2	0.33 2	0.006	0.022	0.003	27711.7 47	1.043	79
DOMTAR CORP	0.04 8	0.10 0	0.010	0.071	0.010	3104.70 6	1.099	54
DONALDSON CO INC	0.16 6	0.38 5	0.019	0.126	0.016	6202.47 9	1.317	37
DONNELLEY (R R) & SONS CO	0.07 2	- 1.39 4	0.004	0.042	0.003	651.930	-20.243	18
DOVER CORP	0.09 3	0.22 5	0.012	0.142	0.016	15635.5 75	1.431	125
DOWDUPONT INC	0.03 8	0.07 2	0.001	0.013	0.003	165752. 585	0.885	216
DR PEPPER SNAPPLE GROUP INC	0.13 6	0.55 5	0.003	0.140	0.005	17445.8 56	3.089	32
EASTERN CO	0.08 1	0.16 5	0.037	0.137	0.032	163.778	1.030	6
EASTMAN CHEMICAL CO	0.10 3	0.30 1	0.018	0.191	0.030	13239.7 38	1.920	288
ECOLAB INC	0.10 3	0.26 8	-0.002	-0.023	-0.002	38821.3 60	1.596	-33
ELANCO ANIMAL HLTH INC -REDH	0.02 1	0.02 4	0.004	0.038	0.014		0.148	40
ENCORE WIRE CORP	0.10 8	0.12 4	0.071	0.561	0.045	1013.47 7	0.144	52

ENNIS INC	0.14 8	0.18 6	0.015	0.185	0.013	492.648	0.259	5
ENPRO INDUSTRIES INC	0.06 4	0.13 4	0.005	0.050	0.008	1994.19 4	1.089	10
ESSENDANT INC	0.04 0	0.14 2	0.090	0.194	0.032	348.775	2.585	159
EXXON MOBIL CORP	0.03 5	0.06 2	0.031	0.636	0.046	354549. 960	0.793	1080 0
FAIRMOUNT SANTROL HOLDINGS	0.09 5	0.37 6	0.001	0.009	0.001	1173.04 2	2.950	1
FARMER BROS CO	0.05 4	0.09 8	0.044	0.309	0.032	509.592	0.826	17
FMC CORP	0.05 3	0.18 2	0.014	0.129	0.044	12715.7 73	2.401	128
FORD MOTOR CO	0.03 1	0.23 0	0.003	0.087	0.006	49627.1 67	6.383	899
FORTUNE BRANDS HOME & SECUR	0.13 2	0.27 9	0.002	0.024	0.003	10396.5 15	1.119	14
FOSTER (LB) CO	0.04 0	0.10 8	0.027	0.110	0.020	280.758	1.707	11
FREDS INC	- 0.25 8	- 0.85 1	0.090	0.193	0.030	122.884	2.301	54
FRIEDMAN INDUSTRIES INC	0.05 5	0.06 5	0.098	0.192	0.060	41.143	0.179	7
FULLER (H. B.) CO	0.04 7	0.19 4	0.003	0.036	0.006	2850.50 6	3.177	13
FUTUREFUEL CORP	0.02 3	0.02 8	0.019	0.186	0.030	616.325	0.210	8
GARDNER DENVER HOLDINGS INC	0.03 3	0.10 2	0.003	0.027	0.006	6657.67 7	2.129	13
GENCOR INDUSTRIES INC	0.07 2	0.07 9	0.030	0.181	0.053	254.495	0.108	4
GENERAL ELECTRIC CO	0.01 8	0.08 4	-0.001	-0.024	-0.004	151475. 964	3.610	-516
GENERAL MILLS INC	0.08 9	0.42 1	0.007	0.130	0.014	25082.1 99	3.717	213
GENUINE PARTS CO	0.08 6	0.30 9	0.035	0.117	0.027	13933.5 02	2.583	441
GLATFELTER	0.03 4	0.08 2	0.013	0.090	0.014	935.084	1.441	23
GLOBAL BRASS & COPPER HLDGS	0.14 5	0.66 2	0.180	0.581	0.078	725.122	3.581	121
GORMAN-RUPP CO	0.11 6	0.14 1	0.151	0.796	0.157	814.800	0.214	60
GRACO INC	0.26 1	0.49 9	0.036	0.207	0.034	7656.60 5	0.907	50
GRAINGER (W W) INC	0.20 0	0.63 5	0.066	0.267	0.037	13307.7 26	2.176	382
HALLIBURTON CO	0.08 0	0.24 1	0.001	0.013	0.002	42663.5 10	2.005	31
HARLEY-DAVIDSON INC	0.10 7	0.58 1	0.005	0.097	0.009	8552.47 0	4.407	52
HARSCO CORP	0.09 6	0.70 7	0.021	0.185	0.021	1500.46 7	6.337	33
HAVERTY FURNITURE	0.09 1	0.14 3	0.042	0.185	0.023	481.871	0.568	19
HAWKINS INC	0.07 0	0.13 5	0.014	0.094	0.011	373.715	0.933	6
HERSHEY CO	0.28 0	1.66 7	0.033	0.240	0.024	23934.8 32	4.962	181

HILLENBRAND INC	0.11 8	0.30 2	0.008	0.099	0.009	2451.43 5	1.555	15
HILL-ROM HOLDINGS INC	0.07 5	0.24 9	0.000	0.007	0.001	4870.23 6	2.316	2
HNI CORP	0.10 0	0.27 1	0.020	0.175	0.013	1672.16 4	1.704	27
HONEYWELL INTERNATIONAL INC	0.13 7	0.46 6	0.001	0.008	0.001	115158. 024	2.405	39
HOOKE FURNITURE CORP	0.13 2	0.20 2	0.052	0.216	0.029	436.958	0.524	18
HUBBELL INC	0.14 4	0.32 4	0.017	0.098	0.017	7427.73 0	1.258	62
HUNTSMAN CORP	0.08 6	0.26 0	0.006	0.057	0.007	7996.72 4	2.039	61
HUTTIG BUILDING PRODUCTS INC	0.00 0	0.00 2	0.061	0.135	0.020	171.856	2.698	15
HYSTER-YALE MATERIALS HNDLNG	0.05 1	0.14 6	0.025	0.099	0.014	1401.98 9	1.879	41
IKONICS CORP	- 0.02 7	- 0.03 6	0.070	0.567	0.069	14.920	0.306	1
ILLINOIS TOOL WORKS	0.20 3	0.74 1	0.005	0.073	0.006	56979.2 75	2.657	89
INGERSOLL-RAND PLC	0.09 4	0.23 6	0.004	0.044	0.005	22251.0 32	1.522	69
INGEVITY CORP	0.21 8	0.73 0	0.008	0.049	0.008	2966.01 2	2.345	8
INTL PAPER CO	0.06 8	0.35 1	0.009	0.127	0.013	23925.8 02	4.183	293
ITT INC	0.08 5	0.19 7	0.003	0.031	0.004	4707.23 4	1.316	10
JOHN BEAN TECHNOLOGIES	0.10 6	0.33 4	0.035	0.257	0.030	3498.73 2	2.149	49
KAISER ALUMINUM CORP	0.10 9	0.20 2	0.018	0.117	0.017	1792.30 2	0.856	24
KAPSTONE PAPER & PACKAGING	0.07 0	0.20 4	0.001	0.009	0.001	2201.92 8	1.923	3
KENAMETAL INC	0.07 8	0.18 0	0.024	0.118	0.028	3018.48 4	1.295	58
KEWAUNEE SCIENTIFIC CORP	0.10 8	0.19 1	0.011	0.050	0.006	95.518	0.775	1
KIMBALL INTERNATIONAL -CL B	0.17 5	0.31 1	0.042	0.347	0.020	622.504	0.781	13
KIMBERLY-CLARK CORP	0.22 0	3.77 1	0.012	0.098	0.010	42364.4 50	16.178	176
KOPPERS HOLDINGS INC	0.11 5	1.30 7	0.039	0.195	0.031	1057.60 0	10.344	46
KROGER CO	0.09 2	0.49 7	0.034	0.191	0.010	26413.2 00	4.387	1248
LANDS' END INC	0.02 9	0.10 5	0.001	0.003	0.001	539.314	2.661	1
LA-Z-BOY INC	0.15 1	0.21 5	0.026	0.123	0.014	1347.49 4	0.428	23
LEE ENTERPRISES INC	0.14 7	- 1.00 1	0.002	0.323	0.002	124.766	-7.807	1
LEGGETT & PLATT INC	0.12 5	0.37 3	0.014	0.089	0.013	6295.58 7	1.982	51
LENNOX INTERNATIONAL INC	0.25 8	9.73 1	0.028	0.108	0.014	8707.14 2	36.754	52

LIBBEY INC	0.04 0	0.42 7	0.019	0.071	0.017	165.575	9.722	13
LILLY (ELI) & CO	0.11 1	0.42 6	-0.001	-0.014	-0.003	88683.6 76	2.855	-60
LINCOLN ELECTRIC HLDGS INC	0.15 1	0.38 9	0.029	0.197	0.026	6013.41 8	1.581	69
LINDSAY CORP	0.07 9	0.14 9	0.009	0.052	0.009	926.039	0.874	4
LIVENT CORP -REDH	0.22 2	0.28 6	0.002	0.018	0.003		0.287	1
LSC COMMUNICATIONS INC	0.08 1	0.66 1	0.028	0.239	0.016	522.842	7.121	57
LYONDELLBASELL INDUSTRIES NV	0.21 0	0.61 5	0.046	0.283	0.035	43522.5 64	1.928	1194
MARATHON PETROLEUM CORP	0.06 9	0.16 1	0.025	0.218	0.018	32066.2 80	1.355	1210
MATERION CORP	0.06 9	0.11 0	0.057	0.203	0.039	977.152	0.598	45
MCKESSON CORP	0.05 1	0.30 9	0.015	0.056	0.004	28455.7 40	5.004	906
MERCK & CO	0.11 9	0.30 3	-0.001	-0.009	-0.001	151738. 357	1.542	-45
MEREDITH CORP	0.10 8	0.29 6	0.000	0.059	0.001	2620.20 6	1.741	1
MILLER (HERMAN) INC	0.13 3	0.29 6	0.009	0.079	0.005	1939.81 5	1.225	13
MONSANTO CO	0.16 0	0.52 9	0.007	0.043	0.010	51518.5 42	2.303	144
MRC GLOBAL INC	0.02 6	0.05 4	0.041	0.136	0.026	1545.60 8	1.101	95
MSA SAFETY INC	0.11 7	0.32 7	0.024	0.259	0.033	2963.04 7	1.796	40
MUELLER INDUSTRIES	0.11 5	0.28 3	0.064	0.258	0.037	2048.20 8	1.463	85
MURPHY USA INC	0.12 3	0.38 9	0.072	0.916	0.015	2739.63 3	2.157	167
MYERS INDUSTRIES INC	0.09 0	0.34 1	0.016	0.119	0.010	594.672	2.797	6
NATIONAL PRESTO INDS INC	0.15 0	0.16 8	0.009	0.037	0.011	692.968	0.124	4
NEENAH PAPER INC	0.11 3	0.25 6	0.012	0.073	0.011	1529.26 6	1.262	11
NEWELL BRANDS INC	0.05 3	0.12 5	0.000	0.005	0.001	14992.6 80	1.337	14
NEWMARKET CORP	0.19 7	0.56 0	0.029	0.128	0.022	4681.25 4	1.846	49
NORDSON CORP	0.14 0	0.41 4	0.002	0.025	0.003	7311.91 3	1.955	7
OCCIDENTAL PETROLEUM CORP	0.01 7	0.03 4	0.001	0.035	0.003	56357.6 34	1.043	43
OLIN CORP	0.04 3	0.14 4	0.005	0.072	0.008	5945.41 8	2.348	49
OLYMPIC STEEL INC	0.04 1	0.09 2	-0.009	-0.019	-0.004	236.154	1.216	-5
OMNOVA SOLUTIONS INC	0.09 8	1.56 8	0.023	0.187	0.018	479.360	15.042	14
O'REILLY AUTOMOTIVE INC	0.22 7	2.62 8	0.000	0.000	0.000	20278.0 03	10.595	0
OSHKOSH CORP	0.09 8	0.21 6	0.016	0.069	0.012	6191.57 3	1.210	83

OWENS & MINOR INC	0.04 6	0.15 3	0.035	0.121	0.013	1160.66 7	2.325	120
OXFORD INDUSTRIES INC	0.12 6	0.20 5	0.088	0.485	0.056	1326.91 3	0.628	62
PACCAR INC	0.09 8	0.28 5	0.007	0.187	0.009	25005.9 44	1.912	174
PARKER-HANNIFIN CORP	0.09 6	0.28 2	0.013	0.125	0.016	21286.7 45	1.941	194
PATTERSON COMPANIES INC	0.06 3	0.15 0	0.024	0.105	0.015	2205.92 0	1.375	82
PERFORMANCE FOOD GROUP CO	0.06 1	0.24 9	0.002	0.007	0.000	2762.08 4	3.110	7
PHILLIPS 66	0.03 8	0.07 4	0.079	1.267	0.048	50804.6 11	0.982	4300
PITNEY BOWES INC	0.06 9	2.45 5	0.002	0.140	0.004	2086.23 3	34.419	13
POTLATCHDELTIC CORP	0.16 0	0.76 2	0.011	0.217	0.016	2026.53 9	3.753	11
PPG INDUSTRIES INC	0.12 5	0.36 6	0.006	0.060	0.007	29342.1 47	1.916	103
PQ GROUP HOLDINGS INC	0.04 2	0.11 3	0.006	0.101	0.018	2224.76 4	1.706	27
PREFORMED LINE PRODUCTS CO	0.07 5	0.11 4	0.008	0.038	0.008	357.950	0.508	3
QUANEX BUILDING PRODUCTS	0.05 7	0.10 9	0.001	0.013	0.001	764.694	0.902	1
REGAL BELOIT CORP	0.07 8	0.14 6	0.010	0.061	0.014	3393.38 0	0.864	46
RELIANCE STEEL & ALUMINUM CO	0.08 2	0.13 6	0.003	0.013	0.002	6229.21 2	0.649	22
REXNORD CORP	0.08 2	0.23 0	-0.002	-0.016	-0.003	3092.03 3	1.823	-6
RITE AID CORP	0.00 8	0.04 4	0.065	0.323	0.027	2102.61 7	4.615	581
RYERSON HOLDING CORP	0.06 4	- 14.8 78	-0.041	-0.115	-0.021	386.974	-232.338	-71
SEABOARD CORP	0.04 5	0.06 8	0.006	0.040	0.005	5164.11 0	0.514	31
SEARS HOLDINGS CORP	- 0.27 6	0.53 9	0.004	0.011	0.002	277.046	-2.951	31
SENECA FOODS CORP	0.00 2	0.00 4	0.148	0.233	0.121	279.074	1.697	159
SHERWIN-WILLIAMS CO	0.10 2	0.55 0	0.014	0.159	0.019	38496.1 95	4.406	287
SIFCO INDUSTRIES	- 0.05 7	- 0.12 6	0.075	0.408	0.068	31.897	1.212	8
SILGAN HOLDINGS INC	0.08 4	0.51 0	0.018	0.115	0.020	3244.21 5	5.064	83
SMITH (A O) CORP	0.16 3	0.31 6	0.007	0.076	0.007	10519.5 09	0.939	22
SNAP-ON INC	0.17 7	0.31 2	0.014	0.118	0.019	9881.06 7	0.766	75
SONOCO PRODUCTS CO	0.09 9	0.26 1	0.004	0.037	0.004	5282.86 0	1.634	18
SPARTANNASH CO	0.06 3	0.18 0	0.025	0.084	0.006	972.913	1.848	50
SPX CORP	0.02 3	0.15 0	0.006	0.087	0.009	1338.81 5	5.484	12

SPX FLOW INC	0.05 1	0.14 1	0.002	0.022	0.003	2016.35 8	1.761	7
STANDARD DIVERSIFIED INC	0.16 0	0.69 9	0.018	0.084	0.019	188.451	3.365	5
STANLEY BLACK & DECKER INC	0.09 0	0.20 7	0.000	-0.001	0.000	26138.7 08	1.299	-3
STARRETT (L.S.) CO -CL A	0.00 0	- 0.00 1	0.136	0.451	0.127	61.211	1.094	26
STEEL PARTNERS HOLDINGS LP	0.03 0	0.11 6	0.001	0.004	0.001	515.103	2.816	1
STEELCASE INC	0.08 4	0.19 2	0.010	0.103	0.006	1585.55 7	1.286	19
STEPAN CO	0.10 2	0.20 3	0.023	0.194	0.017	1777.53 6	0.985	34
STERIS PLC	0.08 5	0.13 8	0.003	0.084	0.007	7911.98 0	0.616	17
STURM RUGER & CO INC	0.27 0	0.33 4	0.159	1.138	0.086	973.298	0.235	45
SUPERVALU INC	0.04 8	0.41 4	0.045	0.203	0.014	540.740	7.653	199
TECHNIPFMC PLC	0.04 5	0.09 4	0.011	0.110	0.020	14559.1 50	1.108	301
TELEDYNE TECHNOLOGIES INC	0.09 2	0.18 2	0.003	0.026	0.004	6438.07 1	0.975	11
TENNANT CO	0.06 2	0.20 7	0.029	0.223	0.028	1299.05 5	2.330	28
TEXTRON INC	0.06 9	0.18 9	0.029	0.109	0.032	14796.6 44	1.716	452
THERMO FISHER SCIENTIFIC INC	0.05 8	0.12 9	0.001	0.010	0.001	76201.6 92	1.230	31
THOR INDUSTRIES INC	0.21 9	0.35 5	0.013	0.073	0.005	5539.93 5	0.622	34
TIMKEN CO	0.08 8	0.20 2	0.049	0.227	0.056	3819.10 3	1.307	168
TIMKENSTEEL CORP	- 0.02 4	- 0.04 9	0.049	0.255	0.043	674.436	1.063	57
TOOTSIE ROLL INDUSTRIES INC	0.07 9	0.10 1	0.020	0.343	0.036	2268.50 3	0.269	19
TORO CO	0.23 8	0.57 7	0.045	0.203	0.027	6717.59 7	1.421	67
TREDEGAR CORP	0.06 1	0.13 3	0.021	0.183	0.017	633.926	1.198	16
TREEHOUSE FOODS INC	0.05 6	0.14 2	0.005	0.031	0.004	2801.31 6	1.553	28
TREX CO INC	0.43 8	0.61 8	0.062	0.510	0.036	3189.70 1	0.411	20
TURNING POINT BRANDS INC	0.18 3	0.97 0	0.019	0.084	0.020	405.928	4.294	5
TWIN DISC INC	- 0.02 5	- 0.04 3	0.125	0.399	0.157	185.917	0.707	26
UNITED STATES STEEL CORP	0.05 2	0.15 4	0.081	0.461	0.065	6166.02 7	1.970	802
UNITED TECHNOLOGIES CORP	0.08 4	0.25 8	0.001	0.011	0.002	101945. 014	2.085	106
US FOODS HOLDING CORP	0.06 4	0.20 9	0.014	0.108	0.005	6863.76 9	2.285	130
VALMONT INDUSTRIES INC	0.10 1	0.22 9	0.017	0.104	0.016	3763.80 0	1.259	44

VALVOLINE INC	0.28 1	- 4.60 7	0.017	0.189	0.016	4760.35 0	-17.368	33
VECTOR GROUP LTD	0.17 6	- 0.70 4	0.017	0.256	0.017	3007.08 9	-5.004	23
VERITIV CORP	0.03 0	0.15 0	0.029	0.109	0.009	453.730	3.927	79
VERSUM MATERIALS INC	0.25 6	12.9 76	0.007	0.058	0.008	4224.19 8	49.683	9
VILLAGE SUPER MARKET -CL A	0.08 9	0.14 2	0.032	0.344	0.009	355.840	0.587	14
VULCAN MATERIALS CO	0.07 1	0.13 6	0.018	0.439	0.043	16986.4 32	0.913	169
WABCO HOLDINGS INC	0.10 8	0.38 9	0.000	0.004	0.000	7710.97 3	2.600	1
WALGREENS BOOTS ALLIANCE INC	0.10 2	0.23 8	0.045	0.337	0.025	83443.6 94	1.335	3000
WEIS MARKETS INC	0.05 3	0.07 7	0.054	0.279	0.023	1113.30 8	0.452	78
WELBILT INC	0.12 4	2.06 1	0.002	0.026	0.003	3278.23 4	15.670	4
WESTROCK CO	0.04 5	0.11 0	0.003	0.046	0.006	14437.7 85	1.416	83
WEYCO GROUP INC	0.08 9	0.11 4	0.070	0.307	0.065	302.015	0.278	19
WEYERHAEUSER CO	0.07 9	0.16 0	0.004	0.183	0.010	26629.1 63	1.029	70
WHIRLPOOL CORP	0.07 3	0.28 4	0.006	0.037	0.005	11913.7 41	2.908	111
WILEY (JOHN) & SONS - CL A	0.09 6	0.22 8	0.002	0.110	0.002	3799.71 0	1.385	4
WINNEBAGO INDUSTRIES	0.14 6	0.29 8	0.039	0.249	0.023	1142.08 7	1.043	35
WOLVERINE WORLD WIDE	0.08 4	0.21 2	0.007	0.059	0.007	3062.39 3	1.512	16