Stockholm School of Economics
Bachelor Thesis
Accounting & Financial Management
Spring 2016

DuPont Analysis and the Persistence of Components

Could the decomposition of RNOA provide strategic guidance for companies?

Abstract

This study aims to investigate whether the DuPont relationship may be used to derive key strategic decisions that will yield sustainable levels of return on net operating assets, RNOA. By adjusting RNOA and its DuPont components asset turnover, ATO, and profit margin, PM, for industry medians, the study facilitates a comparison on a cross-industry level and concludes that RNOA is subject to economy-wide convergence while ATO and PM converge toward the industry median. The results further determine that the persistence of ATO is greater than of PM and that the convergence of ΔRNOA will be lower in dynamic markets when abnormal profitability is derived from abnormal levels of ATO. The study does however not manage to provide a general conclusion regarding the definite impact of DuPont components on operating profitability and the strategic causalities they may be adhered to.

Authors: Per Asplund (23067) and Christoffer Martinell (23161)

Tutor: Hanna Setterberg

Keywords: Financial Statement Analysis, DuPont, Return on Net Operating Assets, Strategy

Acknowledgements: We wish to extend our gratitude to our tutor Hanna Setterberg, Assistant Professor at SSE, for guiding us through the jungle that is academic research. Moreover, we would like to thank Per-Olov Edlund, Associate Professor at SSE, for counseling regarding the statistical methods that constitute the foundation of this study. Lastly, we would like to thank our family and friends for their continuous patience and support.

Table of Content

1. Introduction

1.1. Background

The strategic decisions of an organization have a direct effect on both financial and operational performance. The corporate and business unit strategies determine where a company decides to compete and how it will position itself in relation to its competitors, which will have a key impact on internal control systems and its resource allocation (Anthony et al., 2014; Johnson et al., 2014). A large portion of the research within the strategic field is characterized by qualitative theories and faces challenges in measuring and evaluating appropriate general strategic decisions in terms of financial analysis. Within the accounting field, on the other hand, a large portion of the research is characterized by evaluation of financial ratios and profitability measures, with less emphasis on determining key strategic causalities.

Ratio analysis is one of the most common financial statement analyses used by market participants to predict future growth and profitability. The DuPont formula, where return on net operating assets (RNOA[1]) is decomposed into asset turnover (ATO[2]) and profit margin (PM[3]), is considered one of the most effective tools for gaining insights into operating profitability (Fairfield & Yohn, 2001). Previous research has attempted to establish the correlation between the current composition of a company’s DuPont components and future changes in constituents such as profitability or stock returns (Fairfield & Yohn, 2001; Nissim & Penman, 2001; Penman & Zhang 2002; Soliman 2004,2008; Amir et al., 2011; Bauman, 2014). The studies, to a large extent, are focused on using DuPont analysis to predict abnormal stock market returns from investment strategies or detecting earnings management. This may however be of less use to corporate management when forecasting the impact of strategic decisions on operating profitability.

This study contributes to previous research by incorporating strategic implications emerging from the financial aspects of DuPont analysis. By merging research from the academic fields of accounting and strategy, the aim of the study is to identify how the persistence of profitability

[1] RNOA is defined as Operating Income/ Average Net Operating Assets
[2] ATO is defined as Total Sales/ Average Net Operating Assets
[3] PM is defined as Operating Income/ Total Sales

measures may provide guidance for management about key strategic decisions and resulting financial implications.

1.2. Purpose of Study

The purpose of the study is to investigate if the DuPont relationship may be used to provide strategic guidance for companies by analyzing the financial effects that may be caused by strategic decisions. Using the methodology of Soliman (2004), return measures for companies within the sample may be analyzed regardless of industry classification and leverage, aiding an interpretation of commonalities in the economy. By analyzing the components of the DuPont formula, PM and ATO, results should indicate whether one component offers superior benefits in terms of higher persistence and future change in RNOA. Therefore, the study aims to answer the following research question:

"*Could the decomposition of return on net operating assets (RNOA) through the DuPont formula offer strategic guidance for companies on a cross-industry level?"*

1.3. Delimitations and Research Boundaries

The study is limited to analyzing data from companies listed on the Nasdaq OMX Stockholm Stock Exchange during the period 2010-2014. Companies that have been delisted or became listed on the exchange after 2010 are not included. The research boundaries are also limited to analyzing the operational performance of companies; thus financial performance is excluded. Only profitability measures directly linked to the DuPont analysis will be discussed, hence the study does not provide any conclusions regarding general ratio analyses outside the DuPont relationship. The profitability measures analyzed are limited to RNOA and its components PM and ATO. In contradiction to previous research within the field, the analysis will not attempt to investigate potential stock market reactions resulting from DuPont. Companies are analyzed through industry classifications, where the included companies are assumed to constitute the entire industry. Industries with observations from fewer than five companies have been excluded from the study, as well as companies classified as financial and real estate. Although discussing the implications that strategic directions may have on profitability, the study makes no attempt to determine the current strategy pursued or communicated by individual companies. Moreover, the research bounds are limited to analyzing financial commonalities on a cross-industry level and thus makes no attempt to identify the impact of strategic directions within individual industries. The analyzed sample consists of 138 companies active in nine industries and the conclusions drawn from this study should be transferred with caution to sectors outside the researched scope.

1.4. Outline

The outline of the study is as follows: Chapter 2 presents the theoretical framework and previous research on the DuPont relationship. In Chapter 3, test logic and the general hypothesis are presented. Chapter 4 presents the motivation for the selected sample, research method and hypotheses. Test results are presented in Chapter 5, followed by an analysis in Chapter 6. In Chapter 7, a discussion is conducted regarding sensitivity analyses and robustness tests. Finally, in Chapter 8 conclusions of the research are presented as well as suggestions for future research on the subject.

2. Theoretical Background and Previous Research

2.1. Financial Statement Analysis

The role of financial reporting by companies is to provide information about performance, financial position and changes in financial position, which constitutes the foundation for making economic decisions (Robinson et al., 2014). Financial analysis ratios may also provide guidance for future performance, as key measures display tendencies of convergence towards industry means (Lev, 1969). Moreover, the analysis of financial statements also provide incremental explanatory value through hierarchical decomposition, as components with lower hierarchical levels provide finer information about items above (Nissim & Penman, 2001; Amir et al., 2011).

The financial statements produced by companies constitute the basis for company valuation by market participants (Robinson et al., 2014). The value may be derived from the expectation of future cash flows, dividends, residual income or earnings and is affected by anticipated growth levels and perceived risk (Berk & Demarzo, 2013; Penman, 2013). A decomposition of financial statements into operating and financial activities provides key insight into company performance and risk (Nissim & Penman, 2001; Feltham & Ohlson, 1995). Previous research has concluded that company value is directly related to expectations of future returns on net operating assets (Ohlson; 1995, Feltham & Ohlson, 1995).

2.2. The DuPont Relationship

The DuPont relationship allows financial analysts to determine the operational performance of a company through profitability measures such as return on assets (ROA), return on capital employed (ROCE), and return on net operating assets (RNOA), by decomposing the measures into ATO and PM. Financial statement analysis textbooks advocate the decomposition of a company’s ROA into the DuPont components ATO and PM when evaluating current levels and future changes in profitability measures (Lundholm & Sloan, 2004; Brown & Wahlen, 2004). The DuPont analysis provides insight into the underlying drivers of operating profitability, as companies may achieve similar levels of ROA, ROCE and RNOA through different compositions of ATO and PM (Soliman, 2008). The components may even be used to establish the likelihood of companies engaging in earnings management (Jansen et al., 2012).

The DuPont relationship may provide insight into several profitability measures and various capital structures (Johansson & Runsten, 2014). The original DuPont model was used to analyze return on equity, ROE, by decomposing net PM with ATO and financial leverage:

$$ROE = \frac{Net\ Profit}{Sales} \times \frac{Sales}{Total\ Assets} \times \frac{Total\ Assets}{Equity}$$

This method does not decompose the capital structure of a company, nor does it distinguish between operational and financial performance, which consequently inhibits comparisons of companies with differences in leverage (Nissim & Penman, 2001). Although a company's capital structure in theory is value irrelevant (Modigliani & Miller, 1958), there is a need to separate performance from the influence of the capital structure to determine operational profitability (Feltham & Olson, 1995). The DuPont relationship may further be used to derive profitability measures with differing capital bases.

ROA may be derived by excluding the financial leverage from the original DuPont decomposition. It displays how a profitable company's operations are with respect to its total asset base.

$$ROA = \frac{EBT + Interest\ Expenses}{Sales} \times \frac{Sales}{Total\ Assets}$$

The asset base does however not separate operating activities from financing activities and ROA is therefore unsuitable for isolating operational performance. Two measures that may provide additional insight regarding operational profitability are ROCE and RNOA as both separate the financial assets from the operational asset base (Lombardi & Yohn, 2001; Johanson & Runsten, 2014).

$$ROCE = \frac{EBT + Interest\ Expenses}{Sales} \times \frac{Sales}{Capital\ Employed}$$

$$RNOA = \frac{EBIT}{Sales} \times \frac{Sales}{Net\ Operating\ Assets}$$

By using operational profitability measures, companies of different levels of leverage may be compared. The use of RNOA through a capital base of net operating assets (NOA) is seen as the most accurate way of illustrating operational performance, and is by Burns et al. referred to as "the advanced DuPont Model" (2008). The level of NOA is, however, still exposed to differences in accounting policies relating to items such as pension liabilities and the capitalization of Research & Development costs (Robinson et al., 2014).

2.3 Factors Affecting Profitability Measures

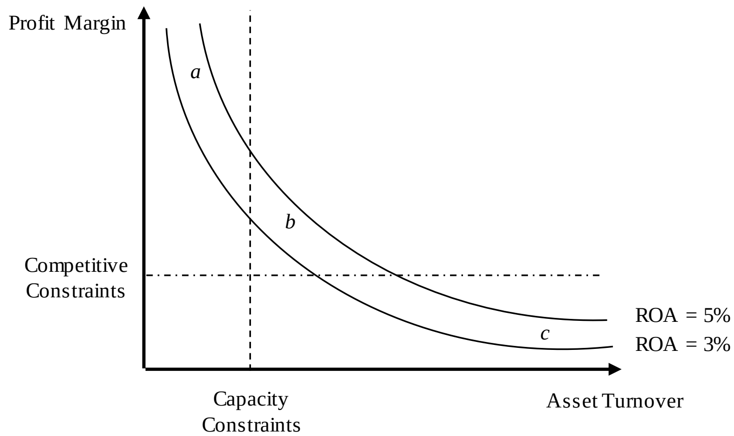
The behavior of ROA is to a great extent affected by a company's operating leverage (Selling & Stickney, 1989). Operating leverage refers to the extent a company's total costs consist of fixed costs, which is usually a prominent factor in capital intensive industries such as telecommunications (Penman, 2013). Companies with high levels of fixed costs experience fluctuations in PM that largely mirror sales trends, where increases (decreases) in sales result in similar increases (decreases) in PM. Companies with high operating leverage often experience larger fluctuations in ROA compared to companies with low operating leverage, who in turn have larger proportions of variable costs (Selling & Stickney, 1989).

The fluctuations in ATO and PM constitute a company's operating risk. ATO-risk is driven by a combination of sales fluctuations and flexibility of the asset base, where a decrease in sales along with inflexible NOA will result in a decrease in ATO. Companies with adaptable levels of NOA will however be able to mitigate the decrease in sales and thereby maintain ATO. PM-risk is driven by expense risk, such as the risk of material and labor cost increases, and the operating leverage, where a larger portion of fixed costs yields a greater expense risk (Penman, 2013).

The general composition of PM and ATO for a company is more indicative of industry classification than explicit operational strategy (Fairfield & Yohn, 2001; Soliman, 2004). McGahan and Porter (1997) conclude that industry effects are more persistent than idiosyncratic factors and although organizational differences largely determine company performance, they should not be analyzed in isolation from the effects of the industry.

Two factors that have a significant impact on PM and ATO composition are capacity- and competitive constraints. Capacity constraints are prominent in industries with high fixed costs, where additions to capacity levels require heavy investments over long periods of time. These are generally located in section *a* in Figure 1 presented below. The constraints are derived from an upper limit on their achievable ATO and consequently, these companies mainly compete by increasing PM. Capacity constraints are common in industries characterized by high entry barriers and high levels of product differentiation (Selling & Stickney, 1989).

Figure 1



(Selling & Stickney, 1989)

Competitive constraints are on the other hand common in industries with low entry barriers and commodity-like products. This results in industry conditions being characterized by intense competition, which creates an upper limit on the price that the incumbents may charge, placing it close to their marginal costs. The competitive constraints thereby force incumbents to compete through higher levels of ATO and efficient cost structures. These companies are generally positioned in section *c* (Selling & Stickney, 1989).

Companies that are located in section *b* usually face neither competitive nor capacity constraints and thus have more options when attempting to increase ROA. This freedom allows for greater leeway in strategic decisions as companies may choose to compete through either product differentiation or cost leadership (Johnson et al., 2014; Selling & Stickney, 1989).

When deciding on operational strategies, a company will consider the marginal rate of substitution of PM and ATO. In the graph above, the companies adhering to section *a* (*c*) experience low marginal rates of substitution between PM and ATO as they would have to substitute significant amounts of PM (ATO) for an increase in ATO (PM). Consequently companies located in *a* (*c*) should instead increase levels of PM (ATO). A company in *b* does not face the same unequal relationship in the marginal rates of substitution between ATO and PM and therefore experience larger flexibility when choosing ROA-maximizing strategies (Selling & Stickney, 1989).

2.4. Economy-wide Mean Reversion

Ghemawat (1991) has shown that the superior financial performance of individual companies typically fade within five years. Further, established economic notions state that profitability is mean reverting in competitive environments, where economy-wide levels of ROA, ROCE and RNOA provide indications for future performance due to an expected convergence of the measures (Soliman, 2004; Fama & French, 2000).

Soliman (2004) builds on the notion of economy-wide convergence to state that although ROA, ROCE and RNOA converge across an economy, the individual DuPont components should instead be expected to converge toward industry medians. Since the firm composition of the components is primarily determined by industry classification, adjustments for industry medians facilitate a comparison of companies in different sectors, as it is the *relative* level of a component that is indicative of explicit operational strategy. This adjustment also neutralizes industry differences in accounting conservatism regarding items such as capitalizations and inventory valuations (Penman & Zhang, 2002; Soliman, 2004).

2.5. Developing Strategies

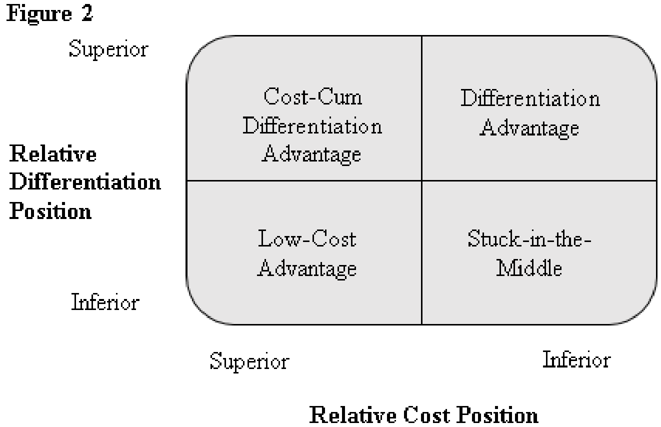
Strategies are tailored to meet different objectives depending on the hierarchical level of strategic decisions, and consist of either corporate strategies or business unit strategies. The objective of corporate strategy is to decide *where* the company will compete, constituting the basis for decisions regarding industry specialization and conglomeration. Business unit strategies, on the other hand, determine *how* a company intends to compete, which determines how an organization aims to position itself within the targeted market (Anthony et al., 2014).

The generic and competitive strategy of a company should be developed with respect to external market factors, determined by the industry attractiveness based on the competitive forces. The competitive forces, presented by Porter (1980), are as follows: the rivalry among incumbents; the bargaining power of suppliers; the bargaining power of customers; the threat of substitutes; the threat of new entrants. The five-forces framework helps companies identify key opportunities and threats within an industry, and should constitute the basis for the development of its generic strategy and competitive advantage (Porter, 1980).

A competitive advantage is achieved when a company manages to provide superior value at an equivalent cost, or equivalent value with a lower cost structure (Anthony et al., 2014). The generic strategy of a company may take three forms: *differentiation*; *low cost;* or *focus* strategy. Differentiation and low cost strategies are business unit strategies, whereas focus strategies consist of a company's corporate strategy (Porter, 1980).

By pursuing a cost leadership strategy, a company attempts to achieve a *low-cost advantage* through superior cost position and an inferior differentiation position, as shown in Figure 2 (Anthony et al., 2014). In order for a low-cost advantage to be sustainable, a company must ensure that it achieves the *lowest* cost among incumbents, and that the strategy is not pursued with total disregard for product quality (Johnson et al., 2014; Porter, 1985).

Figure 2



(Anthony et al., 2014)

After becoming the cost leader, a company may be able to list prices below market levels, consequently increasing the volume of goods sold and the economies of scale. This would in turn yield a virtuous cycle that reinforces the competitive advantage of a low cost leader (Casadesus-Masanell & Enric, 2010). The cost leadership is achieved through an efficient use of the capital base, and may thereby be seen as ATO focused (Selling & Stickney, 1989). Attempts of imitating efficient production processes involve large adjustment costs which might deter competition (Soliman, 2008).

The product differentiation strategy is focused on creating a *differentiation advantage* by achieving a superior relative differentiation position, mixed with an inferior relative cost position. A successful differentiation strategy should increase customers' willingness to pay a sufficient price in order to cover the higher cost structure (Johnson et al., 2014). The ability to innovate in product development is crucial in business units pursuing a differentiation strategy, as it focuses on uniqueness and exclusivity in its value proposition (Anthony et al., 2014). Consequently, a diversifying company must continuously innovate as the competitive advantage will otherwise be lost (Porter, 1980). A differentiation strategy is achieved when the value provided to customers enables high margins, and may therefore be viewed as PM focused (Selling & Stickney, 1989).

When companies are superior in both relative differentiation and low cost structure, they achieve what is known as a *cost-cum differentiation advantage*. This strategy is by Johnson et al. (2014) termed *hybrid strategy* and result in superior levels of profitability measures due to high PM along with an efficient use of its capital. This yields a competitive advantage that is difficult to match by incumbents (Johnson et al., 2014; Anthony et al., 2014).

A company should ensure that it manages to achieve a competitive advantage in either generic field, as it will otherwise find itself in a position of being "stuck in the middle"; essentially lacking a competitive advantage in either category (Porter, 1980). Companies with the highest levels of ROA have been shown to clearly follow either a differentiation or cost leadership strategy, whereas those with lower ROA often lack an explicit strategy (Selling & Stickney, 1989).

2.6. Sustainability of a Competitive Advantage

There are several theoretical approaches to determining the sustainability of a company's competitive advantage. In line with the resource based view, RBV, the sustainability of a competitive advantage will be determined by a company's access to resources that allows it to deliver value to its customers at a level that surpasses its competitors (Peteraf & Barney, 2003). The RBV assumes that resources are heterogeneously distributed among industry incumbents and that the ability of companies showcasing sustainable abnormal profitability is conditioned on the resource differences persisting over time (Amit & Schoemaker, 1993). Any ability of competitors to gain access to, imitate or substitute the company's key resources will allow them to replicate the strategic capabilities and thereby erode its competitive advantage (Barney & Hesterley, 2006).

Emphasizing the market dynamics of industries, the dynamic capabilities view, DCV, recognizes that the sustainability of a competitive advantage of a company is conditioned on its ability to adapt to changing market conditions in a cost efficient way (Teece, 2007). The DCV is an extension of the RBV which has received critique for not sufficiently explaining why certain companies manage to retain competitive advantages in situations of rapid and unpredictable market changes (Eisenhardt & Martin, 2000). In general, the notion of maintaining a competitive advantage in dynamic market conditions has been perceived as unlikely in the RBV (D'Aveni et al., 2010).

Dynamic capabilities consist of processes adhering to the organizational and strategic dimensions of a company, where examples include strategic decision making, product development, and alliancing. The characteristics of successful dynamic capabilities depend on the dynamics within a market, where stable industry structures allow for capabilities that are complex, analytical and reliant on existing knowledge (Nelson & Winter, 1982). In markets of high velocity however, successful dynamic capabilities are characterized by experimentation and simple processes based on newly created knowledge (Eisenhardt & Martin, 2000). The competitive advantage of a company in dynamic market conditions is rarely long term and instead demand managers to create a set of temporary advantages to last through the dynamic growth period (Lengnick-Hall & Wolf, 1999).

An alternative perspective is presented by the competitive positioning or product-market-positioning, PMP, view (Afuah, 2013, Porter, 1980). It argues that it is the complex system of interrelated company specific activities that will determine the strategic positioning of a company within a market segment, and thereby also the sustainability of its competitive advantage (Rivkin, 2000). An example would be the structure of a company's value chain and the directed suboptimization of its linkages in terms of cost structure and value creation (Porter & Millar, 1985). The persistence of abnormal profitability will be contingent on how well a company's system of activities is interlinked with its overall strategic positioning, as well as the overall complexity of the organizational systems (Porter et al., (1996); McGahan & Porter, 1997). Companies like Dell and Ryanair have managed to sustain their competitive advantages even though public case studies have revealed intricate details about company structure and value chains, as their organizational complexity has acted as barriers to imitation. However, a complex system of interrelated company specific activities could prove to be a liability in dynamic market conditions, as the complexity may promote inertia and inhibit a company's ability to evolve (Levinthal, 1997).

A common framework for evaluating the magnitude and persistence of competitive advantages is the VRIO, originally VRIN, developed by Barney (1991). The framework covers four main criteria to determine if strategic capabilities are: Valuable; Rare; Inimitable; and subject to Organizational Support. A capability is *valuable* if it manages to provide a company with increased revenue or if it results in lower organizational costs. It therefore has a direct impact on its generic business unit strategy. The capability is further perceived as *rare* if it is possessed only by the company, or by a few incumbents (Johnson et al., 2014). The general perception is that companies are unable to sustain competitive advantages if strategic resources are mobile and distributed among competitors. In order for the advantage to be sustainable, the strategic resources should be both heterogeneous and immobile (Barney, 1991).

Additional components of the VRIO argue that the strategic capability should further be *inimitable* by being costly or difficult to obtain and implement. A barrier to imitation could be the complexity in internal linkages or external interconnectedness with suppliers and customers (Johnson et al., 2014; Rivkin, 2000). The barrier may also consist of game theoretical notions where companies undertake actions to alter future incentives, creating credible threats of retaliation against imitators (Rivkin, 2000; Porter, 1991). If competing companies are able to replicate key organizational strategies, there will be a convergence of their relative effectiveness and efficiency (Barney, 1991; Porter, 1980; Nelson & Winter, 1982). Finally, the capabilities should receive *organizational support* from appropriate organizational processes and systems (Johnson et al., 2014). Appropriate management control systems should be designed to complement the strategy of a company, where a low cost strategy should be accompanied by management control systems that are similar to the mechanistic management systems with tight quantitative measures, while a differentiation strategy should be complemented by control systems similar to organic management systems with amenities provided to employees (Anthony et al., 2014).

2.7. Previous Research of the DuPont Components

Fairfield and Yohn (2001) investigate the forecastability of the composition in the DuPont components ATO and PM with the change in one-year-ahead RNOA. The report finds no incremental information in the current levels of ATO and PM but discovers a positive correlation between changes in ATO and changes in RNOA, and adheres the change to being indicative of productivity increases. These results are confirmed by Nissim and Penman (2001) and Penman and Zhang (2003).

Bauman (2014) builds on the research by Fairfield and Yohn (2001) and further develops it by partitioning on the specific direction of changes in PM. The author finds that increases in PM of up to about 2.8% are associated with positive changes in one-year-ahead RNOA. PM increases above this level were on the contrary associated with future decreases in RNOA, which was attributed to competitive forces and reversals of accruals associated with earnings management.

Soliman (2004) investigates whether a company’s current composition of ATO and PM may be indicative of future changes in RNOA, after adjusting for the industry medians. The research finds that the composition is in fact indicative of future changes in RNOA and that abnormal levels of ATO are more persistent than abnormal levels of PM.

Amir et al. (2011) further develops the DuPont relationship by introducing the notion of *unconditional* and *conditional* persistence, where unconditional persistence is determined by a variable’s autocorrelation coefficient while conditional persistence refers to the power of a variable’s persistence to explain the persistence of a variable higher in hierarchy. In line with Soliman (2004), the authors conclude that the unconditional persistence in ATO is larger than PM. However they also state that the conditional persistence of PM is in fact larger than for ATO and that the stock market consequently reacts more strongly to changes in PM.

3. Test Logic and General Hypothesis

By using DuPont to calculate the measure RNOA, operating activities may be separated from the financial activities and financial assets, which would facilitate a comparison between companies with differing leverage. This may further provide insight into the relative operating profitability of companies within an industry. By using the methodology of Soliman (2004) and adjusting for industry medians in levels of RNOA, ATO and PM, a cross-industry comparison is facilitated. The adjustment is necessary, as company decomposition of ATO and PM is primarily indicative of industry classification, where an adjustment illustrates the relative levels of ATO and PM that indicate the explicit operational strategy of a company. This methodology will also allow for a comparison of the study with Soliman (2004). The adjustment for industry medians divides the levels of RNOA, ATO and PM into two components, one being the *industry* component consisting of the industry median, and the other the *abnormal* component, consisting of the amount by which the measure differs from the median.

The persistence of the components would display how explanatory current levels are of future RNOA changes. By using the frameworks and tools presented to evaluate business unit strategies and the sustainability of competitive advantages, the persistence levels of DuPont components may be interpreted through strategy frameworks and theory. Also, as industry forces and profitability will have a large effect on company performance, an analysis of how companies behave in different market dynamics would provide additional insight when analyzing the effects of strategic decisions on profitability and accounting measures.

The division of the company levels of the components ATO and PM into an *industry* and an *abnormal* component will provide incremental explanation to industry specific effects on operational profitability. Further, as RNOA converges towards an economy-wide mean, its industry component should be subject to the long term convergence. Subsequently, it would be of interest to investigate which of the components, abnormal or industry, display the highest persistency level. Since industry measures may be seen as long term targets of accounting ratios, H_{1A} will investigate whether the industry component is more persistent when explaining future one-year-ahead levels of RNOA, PM and ATO. Consequently, H_{1A} is formulated in the following way:

H_{1A}*: Abnormal Return on Net Operating Assets, ($RNOA^{AB}$), Profit Margin (PM^{AB}) and Asset Turnover (ATO^{AB}) are less persistent than industry levels of Return on Net Operating Assets ($RNOA^{IND}$), Profit Margin (PM^{IND}) and Asset Turnover ($ATO^{IND)}$, respectively*

H_{1B} will aim to examine if there is a difference in the persistence of ATO^{AB} and PM^{AB} in explaining future abnormal levels of the component the following year. The PMP-view of strategy states that it is the complex system of intra-company activities that determine the magnitude and sustainability of company profitability. By using ATO as a proxy for productivity (Lombardi & Yohn, 2001) and considering that its imitators are faced by large adjustment costs (Soliman, 2008), it is hypothesized that its processes should be more difficult to imitate than for PM. H_{1B} therefore states:

H_{1B}*: Abnormal Profit Margin (PM^{AB}) is less persistent than abnormal Asset Turnover (ATO^{AB})*

The next step will be to apply the findings of H_{1A} and H_{1B} to investigate how ATO^{AB} and PM^{AB} will affect the convergence of $\Delta RNOA_{t+n}$, where n= 1, 2 and 4. If it holds true that ATO^{AB} does display greater persistence, and consequently a more sustainable competitive advantage, this should be illustrated by a slower convergence of $\Delta RNOA_{t+n}$ when RNOA is derived from ATO^{AB}, as opposed to PM^{AB}. H_2 consequently reads:

H_2: *Reversion in future Return on Net Operating Assets (RNOA) will be larger when abnormal profitability is derived from abnormally high Profit Margins (PM^{AB}) than from abnormally high Asset Turnover (ATO^{AB})*

The strategic frameworks presented provide various explanations for the constitution of a competitive advantage in a dynamic market. The RBV deems sustainable competitive advantages as unlikely in dynamic markets (D'Aveni et al., 2010), whereas the DCV argues that the competitive advantage lies in the adaptability of the organization itself (Teece, 2007). The PMP-view further values the complexity of a competitive advantage (Porter, 1985), which may create inertia in dynamic market conditions (Levinthal, 1997). These discrepancies constitute the basis for H_3, which will aim to investigate how the persistence of an abnormal component, and thereby the sustainability of the competitive advantage, will alter in dynamic industries. H_3 is formulated in the following way:

H_3: *Companies in dynamic industries will experience larger reversions in future Return on Net Operating Assets (RNOA) than companies in static industries, regardless if abnormal profitability ($RNOA^{AB}$) is derived from abnormally high Profit Margins (PM^{AB}) or abnormally high Asset Turnover (ATO^{AB})*

4. Method

4.1. Sample

All companies have been listed during the sample period 2010-2014. This criteria was to ensure that all companies followed similar accounting standards, which facilitated comparisons as all publicly traded companies in Sweden must report in accordance with IFRS. The limitation to publicly traded companies will result in the study being biased towards larger and more profitable companies (Bauman, 2014).

The initial sample size consisted of 288 companies listed at Nasdaq OMX Stockholm as of December 2014. The sample size was then decreased, where companies that have been listed after December 31st 2009 were excluded from the sample, as well as companies that were delisted during the sample period. This results in the study being subject to survivorship bias and any conclusions drawn from the tests are only applicable on companies that remained operational. This is not an accurate representation of economy-wide performance as the bankruptcy of a listed company is a recurring feature in financial markets. However, limiting the study to the same set of companies was deemed valid as it was necessary for the composition of industries to remain constant throughout the sample period. Maintaining a constant level of firms and industries was further essential as the study uses rank regression based on the total number of companies in the sample.

The companies were sorted into industries in accordance with the Global Industrial Classification Standard (GICS). The sample was further adjusted to exclude companies within the financial and real estate industry classifications. This is motivated by the clear discrepancies in accounting presentation and ambiguous separation of financial and operating activities when contrasted against the general standards in other industries. The adjustment is consistent with previous research on DuPont analysis and will facilitate comparison between the studies (Nissim & Penman, 2001; Fairfield & Yohn, 2001; Soliman, 2004; Bauman, 2014).

Industries with observations from fewer than 5 companies were excluded to ensure that the industry median calculated was less exposed to the influence of idiosyncratic factors and in fact a valid representation of an industry level. The conclusions drawn from the study are thereby limited to a lower number of industries. The final sample consists of 138 companies listed on the Swedish stock exchange, adhering to nine industries[4].

The dataset of the regressions are constituted by items from the companies' financial statements as well as financial databases. All financial statement data was obtained from the database Business Retriever. Company ISIN-codes were procured from the Nasdaq OMX website, and then used to divide the full sample into industries in accordance with Global Industry Classification Standards (GICS) found on WRDS Compustat. Table A2 provides full definitions of all variables.

The regressions were conducted by adjusting for year fixed effects as dummy variables to control for endogeneity, caused by a correlation between an independent variable and the error term. Adjustments for industry medians[5] are done continuously to derive the abnormal components, resulting in the data being controlled for industry fixed effects. Lastly, as the underlying notion of this study expects individual companies to display similar regression tendencies once adjusted for industry medians, variables controlling for company fixed effects were excluded from the regressions.

4.2. Research Method and Statistical Tests

4.2.1.1. H_{1A}

All levels of the DuPont components RNOA, ATO and PM are adjusted for the industry median to provide an interpretation of two variables, one being the *industry* component consisting of the industry median and the other being termed the company-specific *abnormal* component.

$$RNOA_i = RNOA_i^{AB} + RNOA_i^{IND}$$

$$PM_i = PM_i^{AB} + PM_i^{IND}$$

$$ATO_i = ATO_i^{AB} + ATO_i^{IND}$$

[4] For complete list of industries, see Table A1 in appendix.
[5] For illustration of the adjustment, see 4.3.

The hypothesis testing will be initiated through an examination of the notion that industry classification mainly determines a company's ATO and PM mix. This will illustrate if the adjustment for industry levels in RNOA, ATO and PM is in fact valid. Subsequently, the hypothesis will determine if the sample exhibits evidence of an economy-wide convergence of profitability through graphical presentation. OLS regressions will then be performed to determine if the persistence of $RNOA^{IND}$, PM^{IND} and ATO^{IND} exceed the persistence of $RNOA^{AB}$, PM^{AB} and ATO^{AB}, respectively. To simplify illustration, the company-specific subscript *i* is henceforth excluded from the notation of the regressed components. The continuous values are winsorized at a 95% and 5% level to adjust for extreme outliers, and the observations are pooled before regressed, a methodology used in H_{1A} and H_{1B}. The hypothesis testing is done through the following regressions:

$$\textit{Model 1: } RNOA_{t+1} = \alpha + \beta_1 RNOA_t^{AB} + \beta_2 RNOA_t^{IND} + v_{t+1}$$
$$\textit{Model 2: } PM_{t+1} = \alpha + \beta_1 PM_t^{AB} + \beta_2 PM_t^{IND} + v_{t+1}$$
$$\textit{Model 3: } ATO_{t+1} = \alpha + \beta_1 ATO_t^{AB} + \beta_2 ATO_t^{IND} + v_{t+1}$$

H_{1A} will be confirmed if β_2 is greater than β_1 in all regressions as this would indicate that the industry component is more persistent than the abnormal component.

4.2.1.2. H_{1B}

The hypothesis regards the persistence of PM^{AB}, which was believed to be lower than the persistence of ATO^{AB}. The hypothesis is tested through the following regressions:

$$\textit{Model 2: } PM^{AB}_{t+1} = \alpha + \beta_1 PM_t^{AB} + v_{t+1}$$
$$\textit{Model 3: } ATO^{AB}_{t+1} = \alpha + \beta_1 ATO_t^{AB} + v_{t+1}$$

H_{1B} will be regarded as true if β_2 is greater than β_1 as this would indicate a greater persistence in ATO^{AB}.

4.2.2. H_2

The hypothesis states that the reversion of future RNOA will be larger when abnormal profitability is derived from high PM^{AB} than when it comes from high ATO^{AB}. A two-stage ranking procedure is conducted where the continuous values of $RNOA^{AB}$, ATO^{AB} and PM^{AB} are divided into six groups and three following subgroups. The levels of $RNOA^{AB}$ are sorted by size into six groups, where each group is assigned a value from 0 to 5, which is then divided by 5 to obtain a value between 0 and 1. Within each group of $RNOA^{AB}$, the continuous variables ATO^{AB} and PM^{AB} are subsequently ranked by size and sorted into groups of three, respectively, where each group is assigned a value from 0 to 2, which is then divided by 2 to obtain a value between 0 and 1. The observations are then pooled to generate a sample with similar ranks of $RNOA^{AB}$ but with vastly differing compositions of ATO^{AB} and PM^{AB}. The rank value assigned to each component is given the prefix *R*, denoting the measures *RRNOA*, *RATO* and *RPM*. The rank procedure is used as H_2 states that the coefficient for *RPM* will be *more* negative than *RATO*, and as the scale measures of the measures may differ greatly, regression of the continuous values would inhibit a clear comparison of the two variables. The variables also violate normality and have skewed distributions as well as extreme values, which is mitigated through the ranking procedure without the use of winsorizing (Soliman, 2004). H_2 is initially tested through the following regressions:

$$Model\ 1: \Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + v_{t+n}$$
$$Model\ 2: \Delta RNOA_{t+n} = \alpha + \beta_1 RPM_t + v_{t+n}$$
$$Model\ 3: \Delta RNOA_{t+n} = \alpha + \beta_1 RATO_t + v_{t+n}$$

If β_1, β_2 and β_3 are negative, any deviations from industry median should disappear over time and therefore result in a convergence of $\Delta RNOA_{t+n}$, where n= 1, 2 and 4. This would be in line with the notion that industry levels are suitable long term targets for ratios and that competitive forces will mitigate the persistence of an abnormal component.

Considering that both *RPM* and *RATO* are correlated with *RRNOA*, any univariate tests may be subject to omitted variable bias due to a correlation between the independent variable and an omitted variable. To hedge against this, regressions are conducted to conclude whether *RPM* and *RATO* provide *incremental* explanatory power to the convergence of $\Delta RNOA_{t+n}$, both when conditioned on abnormal profitability and also when conditioned on an abnormality of the other DuPont component. The resulting regressions are presented below:

$$\Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_2 RPM_t + v_{t+n}$$
$$\Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_3 RATO_t + v_{t+n}$$
$$\Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_2 RPM_t + \beta_3 RATO_t + v_{t+n}$$

In order to regard H_2 as true, the coefficients of *RPM* and *RATO* should have negative signs ($\beta_2<0$, $\beta_3<0$), while the coefficient for *RPM* should be more negative than for *RATO* ($\beta_2<\beta_3$).

4.2.3. H_3

The hypothesis will investigate if there is a difference in future reversion of $\Delta RNOA_{t+n}$ depending on the dynamic state of the industry. Industry volatility will constitute the proxy for industry dynamics and is calculated as the standard deviation of sales 2010-2014 divided by the average sales level for each company. One assumption on which this study is based is that the included companies constitute the entire industry and consequently the total amount of sales would represent the industry size. The median volatility of each industry is then calculated, and subsequently the median volatility within the sample. The industries are then split into two groups based on the median volatility of all industries, where industries below and equal to the median volatility level are considered *static industries* whereas those above the median are classified as *dynamic industries*. The static and dynamic groups consist of 75 and 63 companies, respectively.

H_3 was then tested using the rank regressions from H_2 to test $\Delta RNOA_{t+n}$ where n = 1, 2 and 4. A dummy variable is included in the regressions, termed *Volatility*, which is given a value of 0 for static industries and 1 for dynamic industries. In line with established statistical notions, the group with the highest number of observations, static industries, thereby constitutes the reference group. Further, to ensure a statistically valid comparison of the two groups, an interaction term was created for each independent variable, termed *VRRNOA*, *VRPM* and *VRATO*. The beta coefficients of the interaction terms were denoted β_i*. The following regressions were subsequently analyzed:

$$Model\ 1: \Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_1{*}VRRNOA_t + \beta_2 Volatility_t + v_{t+n}$$
$$Model\ 2: \Delta RNOA_{t+n} = \alpha + \beta_1 RPM_t + \beta_1{*}VRPM_t + \beta_2 Volatility_t + v_{t+n}$$
$$Model\ 3: \Delta RNOA_{t+n} = \alpha + \beta_1 RATO_t + \beta_1{*}VRATO_t + \beta_2 Volatility_t + v_{t+n}$$

$$\Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_2 RPM_t + \beta_1{*}VRRNOA_t + \beta_2{*}VRPM_t + \beta_4 Volatility_t + v_{t+n}$$
$$\Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_3 RATO_t + \beta_1{*}VRRNOA_t + \beta_3{*}VRATO_t + \beta_4 Volatility_t + v_{t+n}$$

$$\Delta RNOA_{t+n} = \alpha + \beta_1 RRNOA_t + \beta_2 RPM_t + \beta_3 RATO_t + \beta_1{*}VRRNOA_t + \beta_2{*}VRPM_t + \beta_3{*}VRATO_t + \beta_4 Volatility_t + v_{t+n}$$

In order for H_3 to be regarded as true, the coefficients of the interaction terms *VRPM* and *VRATO*, β_2* and β_3*, should be negative.

5. Results

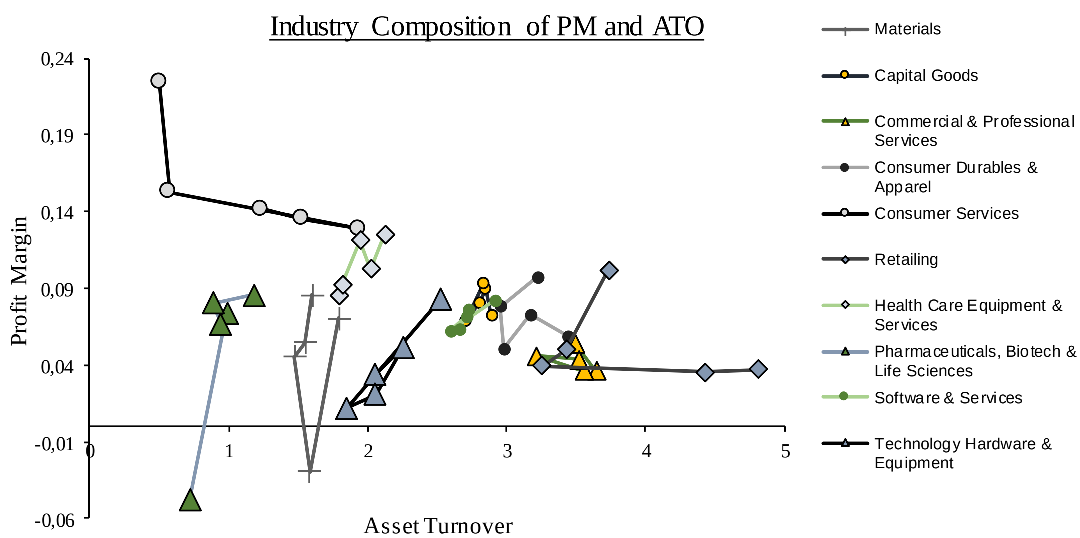
5.1. Descriptive Statistics

Descriptive statistics for the 552 firm-year observations from 2010-2014 are displayed in Table A3 for all independent variables. Table A4 in the appendix further displays Spearman-rank correlations for all variables. $RNOA^{AB}$, PM^{AB} are negatively correlated with $\Delta RNOA_{t+n}$ for n=1, 2 and 4, indicating the mean reversion of abnormal profitability measures. The corresponding correlations for ATO^{AB} are insignificant. The negative correlation between ATO_{t+1} and PM_{t+1} (-0,173) illustrate the tradeoff that companies face between the components, as companies will experience difficulties in increasing RNOA levels to exceed the industry median. The positive correlation between $RNOA^{IND}$, ATO^{IND} and PM^{IND} with $RNOA_{t+1}$, ATO_{t+1} and PM_{t+1}, respectively, further illustrate the effect of industry structures on company specific measures of the DuPont components.

5.2.1. H_{1A}

Figure 3 below plots the composition of ATO^{IND} and PM^{IND} for the industries included in the sample. The representation clearly illustrates differences in composition across industries[6]. This indicates that an extraction of the industry median is necessary to analyze the relative operational strategy of a company and also facilitate cross-industry comparison.

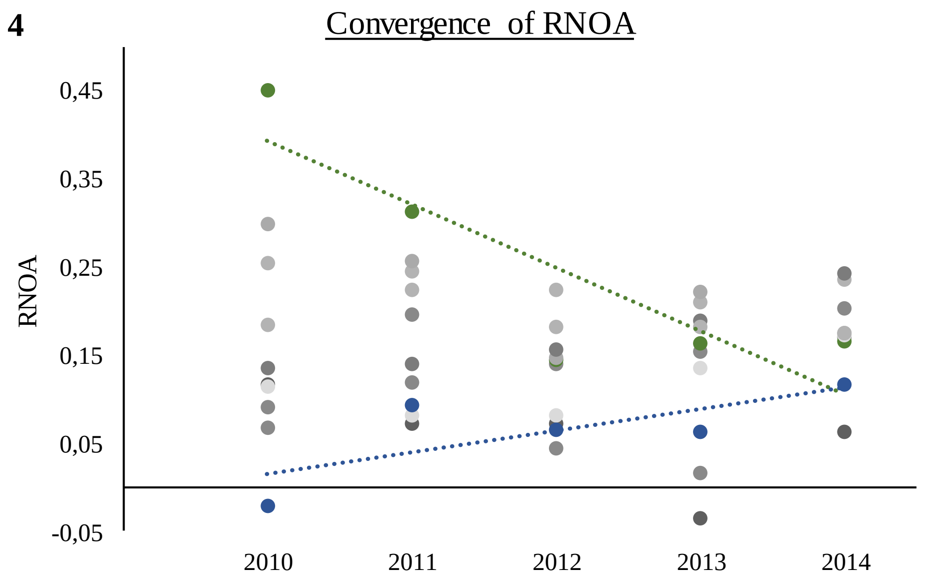
Figure 3



[6] For examples of companies adhering to each industry, see appendix A1

Figure 4 displays the plotted $RNOA^{IND}$ for all industries included in the sample. Trend lines adhering to the industries of highest and lowest $RNOA^{IND}$ in 2010 have been inserted to display a converging trend, indicating that the notion of a long term economy-wide convergence of profitability should be deemed as valid.

Figure 4



The results for H_{1A} are displayed in Table A5:A. The coefficient for $RNOA^{IND}$ (β_2=0,607***) is greater than $RNOA^{AB}$ (β_1=0,520***). The coefficients for PM^{IND} (β_2=0,821***) and ATO^{IND} (β_2=0,969***) are larger, and thereby display greater persistency than PM^{AB} (β_1=0,542***) and ATO^{AB} (β_1=0,924***), respectively. The null hypothesis of H_{1A} should be rejected if all industry coefficients are more persistent than their respective abnormal component. The null hypothesis is thereby rejected and H_{1A} is regarded as valid.

5.2.2. H_{1B}

The results for H_{1B} are illustrated in Table A5:B. The coefficients for PM^{AB} (β_1=0,554***) and ATO^{AB} (β_1=0,921***) display that ATO^{AB} is more persistent than PM^{AB}. H_{1B} should be accepted if ATO^{AB} is more persistent than PM^{AB} and the null-hypothesis is therefore rejected.

5.3. H_2

The results for the univariate regressions are displayed in Table A5:C. The coefficients for *RRNOA* are negative and range from (β_1=-0,271***) for *n*=1 to (β_1= -0,775***) for *n*=4. The results further indicate that for *RPM* (β_1=-0,073**) for *n*=1 and (β_1=-0,775*) for *n*=4. The coefficient for *RATO* is positive, (β_1=0,050*) for *n*=1, while insignificant for *n*=2 and *n*=4. R^2 is consistently higher for *RPM* than for *RATO*.

The results for the bivariate regressions are presented in Table A5:D and A5:E. Table A5:D shows the coefficients for *RRNOA* (β_1=-0,271***) and *RPM* (β_2=-0,074**) for *n*=1. Table A5:E presents the coefficients for *RRNOA* (β_1=-0,271***) and *RATO* (β_3=-0,050*) for *n*=1. R^2 is higher for *RPM* than *RATO*.

The results for the multivariate regressions are presented in Table A5:F. The coefficients are *RRNOA* (β_1=-0,271***) and *RPM* (β_2=-0,065*) for *n*=1, while *RRNOA* (β_1=-0,399***) and *RPM* (β_2=-0,089*) for *n*=2. The coefficients of *RATO* are insignificant in all regressions.

H_2 should be accepted if the coefficients for *RPM* and *ATO* are negative and if the coefficient for *RPM* is more negative than for *RATO*. Table A5:C contradicts H_2 as the coefficient for *RATO* is positive. Table A5:D and A5:E give validity to H_2 for *n*=1 and is in line with the decision rule. Table A5:F controls for omitted variable bias of the other DuPont component, where the coefficient for *RATO* is insignificant for all time periods. The regressions present mixed results regarding the β sign of *RATO*, but tendencies indicate that the coefficient of *RPM* is more negative. No cohesive and statistically valid conclusion can be drawn and the null hypothesis is therefore not rejected.

5.4. H_3

The results for the univariate regressions are presented in Table A6:A. The coefficient of the *VRRNOA* is negative (β_1*=-0,698*) for *n*=4. The coefficients further display that *VRPM* (β_1*=-0,513**) and *VRATO* (β_1*=0,410*) for *n*=4.

The results for the bi- and multivariate regressions are presented in Table A6:B and A6:C. Table A6:B displays a coefficient of *VRPM* (β_2*=-0,124*) for *n*=2. Further, the value of the coefficients are *VRRNOA* (β_1*=-0,263**) and (β_1*=-0,707**) for *n*=2 and *n*=4, respectively. The results in Table A6:C display that for *n*=4, the coefficient *VRATO* is positive (β_2*=0,442*).

The results for the multivariate regressions are presented in Table A6:D. The presented coefficient of *VRRNOA* (β_1*=-0,682**) while *VRATO* is positive (β_3*=0,430*) for *n*=4. Additional coefficients of *VRPM* display negative tendencies, but are statistically insignificant.

The decision rule stated that H_3 should be accepted if coefficients of the interaction terms for *RPM* and *RATO* were negative when regressed against $\Delta RNOA_{t+n}$. H_3 receives support by the coefficients for *VRPM* which are consistently negative. However H_3 is disproven by the positive coefficients for *VATO*. Consequently the null hypothesis is not rejected.

6. Analysis

6.1.1. H_{1A}

The regressions display significant results of $RNOA^{IND}$, PM^{IND} and ATO^{IND} being more persistent than the abnormal company-specific counterparts. This is in line with the conclusions of McGahan and Porter (1997) and Soliman (2004) who state that abnormal measures should disappear over time. Company composition of ATO and PM is primarily determined by the industry in which the company operates and is therefore not necessarily an indication of explicit operating strategy (Fairfield & Yohn, 2001). Therefore it would seem reasonable that the industry components displays greater persistency, as levels of ATO and PM converge towards the industry median. H_{1A} thereby reaffirm that industry level ratios could provide guidance for future performance (Lev, 1969). The plotting of the tendencies of $RNOA^{IND}$ for the nine industries in the sample is in line with the notion of economy-wide convergence of profitability measures (Fama & French, 2000). In that sense, the components $RNOA^{IND}$ and $RNOA^{AB}$ are subject to the long term economy-wide convergence by being exposed to competitive forces across all industries. With $RNOA^{IND}$ being more persistent than $RNOA^{AB}$, the results indicate that short term RNOA of a company will mainly be determined by the overall profitability of the industry in which it operates.

6.1.2. H_{1B}

The results in H_{1B} indicate that ATO^{AB} yields a higher persistence than PM^{AB}, which is consistent with the findings of Amir et al (2011) and Soliman (2004). The higher persistence of ATO^{AB} could be adhered to a more sustainable competitive advantage from which it originates. This could be due to the fact that ATO is used as a proxy for overall productivity and managerial efficiency (Lombardi & Yohn, 2001), which might be a reason to why imitation is difficult and associated with large adjustment costs (Soliman, 2008). The operating risk from ATO would further be lower if companies are able to develop NOA bases that are flexible and thus fluctuate with sales to keep ATO constant (Penman, 2013). ATO is thereby mainly affected by the efficiency of internal processes. The expense risk of PM is however driven by operating leverage and production expenses (Penman, 2013), where production expenses are more difficult to affect as they are largely dependent on external factors. This discrepancy in risk exposure between ATO and PM could thereby provide additional explanation for the displayed persistence of ATO^{AB}.

By analyzing the components through the generic business unit strategies of Porter (1980), low cost strategy and differentiating strategy, additional explanations of the differences in persistence levels could be provided. Using the PMP-view, the sustainability of a competitive advantage is to an extent determined by the complexity of the organizational system and its overall fit with a company's strategic positioning (Rivkin, 2000). Since potential imitators of ATO are faced with large adjustment costs (Soliman, 2008), this could act as an indicator of the degree of complexity that adheres to the low cost strategies yielding ATO^{AB}. A differentiation strategy is on the contrary more focused on PM (Selling & Stickney, 1989) and requires companies to continuously innovate as their competitive advantage would otherwise be lost (Porter, 1980). Since R&D is an uncertain process, the competitive advantage of a differentiating company might therefore be less sustainable.

Substantial levels of PM^{AB} would also draw new entrants into the market and incentivize imitation (Soliman, 2008), which would put downwards pressure on the listed prices and counteract the persistence of PM^{AB}. As stock markets react more positively to changes in PM (Amir et al., 2011; Soliman, 2008), companies are provided with incentives for short-term increases in PM through earnings management to meet or surpass the markets' expectations (Bauman, 2014). These short term increases are however generally followed by future decreases in PM^{AB}, an additional interpretation as to why the measure would be less persistent.

6.2. H_2

A high persistence in a DuPont component would indicate that future reversion of RNOA should be lower. The results in H_2 are to an extent in line with the indications from the persistence levels presented in H_{1B}, as *RPM* displays a more negative coefficient than *RATO* when n=1 in Table A5:C and when conditioned on abnormal profitability in Table A5:D and A5:E.

What is striking is that the coefficient for *RATO* in Table A5:C is in fact *positive*. Since ATO^{AB} converges to the industry median and thereby decreases $\Delta RNOA$, the positive correlation would indicate that ATO^{AB} is expected to result in future PM^{AB} increases. A potential interpretation could be that companies with abnormal levels of ATO, and therefore a cost advantage, are to an extent able to generate a cum-cost advantage where they also manage to provide superior value to its customers (Anthony et al. 2014). The tendencies in Panel A5:E are however more in line with the general notion that as ATO^{AB} converges towards 0, there is a subsequent decrease in *ΔRNOA*. Consequently the positive coefficient of *RATO* that violates H_2, appears to be a result of a correlation with an omitted variable. The results are contradictory to the findings of Soliman (2004) who found *RATO* to be positively correlated with *ΔRNOA* even after controlling for *RRNOA* and *RPM*. The reasoning around the results in H_2 is merely speculative as regression results are insignificant for *RATO* when controlling for *RRNOA* and RPM and thus provide no *incremental* explanatory power to *ΔRNOA* in the tests. Consequently, no coherent conclusion may be drawn from the results in H_2 regarding the comparison of reversions of *ΔRNOA* between *RATO* and *RPM*.

6.3. H_3

The theoretical framework presented offers several possible explanations as to why competitive advantages are expected to behave differently in static and dynamic market conditions. The PMP adheres the sustainability of competitive advantages to its degree of systemic complexity (Porter, 1980), which could however become a liability in dynamic conditions as it promotes inertia (Levinthal, 1997). The DCV states that company profitability depends on its ability to adapt to changing market conditions (Teece, 2007), and dynamic markets promote capabilities characterized by experimentation and processes based on new knowledge (Eisenhardt & Martin, 2000). The RBV on the other hand deems the notion of maintaining a competitive advantage in dynamic markets as unlikely (D'Aveni et al., 2010). Consequently, it seems improbable that a company would be able to maintain equal competitive advantages in dynamic and static markets.

Discrepancies however emerge when comparing the theoretical background with the regressions for dynamic markets. The regressions display three key trends: *i)* the future reversion in RNOA is greater conditioned on *RRNOA*; *ii) VRPM* consistently displays a negative coefficient; *iii)* the coefficient of *VRATO* is coherently positive.

The negative coefficients for *VRRNOA* display that, conditioned on abnormal profitability, the future reversion in *ΔRNOA* will be greater in dynamic markets. The competitive forces that affect industry attractiveness are more difficult to forecast in dynamic conditions (Porter, 1980), and profitable companies might therefore experience difficulties in maintaining profitability levels.

Further, periods of decreasing sales will intensify competition as incumbents lower prices to maintain sales levels (Porter, 1980), which would decrease the profitability of companies without a low cost advantage.

The coefficients of *VRPM* and *VRATO* further display opposite signs, which could be interpreted by analyzing the operational risks that adhere to strategies focused on either PM or ATO as presented by Penman (2013) and discussed in H_{1B}. The exposure to external market expense risks adhering to PM would constitute an additional liability in a dynamic and uncertain market, while the benefits of a flexible asset base would provide ATO with even greater relative advantages. When controlling for the omitted variable bias, *VRPM* becomes insignificant, which means that no clear conclusion may be drawn regarding the relative persistence of the components in dynamic markets.

Considering that ATO^{AB} is *positively* correlated with $\Delta RNOA$, the results indicate that ATO^{AB} is *more* persistent in dynamic markets than in static markets. This trend is further analyzed through the DCV. Building on the previous notion that ATO may be treated as a proxy for productivity and managerial efficiency (Fairfield & Yohn, 2001), resulting implications could be that companies with high ATO^{AB} thereby manage to adapt to dynamic market conditions in a cost efficient way, which is a prerequisite for the dynamic capabilities presented by Teece (2007). By analyzing the trend displayed in Table A6:D it appears as if the coefficient of *VRATO* is not only positive, but also that it is increasing from n=1 to n=4. As the coefficients are only significant for n=4, no valid comparison may however be done. It may only be speculated that the persistence of ATO^{AB} might increase as time passes in dynamic markets, which would contrast Lengnick-Hall and Wolf (1999) who state that competitive advantages are only short term in dynamic markets. Due to the insufficient conclusion that may be drawn from the data, additional research would however be necessary.

The indications of the results of H_2 are that pursuing strategies that yield high levels of ATO would offer more persistent profitability compared to a strategy focused on PM, when faced with dynamic market conditions. By applying these indications to the generic business unit strategies presented by Porter (1980), it may be theoreticized that a strategy that pursues cost leadership would offer benefits in terms of more persistent operating profitability, that exceed those of a differentiation strategy, in dynamic markets. Once again, in order for valid conclusions to be drawn, additional testing would be necessary.

7. Discussion

7.1. Sensitivity Analysis and Reliability of Assumptions

Extreme values and the ranking of components

Due to the presence of extreme values, the data for PM^{AB} and ATO^{AB} was winsorized to the 5th and 95th percentiles for the regressions in H_{1A} and H_{1B}. To examine to what extent this methodology has affected the results, a sensitivity analysis was performed by conducting the regressions with the data winsorized at the 1st and 99th percentile. As shown in Table A7, there is a material decrease in the goodness-of-fit for the model, especially regarding the regressions on PM^{AB}. However, the coefficients are still significant with similar results as in the original tests, indicating that H_{1A} and H_{1B} were not substantially affected by the extreme values.

In line with the methodology by Soliman (2004), the data for regressions H_2 and H_3 were ranked in two stages by size. Due to the relatively small amount of company-year observations, the ranking was adjusted from the methodology of Soliman (2004), who included ten groups of $RNOA^{AB}$ and five subgroups of ATO^{AB} and PM^{AB}, to a ranking of six groups of $RNOA^{AB}$ and three subgroups of ATO^{AB} and PM^{AB}. The ranking procedure constitutes a method for managing extreme values, meaning that the winsorizing of data was unnecessary in the regressions H_2 and H_3. However, as the ranking procedure is a central part of the methodology of the study, it should be scrutinized regarding its effect on the results. A sensitivity analysis was conducted using ten groups of $RNOA^{AB}$ and five subgroups of ATO^{AB} and PM^{AB}, in line with Soliman (2004). The regressions, shown in Table A8, indicate similar results in both goodness-of-fit and significance levels of coefficients. The main difference is a large decrease in significance of PM^{AB}, indicating that the extreme values of this component affect the results. This motivates the use of groups of six and three, as the difference in sample size between the two studies[7] aggravates the use of the same ranking methodology.

Additional tests were performed without the use of rank regression as well. The second sensitivity analysis, performing the regressions for H_2 and H_3 with the use of continuous values, show a general loss of statistical significance as presented in Table A9. Although resulting in an increase

[7] 552 firm-year observations compared to 88,573 firm-year observations

in goodness-of-fit for the regressions, statistical significance was mainly limited to the coefficients of *RRNOA.* This results in low explanatory power with regards to the hypotheses, and motivates the use of ranked regressions as argued by Soliman (2004).

Definition of dynamic industries

In order to study H_3, the sample was divided into two groups of either dynamic or static industries. The division was based on volatility in sales over the sample period, as dynamic markets are characterized by rapid change and uncertainty. One could argue that the ability to characterize an industry solely based on accounting information is limited. Industries are in reality affected by the environmental factors covered in the PESTEL-framework, which include the political; economic; social; technological; environmental; and legal dimensions of a market (Johnson et al., 2014). However, as accounting measures provide generalizable information for all companies, it was deemed as a more stable proxy for industry characteristics.

Estimation of industries

This study classifies companies by industry to enable the deduction of industry effects and facilitate cross-industry comparisons. The notion of convergence towards industry medians is solely applicable to the sample analyzed, which means that no conclusions regarding industry characteristics may be applied to the classifications (GICS) in general. The study has also been conducted with the underlying assumption that the included companies within each industry classification in fact constitute the *entire* industry, which is a biased representation of reality. In order to truly study the competitive forces' effects of company strategies and profitability, all explicit competitors should be included in the sample. The competitors of Swedish and publicly traded companies are in reality international and not limited to Sweden. This creates a bias in the sample with the implication that the derived industry median, which is treated as an indicator of long term performance, is in reality misleading as it might not represent the true industry median.

Sample bias

In order to facilitate statistical tests in industries composed by the same companies throughout the sample period, a large number of companies currently listed on Nasdaq OMX Stockholm were excluded. This leads to the study being subject to survivorship bias, which limits the inference and conclusions that can be drawn from the sample. Companies facing the possibility of bankruptcy might have more unstable characteristics in the DuPont components, which could have resulted in different results if they were to be included in the final sample. The annual rank regressions were however based on the total number of companies and to counteract fluctuating group sizes, the exposure to survivorship bias was deemed necessary. This was further motivated by the requirement of only including industries with at least 5 company observations, as single bankruptcies would in some cases have resulted in exclusions of entire industries during the sample period. By further limiting the sample to companies listed on Nasdaq OMX Stockholm, the study is biased towards larger and more profitable companies.

7.2. Robustness Tests

Heteroscedasticity

An OLS regression is built on the standard assumption that the variance of the errors terms are constant, indicating homoscedasticity. If the variance term would however display inconsistent variance in the error term, the regression would be subject to heteroscedasticity. This would create a potential bias in error terms and a consequent bias in test statistics and statistical significance (Newbold et al., 2012). In order to assess whether the regression results are subject to heteroscedasticity, the Breusch-Pagan test was performed with the null-hypothesis that the error variances are constant (homoscedastic). A potential disadvantage of this method is that the BP-model only tests for *linear* heteroscedasticity. Comparing the test results with a $\chi 2$-table showed that heteroscedasticity was present in the regressions with statistical significance (see Table A10). The effects of heteroscedasticity were consequently mitigated by using robust standard errors in all regressions of this study.

Multicollinearity

Multicollinearity indicates that several independent variables are intercorrelated, which would inhibit a distinct separation of its relative effects on the dependent variable. If multicollinearity is present in the independent variables, the variance and accuracy of the model might be misinterpreted (Newbold et al., 2012). In order to ensure valid interpretations of the results the sample was further tested for multicollinearity. By performing a Variance Inflation Factor test

(VIF), displayed in Table A11, it was confirmed that the independent variables were not subject to multicollinearity when using the established cutoff point of 10 (Wooldridge, 2012).

Autocorrelation

A critical component in regressions using time series data is to test for autocorrelation of the error terms within different dates. The presence of autocorrelation would indicate a bias in the estimated standard errors for the coefficients as the number of independent observations would be reduced (Newbold et al., 2012). In order to test for autocorrelation, the Durbin-Watson test was performed on all regressions. The test assigns a continuous value between zero and four to the regression, where a value of approximately two would indicate no autocorrelation. For this study, the cutoff point was set conservatively at 1.5 and 2.5 to ensure validity in the statistical results. All regressions received values within the range, indicating no, or limited amount of, autocorrelation in the statistical tests (see Table A12).

8. Conclusion

The purpose of the study was to investigate if the DuPont relationship could be used to analyze what commonalities in a cross-industry comparison of operating profitability may indicate about the general financial implications of key strategic decisions. The analysis has been conducted by comparing the effects that ATO and PM have on RNOA by incorporating theoretical frameworks and interpretations from the academic field of strategy. The sample analyzed consisted of Swedish companies listed on Nasdaq OMX Stockholm during the years 2010-2014.

The study finds the notion of an economy-wide convergence of RNOA as valid, while also displaying that abnormal levels in ATO and PM converge towards industry medians over time. When comparing the persistence of the DuPont components, the regressions indicate that ATO^{AB} should be expected to be more persistent than PM^{AB}, which is adhered to the relatively large adjustment costs for potential imitators, mitigation of risks as well as being established as a proxy for managerial efficiency. Consequently, the higher persistence of ATO^{AB} indicates that a strategy focused on achieving a cost leadership offers a more persistent competitive advantage than a strategy focused on a differentiation advantage.

The regressions however display no cohesive and statistically significant results when attempting to compare the effects on future reversion in RNOA between ATO^{AB} and PM^{AB} within the total sample. When analyzing the effects that dynamic and static market conditions have on the future reversion in RNOA, the results indicate that the persistence levels of ATO^{AB} increases while PM^{AB} appears to experience simultaneous, although statistically insignificant, decreases. The discrepancies are interpreted as being a result of more sustainable competitive advantages from cost leadership positions and resulting cost efficient adaptations to market dynamics as well as a relatively more efficient mitigation of the increased market risks. Additional testing would however be necessary before a general conclusion regarding the effects of ATO^{AB} and PM^{AB} on future RNOA may be provided.

The research has been conducted on a sample of 138 companies in nine industries and it is therefore difficult to determine to what extent the results presented may be generalized across the economy.

The statistical significance of the results are insufficient to allow for a general recommendation regarding the financial effects that general strategic decisions may have on profitability. Consequently, the study may be viewed as a guidance for future research, as the full implications of connecting the academic fields of accounting and strategy remain to be explored.

8.1. Validity, reliability and generalizability

The validity of this study will determine to what extent its conclusions may be drawn. This study has attempted to objectively analyze the effects that a company's ATO and PM composition will have on future RNOA through several strategic frameworks. It is unclear why the persistency of ATO is higher than for PM. The interpretations considering managerial efficiency and risk exposure are not definite conclusions as this study does not attempt to measure either component. The displayed results are further not significant for all regressions, and contradictory at times, which indicates that they should be interpreted with caution.

The reliability of the study regards its level of replicability. The study has applied previously accepted methodology of DuPont analysis and been transparent regarding the assumption on which it is built. The analyzed companies apply IFRS as accounting standard and have been sorted in accordance with GICS. Measurement errors may have occurred in conjunction with the sorting of the datasets, or through inaccuracies in the definition of variables.

The generalizability of the study refers to its ability to be generalized outside its researched scope to include other industries and markets. The conducted analyses have been limited to listed companies, which may inhibit the value of its results as it is unclear how well the sample reflects the population. The research generalization is further limited by the low number of industries included in the study, as well as its narrow scope of industry definitions that are limited to the Swedish market. The findings of this study should therefore be cautiously applied to markets outside its scope.

8.2. Suggestions for future research

The findings of this study could be further developed by including additional markets and industries to allow for a more diverse sample and more reliable industry definition. The research could be further developed by including a larger sample period and analyzing the effects on components throughout diverse economic cycles. The results have displayed that ATO yields a higher persistency in dynamic markets than in static markets, and that the components ATO and PM may be expected to converge towards the industry median. Although yielding the highest long term persistence in dynamic markets, no attempt has been made at deriving the actual causal effect of this persistence of ATO. By researching the key managerial and organizational characteristics that determine the persistence levels of the DuPont components, additional insight might be able to explain how companies achieve superior profitability.

References

Afuah, A., 2013, “Are network effects really all about size? The role of structure and conduct”, *Strategic Management Journal*, *34*(3), pp.257-273.

Amir, E., Kama, I. and Livnat, J., 2011, “Conditional versus unconditional persistence of RNOA components: implications for valuation”, *Review of Accounting Studies*, *16*(2), pp.302-327.

Amit, R. and Schoemaker, P.J., 1993, “Strategic assets and organizational rent”, *Strategic management journal*, *14*(1), pp.33-46.

Anthony, R., Govindarajan, V., Hartmann, F.G.H., Kraus, K. & Nilsson, G., 2014, *Management Control Systems*, 13th edition, New York, McGraw Hill.

Barney, J., 1991, “Firm resources and sustained competitive advantage”, *Journal of management*, *17*(1), pp.99-120.

Barney, J. and Hesterly, W., 2006, “1.3 Organizational Economics: Understanding the Relationship between Organizations and Economic Analysis”, *The Sage handbook of organization studies*, p.111.

Bauman, M., 2014, “Forecasting operating profitability with DuPont analysis”, *Review of Accounting and Finance,* 13(2), pp. 191-205.

Berk, J. & Demarzo, P., 2013, *Corporate Finance,* 3rd edition, London, Pearson.

Burns, D.C., Sale, J.T. and Stephan, J.A., 2008, “A better way to gauge profitability”, *Journal of Accountancy*, *206*(2), p.38.

Casadesus-Masanell, R. and Ricart, J.E., 2010, “From strategy to business models and onto tactics”, *Long range planning*, *43*(2), pp.195-215.

D'Aveni, R.A., Dagnino, G.B. and Smith, K.G., 2010, “The age of temporary advantage”, *Strategic Management Journal*, *31*(13), pp.1371-1385.

Eisenhardt, K.M. and Martin, J.A., 2000, “Dynamic capabilities: what are they?”, *Strategic management journal*, 21(10-11), pp.1105-1121.

Fairfield, P.M. & Yohn, T.L., 2001, “Using Asset Turnover and Profit Margin to Forecast Changes in Profitability”, *Review of Accounting Studies*, vol. 6, no. 4, pp. 371-385.

Fama, E.F. and French, K.R., 2000, “Forecasting Profitability and Earnings”, *The Journal of Business*, *73*(2), pp.161-175.

Feltham, G.A. and Ohlson, J., 1995, “Valuation and clean surplus accounting for operating and financial activities”, *Contemporary accounting research*, *11*(2), pp.689-731.

Ghemawat, P., 1991, “Market incumbency and technological inertia”, *Marketing Science*, *10*(2), pp.161-171.

Jansen, I., Ramnath, S. & Yohn, T., 2012, “A Diagnostic for Earnings Management Using Changes in Asset Turnover and Profit Margin”, *Contemporary Accounting Research*, vol. 29, no. 1, pp. 221-251.

Johansson, S. & Runsten, M., 2014, *The profitability, financing, and growth of the firm*, 2nd edition, Lund, Studentlitteratur.

Johnson, G., Whittington, R., Scholes, K., Angwin, D., Regnér, P., 2014, *Exploring Strategy*, 10th edition, London, Pearson.

Lengnick-Hall, C.A. and Wolff, J.A., 1999, “Similarities and contradictions in the core logic of three strategy research streams”, *Strategic Management Journal*, *20*(12), pp.1109-1132.

Lev, B., 1969, “Industry averages as targets for financial ratios”, *Journal of Accounting Research*, pp.290-299.

Levinthal, D.A., 1997, “Adaptation on rugged landscapes”, *Management science*, *43*(7), pp.934-950.

McGahan, A.M. and Porter, M.E., 1997, “How much does industry matter, really?”.

Modigliani, F. and Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, *48*(3), pp.261-297.

Nelson, R.R. and Winter, S.G., 1982, “The Schumpeterian tradeoff revisited”, *The American Economic Review*, *72*(1), pp.114-132.

Newbold, P., Carlson, W.L. & Thorne, B. 2012, *Statistics for Business and Economics*, Prentice Hall, 8th edition, New York, Pearson.

Nissim, D. & Penman, S., 2001, “Ratio Analysis and Equity Valuation: From Research to Practice”, *Review of Accounting Studies,* no. 6, pp. 109-154.

Ohlson, J., 1995, “Earnings, book values, and dividends in equity valuation”, *Contemporary accounting research*, *11*(2), pp.661-687.

Penman, S.H., 2013, *Financial Statement Analysis and Security Valuation,* McGraw-Hill.

Penman, S.H. & Zhang, X.J., 2002, “Accounting Conservatism, the Quality of Earnings, and Stock Returns”, *The Accounting Review*, vol. 77, no. 2, pp. 237-264.

Peteraf, M.A. and Barney, J.B., 2003, “Unraveling the resource-based tangle”, *Managerial and decision economics*, *24*(4), pp.309-323.

Porter, M.E. 1980, *Competitive Strategy,* Simon & Schuster.

Porter, M.E., 1991, “Towards a dynamic theory of strategy”, *Strategic management journal*, *12*(S2), pp.95-117.

Porter, M.E., Goold, M. and Luchs, K., 1996, “From competitive advantage to corporate strategy”, *Managing the multibusiness company: Strategic issues for diversified groups*, 285, pp.285-314.

Porter, M.E. and Millar, V.E., 1985. “How information gives you competitive advantage”.

Rivkin, J.W., 2000, “Imitation of complex strategies”, *Management science,46*(6), pp.824-844.

Robinson, T.R., van Greuning, H., Henry, E. & Broihahn, M.A., 2014, *International financial statement analysis,* Wiley.

Selling, T.I. and Stickney, C.P., 1989, “The effects of business environment and strategy on a firm's rate of return on assets”, *Financial Analysts Journal*,*45*(1), pp.43-52.

Soliman, M.T., 2004, “Using industry-adjusted DuPont analysis to predict future profitability”, Ph.D dissertation, University of Michigan.

Soliman, M.T., 2008, “The Use of Dupont Analysis by Market Participants”, *The Accounting Review*, vol. 83, no. 3, pp. 823-853.

Teece, D.J., 2007, “Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance”, *Strategic management journal*, *28*(13), pp.1319-1350.

Wooldridge, J. 2012, *Introductory econometrics: A modern approach*, Cengage Learning.

Appendix

Table A1:

Descriptive Statistics by Industry Classification				
Industry Name	# of Observations	Median RNOA	Median Profit Margin	Median Asset Turnover
Materials	7	6.69%	4.98%	1.57
Capital Goods	36	22.89%	7.64%	2.82
Commercial Services & Supplies	15	14.93%	4.24%	3.51
Consumer Durables & Apparel	9	18.51%	7,00%	3.13
Consumer Services	5	9.72%	14.71%	0.91
Retailing	9	21.80%	4.49%	3.58
Healthcare Equipment & Services	8	16.67%	10.25%	1.98
Pharmaceuticals, Biotechnology & Life Sciences	14	6.42%	7.04%	0.96
Software & Services	15	18.14%	6.81%	2.72
Technology Hardware & Equipment	20	5.84%	3.47%	2.05

The Materials Industry Group is constituted by companies engaged in e.g. Oil & Gas, Exploration & Production and Coal & Consumable Fuels. Capital Goods includes companies engaged in e.g. Building Products and Electrical Equipment. Commercial Services & Supplies includes Office Services & Supplies and HR Services. Consumer Durables & Apparel is constituted by e.g. Leisure Equipment & Luxury Goods. Consumer Services include Hotels, Restaurants & Leisure. Retailing include Distributors and various forms of Retail. Healthcare Equipment & Services is constituted by companies engaged in e.g. Healthcare Equipment & Facilities. Pharmaceuticals, Biotechnology & Life Sciences includes all the different areas mentioned in the industry group name. Software & Services includes areas such as IT Services and Software. Finally, Technology Hardware & Equipment include areas such as Communications Equipment and Office Electronics.

Table A2:

Definition of Variables

Variable	Definition
NOA	Net Operating Assets = Operating Assets - Operating Liabilities. Operating Assets is calculated as total assets less cash and short-term investments. Operating Liabilities is calculated as total assets less total debt, less book value of total equity, less minority interest.
OA	Operating Assets = Total Assets - Cash & Short-term Investments
OL	Operating Liabilities = Total Assets - Total Debt - BV Total Equity - Minority Interest
PM	Profit Margin = Operating Income / Total Sales
ATO	Asset Turnover = Total Sales / Average NOA ((NOAt - NOA t-1)/2)
RNOA	Return on Net Operating Assets = PM * ATO
RNOAab	Abnormal RNOA = RNOAt - Industry Median (RNOAt - RNOAind)
PMab	Abnormal Profit Margin = PMt - Industry Median (PMt - PMind)
ATOab	Abnormal Asset Turnover = ATOt - Industry Median (ATOt - ATOind)
ΔRNOAt+n	Future change in RNOA from year t through t+n where n= one, two and four. (RNOAt+n - RNOAt)

Table A3:

Variable	Mean	Std.Dev.	Minimum	Median	Maximum
	Descriptive Statistics				
RNOA	0.136	0.451	-5.407	0.159	2.027
RRNOA	0.496	0.344	0.000	0.400	1.000
$RNOA_{t+1}$	0.163	0.344	-1.438	0.168	2.027
$RNOA_{ab}$	-0.024	0.438	-5.473	0.000	1.962
$RNOA_{ind}$	0.159	0.089	-0.035	0.165	0.452
$RNOA^{AB}{}_{t+1}$	-0.000	0.334	-3.289	0.000	1.962
ATO	3.244	2.479	0.363	2.601	10.336
RATO	0.496	0.415	0.000	0.500	1.000
ATO_{t+1}	3.296	2.492	0.451	2.628	10.663
ATO_{ab}	0.782	2.312	-3.007	0.000	8.516
ATO_{ind}	2.462	0.846	0.502	2.704	4.433
$ATO^{AB}{}_{t+1}$	0.769	2.328	-3.289	0.000	8.516
PM	0.023	0.203	-0.918	0.064	0.239
RPM	0.496	0.415	0.000	0.500	1.000
PM_{t+1}	0.041	0.163	-0.823	0.067	0.276
PM_{ab}	-0.040	0.196	-0.952	0.000	0.287
PM_{ind}	0.063	0.037	-0.048	0.069	0.225
$PM^{AB}{}_{t+1}$	-0.028	0.160	-0.916	0.000	0.233

This table presents descriptive statistics for all main variables for 552 firm-year observations between 2010-2014.

Table A4:

Spearman-Rank Correlation for Variabels

	$RNOA_{t+1}$	$RNOA_t^{AB}$	$RNOA_t^{IND}$	PM_{t+1}	$PM^{AB}{}_{t+1}$	PM_t^{AB}	PM_t^{IND}	ATO_{t+1}	$ATO^{AB}{}_{t+1}$	ATO_t^{AB}	ATO_t^{IND}	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
$RNOA_{t+1}$	---													
$RNOA_t^{AB}$	0.682	---												
$RNOA_t^{IND}$	0.271	0.005*	---											
PM_{t+1}	0.732	0.551	0.120	---										
$PM^{AB}{}_{t+1}$	0.694	0.572	0.048*	0.931	---									
PM_t^{AB}	0.524	0.770	0.036*	0.748	0.78	---								
PM_t^{IND}	0.147	0.035	0.538	0.204	0.023	-0.026	---							
ATO_{t+1}	0.407	0.221	0.293	-0.173	-0.152	-0.189	0.001*	---						
$ATO^{AB}{}_{t+1}$	0.313	0.235	-0.007*	-0.199	-0.202	-0.249	0.035*	0.843	---					
ATO_t^{AB}	0.303	0.334	-0.030	-0.182	-0.188	-0.170	0.015*	0.783	0.916	---				
ATO_t^{IND}	0.205	0.006	0.665	-0.034	0.047	0.040	-0.013*	0.409	-0.032*	-0.039*	---			
$\Delta RNOA_{t+1}$	0.170	-0.341	-0.159	0.136	0.106	-0.273	-0.155	0.031*	0.059*	-0.061*	-0.086	---		
$\Delta RNOA_{t+2}$	-0.194	-0.496	-0.180	-0.148	-0.175	-0.397	-0.126	-0.124	-0.058*	-0.173	-0.119	0.611	---	
$\Delta RNOA_{t+4}$	-0.382	-0.550	-0.234	-0.269	-0.290	-0.438	-0.251	-0.198	-0.095*	-0.154	-0.198	0.434	0.680	---

All results are statistically significant unless marked with a *, indicating insignificance

Table A5:

	Panel A: Persistance of Abnormal and Industry Profitability measures			Panel B: Persistance of Abnormal Profitability Measures	
	Model 1	Model 2	Model 3	Model 2	Model 3
α	0.105***	0.007	0.150	-0.018*	0.076
	(0.039)	(0.025)	(0.157)	(0.013)	(0.078)
β_1	0.520***	0.542***	0.924***	0.554***	0.921***
	(0.150)	(0.063)	(0.025)	(0.063)	(0.025)
β_2	0.607***	0.821***	0.969***		
	(0.129)	(0.231)	(0.056)		
F-test	102.673***	106.469***	655.542***		
Adj.R^2	48.0%	48.9%	85.6%	46.6%	83.6%

Robust Standard Errors are presented in parenthesis. Significance levels indicated as *** p<0.01, ** p<0.05, * p<0.1

Panel C: Abnormal Profitability Measures Predicting Future Changes in RNOA

	Model 1			Model 2			Model 3		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.199***	0.225***	0.493***	0.101**	0.065	0.493**	0.040	0.018	0.033
	(0.060)	(0.067)	(0.139)	(0.055)	(0.064)	(0.118)	(0.033)	(0.034)	(0.043)
β_1	-0.271***	-0.399***	-0.775***	-0.073**	-0.075*	-0.775*	0.050*	0.020	0.152
	(0.052)	(0.067)	(0.194)	(0.037)	(0.051)	(0.140)	(0.036)	(0.050)	(0.137)
Adj.R^2	10.7%	15.0%	18.2%	3.6%	2.5%	0.8%	3.2%	1.9%	0.3%

Robust Standard Errors are presented in parenthesis. Significance levels indicated as *** p<0.01, ** p<0.05, * p<0.1

	Panel D: Abnormal Profit Margin			Panel E: Abnormal Asset Turnover			Panel F: Both Components		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.236***	0.263***	0.584**	0.175***	0.216***	0.418**	0.224***	0.283***	0.525***
	(0.073)	(0.086)	(0.190)	(0.052)	(0.057)	(0.104)	(0.072)	(0.087)	(0.169)
β_1	-0.271***	-0.399***	-0.775***	-0.271***	-0.400***	-0.774***	-0.271***	-0.399***	-0.775***
	(0.052)	(0.067)	(0.193)	(0.052)	(0.068)	(0.193)	(0.052)	(0.067)	(0.193)
β_2	-0.074**	-0.075*	-0.184*				-0.065*	-0.089*	-0.144
	(0.036)	(0.048)	(0.131)				(0.040)	(0.056)	(0.120)
β_3				-0.050*	-0.019	-0.151	0.016	-0.027	0.079
				(0.035)	(0.04)	(0.127)	(0.039)	(0.054)	(0.113)
F-test							9.111***	12.108***	6.996***
Adj.R^2	11.4%	15.5%	19.1%	10.9%	14.8%	18.6%	11.2%	15.3%	18.7%

Robust Standard Errors are presented in parenthesis. Significance levels indicated as *** p<0.01, ** p<0.05, * p<0.1

Table A6:

Panel A: Abnormal Profitability Measures Predicting Future Changes in RNOA

	Model 1			Model 2			Model 3		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.152***	0.128***	0.222**	0.040	-0.039	-0.013	0.028	-0.001	0.025
	(0.044)	(0.041)	(0.074	(0.040)	(0.046)	(0.056)	(0.035)	(0.038)	(0.039)
β_1	-0.213***	-0.258***	-0.405**	0.003	0.060*	0.069	0.031	-0.009	-0.005
	(0.051)	(0.050)	(0.124)	(0.034)	(0.038)	(0.066)	(0.033)	(0.040)	(0.082)
β_1*	-0.106	-0.261**	-0.698**	-0.163**	-0.285***	-0.513**	0.044	0.062	0.410*
	(0.102)	(0.129)	(0.362)	(0.076)	(0.102)	(0.282)	(0.079)	(0.045)	(0.344)
β_2	0.094*	0.191**	0.539**	0.128**	0.214***	0.433**	0.025	0.042	-0.016
	(0.072)	(0.091)	(0.270)	(0.060)	(0.082)	(0.236)	(0.028)	(0.045)	(0.108)
Adj.R^2	11.0%	16.7%	23.3%	4.8%	5.4%	4.5%	3.4%	2.5%	3.0%

Robust Standard Errors are presented in parenthesis. Significance levels indicated as *** p<0.01, ** p<0.05, * p<0.1

	Panel B: Abnormal Profit Margin and Interaction Term			**Panel C: Abnormal Asset Turnover and Interaction Term**			**Panel D: Both Components and respective Interaction Terms**		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.176***	0.121***	0.229***	0.139***	0.137***	0.228**	0.176**	0.143**	0.253**
	(0.057)	(0.049)	(0.093)	(0.044)	(0.044)	(0.078)	(0.077)	(0.072)	(0.116)
β_1	-0.225***	-0.256***	-0.408***	-0.211***	-0.259***	-0.405***	-0.225***	-0.262***	-0.414***
	(0.057)	(0.048)	(0.129)	(0.051)	(0.050)	(0.126)	(0.061)	(0.051)	(0.132)
β_2	-0.039	0.007	-0.010				-0.039	-0.008	-0.026
	(0.037)	(0.035)	(0.064)				(0.051)	(0.051)	(0.079)
β_3				0.024	-0.017	-0.012	0.000	-0.022	-0.026
				(0.031)	(0.037)	(0.074)	(0.044)	(0.053)	(0.091)
β_1*	-0.067	-0.229**	-0.635**	-0.111*	-0.263**	-0.707**	-0.076	-0.227**	-0.682**
	(0.098)	(0.116)	(0.336)	(0.103)	(0.132)	(0.364)	(0.106)	(0.125)	(0.360)
β_2^*	-0.060	-0.124*	-0.206				-0.037	-0.097	-0.030
	(0.069)	(0.084)	(0.227)				(0.081)	(0.099)	(0.204)
β_3^*				0.063	0.089	0.442*	0.055	0.049	0.430*
				(0.078)	(0.104)	(0.321)	(0.089)	(0.120)	(0.316)
β_4	0.104	0.237**	0.604**	0.065	0.148**	-0.332**	0.070	0.199**	0.328*
	(0.092)	(0.110)	(0.321)	(0.057)	(0.078)	(0.194)	(0.096)	(0.117)	(0.250)
F-test							5.966***	8.053***	3.182***
Adj.R^2	11.5%	17.0%	23.1%	11.3%	16.5%	25.4%	11.3%	16.6%	24.4%

Robust Standard Errors are presented in parenthesis. Significance levels indicated as *** p<0.01, ** p<0.05, * p<0.1

Table A7:

	Panel A: Persistance of Abnormal and Industry Profitability measures			**Panel B: Persistance of Abnormal Profitability Measures**	
	Model 1	Model 2	Model 3	Model 2	Model 3
α	0.016	-0.325***	0.255*	-0.173**	0.208**
β_1	0.444***	0.415***	0.881***	0.427***	0.880***
β_2	0.807***	3.741***	0.981***		
F-test	70.510***	26.112***	574.059***		
Adj.R^2	38.7%	18.6%	83.9%	16.9%	82.3%

Robust Standard Errors are presented in parenthesis. Significance levels indicated as *** p<0.01, ** p<0.05, * p<0.1

Table A8:1

Panel C: Abnormal Profitability Measures Predicting Future Changes in RNOA

	Model 1			Model 2			Model 3		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.218***	0.252***	0.539***	0.088**	0.052	0.183**	0.041	0.018	0.027
β_1	-0.339***	-0.499***	-0.956***	-0.057	-0.063	-0.188	0.062*	0.024	0.206
Adj.R^2	11.5%	16.4%	19.6%	3.0%	2.1%	0.1%	3.1%	1.9%	0.2%

	Panel D: Abnormal Profit Margin			**Panel E: Abnormal Asset Turnover**			**Panel F: Both Components**		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.241***	0.277***	0.614***	0.193***	0.242***	0.457***	0.214***	0.287***	0.525***
β_1	-0.339***	-0.499***	-0.956***	-0.339***	-0.499***	-0.956***	-0.339***	-0.499***	-0.956***
β_2	-0.057	-0.063	-0.188				-0.033*	-0.072	-0.117
β_3				0.062*	0.024	0.206	0.043	-0.017	0.150
F-test							13.022***	17.021***	6.996***
Adj.R^2	11.6%	16.4%	19.8%	11.7%	16.2%	20.0%	11.6%	16.2%	19.6%

Table A8:2

Panel A: Abnormal Profitability Measures Predicting Future Changes in RNOA

	Model 1			Model 2			Model 3		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.163***	0.147***	0.241**	0.046	-0.035	-0.037	0.020	0.000	0.037
β_1	-0.260***	-0.331***	-0.490**	-0.009	0.062	0.138	0.059	-0.015	-0.038
β_1*	-0.145*	-0.308***	-0.918*	-0.101	-0.263**	-0.610**	0.004	0.079	0.594**
β_2	0.108**	0.203***	0.609***	0.087**	0.177***	0.418**	0.045	0.041	-0.045
Adj.R^2	12,0%	18.1%	25.7%	3.4%	3.6%	2.8%	3.2%	2.4%	3.2%

	Panel B: Abnormal Profit Margin and Interaction Term			**Panel C: Abnormal Asset Turnover and Interaction Term**			**Panel D: Both Components and respective Interaction Terms**		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	0.198***	0.153**	0.255*	0.140***	0.154***	0.259**	0.183**	0.192**	0.320
β_1	-0.277***	-0.334***	-0.498**	-0.259***	-0.331***	-0.490**	-0.273***	-0.343***	-0.518**
β_2	-0.068	-0.012	-0.024				-0.053	-0.047	-0.078
β_3				0.056	-0.016	-0.043	0.020	-0.048	-0.082
β_1*	-0.125*	-0.294***	-0.920***	-0.147*	-0.308***	-0.925***	-0.138*	-0.292***	-1.024***
β_2^*	0.053	-0.033	0.056				0.076	0.032	0.445
β_3^*				0.015	0.086	0.623**	0.062	0.111	0.828**
β_4	0.078	0.210***	0.588***	0.103**	0.169**	0.367**	0.050	0.139	0.165
F-test							8.347***	10.719***	8.590***
Adj.R^2	11.9%	17.8%	24.6%	12.0%	17.8%	27.9%	11.8%	17.5%	27.9%

Table A9:1

Panel C: Abnormal Profitability Measures Predicting Future Changes in RNOA

	Model 1			Model 2			Model 3		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	-0.013	-0.010	0.089	-0.040	-0.047	0.064	-0.024	-0.002	0.104
β_1	-0.573***	-0.514***	-0.510***	-0.004	-0.059	-0.016	-0.015	-0.030*	-0.037
Adj.R^2	29.3%	27.7%	24.8%	1.2%	1.4%	0.0%	1.5%	1.9%	1.1%

	Panel D: Abnormal Profit Margin			**Panel E: Abnormal Asset Turnover**			**Panel F: Both Components**		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	-0.005	-0.017	0.089	-0.024	-0.004	0.117*	-0.015	-0.012	0.118
β_1	-0.580***	-0.509**	-0.514	-0.583***	-0.507**	-0.508	-0.585***	-0.503*	-0.508
β_2	0.033	-0.030	-0.001				0.032	-0.029	0.003
β_3				0.011	-0.006	-0.027	0.010	-0.005	-0.028
F-test							5.385***	12.921***	15.516***
Adj.R^2	29.5%	27.9%	24.2%	29.4%	27.6%	25.2%	29.5%	27.7%	24.6%

Table A9:2

Panel A: Abnormal Profitability Measures Predicting Future Changes in RNOA

	Model 1			Model 2			Model 3		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	-0.035	-0.037	0.014	-0.060	-0.058	-0.007	-0.038	-0.020	0.052
β_1	-0.531***	-0.576**	-0.852*	-0.918*	-0.728*	-1.212	-0.018	-0.033**	-0.051*
β_1*	-0.046	0.065	0.359	0.918*	0.671	1.206	0.007	0.007	0.040
β_2	0.046	0.062	0.170	0.041	0.023	0.149	0.031	0.038	0.105
Adj.R^2	29.1%	27.6%	24.9%	1.5%	1.3%	0.0%	1.2%	1.5%	0.5%

	Panel B: Abnormal Profit Margin and Interaction Term			**Panel C: Abnormal Asset Turnover and Interaction Term**			**Panel D: Both Components and respective Interaction Terms**		
Dependent Variable	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$	$\Delta RNOA_{t+1}$	$\Delta RNOA_{t+2}$	$\Delta RNOA_{t+4}$
α	-0.032	-0.036	0.015	-0.036	-0.026	0.019	-0.035	-0.027	0.019
β_1	-0.539***	-0.650***	-0.873**	-0.542***	-0.481***	-0.795**	-0.584**	-0.489*	-0.792
β_2	0.034	0.322	0.119				0.127	0.023	-0.008
β_3				0.002	-0.013	-0.006	0.004	-0.013	-0.006
β_1*	-0.045	0.144	0.379	-0.045	-0.031	0.293	-0.009	-0.019	0.289
β_2^*	0.003	-0.350	-0.112				-0.094	-0.052	0.021
β_3^*				0.019	0.017	-0.031	0.015	0.018	-0.032
β_4	0.060	0.047	0.173	0.027	0.047	0.203	0.043	0.033	0.211
F-test							23.747***	18.188***	6.951***
Adj.R^2	29.2%	27.5%	23.8%	29.2%	27.4%	24.4%	29.2%	27.2%	23.3%

Table A10:

Breusch-Pagan Test		N	Residual Sum of Squares	RSS*	BP-value
Hypothesis 1a	Panel A	552	33.653	1565.562	782.781
		552	7.458	1870.075	935.0375
		552	488.682	266.045	133.023
Hypothesis 1b	Panel B	552	33.050	1425.527	712.764
		552	7.444	1519.212	759.606
		552	485.864	410.870	205.435
Hypothesis 2	Model 1	552	54.264	465.873	232.937
		414	50.347	335.892	167.946
		138	42.451	181.647	90.824
	Model 2	552	58.542	172.755	86.378
		414	57.738	109.057	54.529
		138	51.469	121.906	60.953
	Model 3	552	58.814	138.603	69.302
		414	58.106	29.114	14.557
		138	51.704	93.587	46.794
Hypothesis 3	Model 1	552	53.749	589.379	294.690
		414	49.942	410.870	205.435
		138	41.650	212.984	106.492
	Model 2	552	54.029	569.067	284.534
		414	50.321	356.036	178.018
		138	41.911	212.414	106.207
	Model 3	552	53.731	609.736	304.868
		414	51.435	393.291	196.646
		138	41.537	221.982	110.991

Table A11:

			Test of Variance Inflation Factor (VIF)						
Variable	RRNOA	$RNOA_t^{AB}$	$RNOA_t^{IND}$	RPM	PM_t^{AB}	PM_t^{IND}	RATO	ATO_t^{AB}	ATO_t^{IND}
Tolerance	1.000	0.995	0.944	1.000	0.999	0.999	1.000	0.982	0.952
VIF	1.000	1.005	1.060	1.000	1.001	1.001	1.000	1.019	1.051

Test results for the RRNOA; RPM, and RATO measures are identical as ranked variables do not fluctuate in variance

Table A12:

Durbin-Watson Test

	H_{1A}			H_{1B}			H_2									H_3								
	Panel A			Panel B			Model 1			Model 2			Model 3			Model 1			Model 2			Model 3		
N	552	552	552	552	552	552	552	414	138	552	414	138	552	414	138	552	414	138	552	414	138	552	414	138
Value	1.903	1.856	2.041	1.904	1.874	2.077	1.897	1.980	1.972	1.918	2.012	1.940	1.919	2.008	1.971	1.909	1.993	1.992	1.908	1.984	2.015	2.013	1.911	1.988