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DETERMINANTS OF PROFITABILITY: EVIDENCE FROM MANUFACTURING COMPANIES IN FINLAND AND SWEDEN

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ABSTRACT

This study examines different determinants of profitability within the largest companies from the industry of manufacture of machinery and equipment in Finland and Sweden. Company financial data is used for 20 largest companies, ten from each country, during the time period of eight years from 2011 to 2018. Overall, 147 data observations are made. The relationship between company profitability, measured as return on assets (ROA), and six independent company-specific factors are investigated. The six independent factors are: company size, growth, liquidity, capital intensity, debt ratio and debt to equity ratio. In addition, a dummy variable for Finnish companies is used in order to see how the average profitability levels between Finnish and Swedish companies differ from each other. Moreover, year dummy variables are used to compare the company profitability levels during studied years (2011-2018) to the base year 2011. The results of a multiple regression analysis show that company size and growth have a positive and significant relationship with profitability. Liquidity is found to have a positive and insignificant relationship with profitability. On the other hand, capital intensity, debt ratio and debt to equity ratio are found to have a negative and statistically significant impact on company profitability.

Keywords: Profitability determinants, Finland, Sweden, Manufacturing

INTRODUCTION

Profitability is one of the, if not the most, important elements and concerns of a company. The term ’profitability’ refers to the ability of a company to make profit from revenues after deducting all costs and expenses incurred during a certain period of time. Profitability is considered one of the most important objectives that a company’s management tries to achieve and the main pillar for any company to survive in the long run (Al-Jafari, Samman 2015) and (Alarussi, Alhaderi 2018). While profitability and performance might be one of the most important objectives for most companies, it is also important to examine different factors that might have an impact on it, and more specifically, what is the type of impact. Therefore, this paper attempts to examine and explain the impact of some chosen company-specific factors on company profitability.

The subject of the determinants of profitability within the manufacturing industry and companies belonging to it has been studied quite a lot previously. Additionally, profitability determinants from other industries, such as financial and banking sector, have also been studied quite widely. However, there seems to be a lack of studies focusing on profitability determinants among Nordic manufacturing companies, and therefore, this paper attempts to fill that gap. This paper focuses on six different factors and their relationship with the profitability of the largest Finnish and Swedish companies from the industry of manufacture of machinery and equipment. In previous studies, determinants of company profitability have been investigated using company-specific, industry-specific and/or macroeconomic factors. This study focuses only on company-specific factors.

The research problem of this study arises from the above mentioned statements, stating that there exists a lack of profitability determinants studies conducted on this specific industry and countries. In addition, the research questions that are attempted to be answered in this study are as follows: ”What type of impact do the chosen company-specific factors have with company profitability?” and ”How do the Finnish and Swedish companies differ from each other in terms of their profitability?”.

Manufacturing industry, and more specifically, the industry of manufacture of machinery and equipment, plays a vital role in both Finland and Sweden. It is an export-driven industry in both of these fairly small countries on a global scale. The importance of the largest Finnish and Swedish companies in this industry is significant in terms of their contribution to their economies. To demonstrate that, Finland exports nearly 50 percent of its manufacturing output, and among the top 3 key manufacturing industries in Finland is machinery and equipment. Additionally, in Sweden, nearly 60 percent of its manufacturing output is exported, while manufacture of machinery and equipment also belongs to their top 3 biggest manufacturing industries. Around one third of the GDP of both of these countries comes from the manufacturing exports (Alsen et al. 2013). That being said, for countries like Finland and Sweden, where export-driven manufacturing industry, including its largest companies, plays a big role in terms of their economies, it is important to examine the impact of different factors on the profitability of these companies.

This study uses the 20 largest companies in the industry of manufacture of machinery and equipment from Finland and Sweden and investigates how certain company-specific factors might affect the profitability of these companies. The independent investigated factors are: company size, growth, liquidity, capital intensity, debt ratio and debt to equity ratio. In addition, the difference between the profitability levels of Finnish and Swedish companies is examined with a dummy variable. The differences between the average profitability levels between the studied years are also examined with a use of year dummy variables. Only the 20 largest companies, ten from each country, are used in this study because: 1) the largest companies have the largest contribution to both of the studied countries' economies and therefore play a vital role in these countries and 2) since the largest companies dominate the industry of manufacture of machinery and equipment in both Finland and Sweden, the author was not able to find enough sufficient financial data on the smaller companies within the industry in question.

The main aim of this study is to examine the impact of the six chosen variables: 1) company size, 2) growth, 3) liquidity, 4) capital intensity, 5) debt ratio and 6) debt to equity ratio on company profitability among the largest companies in Finland and Sweden in the industry of manufacture of machinery and equipment. It also aims to examine how much of the variation in profitability the chosen independent variables can explain. While different factors affecting profitability could be found inside or outside of a company, such as internal and external factors, this study focuses

on company-specific factors when it comes to examining different determinants of profitability. Moreover, this study aims to explain what type of relationship, whether positive or negative, or significant or insignificant, each of the above mentioned individual variables have with company profitability within the studied companies. In addition, this study aims to compare the two studied countries, Finland and Sweden, within the industry in question, and how they might differ from each other in terms of their profitability.

There exists a large amount of previous studies that have investigated different determinants of company profitability. However, this paper examines a specific industry, manufacture of machinery and equipment, which stands out from a relatively widely studied industry of manufacturing companies in general. Moreover, this study focuses on manufacture of machinery and equipment companies from Nordic countries Finland and Sweden. That being said, there exists a relatively low number of determinants of profitability studies including Finland and Sweden, and if the countries in question have been included, those studies have focused on different industry, which makes the results and findings somewhat irrelevant to this specific topic.

Moreover, what contributes to the significance of this study, is the fact that this study focuses on the industry of manufacture of machinery and equipment and its largest companies from Finland and Sweden. This industry, and therefore its largest companies, play a vital role in both countries in terms of their countribution to their economies and the share of their GDP's. In addition, the manufacture of machinery and equipment sector is among the three largest manufacturing sectors in both Finland and Sweden. Since this is an economically significant industry in the studied countries, plus the non-existence of previous related studies, it seems important to investigate the profitability determinants of the largest companies in these countries within this industry.

1. LITERATURE REVIEW AND SELECTED VARIABLES

1.1. Review of previous literature

There have been quite many previous studies and papers that, similar to this, focus on investigating the determinants of company profitability. However, none of the existing literature focuses specifically on companies from Scandinavian manufacturing industry, or more specifically, on the industry of manufacture of machinery and equipment companies. In this section, the author goes over some previous literature that have investigated different factors that might have an impact of some type on company profitability.

1.1.1. Size

Asimakopoulos, Samitas and Papadogonas (2009) studied company-specific and economy wide determinants of profitability of companies from Greek. Their study focused on listed non-financial companies during the years 1995 to 2003. Panel data estimation techniques, including panel OLS and fixed effects methods, were used to examine the impact of the independent variables on the dependent variable. In their study, return on assets (ROA), was used as the dependent variable to measure profitability. In addition, size (natural logarithm of sales), leverage, growth, investment, current assets and the possible European monetary union and euro effects acted as the independent variables. The results of their study showed that company size, growth in sales, and investment had a positive impact on profitability. On the other hand, leverage and current assets were found to have a negative effect on profitability. Moreover, it was concluded that the European monetary union participation and the adoption of the euro had a negative impact on company profitability.

Yazdanfar (2013) investigated factors that affect company profitability among non-financial micro firms from four industry sectors in Sweden. The seemingly unrelated regression method was used for a sample of 12,530 firms during the years 2006 and 2007. Among different profitability

determinants in the study, firm specific as well as industry specific factors were considered. The findings of the study indicated that company size, growth, lagged profitability and productivity had a positive impact on profitability while company age and industry affiliation had a negative impact on firm profitability. In addition, the results suggested that productivity is the most significant factor regarding the profitability of the studied companies.

1.1.2. Growth

Al-Jafari and Al Samman (2015) investigated the determinants of profitability within industrial companies in Oman. They used a sample of 17 industrial companies listed on Muscat securities market over a time period of eight years from 2006 to 2013. To examine the profitability determinants in their study, two different dependent variables, to measure profitability, were used; profit margin and return on assets. In addition, six different independent variables were used being: average tax rate, size, growth, fixed assets ratio, leverage and working capital. The results from multiple linear regression model in their study revealed that company size, growth, fixed assets ratio and working capital had a statistically significant and positive relationship with profitability. On the other hand, the average tax rate and leverage turned out to have a negative impact on profitability. Moreover, the negative impact on profitability was only significant with the leverage variable. Their study concludes that large growing companies with well managed assets improve their revenue and ultimately increase profitability.

Hama and Santosa (2018) studied whether working capital, company size and company growth had an impact on company profitability. They studied and collected data on 129 manufacturing companies listed on Indonesian stocks exchange during the years from 2012 to 2016. In their study, it was concluded that all 3 of the above mentioned independent factors, working capital, company size and company growth, had a significant and positive impact on profitability of the studied manufacturing companies listed on the Indonesian stock exchange.

1.1.3. Liquidity

Goddard, Tavakoli and Wilson (2006) examined different determinants of profitability of companies from manufacturing and service sector. Their study included companies from Belgium, France, Italy and the UK during a nine-year period from 1993 to 2001. To examine the relationship between the chosen independent factors and company profitability, dynamic panel estimation model was used. Return on assets (ROA), was used as the dependent variable to measure profitability. In addition, company size, market share, leverage (gearing) and liquidity were used to represent the independent variables whose impact on profitability was studied. The results of their study showed that liquidity and market share had a positive relationship with company profitability, while on the other hand, it was concluded that company size and leverage had a negative relationship with profitability. Additionally, it was concluded that despite the fact the the EU's single market for goods and services was created, abnormal profit still seems to exist significantly year after year.

Besong (2017) studied the determinants of profitability of Japanese companies operating in the manufacture of automobile and parts industry over an 11-year period from 2005 to 2015. In his study, company size, growth, liquidity, current assets, long term debt, GDP growth and inflation rate were used as independent factors whose relationship with company profitability, measured as return on assets (ROA), were examined. In his study, panel data analysis was used and moreover, fixed and random effect methods were utilized to examine the relationship between the dependent and independent variables. The results of his study showed that company size, sales growth, liquidity and GDP growth had a positive and statistically significant relationship with profitability. On the other hand, it was concluded that current assets and long-term debt had a negative and statistically significant impact on profitability.

1.1.4. Capital intensity

Shimeles (2019) examined profitability determinants among Ethiopian manufacturing companies. Company data was used from 17 different Ethiopian companies over a time period of five years from 2013 to 2017. He used return on assets (ROA) as the dependent variable to measure company profitability. Additionally, eight different independent variables including firm-specific factors as well as external factors were used in his study. The results of the study showed that liquidity, interest rate, managerial efficiency, growth and capital intensity had a significant impact on profitability whereas company size, leverage and inflation rate had an insignificant impact on

profitability. Moreover, liquidity, leverage and managerial efficiency were found to have a positive relationship with profitability while size, growth, interest rate, inflation rate and capital intensity showed a negative impact on profitability.

1.1.5. Debt ratio

Nunes, Serrasqueiro and Sequeira (2009) studied the determinants of profitability among Portuguese service industries. The selected companies were chosen from among the 500 biggest Portuguese companies considering the volume of their sales. The final sample totaled up to 375 companies covering the years from 1999 to 2003. To estimate the findings of the relationship between profitability of Portuguese service industries and the factors affecting it, the researchers used static panel models and dynamic estimators. In their study, profitability acted as the dependent variable while company size, growth, leverage, liquidity and tangibility were used as the independent variables. In addition, profitability between previous and current periods was examined. The results of their study showed that profitability is persistent over time. It was also concluded that company size and growth had a positive relationship with profitability. However, the impact of leverage (debt ratio) and tangibility on profitability was found to be negative. In addition, it was stated that there was no statistically significant relationship between liquidity and profitability. In their study, it was concluded that larger companies with greater growth, lower level of debt and lower level of fixed assets tend to be more profitable.

Usman, Shaikh and Khan (2017) investigated the impact of working capital management on company profitability in Scandinavian countries (Denmark, Norway, Sweden) from 2003 to 2015. In the study, an ordinary least squares regression analysis was conducted. They used receivable days, inventory days, payable days, cash conversion cycle, current ratio and working capital as a measurement of working capital management. They measured a company's profitability as return on assets (ROA). In addition, they also used five control variables: firm size, age, leverage, GDP growth and financial crisis. The study showed that inventory days, receivable days, payable days and cash conversion cycle have a negative impact on firm profitability. However, working capital and current ratio were found to have a positive impact on profitability. For the control variables, firm age and size were found to have a positive and statistically significant impact on profitability while leverage had a negative impact on it. Additionally, a positive relationship between GDP

growth and profitability was found whereas no significant relationship between financial crises and firm profitability was found.

1.1.6. Debt to equity ratio

Nanda and Panda (2018) investigated the determinants of profitability in Indian manufacturing companies. They classified the determinants into two categories: firm-specific factors and macroeconomic factors and collected data from years 2000 to 2015. In their study, panel generalized least square and panel vector auto-regression models were used. Return on assets and net profit margin were used as dependent variables to measure profitability and multiple firm-specific and macroeconomic factors were used as independent variables to describe the determinants of profitability. The results revealed that firm size and liquidity have a positive and significant impact on profitability while financial leverage has a negative and significant impact on profitability. The results also show that in the short run, changes in exchange rate do not increase the profitability, but in the long run, changes in exchange rate have a positive impact on it. They also concluded that with return on assets (ROA) as a measurement of profitability, the firm-specific factors are more important than the macroeconomic factors in determining the company profitability, whereas with net profit margin (NPM) acting as an indicator for profitability, both firm-specific and macroeconomic factors play an important role in terms of company profitability.

Alarussi and Alhaderi (2018) investigated the determinants of profitability among listed companies in Malaysia. Data from 120 non-financial companies listed on Bursa Malaysia were used during the years from 2012 to 2014. In their study, five independent variables including company size, working capital, efficiency, liquidity and leverage (as debt ratio and D/E ratio) were used. As their dependent variables, measuring company profitability, they used return on equity and earnings per share. Pooled ordinary least squares regression and fixed effects were used to analyse the data in the study. The results of their study showed that company size, working capital and company efficiency had a strong positive relationship with profitability. On the other hand, the results revealed that there was a negative relationship between profitability and both the debt ratio and debt to equity ratio which measured leverage. In addition, liquidity, which was measured as current ratio, was found to have no significant relationship with company profitability.

1.2. Overview of selected variables and hypotheses

This study uses six different company-specific factors as independent variables to investigate what is the nature of relationship that each independent variable has with company profitability. The company profitability is measured as return on assets (ROA), which acts as the dependent variable in this study. Return on assets indicates how much profit companies are able to generate from their assets. Based on previous studies conducted on topics similar to this, return on assets (ROA) is one of the most commonly used profitability measures used by researchers, and for that reason, it is used in this study. Many researchers have suggested that one of the key indicators and measurement tools of a company's profitability is return on assets (ROA), measured as net income divided by total assets (Goddard 2005) and (Shimeles 2019). On top of return on assets, the dependent variable, six different independent variables are also used in this study. The six independent factors and their expected impact on profitability are discussed in this chapter individually.

Table 1 below displays each variable used in this study and their measurement. In addition, each independent variable's expected impact on the dependent variable, profitability, is displayed.

Table 1. Summary of selected variables and their expected impact on profitability

Variable	Measurement	Expected impact on profitability
Dependent:		
ROA (profitability)	Net income/total assets	…
Independent:		
Size	Natural logarithm of sales	+
Growth	% Change in total assets	-
Liquidity (current ratio)	Current assets/current liabilities	+
Capital intensity	Total assets/sales revenue	+
Debt ratio	Total liabilities/total assets	-
Debt to equity ratio	Total liabilities/total equity	-
Dummy variable for Finnish companies	Average profitability level compared to Sweden	…

The first independent variable is the company size. In this paper, natural logarithm of sales of a company is used to measure its size. Company size is viewed as the most important factor

regarding profitability and is expected to have a significant and positive impact on firm performance (Besong 2017). The company size is an important and fundamental firm characteristic that often affects the empirical results in corporate finance research. The reason for choosing log of sales over log of assets to represent a company's size, is that some firm size measures are more relevant than others in specific areas. For example, total assets is not so relevant size measure when firm performance, such as profitability, is studied (Dang et al. 2018). Company size is very important in modern world due to economies of scale as larger companies can produce products with much lower costs compared to smaller companies (Ali 2019) and (Yazdanfar 2013). In line with the fact that the average costs are lower for larger companies compared to smaller ones, due to economies of scale, the author in this study expects there to be a positive and significant relationship between company size and profitability. Based on what is stated above, it seems important to investigate the impact of the company size on company profitability.

H1: Size of a company has a statistically significant and positive impact on profitability.

The second independent variable is the growth of a company. Company growth is measured in terms of percentage change, positive or negative, in a company's total assets for each studied year compared to the previous year. In previous studies that have investigated determinants of company profitability similar to this study, it has been stated by researchers that company growth could have either a positive or negative significant relationship with profitability. Previously, the results in terms of company growth have showed that there is a significant and negative relationship between company growth and profitability (Shimeles 2019). While on the other hand, the results of regression analysis have implied there to be a positive and statistically significant relationship between profitability and company growth (Al-Jafari, Al Samman 2015). For that reason, it seems appropriate to investigate the impact of company growth on profitability within the largest Finnish and Swedish machinery and equipment manufacturing companies. In this study, company growth is measured with a company's total assets, and total assets acts as the denominator in the ROA formula, which measures profitability. This fact indicates that the value of ROA ratio decreases as the value of total assets, the denominator, increases. For that reason, the author expects there to be a negative relationship between company growth and profitability.

H2: Growth of a company has a statistically significant and negative impact on profitability.

The third independent variable is liquidity. In this study, a company's current ratio is used to measure its liquidity ratio. Current ratio is calculated by dividing a company's current assets by its current liabilities. Liquidity ratios, such as current ratio, measure a company's ability to pay off its

debt obligations without raising external capital (Investopedia). Effective management of a company's liquidity is relevant for its profitability and well-being (Ali 2019). In addition, appropriate liquidity levels are important for companies in order to gain market share and carry out their operations (Besong 2017). Current ratio is calculated by dividing a company's current assets by its current liabilities. Besong (2017) and Charumathi (2012) concluded that company liquidity measured as current ratio has a positive and statistically significant impact on profitability, while Alarussi et al. (2018) and Nunes et al. (2009) did not find a statistically significant relationship between current ratio and profitability. Moreover, Goddard et al. (2006) found a positive relationship between liquidity and profitability and stated that companies with higher liquidity tend to be more profitable. They explained this argument by concluding that companies that stay liquid can adapt to changing circumstances faster, which puts them in a stronger position to remain profitable. According to related literature and previous studies conducted with similar objectives, the author in this study expects that liquidity, as current ratio, has a positive and significant impact on company profitability.

H3: Liquidity (current ratio) has a statistically significant and positive impact on profitability.

Capital intensity ratio is the fourth independent variable used in this study. Capital intensity considers the amount money that is invested by companies, into things like fixed assets, to produce goods and services, and to eventually generate a certain amount of sales with regards to the amount of assets that it takes (Shimeles 2019). Capital intensity ratio indicates how many assets are needed to generate one dollar worth of sales. It is calculated by dividing total assets by sales revenue, and acts as the inverse of the asset turnover ratio. Both capital intensity and asset turnover ratio are measures of how efficiently a company uses its assets to generate revenue (Investopedia). As an example, if capital intensity was to be 0.85, then it could be concluded that 0.85 assets are needed to produce a dollar of sales. Therefore, since this is a study that focuses on the concept of profitability, which is closely related to company performance and efficiency, it seems important to investigate the impact of capital intensity on company profitability. Lee and Xiao (2011) and Shimeles (2019) stated that capital intensity can help a company to be financially efficient because its fixed assets, that are already expensed, can have a significant contribution to its production and operations. In addition, Goddard et al. (2005) stated that companies tend to be more profitable in capital intensive industries, such as manufacture of machinery and equipment, where large investments are needed. Therefore, the author in this study expects that capital intensity has a positive and significant relationship with company profitability.

H4: Capital intensity has a statistically significant and positive impact on profitability

The fifth independent variable in this study is a company's debt ratio. The debt ratio is one measurement tool of a company's leverage. The debt ratio shows the extent to which the total assets of a company is financed with debt as a percentage. Debt ratio can be looked at as an indicator that describes the financial health of a company (Alarussi, Alhaderi 2018). Debt ratio is calculated by dividing a company's total liabilities by its total assets. According to previous studies, it has been concluded that leverage has a negative and statistically significant relationship with company profitability (Charumathi 2012) and (Alarussi, Alhaderi 2018). Whereas, on the other hand, the impact of the debt ratio on company profitability was found to be statistically insignificant and positive (Shimeles, 2019). Based on the fact that there is no certain presumption on the impact of debt ratio on profitability, the nature of relationship between the two variables is examined in this study. It was stated by Alarussi and Alhaderi (2018) that companies that use large borrowings face higher financial risks compared to companies that use lower amounts of debt. They also stated that financing investments where retained profits are used are more profitable compared to using borrowings. Therefore, since using higher levels of debt could be bad for profitability, the author in this study believes there to be a negative relationship between debt ratio and profitability.

H5: Debt ratio has a statistically significant and negative impact on profitability.

Debt to equity ratio is the sixth and last independent variable used in this paper. Debt to equity ratio is also used to measure the leverage of a company in this study. It is calculated by dividing a company's total liabilities by its total equity. Companies that use large borrowings face higher risks whereas those using more equity tend to operate more conservatively by relying on internal funds (Alarussi, Alhaderi 2018). According to their findings, Nanda and Panda (2018) and Alarussi and Alhaderi (2018) stated that leverage, which was measured using debt to equity ratio, had a negative impact on company profitability. Additionally, Al-Jafari and Samman (2015) concluded there to be a negative and statistically significant relationship between company profitability (ROA) and debt to equity ratio. However, Sangeetha and Sivathaasan (2013) found a positive and statistically significant relationship between leverage, as debt to equity ratio, and profitability and stated that more profitable companies tend to use relatively high debt in their capital structure. Based on previous literature and findings, there is more empirical evidence suggesting that leverage, as debt to equity ratio, has a negative impact on company profitability. However, there is also evidence that it can affect profitability positively. Therefore, the relationship between debt

to equity ratio and company profitability is examined in this study. In line with what Asimakopoulos et al. (2009) stated, that leverage could affect profitability negatively since higher levels of debt takes company resources in order to pay back the debt and therefore reducing the available capital for investments, the author in this paper expects there to be a negative relationship between profitability and debt to equity ratio.

H6: Debt to equity ratio has a statistically significant and negative impact on profitability.

In addition to the six independent variables discussed above, one dummy variable is used in this paper. The dummy variable refers to Finland and it reflects all studied companies from Finland. Sweden does not have its own dummy variable because it acts as the base country. The purpose of the dummy variable for Finland and the base country Sweden is to examine how the average profitability level between these two studied countries differ from each other. At this stage, the author does not have any expected assumptions on the differences between the profitability levels of Finnish and Swedish companies.

2. METHODOLOGY AND DATA

2.1. Regression

Regression is a tool used in statistics to determine what type of relationship different variables have with each other. In regression, the relationship of the dependent variable is studied with one or more independent variables to find out what type of relationship exists between them. If the regression function is linear in terms of the parameters, it is a linear regression model. Otherwise, it is a non-linear model. In this study, the linear regression model is used. Linear regression models with one independent variable are referred to as simple linear models, whereas linear models with more than one independent variable are called multiple linear models (Orlov 1996). This study uses more than one independent variable. A regression model is employed to investigate the causal effect of the independent variables on the dependent variable. Regression analysis is the statistical tool for estimating such relationship (Yan, Su 2009).

In this study, a regression analysis is conducted in order to examine and explain the relationship between the chosen variables. The chosen variables include one dependent variable whose relationship with six different independent variables is investigated. The dependent variable, which is return on assets, measures company profitability in this study. The six independent variables whose nature of relationship with profitability is studied are: size, growth, liquidity, capital intensity, debt ratio and debt to equity ratio. In addition, one dummy variable, which is used to compare the profitability levels between the studied countries, is used. The general form of the ordinary least squares regression model for pooled panel data, which is employed in this study, is as follows:

$$y_{it} = \beta_0 + \beta_n X_{itn} + T_t + \epsilon_{it} \quad (1)$$

where

y_{it} – Dependent variable

β_0 – Intercept

β_n – Coefficient for each X variable

i – Company

t – Year index

n – Number for each control variable

X – Set of n control variables

T – Set of year dummy variables

ϵ_{it} – Error term

In order to examine the type of impact the independent variables have on the dependent variable in this study, four different values in the regression summary output are looked at; significance F, coefficients, P-values and R squared. Significance F indicates whether the regression model is statistically significant or not. With the confidence level of 95%, which is commonly used in a regression, the significance F value should be less than 0.05 in order for the regression model to be statistically significant. In the case of a significance F value less than 0.05, the null hypothesis can be rejected.

The variable coefficients show the type of impact of the independent variables on the dependent one, whether it is positive, negative or no relationship. The coefficient values of variables that are positive show that there exists a positive relationship between the dependent and independent variables, whereas a negative coefficient value indicates that there is a negative relationship between the dependent and independent variable. A change in the value of an independent variable with a positive coefficient in one direction results in a change in the value of the dependent variable in that same direction. In case of a negative coefficient value, a change in the value of an independent variable in one direction results in a change in the value of the dependent variable in the opposite direction (Taylor 1990).

The P-values of the independent variables show whether the relationship between them and the dependent variable is statistically significant. When investigating the relationship between the dependent and independent variables, a good P-value, or strong statistical significance, supports the results that they are reliable and not caused by a chance. P-values of independent variables that are lower than 0.05, at 95% confidence level, are considered statistically significant. On the other

hand, P-values higher than 0.05 are considered statistically insignificant. P-value shows the probability that the result was caused by a chance or luck (Investopedia).

Lastly, the R squared value indicates how much the independent variables explain the variation in the dependent variable in terms of a percentage (Lang 2016). As an example, an R squared value of 0.5 would indicate that 50% of the variation in the dependent variable is explained by the studied independent variables. With these four key figures in the regression summary output, the relationship between company profitability and the chosen independent variables will be examined.

2.2. Overview of data

The data used for this study and for the regression analysis was obtained from Orbis Europe databases. Orbis Europe contains company financial information such as companies' balance sheets, income statements and some financial ratios. This study used company financial data gathered from balance sheets and income statements. The author in this study chose to investigate the largest companies, measured by annual turnover, from Finland and Sweden in the manufacture of machinery and equipment industry, and to examine different factors' impact on the profitability of these companies.

The amount of data in the sample was limited to 20 companies, ten from each country, because of the lack of information available on Orbis Europe databases. The usual time period of company data that was available on Orbis Europe, and also used for this study, was for the years from 2010 to 2018. However, since the target industry in this study, manufacture of machinery and equipment, is quite specific industry, there was not enough information available on the smaller companies. Most of the smaller companies, compared to the 20 largest ones, only had financial data available on the years 2014 to 2018, which did not fit the study since the author wanted to use a time period closer to ten years. For that reason, the 20 largest companies were chosen for this study to determine how certain factors affect and explain their profitability.

The company selection criteria for this study was that every company had to be from the manufacturing industry, and more specifically, from the industry of manufacture of machinery and

equipment. In addition, the companies had to be either from Finland or Sweden, with the same amount of companies from each country. Lastly, the companies representing each country had to be the largest ones in their category, manufacture of machinery and equipment, measured by their annual turnover. The information on the rankings of the largest companies in each country in question was obtained from the *Largest Companies* website.

Microsoft Excel is used in this study to conduct the regression analysis. One set of observations per company from the initial data needed to be excluded. One of the studied variables was growth, where the current and previous year were needed for its calculation. On Orbis Europe, there was no financial information available on the years before 2010. Therefore, the year 2010 needed to be excluded from the sample, reducing the number of observations from 180 to 160.

In addition, all extreme values from the final data sample were excluded by detecting the statistical outliers. Detecting and removing the statistical outliers ensures that any extreme values from the data sample, that differ significantly from the rest of the values, do not affect the results of the regression analysis. A method called the non-recursive outlier elimination was suggested by Van Selst and Jolicoeur (1994) to detect sample outliers for each studied variable. According to this method, a statistical outlier is detected if the examined value is greater than the upper bound or lower than the lower bound. The upper and lower bound are determined as follows: the upper bound is the sum of the mean and 2.5 times the standard deviation, and the lower bound is the difference between the mean and 2.5 times the standard deviation. Following the test of detecting the statistical outliers, a total of 13 observations were removed from the sample. The final sample ended up having 147 observations instead of 160.

The Table 2 represents the descriptive statistics of the data used in this study and in the regression model. Descriptive statistics is a useful tool to summarize the data that is used in the study and in the regression. The table of descriptive statistics includes information on the variables used in this study and their key figures. The key figures include: The mean, median, standard deviation, minimum value, maximum value and the number of observations. The Table 2 below was done on a sample where the extreme values had not been removed yet. Therefore, the values for minimum and maximum might be extreme in this table but not included in the final sample. Table 2 variables and their measurements are explained in Table 1 in the first chapter.

Table 2. Descriptive statistics table

	ROA	Size (log of sales)	Growth	Liquidity	Capital intensity	Debt ratio	D/E ratio
Mean	0,060	21,28	0,044	1,469	0,972	0,643	2,431
Median	0,055	21,76	0,025	1,370	0,967	0,625	1,665
Standard Deviation	0,102	1,411	0,223	0,440	0,300	0,101	2,799
Minimum	-0,275	18,38	-0,421	0,750	0,301	0,470	0,890
Maximum	1,098	23,40	1,650	2,770	1,696	0,960	21,91

Source: Author's calculations

From Table 2 presented above, it can be found that the average return on assets (ROA) for Finnish and Swedish companies was 0.060, or 6% with a standard deviation value of 0.102. For the studied companies, the average values for independent variables such as growth and capital intensity were 4.4% and 0.972, respectively. the average growth was 4.4% and average capital intensity 0.972. The rest of the studied variables' values, such as the mean, median, standard deviation, minimum and maximum can be discovered from Table 2.

3. REGRESSION ANALYSIS AND RESULTS

Before conducting the regression analysis, the author had eliminated the extreme values from the data of sample, which could affect the outcome of the regression. This process was explained in the previous chapter. Additionally, before running the regression, the author tested the collinearity among the studied variables in the correlation matrix. The aim of this test was to ensure that none of the independent variables were too highly correlated with each other before conducting the regression analysis. Independent variables that are too correlated with each other might affect the output of the regression negatively, and therefore the results would not be as truthful. Yazdanfar (2013) stated that if correlation coefficients are less than 0.5 in absolute terms, then multicollinearity is not a problem among tested variables. According to Dormann et al. (2013), correlation coefficient values in the correlation matrix among different variables that are higher than the threshold of 0.5 to 0.7, can be considered problematic and too high. The correlation matrix that was conducted in this study, showed a correlation coefficient value that was too high (>0.5) between the independent variables debt ratio and debt to equity ratio. For that reason, the author chose to use two different regression models, where debt ratio and debt to equity ratio were used separately, and all other variables remaining the same.

In the context of the two different regression models, where debt ratio and D/E ratio were used separately, the correlations between all variables were lower than 0.5, thus passing the collinearity test for the studied independent variables. Multicollinearity causes the standard errors of one or more of the coefficients to be too high, and therefore the point estimates of those coefficients to be imprecise (Lang 2016). Table 3 shows the correlation between the studied variables. From the Table 3 presented below, it can be observed that debt ratio and debt to equity ratio are too correlated with each other, having a correlation coefficient value of around 0.91. Nonetheless, all other variables used in this study have a correlation value lower than 0.5.

Table 3. Correlation matrix and correlation between all variables

	ROA (profitability)	Size	Growth	Liquidity	Capital intensity	Debt ratio	D/E ratio
ROA (profitability)	1						
Size	0,340	1					
Growth	0,274	0,012	1				
Liquidity	0,359	0,353	-0,002	1			
Capital intensity	-0,270	0,314	0,018	0,038	1		
Debt ratio	-0,377	-0,061	-0,119	-0,442	0,050	1	
D/E ratio	-0,296	-0,137	-0,054	-0,382	-0,024	0,913	1

Source: Author's calculations

After testing the correlation among the studied variables in the correlation matrix, two regression models were chosen to be used in this study. The two models only differ from each other in terms of X_5, where in the Model 1 it represents debt ratio, and in Model 2 it represents debt to equity ratio. The regression models used in this study are as follows:

$$y_{it} = \beta_0 + \beta_1 X_{it1} + \beta_2 X_{it2} + \beta_3 X_{it3} + \beta_4 X_{it4} + \beta_5 X_{it5} + \beta_6 X_{it6} + T_t + \epsilon_{it} \quad (2)$$

where

y_{it} – ROA (profitability)
β_0 – Intercept
β_n – Coefficient for each X_n variable
i – Company
t – Year index
n – Number for each control variable
X_1 – Size
X_2 – Growth
X_3 – Liquidity
X_4 – Capital intensity
X_5 – Debt ratio in Model 1, Debt to equity ratio in Model 2
X_6 – Dummy variable for Finnish companies
T – Set of year dummy variables
ϵ_{it} – Error term

In addition, same dummy variables are included in both regression models to examine the difference between the profitability of Finnish and Swedish companies, and to examine the

profitability levels between different studied years (2011-2018). Within the dummy variables, Sweden acts as the base country and 2011 as the base year.

Significance F value was less than 0.05 in both regression models, therefore indicating that both models were statistically significant. In Model 1. significance F value was 8,67E-17 and in Model 2. significance F was 1,07E-13. These values suggest that both regression models are statistically significant.

R squared value turned out to be 0,498 in the regression Model 1. In the regression Model 2. the R squared value was 0,481. This means that about 50% (49.8% in model 1 and 48.1% in model 2) of the variation in the dependent variable, profitability (ROA), is explained by the independent variables used in this study. The remaining 50% in the variation in the company profitability is explained by some other factors than the ones used in this study.

In both regression models, all corresponding independent variables ended up having the same type of relationship with company profitability in terms of their significance and coefficient. However, because independent variables debt ratio and debt to equity ratio needed to be studied separately, two regression models were conducted and the results of both models are discussed in this section.

In Table 4, the key values from the regression summary output from Microsoft Excel are displayed. The key values for the regression analysis of this study include the regression coefficients and the P-values. The significance F and R squared values, which are also among the key figures in this regression analysis, are discussed individually in this chapter.

Table 4. Key values from regression summary output

Model 1.			Model 2.		
	Coefficient	P-value		Coefficient	P-value
Intercept	-0,088	0,149	Intercept	-0,155	0,005
Size	0,015	4,43E-08	Size	0,014	2,69E-07
Growth	0,113	7,42E-05	Growth	0,121	2,74E-05
Liquidity	0,009	0,384	Liquidity	0,015	0,136
Capital intensity	-0,090	1,27E-09	Capital intensity	-0,093	7,18E-10
Debt ratio	-0,153	0,001	D/E ratio	-0,009	0,015
Finnish	-0,018	0,021	Finnish	-0,018	0,020

Source: Author's calculations

The first independent variable, company size, was found to have a positive and statistically significant relationship with profitability in both models. Yazdanfar (2013) stated that larger companies have better access to resources and can take advantage of economies of scale easier to diversify their product range, which results in higher profitability. Additionally, based on what the author stated previously, saying that larger companies can operate with lower average costs compared to smaller companies due to the economies of scale, the hypothesis (H1) is consistent with the results.

The second independent variable, company growth, was also found to have a positive and statistically significant impact on company profitability in both models. The results were not consistent with the author's hypothesis, stating that growth is expected to have a negative and significant relationship with profitability. However, the results from the regression analysis between company growth and profitability are similar to findings from Al-Jafari and Samman (2015), stating that growth has a positive and significant relationship with profitability.

Liquidity, the third independent variable, has a positive and statistically insignificant relationship with profitability in both models according to the regression analysis. The results of the regression analysis did not correspond to the author's hypothesis believing that liquidity would have a positive and significant impact on profitability. The results of this study go hand in hand with the findings of Nunes et al. (2009) and Alarussi and Alhaderi (2018), concluding that there is no statistically significant relationship between liquidity and profitability. On the other hand, findings made by Goddard et al. (2005), finding a positive and significant relationship between liquidity and profitability and stating that companies with higher liquidity tend to be more profitable, did not hold true with the results of this study.

Capital intensity is found to have a negative yet statistically significant relationship with company profitability in both regression models. The results are not consistent with the author's hypothesis, stating that capital intensity has a positive and significant impact on profitability because it could help a company to be financially efficient from its fixed assets that could have a significant contribution to its production. However, the results of this study are similar to Shimeles (2019), who found there to be a negative and statistically significant relationship between profitability and capital intensity.

Debt ratio, which is only used in regression Model 1, has a negative and statistically significant relationship with profitability. The results of the regression analysis concerning the relationship between debt ratio and profitability seem to be in line with the hypothesis made by the author, suggesting that debt ratio has a negative and significant relationship with profitability. The results are in line with statements by Alarussi et al. (2018), stating that companies that use large borrowings face higher risks than those who use lower amounts of debt. Additionally, it was stated that financing investments where retained profits are used are more profitable than debt.

Debt to equity ratio, only used in Model 2, is found to have a negative and statistically significant impact on profitability. As the author cited in previous chapters, companies that use large amounts of debt face higher risks, while those who are using more equity tend to operate more conservatively by relying on internal finance. Nanda et al. (2018) found there to be a negative relationship between debt to equity ratio and profitability. Additionally, Al-Jafari and Samman (2015) concluded that there exists a negative and statistically significant relationship between profitability and debt to equity ratio. Based on what is mentioned above, the hypothesis concerning the impact of D/E ratio on profitability seems to hold true.

In addition, the country dummy variables in both models show that Swedish companies are more profitable on average than Finnish companies. The P-value for the Finnish dummy variable is significant in both models, and coefficient is negative. Based on model 1, the average profitability level (as ROA) is 1,76% higher for Swedish companies compared to Finnish companies. Moreover, in model 2, the coefficient for the dummy variable is -0,0181, meaning that average profitability, based on this model, is 1,81% higher for Swedish companies.

Moreover, the year dummy variables show that the year 2015, out of the studied years 2011-2018, is the most profitable year for the studied companies. 2015 dummy variable had a coefficient value of 0.017 in Model 1 and 0.018 in Model 2. This indicates that compared to the base year of 2011, the average profitability during 2015 was 1.7% and 1.8% higher than during 2011. Out of the studied years, 2012 is found to be the least profitable year for the studied companies. Compared to the base year, the average company profitability during 2012 was 1.5% and 1.6% lower than during the base year 2011. The coefficient values for 2012 dummy variables were -0.0146 in Model 1 and -0.0161 in Model 2.

CONCLUSION

There exists a lot of profitability determinants studies within manufacturing industries. While many of those studies feature similar elements to this study, there exists an absent of concentration on Finnish and Swedish companies and/or on the industry of manufacture of machinery and equipment. In this study, the determinants of company profitability is searched for from among certain company-specific factors. With the chosen independent factors, it is attempted to explain how these factors affect and explain the company profitability within the studied companies. The studied companies include the 20 largest companies from Finland and Sweden from the industry of manufacture of machinery and equipment.

The research problem in this study arises from the fact mentioned above, that none of the existing studies has paid attention to this specific industry within the studied countries Finland and Sweden. To be more accurate, to the author's understanding, there exists a lack of studies focusing on profitability determinants alone in the manufacture of machinery and equipment industry whatsoever. The two research questions that were aimed to be answered in this study were as follows: "What type of impact do the chosen company-specific factors have with company profitability?" and "How do the Finnish and Swedish companies differ from each other in terms of their profitability?".

Regression analysis on Microsoft Excel was conducted in order to examine the relationship between the chosen dependent and independent variables. The dependent variable, that measured profitability in this study, was return on assets (ROA). Additionally, the six independent company-specific variables were: size, growth, liquidity, capital intensity, debt ratio and debt to equity ratio. Due to the high correlation, tested in the correlation matrix, between debt ratio and debt to equity ratio, two different regression models were used. The two regression models were identical apart from the fifth studied variable, which was debt ratio in the first model and debt to equity in the second one. In addition to the independent variables, one dummy variable was used in both regression models to describe the average profitability level of the studied Finnish companies. The reason for the Finnish dummy variable was to compare the average profitability levels between the studied Finnish and Swedish companies and to conclude which country's companies are more profitable on average.

Before the regression, all extreme values were removed from the sample data. Following the removal of the outliers, the sample size was reduced from 160 observations to 147. In addition, the collinearity between the studied independent variables was tested in the correlation matrix, leading to a conclusion that the correlation between the independent variables debt ratio and debt to equity ratio was too high. The high correlation between the two independent variables resulted in two different regression models conducted by the author. The two regression models were identical, only differing from each other in terms of the last independent variable, debt ratio in Model 1 and debt to equity ratio in Model 2.

The findings show that company size and growth have a positive and statistically significant relationship with profitability, whereas it is found that liquidity has a positive but statistically insignificant impact on profitability. Moreover, capital intensity, debt ratio and debt to equity ratio show a negative and statistically significant relationship with company profitability. In addition, the Finnish dummy variable is found to be negative against the base country Sweden. Therefore, it can be concluded that the largest Swedish companies in the industry of manufacture of machinery and equipment are more profitable on average than those of Finnish companies.

The reason for choosing this particular industry, manufacture of machinery and equipment, to be studied in this paper was because it is such an important industry in both Finland and Sweden. It is an export driven industry in the two studied countries, and while exports in general may be an important area in almost every country, this studied industry accounts for the largest part of the exports in Finland and Sweden. Therefore, this industry, and these studied companies' contribution to both Finland and Sweden's economies is very significant. As mentioned earlier in this paper, around one third of the GDP of Finland and Sweden comes from the manufacturing exports, and both countries export around one half of their manufacturing output. In terms of this specific industry studied, manufacture of machinery and equipment belongs to the three largest manufacturing industries in both studied countries (Alsen et al. 2013). In addition, most of the studied companies are within the largest companies of the whole country, in case of both Finland and Sweden, based on the *Largest Companies* list in 2019. This fact shows that a big proportion of all of the largest companies in a whole country comes from the same industry. Therefore, the importance of the industry of manufacture of machinery and equipment in these two countries contributed to the author's decision of choosing an industry to study.

The results in terms of company profitability determinants from this studied industry compared to the results from other reviewed industries and countries were fairly consistent. The author mainly reviewd articles and studies focusing on company profitability determinants within manufacturing industries. However, some reviewed articles focused on companies from other industries such as banking, insurance, service and non-financials. In regard to all reviewed industries, such as the ones mentioned above, company/institution size seems to play an important role in determining the profitability as it indicates a positive and significant relationship with it across all different reviewed industries and countries.

Some similar results between companies from the studied industry and the reviewed non-financial firms were also found. Like in this study, the results of the profitability determinants studies of non-financial companies conducted by Yazdanfar (2013), Alarussi and Alhaderi (2018) and Asimakopoulos et al. (2009) show that there is a negative relationship between company leverage and profitability. In addition, company growth seems to have a positive impact on profitability among the reviewed non-financials, which is consistent with this study. The results of this study being compared to the results from the service industry companies, studied by Nunes et al. (2009), show similar findings in terms of company size, growth, leverage and liquidity. On the other hand, Goddard et al. (2006), who studied the firm profitability determinants in manufacturing and service sectors, found company size to have a negative impact on profitability. Compared to the studied manufacture of machinery and equipment industry, this negative size-profitability relationship is inconsistent with the findings of the author in this study.

In comparison to other reviewed profitability determinants studies concentrating on manufacturing companies, liquidity seems to be the only independent variable in this study that differs from the findings of other reviewed studies. While it seems to be fairly consistent in other related articles, that liquidity has a positive and significant impact on profitability, it is found to be the opposite in this study. The author finds that liquidity has a positive yet statistically insignificant relationship with company profitability in the analysis of both regression models.

The limitations of this study is culminated around the fact that only a fairly narrow sector, manufacture of machinery and equipment, of the whole manufacturing industry is studied. This study limits the opportunities to investigate and focus on a whole industry as only one part of it is examined. However, the part of the industry that is examined in this study is an important and large part of the overall manufacturing industry in the studied countries Finland and Sweden. In addition,

the fact that only two Nordic countries, Finland and Sweden, are used in this study might set some limitations to this study. Another fact that contributes to the limitations of this study is the fact that only the largest companies within the studied industry are examined. That being said, there is no randomly chosen companies in the sample of this study, which could include small, medium and large sized companies. However, all Finnish and Swedish companies chosen for this study represented the largest ones in their category of manufacture of machinery and equipment industry. Therefore, since only large companies are studied, the results and findings are limited and relevant to mostly those who are concerned about larger companies. In other words, the findings in this study may not be as beneficial to the managers of small businesses as they are to those of large enterprises.

The main reason for using only the 20 largest companies in this study was that there was not enough financial data available on the smaller companies from the industry in question. This fact forced the author to only use the largest companies in order to gather sufficient amounts of data. The main limitation arises from the lack of variability, in terms of size, within the used companies. A more informative study could have been conducted if: 1) all Finnish and Swedish companies from the target industry were used or 2) companies were selected randomly from the target population regardless of their size. Therefore, only the 20 largest companies from Finland and Sweden, in the industry of manufacture of machinery and equipment, were chosen for this study.

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APPENDICES

Appendix 1. Regression summary output from Model 1

SUMMARY OUTPUT
Regression Model 1

Regression Statistics	
Multiple R	0,70570481
R Square	0,49801927
Adjusted R Square	0,44895349
Standard Error	0,03938236
Observations	147

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	0,20465114	0,0157424	10,1500316	1,4021E-14
Residual	133	0,20627902	0,00155097		
Total	146	0,41093016			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0,0879744	0,06054457	-1,4530518	0,14856474	-0,2077292	0,03178042
Size	0,01521866	0,00262046	5,80761665	4,4342E-08	0,01003548	0,02040183
Growth	0,11308537	0,02764698	4,09033307	7,42E-05	0,05840071	0,16777003
Liquidity	0,00873983	0,01001227	0,87291155	0,38428454	-0,0110641	0,02854371
Capital intensity	-0,0901401	0,0138007	-6,5315636	1,2652E-09	-0,1174374	-0,0628429
Debt ratio	-0,1526973	0,04655537	-3,2799066	0,00132579	-0,244782	-0,0606125
year12	-0,0146265	0,01267391	-1,1540625	0,25054407	-0,039695	0,01044202
year13	-0,0088549	0,01312144	-0,6748433	0,50094679	-0,0348086	0,01709878
year14	0,00836927	0,01313668	0,63709204	0,52516001	-0,0176146	0,03435311
year15	0,01666348	0,01340882	1,24272496	0,21615571	-0,0098587	0,0431856
year16	0,00632915	0,01290665	0,49037909	0,6246737	-0,0191997	0,031858
year17	-0,0017726	0,01328241	-0,1334552	0,89403514	-0,0280447	0,02449949
year18	0,00217928	0,01369048	0,15918248	0,87376658	-0,0248999	0,02925852
Finnish	-0,0175747	0,0075268	-2,3349464	0,0210432	-0,0324624	-0,002687

Appendix 2. Regression summary output from Model 2

SUMMARY OUTPUT
Regression Model 2

Regression Statistics	
Multiple R	0,69356032
R Square	0,48102592
Adjusted R Square	0,43029913
Standard Error	0,04004341
Observations	147

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	0,197668057	0,01520524	9,48268002	1,0666E-13
Residual	133	0,213262102	0,00160347		
Total	146	0,410930159			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0,1552912	0,054744198	-2,8366702	0,00527255	-0,2635731	-0,0470093
Size	0,01437753	0,002651952	5,42148905	2,6936E-07	0,00913207	0,01962298
Growth	0,12135602	0,027927544	4,34538818	2,7385E-05	0,06611642	0,17659562
Liquidity	0,01467034	0,009777489	1,5004198	0,13587589	-0,0046692	0,03400983
Capital intensity	-0,0930591	0,014008086	-6,6432401	7,1785E-10	-0,1207665	-0,0653516
D/E ratio	-0,0090919	0,00369621	-2,4597894	0,01518521	-0,0164029	-0,0017809
year12	-0,0161201	0,012868834	-1,2526463	0,21253249	-0,0415742	0,00933396
year13	-0,0092855	0,013379275	-0,6940237	0,48887778	-0,0357492	0,01717815
year14	0,00806555	0,013365483	0,60346152	0,5472295	-0,0183709	0,03450196
year15	0,01795691	0,013622623	1,31816837	0,189713	-0,0089881	0,04490193
year16	0,00729664	0,013125774	0,55590166	0,57921206	-0,0186656	0,03325891
year17	-0,0005718	0,013514553	-0,042312	0,96631346	-0,0273031	0,02615943
year18	0,0053008	0,01384037	0,38299548	0,70233455	-0,0220749	0,03267652
Finnish	-0,0180561	0,00766548	-2,3555095	0,0199589	-0,0332181	-0,0028941

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