Thesis

The impact of the financial distress of 2007-2009 on the revenues of U.S manufacturing firms

Lec Gjeka 411973

Abstract

Despite the vast research related to the financial crisis, little is known about the perspective of bank dependence and its effects during the financial recession of 2007-2009. The overall image that emerges in this analysis is related to the effect of bank dependence and other fundamentals on the Revenues of firms operating in the U.S manufacturing sector. This paper empirically uses two panel data regression models for 269 firms in a time span from the 2nd quarter of 2000 until the 4th quarter of 2015. It predicts that a decrease in the level of bank dependence decreases Revenue growth, but does not have a significant effect. Moreover, there is significant evidence that firms which were able to reduce the bank dependence growth during the financial crisis saw an increase in the Revenue growth. Additionally, there is evidence that an increase in the Interest Rate and Related Expenses reduces Revenues and an increase in Capital Expenditures and GDP increases them. The lack of feasible data for bank dependence brings limitation to this analysis related to endogeneity. Nevertheless, the main empirical findings seem to be robust throughout different specifications, and this research vastly contributes to the literature of firm-specific microeconomic analysis.

I. Introduction

The financial crisis of 2007-2009 has been the most severe turmoil in the U.S financial market since the Great Depression. The bursting of the housing bubble caused relentless loans being written off by banks, leading to a vicious cycle that affected all the major financial players operating inside and outside the U.S market. The crisis started as a banking crisis and further eroded towards unseen levels, amounting to a total cost of $22 trillion for the U.S economy (Government Accountability Office, 2013). The vast use of structured financial products and the lack of adequate debt rating paralyzed the entire U.S market. Financial intermediaries created tight networks with investors, and the dependence of the big U.S firms in this network made them reliant upon the health of the financial sector. The Great Recession of 2007-2009 was a complex one that affected U.S as a banking crisis, as a financial crisis, as an economic crisis, and as a social one. It has been a major negative event in the life of millions and a good lesson for the

financial market participants as a whole.

The purpose of this paper is to assess the impact of the 2007-2009 crisis on the revenues of the U.S manufacturing firms, by analyzing their dependence on banks. The manufacturing sector is an important sector of the U.S economy, which adds a considerable amount of value to the Gross Domestic Product (GDP). From 1997 to 2009 the value added percentage of the manufacturing sector to GDP was characterized by a declining slope, probably due to the shift of manufacturing towards cheap labor countries. In 2006 the value added of manufacturing to GDP followed a sharp decline, reaching the lowest point in 2009 (Appendix, Figure 1.1). This decline was characterized by a decrease in the sales and revenues, which were closely related to the lack of demand, the deterioration of productivity, the higher taxes needed to bail out the important banks and the huge amounts of bad debt.

The financial crisis had a negative effect on the manufacturing sector and caused a slump in orders, rash of job losses and mass factory closures (Thornton, 2010). Therefore, this paper aims to have a positive societal impact by giving detail knowledge on the need to reconstruct and nurture the manufacturing sector to protect people reliant on this sector. Besides this, quantifying the incidence of the crisis on manufacturing firms' revenues is scientifically relevant, because it helps understanding how bank dependence can cause extensive handicaps in the revenue flow. This paper gives insights into the effects of the crisis in one of the leading sectors of the most influential market in the world.

My main conclusions predict that a decrease in the level of bank dependence leads to a decrease in Revenue growth of 18% on average, during all times. However, the effect is not significant and is not appropriate to derive a correct estimation. Most importantly, the decrease in bank dependence growth during the financial crisis results in a significant increase in Revenues growth by 0.654%, whether during normal times a decrease in bank dependence growth results much more beneficial, with an increase in Revenue growth of 14.441%. Moreover, an increase in Interest and Related Expenses decreases Revenues, and an increase in Capital Expenditures and GDP increases them with different magnitudes and explanatory powers.

The rest of the paper is structured as follows: Section II presents relevant articles and methodologies that contribute to this research. Section III states the research question and the

hypotheses. Following this, Section IV and V present methodology and data respectively. In Section VI the results of the research paper are reported. Section VII addresses robustness check, and Section VIII discusses and concludes the results.

II. Literature Review

Financial and economic crises have inspired many researchers to study their effects and developments. This literature review takes a closer look at the studies related to various crises, exploring the breadth and the effects of those spells on the microeconomic and macroeconomic mechanisms. Although the literature on financial crisis covers a variety of concepts and mechanism, this section will focus on three major themes which emerge repeatedly in the literature reviewed. These themes are: the 2007-2009 financial crisis, impact of the financial crisis on the revenues/outputs and the effect of the bank dependence on firm's fundamentals.

The business cycle is characterized by downward and upward movements around its long term trend. The financial markets have always been impacted by different crises, Leaven and Valencia (2005) counted 124 systematic crises worldwide in the period from 1970 to 2005. Goldsmith (1969), found that crises normally result in sharp (and cyclical) deterioration of all or the majority of financial indicators, such as short-term interest rates, the value of assets, housing and land, and insolvency or bankruptcy of firms and financial institutions. Discussions about the causes of the recent financial crisis are plenty. Brunnermeier (2010) found that the financial crisis of 2007-2009 happened from the vast use of financial structured products, which caused a contagious amplifying mechanism that affected all the financial players in the U.S market. Coval Jurek and Stafford (2009), provide a different view, they argue that the credit rating agencies reduced credit quality. This way, the risk was higher than reported, and the burst caused the recent crisis.

Much research has been focused on analyzing the impact of the crisis on the real economy, and it spread through the financial channels. Reinhart and Rogoff (2009) found that overall output during the crisis decreased on average 9 percent and the associated recession was a long one, lasting more than two years. Furthermore, a chapter from IMF (2009) found that the recent crisis caused on average a 70 percent annualized aggregate output decline in all the developed

economies. Gros and Alcidi (2010) provided an extensive assessment on the impact of the crisis on the real economy. They found that if the recovery from a recession is slow and long, idle machinery may get scrapped prematurely, discouraged job-seekers may drop out of the labour force, and there might be slow productivity growth. Redmond and van Zandweghe (2016) found that productivity decreased as a result of the crisis and the recovery is still below average, reassuring the long-lasting crisis effects. Henceforth, the impact of the crisis on the macroeconomic factors emerges vastly in the literature. There is a lack of information on the firm-specific microeconomic repercussions of the crisis (Fassler 2007) and hardly any research directly related to the impact of the crisis on the manufacturing sector.

Gieber and Kraft (2015) investigated the extent to what a firm is impacted by the crisis by analyzing revenues as a dependent variable. They found that the impact of the crisis on the revenues of firms with more innovation is much stronger than the ones with less innovation. Innovations are measured as the extent of new products offered in the market. Accordingly, strong shocks in the market decrease the returns of these innovations and impact revenues. Pindyck and Solimano (1993), Janicko et al. (2012) found that financial crises lower incentives to invest in capital, by decreasing demand for products and raising uncertainty on investment returns. The decrease in investment growth can be translated into a reduction in future productive capacity. Firms may have to cope with less favorable capital financing conditions due to tighter lending standards, in the form of an increasing real cost of borrowing, stricter collateral requirements and/or limited credit supply.

There are, potentially, a number of papers contributing to this research by making use of firms' bank dependence in times of crisis. Nakajima and Sasaki (2015) investigated the cash saving behaviours of bank dependent and independent firms, even though cash savings are not on this paper's purpose, the bank dependence methodology is a key part of this research. They used a firm's ratio of tangible assets to assets as a proxy for free borrowing capacity and bank dependence. Their theory has tight linkages with the ones of Bester (1985) and Besanko and Thakor (1987), who found that in a lending market with adverse selection problems, such as the one intended to be analyzed, collateral can serve as a mechanism to alleviate the uncertainty problem. They prove that a bank-dependent firm with a higher fraction of unpledged tangible

assets should be able to raise funds relatively easily by offering their collateral at the time of crisis. Furthermore, a chapter from Government Accountability Office Report (2013) states that it was common for firms to restrict lending and sell assets at a depressed price to search for liquidity in the financial market of 2007-2009 and thus, proving the phenomenon described by Nakajima and Sasaki.

My paper contributes to the literature in a number of ways. Firstly, it is novel in the perspective of how it assesses the impact of the crisis on revenues, making use of bank dependence. Secondly, the dataset used is a mosaic of all variables used in previous researches such as, Gieber and Kraft (2015) that use investment, Nakajima and Sasaki (2015) that use tangible assets, etc. Thirdly, it is analyzing a sector (manufacturing), never specifically analyzed for, making use of both macro-financial and micro-economical empirical findings.

III. Research Question and Hypotheses

In order to assess the brunt of the financial crisis of 2007-2009 on the firms' revenues of the manufacturing sector in U.S, answering the following question is the aim of this research paper:

How did bank dependence impact the revenues of the firms operating in the U.S manufacturing sector during the 2007-2009 financial crisis?

The financial crisis of 2007 and 2009 had a noteworthy impact on banks. The failure of important U.S financial intermediaries due to insolvency, caused plenty of deposits to vanish and liquidity to crunch. Bank dependence refers to the dependence that a firm has to get finances from commercial or investment banks. There are two opposing views on the impact that bank dependence has on a particular firm. On the one hand, bank dependence represents the bargaining power of a bank, allowing them to extract more rent and thus affecting negatively future revenues through lower levels of production. On the other hand, bank dependence can resolve issues of information asymmetries and incomplete contracting and thus have a positive impact on performance and revenues (Gorton and Schmid, 2000). In this research, bank dependence is represented as the extent of tangible assets over total assets, more tangible assets/assets lead to more independence from banks. Firms that have close ties with banks tend

to depend on bank's funds and have deposits in them. During the 2007-2009 crisis, firms that were bank dependent faced difficulties in acquiring funds at an appropriate interest rate. Therefore, bank dependent firms faced handicaps in their daily operation and/or were constrained to cut production and sell assets at a depressed price (Government Accountability Office Report, 2013). Firms that had less dependence on banks had other types of primary external financing. These types of external financing were: inter-firm lending and/or different investments in the form of tangible assets. Therefore, in order to operate in times of crisis, these firms raised capital by selling their excess assets and thus, not cutting production heavily. For this reasons, the revenues of firms were impacted by bank dependence during the financial distress, and the following hypothesis is intended to be analyzed.

H1: An increase in bank independence has a positive impact on the revenue changes of U.S manufacturing firms, during the crisis.

The U.S financial market in 2007-2009 was characterized by high information asymmetry that caused interest rates to increase. Interest rate and related expenses are non-operating expenses reported in the financial statements, calculated as the multiplication of interest rate and the amount of debt. Ivashina and Scharfstein (2009) explained that even though government policies tried to lower cost of borrowing, the cost of corporate borrowing increased. Inter-bank and inter-firm interest rates such as LIBOR and inter-bank overnight borrowing rates increased substantially. High-interest rate and related expenses impact the firms in two different ways. Firstly, when interest rates increase, businesses need to use more of their earnings to pay loans, and this decreases the profits. Eventually, a firm does not engage in expansions when interest rates are high, and this hampers the growth of the company. Therefore, firm's sales decrease and the revenues are negatively impacted (Johnston, 2017). Secondly, on the demand side, consumers also face high-interest rate expense on their personal loans. This way, consumers have less money to spend, and this reduces demand (Riley, 2015). Eventually, sales decrease and revenues are impacted. Henceforth, the following hypothesis is intended to be assessed:

H2: An increase in interest rate and related expenses has a negative effect on the revenue change of manufacturing firms in U.S.

The financial distress of 2007-2009 affected non-firm-specific macroeconomic variables such as

Gross Domestic Product, Employment, Economic Policy Uncertainty etc. GDP is a macroeconomic indicator of the strength of business, relative wealth of workers and the overall strength of the economy. Kannan, Scott and Terrones (2009) found that recessions in an economy lead to an overall GDP decrease of 2¾ percent on average. There was a decrease in the U.S GDP during the financial crisis of 2007-2009, and this decrease affected the wealth of the U.S citizens. A lot of people lost their jobs, and thousand lost their houses. Therefore, consumers responded by lowering the demand for products. Eventually, manufacturing firms faced lower sales that caused revenues to decrease substantially.

H3: An increase in GDP change is positively related to the change in the revenues of firms operating in the manufacturing sector of U.S.

Investment growth tends to decrease during financial crises, due to several factors related to a liquidity crunch, uncertainty in market returns and lack of capital. The U.S manufacturing firms were facing high investment uncertainty during the financial crisis, also observed in the Economic Policy Uncertainty index in 2007-2009 (Appendix, Figure 1.2). In this research, investment growth is represented by a firm's capital expenditures. Capital expenditures are funds used by a company to acquire physical assets such as property, buildings or new equipment. It is used to undertake new investment by the firms and this way outlying the increase of the scope of firms' operations. These capital expenditures can include everything from repairing a roof to purchasing a piece of equipment, or building a brand new factory. Therefore, when firms engage in new investments, they increase capital expenditures. On the one hand, the increase in investments and thus capital expenditures, determines sales and the performance of a particular firm (Ericsson and Pakes, 1995). On the other hand, an increase in capital expenditures leads to a reduction in net income due to higher depreciation (Keythman, n.d.). This paper aims at analyzing the impact of capital expenditures on firm's revenues in the short run. Therefore the following hypothesis is expected:

H4: An increase in capital expenditures of firms has a positive impact on the change in revenues of U.S manufacturing firms.

IV. Methodology

In order to assess the impact of the financial distress of 2007-2009 on the revenues of firms operating in the manufacturing sector of U.S, an empirical-analytical method of research is used. This quantitative approach consists of converting data into numerical forms and performing statistical calculations, later used to draw results.

The setting in this research consists on financial modeling where data compromises of both cross-sectional and times series elements. This type of dataset is known as panel data or longitudinal data and it embodies both information from time and space. Panel data combines both cross-sectional and time series entities and gives access to more information, it increases the number of degrees of freedom and thus the power of the tests.

The first step towards the assessment is the transformation of multi-dimensional observations into percentage change. There are two methods for this transformation, the simple percentage change, and the natural logarithm. It is known that the natural logarithm has advantages over the simple percentage change, related to the additive function and correction of outliers. However, the major disadvantage of natural logarithm is when the observations consist of zero values, this renders the observation invalid. Therefore, this research will use simple percentage change due to the invalid natural logarithm of zero. The removal of these observations from the dataset would have caused measurement errors and possible bias. Hence, the coefficient derived from the regression modeling will represent how the change in a particular variable affects the change in revenues.

A concept that needs to be analyzed for a fruitful analysis is stationarity. Stationarity is an important assumption in statistical modeling and assumes that the process of analysis is stochastic, meaning that the joint probability distribution of characteristics does not change over time. The process of stationarity testing or unit root testing in panel data is a complex one. Several tests with different assumptions are available such as: Levin– Lin–Chu (2002), Harris–Tzavalis (1999), Breitung (2000; Breitung and Das 2005), Im–Pesaran–Shin (2003), Fisher-type (Choi 2001) and the Hadri (2000) Lagrange multiplier (LM). In this research, the test of Harris and Tzavalis (1999) is used, with the null hypothesis that the panels contain unit roots. This test is designed for panel data with a large number of cross-sectional entities relative to the time

periods, as it is the case in this research. If there are cases of unit root variables, the methods of differencing and de-trending are used to correct them, in the results part.

Once the stationarity issues are dealt with, the regressions are addressed. In order to assess the impact of the crisis on the revenues of the manufacturing firms through the bank dependence, two regression models are used:

$$(A)\Delta Revenue_{it} = \beta_0 + \beta_1(Tangible\ Assets_{it}/\ Assets_{it}) + \beta_2 Crisis_{it} + \beta_3(Tangible\ Assets_{it}/\ Assets_{it}) * Crisis_{it} + \beta_4 \Delta Interest\ and\ Related\ Expense_{it} + \beta_5 \Delta GDP_{it} + \beta_6 \Delta Capital\ Expenditures_{it} + \beta_7 \Delta Debt\ to\ Asset\ Ratio_{it} + \beta_8 \Delta Current\ Ratio_{it} + \varepsilon_{it}$$

$$(B)\Delta Revenue_{it} = \beta_0 + \beta_1 \Delta(Tangible\ Assets_{it}/\ Assets_{it}) + \beta_2 Crisis_{it} + \beta_3 \Delta(Tangible\ Assets_{it}/\ Assets_{it}) * Crisis_{it} + \beta_4 \Delta Interest\ and\ Related\ Expense_{it} + \beta_5 \Delta GDP_{it} + \beta_6 \Delta Capital\ Expenditures_{it} + \beta_7 \Delta Debt\ to\ Asset\ Ratio_{it} + \beta_8 \Delta Current\ Ratio_{it} + \varepsilon_{it}$$

Regression (A) is used to assess how the level of bank dependence of firms through time affects the Revenue growth. Regression (B) is established to analyze how the bank dependence growth from period to period affects the Revenue growth.

The primary dependent variable in regression (A) and (B) is Revenue growth. The independent variable of interest is the ratio between the Tangible Assets and the total Assets, used as a proxy for bank dependence. This variable is used differently across the two regression models. Regression (A) analyses the change in Revenues corresponding to different levels of bank dependence of different firms, and therefore the level of Tangible Assets/Assets is used. Regression (B) analyses the impact of bank dependence growth in the change in Revenues, and therefore the change in Tangible Assets/Assets is used.

The other variables used to complete the regressions are the same for both the regressions. The variable named Crisis is a dummy variable indicating the absence or presence of the financial crisis. This variable is believed to have a negative impact on the change in Revenues.

Furthermore, two interaction effects between Crisis and bank dependence are generated in order to investigate the effect of the change in Revenues based on the absence or presence of the financial crisis. The interaction term leads to a result that cannot be anticipated separately and is expected to have a negative impact on the dependent variable. Another variable used is the change in Interest Rate and Related Expense, which is expected to have a negative effect on Revenue growth. Along these lines, the change in GDP is used as a macroeconomic variable and is believed to impact the change in Revenues positively. Moreover, the change in Capital Expenditures is a proxy created to present investment and is expected to have a significant positive effect on the change in Revenues. In addition, two control variables name the change in Debt to Asset Ratio and in Current Ratio are used in the regression. Debt to Asset Ratio is an indicator of financial leverage, and it represents the extent of total assets financed by debt. High levels of debt are associated with under-performance of firms operating in the products markets (Campello, 2006). In order to correct for possible firm's size bias the change in Debt is divided by the change in Assets and an increase in this variable is expected to have a negative effect on Revenues. The Current Ratio is a measure of the ability of a company to pay its short-term Liabilities with the Assets owned. A particular firm needs to ensure its ability to pay the debt because a delay may cause the company's growth to hamper due to the low credit quality, and thus affect revenues (Poznanski et.al, 2013). Therefore an increase in Current Ratio is positively associated with the change in Revenues. Besides this, the lag of the change in Revenue has been added to both regressions but it is highly insignificant and thus is concluded to not be appropriate for this analysis.

Panel data analysis consists of different regression models such as Fixed Effect model, Random Effect model, Between Effect model and Pooled Ordinary Least Squared model.

The Fixed Effect regression model is used to analyze the impact of variables that vary over time and explores the relationship between the dependent and independent variables. Each cross-sectional entity has its characteristics that may affect the independent variables in different ways. When using Fixed Effect regression model, it is assumed that the unobserved heterogeneity of a particular entity impacts the analysis and hence it is controlled for. The advantage is that this model removes the time-invariant correlation of the error term with the independent variables,

in order to assess the net effect on the dependent variable. Thus, Fixed Effect regression models allow exploiting within entity variation to identify the correct causal relationship. However, the Fixed Effect model is not appropriate to analyze the causes of the time-invariant characteristics on the independent variables.

The Random Effect model consists of an analysis where the cross sectional unobserved differences are considered random and uncorrelated with the independent variables. Random Effect regression model is used when there are differences in the cross-sectional entities that have an impact on the dependent variable. The advantage of this type of model is that it assumes unobserved heterogeneity not to be correlated with the independent variables, therefore allowing the time-invariant characteristics to play an explanatory role. The problem with the Random Effect regression model is that the time-invariant characteristics need to be specified in order to control for possible bias and to have a proper estimation of variables.

In order to decide which of the two panel data models is appropriate for this analysis, two Hausman (1978) specification tests are performed, respectively for regression (A) and (B). The null hypothesis of the Hausman test states that the preferred model is Random Effect Model, whether the alternative hypothesis states that the preferred model is the Fixed Effect Model. The problem with this test is that many versions of the test — with a different hypothesis and possible conclusions — exist (Chmelarova, 2007). In Stata 14, the platform that is used for this analysis, the null hypothesis is that the Random Effect estimator is indeed an efficient (and consistent) estimator of the true parameters. If this is the case, there should be no difference between the two estimators. If there exists a systematic difference in the estimators, there is a reason to doubt the assumptions on which the efficient estimator is based (Hausman, 1978). Additionally, the Between Effect Model consists of average entity analysis, it exploits the cross-sectional dimensions and regresses them over the averages of independent variables and is not suitable here due to the major firm-specific differences. Lastly, the Pooled OLS Model is not appropriate for the analysis since it pools together all the firms without controlling for firm specific unobserved heterogeneity and therefore can lead to possible bias.

The use of the appropriate panel data regression models is the crucial part of this research as it

is important to have a correct quantitative analysis of the independent variables on the dependent one.

V. Data

The dataset used in this research is retrieved from Wharton Research Data Service (WRDS). The data is firm-specific, and Compustat North America platform is used to download it. The data consists of firms operating in the manufacturing sector of United States. The manufacturing firm's data is filtered using U.S Standard Industry Classification (SIC) codes. SIC codes are a system of classifying industries by four digit codes, and it is vastly used by U.S government agencies, making this classification a highly reliable one. SIC codes have a hierarchical, top-down structure that begins with general characteristics and narrows down to the specifics. The first two digits of the SIC code represent the major industry sector. The third and fourth digits describe the subclassification of the business group and specialization, respectively. For example, "26" refers to a business that manufactures "Paper and Allied Products." Adding "7" as a third digit to get "267" indicates that the business operates in "Converted Paper & Paperboard Prods (No Containers/Boxes)." The fourth digit distinguishes the specific industry, so a code of "2673" indicates that the business is specialized in "Plastics, Foil & Coated Paper Bags." Therefore, for this research, the SIC codes from 2000-3999 representing the manufacturing firms have been used.

The data consist of 269 firms operating in various sub-industries in a time span from the 2nd quarter of 2000 to the 4th quarter of 2015. In panel data expressions the analysis has 269 cross-sectional entities (N=269) and 63 time series entities (T=63). Therefore, the dataset is sufficiently large for a proper panel data analysis.

The firm revenue data is manipulated using different statistical methods in a process known as list-wise deletion. Firstly, there were a high number of firms which operated through the time span of 2000-2015 but closed their operations before 2015 or started operations after 2000. It is believed that these firms are not appropriate for this study and are deleted from the dataset. Therefore, only the firms operating in the time span of second quarter 2000 until the last quarter

of 2015 are taken into account. Secondly, there were a lot of missing values for most of the firm-specific data. The firms with missing values consisting of more than six observations following each other, are deleted from the dataset. Consequently, if the number of missing values was smaller than six observation, interpolation is performed using Matlab[1]. Interpolation is a mathematical, statistical method of constructing new data points within a range of discrete known data. The interpolation used in this research is a linear one. Thirdly, there were a vast number of zero values in variables that are not characterized by zero values, such as Revenues or Tangible Assets. The firms showing this trend are deleted from the dataset, as the data is believed to have been wrongly reported and thus, invalid. Ultimately, the final dataset contains 16947 reliable observations of firms operating in the needed time span.

In order to have a detailed knowledge of the data, some descriptive statistics are performed for all the variables (Appendix, Table 1.1). Panel data describes data in three types of variations, named overall, between and within. The overall variation describes the overall statistics of the data, the between variation describes the average statistics between cross-sectional entities and the within one describes the average firm-specific statistics over time. The dataset contains two identification variables, Key and Periods. The former is a firm-specific number, and the latter represents the time periods. Key has a logical zero variation over time, meaning that is static per firm. Whether, Periods has a zero variation over the entities, meaning it changes across time. GDP and Crisis are characterized by zero variation between firms, as they vary only through time, as well. Noteworthy is the fact that in all the used variables except the level of Tangible Assets/Assets, the within variation is bigger than the between variation, representing bigger variation across time rather than between firms. Table 1.2 presents the overall statistics of the variables used in the regression models.

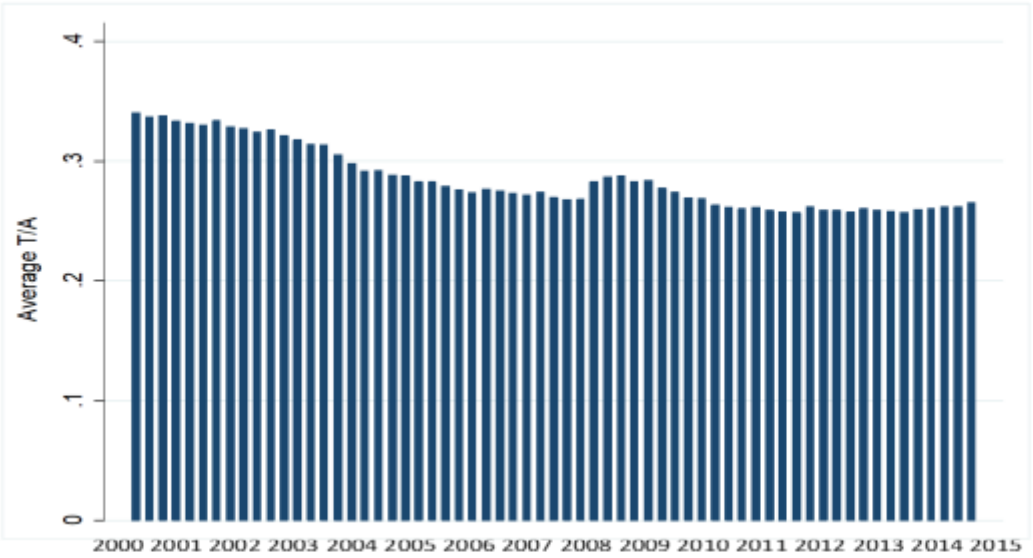
[1] Statistical programming platform

Table 1.2: Overall Descriptive Statistics of Main Variables

Variable	Variation	Mean	Std. Dev.	Min.	Max.	Obs.
ΔRevenue	overall	0.0752832	5.329409	-0.9761072	692.08	N = 16947
T/A	overall	0.2853717	0.162354	0.0000305	0.9650573	N = 16947
Δ(T/A)	overall	-0.0023283	0.0818391	-0.9668432	2.123308	N = 16947
Crisis	overall	0.1111111	0.314279	0	1	N = 16947
Crisis*(T/A)	overall	0.0307595	0.1018298	0	0.904302	N = 16947
Crisis*Δ(T/A)	overall	0.0010197	0.0280386	-0.9668432	0.6617801	N = 16947
ΔInt. Rate Expense (IE)	overall	0.3558993	4.512939	-2.072847	539	N = 16947
ΔGDP	overall	0.0095469	0.0071887	-0.0197467	0.0246536	N = 16947
ΔCapital Expenditure (CE)	overall	0.4321381	1.566396	-6.666667	114	N = 16947
ΔDebt to Asset Ratio	overall	0.0041795	0.1152794	-0.8494406	8.064978	N = 16947
ΔCurrent Ratio (CR)	overall	0.01763	0.2089134	-0.8479189	4.805706	N = 16947

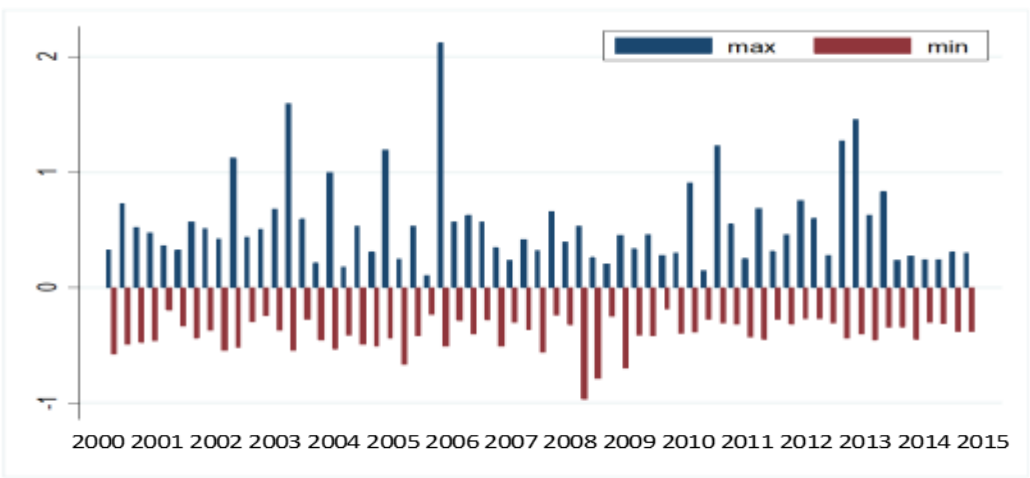
The change in Capital Expenditure has the highest mean, followed by the change in Interest Rate and Related Expenses. The variable of interest of regression (B), the change in Tangible Assets/Assets has the lowest mean followed by its interaction term with the crisis. Furthermore, the change in Revenue has the highest overall standard deviation in contrast with the change in GDP, which has the lowest. In Figure 1.3 the average level of Tangible Assets/Assets is plotted over time and a variety of average levels can be observed.

Figure 1.3: Average level of T/A over time



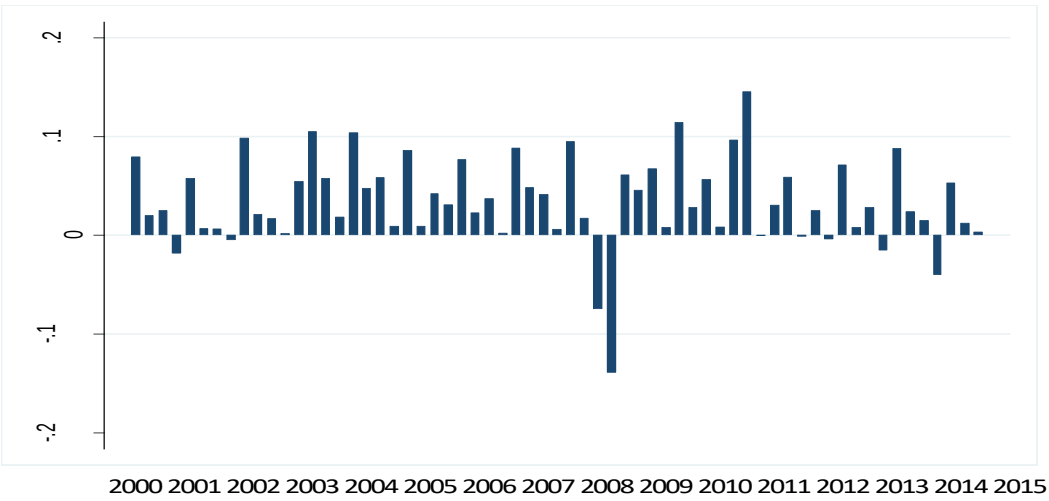
Notable, in the descriptive statistics, is the contrast between the minimum change and the maximum change in some of the variables. This can also be seen for the variable of interest of regression (B). Figure 1.4 plots the minimum and maximum values of the change in Tangible Assets/Asset during 63 quarters for every firm.

Figure 1.4: Max and Min of ΔT/A over time



It can be noticed that the trend is characterized by higher positive changes rather than negative changes. During 2007-2009, which corresponds to the financial crisis (Appendix, Figure 1.5), the graph shows higher absolute minimum values in the change of Tangible Assets/Assets. Furthermore, in Figure 1.6 below, the average change in Revenues corrected for outliers, can be observed.

Figure 1.6: Average of ΔRevenues over time



The data characteristics give access to important information on the methodologies needed to analyze and synthesize the impact of bank dependence on the revenues of firms operating in the U.S manufacturing sector, during the financial crisis.

VI. Results

In this section, the main empirical findings are established and analyzed. The variables used in regression (A) and (B) are controlled for non-stationarity, as the problem of non-stationarity needs to be addressed before the econometric modeling. Table 1.3 in the Appendix reports the Harris-Tzavalis unit-root tests for the variables used in the regressions. The p-values of all the tests are smaller than the 5% significance level, thus representing strong evidence against the null hypothesis that the variables contain unit roots. It can be concluded that the null hypotheses are rejected, and therefore the variables are stationary.

In order to model the impact of bank dependence on the Revenue growth, the two regressions are presented and analyzed in this section. Regression (A) analyzes the impact of the level of Tangible Assets/Assets on the change in Revenues of the firms operating in the manufacturing sector of U.S, during the financial crisis. Two panel data regression models are presents in Table 1.4 for regression (A), named Fixed Effect model and Random effect model.

Table 1.4: Fixed Effect model and Random Effect Model for regression (A)

	Fixed Effect Model				Random Effect			
Dependent variable = ΔRevenues								
Variable	Coeff.	Std. Err.	t-stats	p-value	Coeff.	Std. Err.	t-stats	p-value
T/A	-0.101	0.742	-0.140	0.892	0.109	0.265	0.410	0.681
Crisis	-0.018	0.275	-0.070	0.947	-0.032	0.275	-0.120	0.908
Crisis*(T/A)	-0.162	0.817	-0.200	0.843	-0.107	0.814	-0.130	0.896
ΔInt. Rate Expense (IE)	-0.019	0.009	-2.040	0.041**	-0.020	0.009	-2.160	0.031**
ΔGDP	1.638	6.977	0.230	0.814	1.823	6.974	0.260	0.794
ΔCapital Expenditure (CE)	0.247	0.026	9.360	0.000***	0.246	0.026	9.420	0.000***
ΔDebt to Asset Ratio	3.933	0.375	10.480	0.000***	4.173	0.372	11.200	0.000****
ΔCurrent Ratio (CR)	0.364	0.203	1.800	0.072*	0.469	0.201	2.330	0.020**
Constant	-0.027	0.228	-0.120	0.905	-0.091	0.116	-0.790	0.429
R-sq within	0.012				0.012			
R-sq between	0.087				0.104			
R-sq overall	0.013				0.013			
corr(u,X)	0.025				0 (assumed)			
F test tha all u=0			0.980	0.562			-	-
F Test (8,16670) - FE only			25.210	0				
Wald Chi Test (8) - RE only							218.400	0

Note: *p<0.1 ; **p<0.05 ; ***p<0.01

It is observed that the regression models are similar in most of the characteristics, such as: coefficients, standard errors, t-statistics and even the goodness of fit (R^2). However, there are a few substantial differences between the two models. There is a major difference in the correlation between the error terms and the independent variables. In the Fixed Effect model

this correlation is equal to 0.025 and in the Random Effect model, this is assumed to be zero. On the one hand, the Fixed Effect model uses an F-test in order to test if all the unobserved firm-specific characteristics are equal to zero. The p-value of this test is bigger than 5% significance level, meaning that there is not enough evidence to accept the hypothesis that unobserved heterogeneity is equal to zero. On the other hand, Random Effect model assumes this to be zero, and no test is performed. There is also a difference between the two models is the joint probability test of the independent variables. The Fixed Effect model reports an F-test for the joint probability, and the Random Effect model reports a Wald-Chi Test. This is due to the asymptotic properties[2] of the Random Effect model.

In order to decide which one of the above-mentioned panel data models is appropriate to analyze the impact of the level of bank dependence on Revenue growth, a Hausman test is performed and reported in Table 1.5. The Hausman test is used to test the null hypothesis that the preferred model is the Random effect model against the alternative one that the Fixed Effect model is preferred.

Table 1.5: Hausman Specification Test regression (A)

H0: Differences in coefficient not systematic
H1: Differnces in coefficient systematic

	Coefficients			
Dependent variable = ΔRevenues	(b)	(B)	(b-B)	
Variable	Fixed	Random	Difference	Std. Error
T/A	-0.101	0.109	-0.210	0.693
Crisis	-0.018	-0.032	0.013	0.018
Crisis*(T/A)	-0.162	-0.107	-0.055	0.073
ΔInt. Rate Expense (IE)	-0.019	-0.020	0.001	0.001
ΔGDP	1.638	1.823	-0.184	0.204
ΔCapital Expenditure (CE)	0.247	0.246	0.001	0.003
ΔDebt to Asset Ratio	3.933	4.173	-0.240	0.045
ΔCurrent Ratio (CR)	0.364	0.469	-0.105	0.025
Chi2(8)=30.29		Prob>Chi2= 0.0002		

The result of the Hausman Test clearly shows that there is enough evidence to reject the null hypothesis that the preferred model is the Random Effect model. Therefore, the preferred model for regression (A) is the Fixed Effect model reported on the left side of Table 1.4. The Fixed Effect model for regression (A) explains 1.3% of the overall variance of the dependent

[2] Asymptotic properties of the Random Effect assume that the sample size growth indefinitely.

variable between firms and across times. The between $R^{2,}$ which explains the variation between the cross-sectional entities is 8.7% and is bigger than the within R2 of 1.2%.

The coefficients of the independent variables in the Fixed Effect model describe how much the Revenue growth changes based on the changes in the independent variables. It can be observed that in the absence of the financial crisis an increase in the level of Tangible Assets/Assets by 1, leads to a decrease in Revenues by 10.1%. In the case when the crisis is present, an increase in this ratio by 1 leads to a decrease in Revenues by 26.3%. In other words, a decrease in bank dependence level affects Revenues much more negatively during a crisis rather than during normal times. However, this variable does not have a significant effect on Revenue growth, since the p-value is bigger than the significance levels. Furthermore, the presence of crisis when the level of bank dependence is fixed leads to 0.018 lower Revenues. However, this effect is not significant. Another insignificant effect is observed in the change of GDP, an increase of 1% in this variable leads to an increase in Revenues by 1.638%. The other control variables have surprising significant effects on Revenue growth. An increase of 1% in the Interest Rate Expense leads to a decrease in Revenues by 0.019%. An increase of 1% in the Debt to Asset Ratio increases Revenues by 3.933%. Additionally, an increase in the Current Ratio increases Revenues by 0.364%, but significant only at the 10% confidence level. Lastly, when the crisis is not present and all the variables are reported as zero, there are 0.027 lower Revenues. In order to investigate the joint significance of the eight variables used in the model, an F- test is reported, and the null hypothesis that all the coefficients are equal to zero is strongly rejected (p-value <5%). Regression (A) does not show a significant effect of the main variable of interest on Revenue growth, and thus lacks explanatory power to some extent.

Henceforth, in order to assess how the change in bank dependence affects the Revenue growth, regression (B) is established. A Fixed Effect model including time and a Random Effect model are presented in Table 1.6 below. The full table of Fixed Effect model including time is reported in the Appendix, Table 1.8.

Table 1.6: Fixed Effect Model and Random Effect Model for regression (B)

	Fixed Effect Model				Random Effect			
Dependent variable = ΔRevenues								
Variable	Coeff.	Std. Err.	t-stats	p-value	Coeff.	Std. Err.	t-stats	p-value
Δ(T/A)	14.488	0.534	27.120	0.000***	14.441	0.527	27.400	0.000***
Crisis	0.613	0.550	1.110	0.265	-0.042	0.155	-0.270	0.787
Crisis*Δ(T/A)	-13.897	1.574	-8.830	0.000***	-13.787	1.525	-9.040	0.000***
ΔInt. Rate Expense (IE)	-0.017	0.009	-1.850	0.064*	-0.018	0.009	-1.990	0.046**
ΔGDP	21.115	22.176	0.950	0.341	9.486	6.859	1.380	0.167
ΔCapital Expenditure (CE)	0.140	0.027	5.110	0.000***	0.137	0.026	5.290	0.000***
ΔDebt to Asset Ratio	4.989	0.372	13.400	0.000***	5.152	0.367	14.050	0.000***
ΔCurrent Ratio (CR)	0.616	0.199	3.090	0.002***	0.664	0.197	3.370	0.001***
Constant	-0.490	0.393	-1.250	0.212	-0.049	0.087	-0.570	0.572
R-sq within	0.057				0.053			
R-sq between	0.236				0.238			
R-sq overall	0.059				0.055			
corr(u,X)	0.034				0(assumed)			
F test tha all u=0			0.910	0.855			-	-
F Test (8,16670) - FE only			14.850	0.000				
Wald Chi Test (8) - RE only							978.580	0.000

Note: *p<0.1 ; **p<0.05 ; ***p<0.01

To conclude which panel data model is appropriate for regression (B), a Hausman specification test is performed and reported in Table 1.7.

Table 1.7: Hausman Specification Test regression (B)

H0: Differences in coefficient not systematic

H1: Differnces in coefficient systematic

	Coefficients			
Dependent variable = ΔRevenues	(b)	(B)	(b-B)	
Variable	Fixed	Random	Difference	Std. Error
Δ(T/A)	14.48818	14.44051	0.0476673	0.0872992
Crisis	0.6126061	-0.04191	0.6545189	0.5273835
Crisis*Δ(T/A)	-13.89682	-13.7866	-0.1102695	0.3891145
ΔInt. Rate Expense (IE)	-0.0169412	-0.01801	0.0010706	0.0014778
ΔGDP	21.11528	9.486198	11.62909	21.0891
ΔCapital Expenditure (CE)	0.1400974	0.136901	0.0031964	0.009025
ΔDebt to Asset Ratio	4.988589	5.151868	-0.1632787	0.0641958
ΔCurrent Ratio (CR)	0.6163213	0.663546	-0.0472249	0.0300531
Chi2(8)=12.94		Prob>Chi2= 0.0736		

The reported p-value of this test is 0.074, which is bigger than the 5% significance level. It is concluded that there is not enough evidence to reject the null hypothesis that the appropriate model is the Random Effect. Henceforth, the preferred model for this analysis is the Random Effect model which is reported on the right side of Table 1.6 above.

The Random Effect model is used to analyze the impact of the change in bank dependence during the financial crisis of 2007-2009 on the Revenue growth of firms operating in the U.S manufacturing sector. It can be observed that the model accounts for 5.3% of the overall variance

of the dependent variable for both within the firms and across time. The between R^2 separately is equal to 23.8%, and is higher than the within one, meaning that between firm variance is explained better.

In the Random Effect model, the coefficients represent the average effects of the independent variables on the dependent one, when the variables change across time and between firms. The net effect of the variable of interest, the change in Tangible Assets/Assets, varies from the interaction term with the dummy Crisis. On the one hand, when there is no crisis, a 1% change in Tangible Assets/Assets changes Revenues by 14.441%. On the other hand, when the crisis is present, a 1% increase in Tangible Assets/Assets leads to a 0.654% increase in Revenues. Therefore, the interaction effect has a significant negative impact on the change in Revenues. The effect of the dummy Crisis is ambiguous as it depends on the level of change in Tangible Assets/Assets. However, when the crisis is present and the change in the ratio between Tangible Assets and Assets is fixed, there is a 0.042 negative change in Revenue growth in contrast with the situation where there is no crisis. Surprisingly, this effect is not significant at the 5% significance level. Moreover, a 1% increase in Interest Rate and Related Expenses leads to a 0.018% decrease in Revenues and this effect is significant. A 1% increase in the firms' Capital Expenditures leads to a significant increase in Revenues by 0.137%. The change in GDP affects the change in Revenues positively, a 1% increase in GDP leads to a 9.486% increase in Revenues. However, this effect is not significant as the p-value is bigger than the 5% significance level. The change in the Debt to Asset Ratio, which is a control variable, has a positive effect on the change in Revenues. A 1% increase in this variable leads to a significant increase of the change in Revenues by 5.152%. In the same line of reasoning, a 1% change in the other control variable, Current Ratio, leads to a significant increase in Revenues of firms by 0.664%. Lastly, the constant term is equal to -0.049 and represents the level of the change in Revenue growth when there is no crisis, and all the variables are equal to zero. Furthermore, the Wald-Chi test of joint significance shows that the variables used in regression (B) are jointly significant. The results mentioned above for regression (A) and (B) are used extensively in the discussion and conclusion part, to assess the hypotheses and to answer the research question.

VII. Robustness

Next, some robustness checks for the results presented above are performed in order to correct for possible misspecification. Table 1.9 and Tables 1.10 in the Appendix present the new regressions performed by adding variables, removing variables and changing the dataset for both regressions (A) and (B).

First, the change in Long Term Debt is added to both regressions (A) and (B) as a control variable, and represents the extent of debt maturing in more than one year for a particular firm. Long Term Debt is believed to negatively affect the financial performance of a firm (Ikapel and Kajirwa, 2017). The latter is a measure of how well a firm can use its assets to conduct business and generate revenues, and hence it impacts revenues. The change in Long Term Debt added to regressions (A) and (B) does not have a significant effect on Revenue growth of firms operating in the U.S manufacturing sector. Therefore, the main results of both regressions are robust to the inclusion of this variable.

Second, the two control variables named the change in Debt to Asset Ratio and the change in Current Ratio are replaced by the change in Assets and in Liabilities, in the 3rd columns of the tables. Assets represent the economic resources used by a company to produce future benefit, and Liabilities are the obligations of a particular firm. It can be observed that when added to regression (A) and (B) these variables have a significant positive effect on Revenue growth. Furthermore, the R^2 slightly increase, meaning that these regressions predict better the proportion of variance of the dependent variables. Regression (A) is not robust to the inclusion of the change in Assets and Liabilities in the regression model. The independent variable of interest becomes significant at 10% and reverses sign. Besides this, the interaction term becomes significant and the change in Interest Rate Expense becomes insignificant. It can be concluded that this new regression has a better explanatory power than the previously used Fixed Effect models due to better explanation of unobserved heterogeneity.

Regression (B) is observed to be robust to these changes. Noteworthy is the fact that, the change in Capital Expenditures reverses from significant to insignificant. This can be due to potential endogeneity in the model. However, this type of regression can be prone to bias related to the control variables that can be highly correlated with the size of the firm, which is highly correlated

with revenues.

Third, the dataset has been manipulated by decreasing the number of time periods from 63 to 36, from the 1st quarter of 2005 until the 4th quarter of 2013. This change is performed for regressions (A) and (B) and the results are presented in the 4th columns of Table 1.9 and 1.10 respectively. For regression (A) it can be observed that the effects of most of the variables on the dependent variable have increased substantially. It can be concluded that the main results of regression (A) are robust to this change but still remain insignificant for this analysis. This can happen from the sample size and from endogeneity problems of the Fixed Effect model. For regression (B), noteworthy is only the reversion of the change in Interest Rate Expense from significant to insignificant. On the one hand, this case can be due to the low number of observations which do not allow the variable to be explained correctly. On the other hand, this can be due to endogeneity. However, the main results remain highly explanatory and thus robust to this dataset change.

VIII. Discussion and Conclusion

This analysis assesses the impact of bank dependence in the Revenues of the U.S manufacturing firms during the financial recession that started in the 4th quarter of 2007 and ended in the 2nd quarter of 2009. It uses two regression models that differ from each other only on the independent variable of interest. The first regression analyzes the effect of the level of bank dependence on the change in Revenues and the second one analyzes the effect of the change in this variable on the change in Revenues.

Firstly, the empirical findings suggest that an increase in the level of Tangible Assets/Assets leads to a decrease in Revenues during all times. The ratio of Tangible Assets/Assets is a proxy for bank dependence, and thus an increase in this variable leads to a decrease in bank dependence, as theory predicts. Therefore a decrease in the level of bank dependence causes a decrease in the Revenues, with a bigger effect during the financial recession of 2007-2009 than during normal times. However, these results do not have a significant effect on the Revenue growth. Furthermore, following the results of the level of bank dependence, another regression is

established by making use of the bank dependence growth. The results are surprising and have a significant explanatory power on the Revenue growth. These empirical findings suggest that a decrease in bank dependence growth leads to an increase in Revenue growth. During times when the crisis is not present a decrease in bank dependence growth (increase in bank independence) is predicted to be much more beneficial than when the crisis is present, as it leads to higher Revenues. On the one hand, decreasing bank dependence growth during the financial crisis of 2007-2009 resulted in a benefit for the manufacturing firms because revenues increased. On the other hand, this could have also resulted is an opportunity cost as a decrease in bank dependence when there was no crisis, resulted in a revenue increase of about 22 times more than during the crisis.

Answering the research question, firms that had a low level bank dependence level during the financial crisis of 2007-2009 had a larger drop in their Revenue growth compared to firms that had a high level of bank dependence. Noteworthy, the level of bank dependence does not have a significant effect on the Revenue growth and empirical conclusions cannot be drawn. The bank dependence growth, however has a significant effect on the Revenue growth. Firms that were able to reduce bank dependence growth during the crisis had a slight increase in Revenue growth. This suggests that the phenomenon of firms that were able to sell off tangible assets relative to total assets was contrary to the phenomenon of firms that had low levels of bank dependence. All in all, U.S manufacturing firms that had low levels of bank dependence were prone to lower levels of Revenue growth during the financial crisis, however the ability of these firms to reduce this growth slightly improved their Revenue growth.

As Nakajima and Sasaki (2015) explain, a higher ratio of Tangible Assets to Assets gives firms less dependence from banks and less impact from financial events. In the case of the financial crisis of 2007-2009, firms that reduced bank dependence growth were able to achieve higher Revenues because they were less impacted by the banking crisis and the contagious financial environment. This can be due to better usage of external funding that can be achieved through increasing Tangible Assets/Assets and thus improving the productivity of the manufacturing firms which were less dependent on banks.

The two regression models have a surprising insignificant results on the effect of the dummy

Crisis on the Revenue growth. This can be due to endogeneity problems but also due to the major unobserved heterogeneity problems that panel data analysis brings to the analysis.

Secondly, the increase in Interest Rate and Related Expenses has a negative effect on Revenues, however significant only at the 10% significant level. Therefore, this finding is logical to economic theory and also is in line with the ideas of Riley (2015) and Johnston (2017), on the repercussions of Interest Expense on sales and revenues. Thirdly, GDP has a large positive effect on the Revenues. However, the effect does not show any explanatory power at any significance level at any regression. Therefore, the findings of this paper on GDP are not in line with the findings of Gross and Alcidi (2010) that argue on a decrease in output related to a decrease in real economy. Henceforth, this is a surprising finding because GDP is a perfect indicator of the health of the economy, and the health of the economy is logically related to firm performance. Lastly, a positive effect of the change in Capital Expenditures on Revenue growth is predicted by the models. Capital Expenditures, representing investments, have an interesting positive explanatory power on Revenues. Therefore it can be concluded that the findings are in line with Pindyck and Solimano (1993), Janicko et al. (2012) who found that low investment expenditures are related to low productivity and high investment expenditures are related to high productivity. The explanatory power of this variable is robust for both regressions. Furthermore, the effect of this variable is expected to be better explained in analysis that studies the effect of investment in a larger time span. All in all, this empirical study suggests enough evidence to accept all the hypotheses stated.

Has this analysis provided evidence on the causal relationship between bank dependence and Revenues, during the financial crisis of 2007-2009? Properly answering this questions requires full resolution of potential endogeneity problems. The findings of this paper are limited by the different unobserved characteristic of firms and unobserved behavioral characteristics of the financial market. The use of a proxy for bank dependence is a limitation because it might contain different characteristics not related to bank dependence. For example, the lower bank dependence growth that suggest higher Revenue growth, is a consequence of an increase in Tangible Assets relative to total Assets, but in the same time it can be an increase in Non-Tangible Assets relative to Assets. Besides this, the use of a low number of control variables brings

problems of endogeneity that might result in some misspecification. For example, the regression (A) does not have proper explanatory power for the phenomenon. Furthermore, since some of the firm-specific data were inadequate or miss-reported, interpolation is used. Interpolation can be a limitation as it causes the data points to be approximations rather than original values. Nevertheless, this analysis can be viewed as an attempt to carefully study a different dimension of the crisis by using bank dependence. Even though limited to some extents, this analysis shows some novel relationships between bank dependence and Revenues.

There are several directions for further research that would undoubtedly have a scientific and social impact. Most importantly, there is the need for a feasible bank dependence variable. This way it will be possible to study the impact of bank dependence on various dimensions, such as: firm-specific, government or regulation. There needs to be more research related to the manufacturing sector, as it is important to study the weaknesses of this sector and restructure them in the appropriate way. Furthermore, my analysis can be extended to the whole U.S market in order to assess the overall impact of bank dependence during the financial crisis.

To conclude, this study contributes to the claim of Fassler (2007) for the need of more microeconomic repercussion of the crisis. Henceforth, my recommendation stands in line with the one of Fassler (2007), to extend the body of firm-specific microeconomic analysis of the crisis.

Appendix

Figure 1.1: Manufacturing Sector, value-added % on GDP

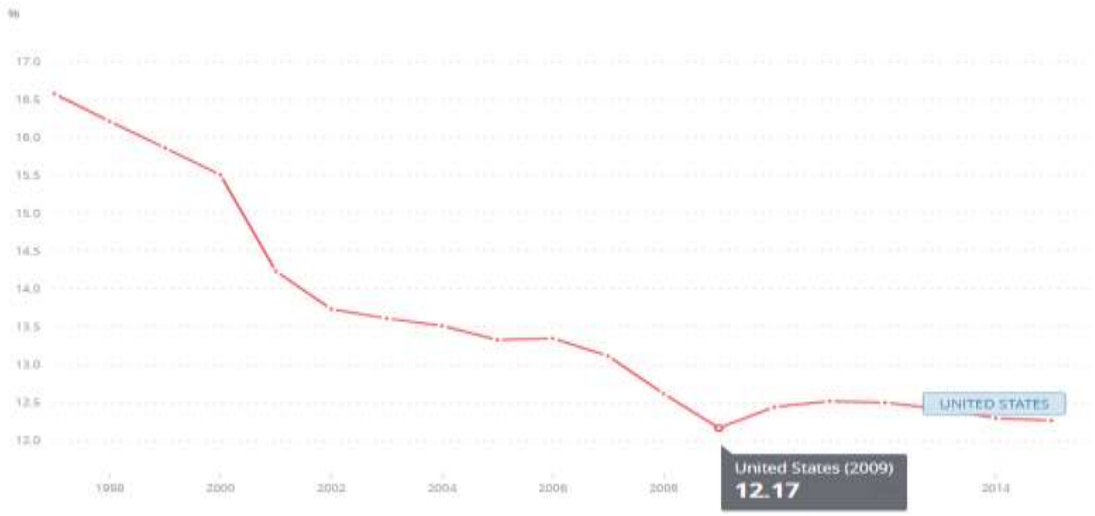


Figure 1.2: Economic Policy Uncertainty U.S 1985-2011

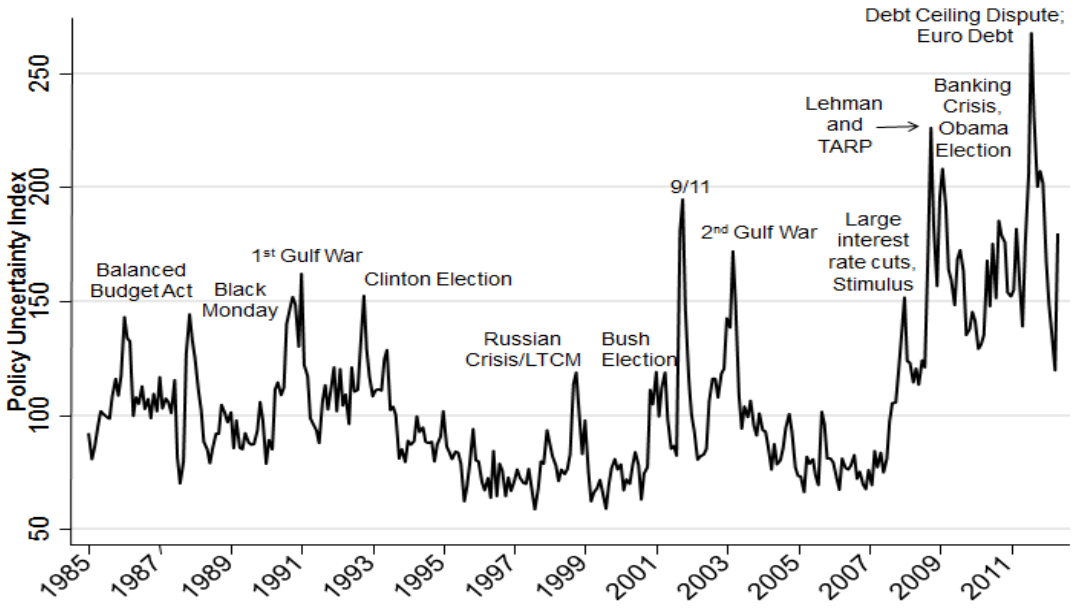


Table 1.1: Descriptive Statistics Panel Data

Variable	Variation	Mean	Std. Dev.	Min.	Max.	Obs.
Key	overall	12278.23	10345.33	1104	61400	N = 16947
	between		10364.31	1104	61400	n = 269
	within		0	12278.23	12278.23	T = 63
Periods	overall	33	18.18478	2	64	N = 16947
	between		0	33	33	n = 269
	within		18.18478	2	64	T = 63
Crisis	overall	0.1111111	0.314279	0	1	N = 16947
	between		0	0.1111111	0.1111111	n = 269
	within		0.314279	0	1	T = 63
ΔGDP	overall	0.0095469	0.0071887	-0.0197467	0.0246536	N = 16947
	between		0	0.0095469	0.0095469	n = 269
	within		0.0071887	-0.0197467	0.0246536	T = 63
ΔRevenue	overall	0.0752832	5.329409	-0.9761072	692.08	N = 16947
	between		0.6826307	-0.011241	11.14704	n = 269
	within		5.285672	-12.04787	681.0082	T = 63
ΔInt. Rate Expense (IE)	overall	0.3558993	4.512939	-2.072847	539	N = 16947
	between		0.5591667	0.0377496	8.802261	n = 269
	within		4.478291	-9.420555	530.5536	T = 63
ΔCapital Expenditure (CE)	overall	0.4321381	1.566396	-6.666667	114	N = 16947
	between		0.2009232	0.2022204	2.152561	n = 269
	within		1.553504	-7.330619	112.2796	T = 63
ΔLong-Term Debt (LTD)	overall	1.71879	108.2157	-535.6024	11713.11	N = 16947
	between		13.68564	-7.802687	188.0704	n = 269
	within		107.35	-526.0809	11526.76	T = 63
ΔAssets (A)	overall	0.0181657	0.1305485	-0.7338756	3.13371	N = 16947
	between		0.0208516	-0.0232089	0.1124785	n = 269
	within		0.1288787	-0.7579132	3.124733	T = 63
ΔLiabilities (L)	overall	0.0265926	0.3119202	-0.9414779	28.26068	N = 16947
	between		0.0415954	-0.0181602	0.48736	n = 269
	within		0.3091446	-0.931915	27.79991	T = 63
ΔCurrent Assets (CA)	overall	0.0205207	0.1513545	-0.6839418	3.883832	N = 16947
	between		0.0206213	-0.0233096	0.1514625	n = 269
	within		0.1499483	-0.7240182	3.800139	T = 63
ΔCurrent Liabilities (CL)	overall	0.0342326	0.2700516	-0.8909579	6.564573	N = 16947
	between		0.0362422	-0.0225626	0.2496185	n = 269
	within		0.2676176	-1.035518	6.508352	T = 63
T/A	overall	0.2853717	0.162354	0.0000305	0.9650573	N= 16947
	between		0.1529891	0.0413216	0.8524871	n= 269
	within		0.0551254	-0.0080619	0.6357956	T = 63
Δ(T/A)	overall	-0.0023283	0.0818391	-0.9668432	2.123308	N = 16947
	between		0.0086675	-0.0433526	0.0479655	n = 269
	within		0.0813805	-0.9258189	2.073014	T = 63
ΔDebt to Asset Ratio	overall	0.0041795	0.1152794	-0.8494406	8.064978	N = 16947
	between		0.0119252	-0.0220541	0.1049139	n = 269
	within		0.1146632	-0.860421	7.964243	T = 63
ΔCurrent Ratio (CR)	overall	0.01763	0.2089134	-0.8479189	4.805706	N = 16947
	between		0.0217537	-0.0062021	0.1853203	n = 269
	within		0.2077819	-0.9626638	4.744779	T = 63
Crisis*(T/A)	overall	0.0307595	0.1018298	0	0.904302	N = 16947
	between		0.0174629	0.0014903	0.0952459	n = 269
	within		0.1003268	-0.0644864	0.8398156	T = 63
Crisis*Δ(T/A)	overall	0.0010197	0.0280386	-0.9668432	0.6617801	N = 16947
	between		0.0033706	-0.0302172	0.012912	n = 269
	within		0.027836	-0.9356062	0.693017	T = 63

Figure 1.5: Crisis over time

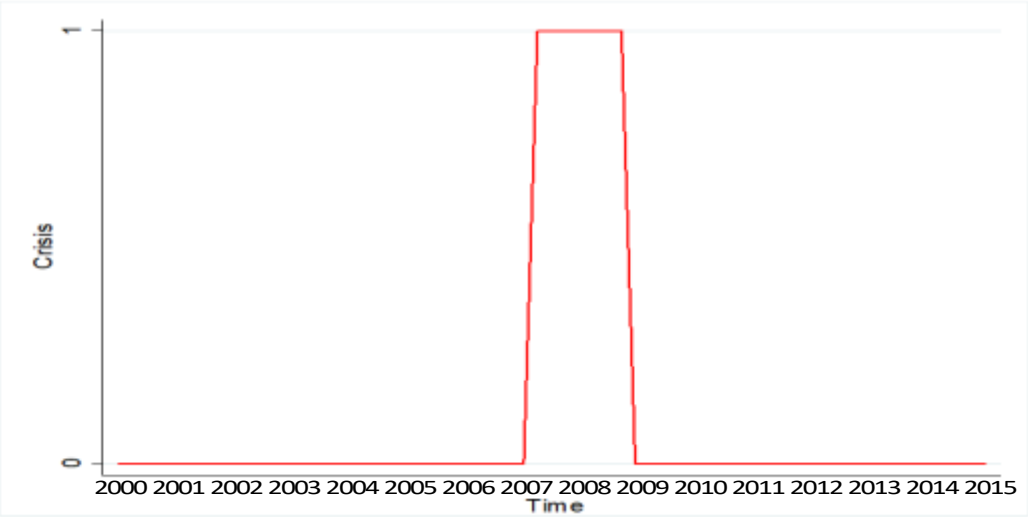


Table 1.3: Harris-Tzavalis unit-root tests

Ho: Panels contain unit roots				Nr. Panels = 269
Ha: Panels are stationary				Nr. Periods= 63
Variable	Statistics	z-test	p-value	Stationary
ΔRevenue	-0.017	-3.20E+02	0.000	Yes
T/A	0.925	-9.22E+00	0.000	Yes
Δ(T/A)	-0.025	-3.20E+02	0.000	Yes
Crisis	0.839	-3.79E+01	0.000	Yes
Crisis*(T/A)	0.831	-4.04E+01	0.000	Yes
Crisis*Δ(T/A)	0.027	-3.10E+02	0.000	Yes
ΔInt. Rate Expense (IE)	-0.024	-3.20E+02	0.000	Yes
ΔGDP	0.453	-1.70E+02	0.000	Yes
ΔCapital Expenditure (CE)	-0.107	-3.50E+02	0.000	Yes
ΔDebt to Asset Ratio	-0.061	-3.40E+02	0.000	Yes
ΔCurrent Ratio (CR)	-0.141	-3.60E+02	0.000	Yes
cross sectional means removed				

Table 1.8: Fixed Effect time-varying Model regression (B)

Variables	Coeff.	Std. Err.	t-stats	P-value
Δ(T/A)	14.488	0.534	27.120	0.000***
Crisis	0.613	0.550	1.110	0.265
Crisis*Δ(T/A)	-13.897	1.574	-8.830	0.000***
ΔInt. Rate Expense (IE)	-0.017	0.009	-1.850	0.064*
ΔGDP	21.115	22.176	0.950	0.341
ΔCapital Expenditure (CE)	0.140	0.027	5.110	0.000***
ΔDebt to Asset Ratio	4.989	0.372	13.400	0.000***
ΔCurrent Ratio (CR)	0.616	0.199	3.090	0.002***
Constant	-0.490	0.393	-1.250	0.212
Periods				
30/09/2000	0.336	0.416	0.810	0.419
31/12/2000	0.085	0.395	0.220	0.829
31/03/2001	0.572	0.460	1.240	0.213
30/06/2001	0.143	0.390	0.370	0.713
30/09/2001	0.527	0.503	1.050	0.295
31/12/2001	0.151	0.433	0.350	0.727
31/03/2002	0.340	0.391	0.870	0.384
30/06/2002	0.248	0.405	0.610	0.540
30/09/2002	0.248	0.404	0.610	0.539
31/12/2002	0.127	0.431	0.290	0.768
31/03/2003	0.377	0.394	0.960	0.339
30/06/2003	0.324	0.390	0.830	0.406
30/09/2003	0.112	0.424	0.260	0.793
31/12/2003	0.216	0.390	0.550	0.579
31/03/2004	0.679	0.389	1.750	0.081*
30/06/2004	0.386	0.389	0.990	0.321
30/09/2004	0.402	0.388	1.040	0.300
31/12/2004	0.150	0.388	0.390	0.699
31/03/2005	0.195	0.407	0.480	0.632
30/06/2005	0.163	0.390	0.420	0.676
30/09/2005	0.328	0.394	0.830	0.406
31/12/2005	0.071	0.388	0.180	0.855
31/03/2006	0.370	0.407	0.910	0.363
30/06/2006	2.763	0.395	6.990	0.000***
30/09/2006	0.408	0.415	0.980	0.325
31/12/2006	-0.002	0.394	-0.010	0.996
31/03/2007	0.287	0.393	0.730	0.464
30/06/2007	0.333	0.388	0.860	0.391
30/09/2007	0.276	0.399	0.690	0.490
31/12/2007	-0.280	0.509	-0.550	0.582
31/03/2008	-0.138	0.451	-0.310	0.759
30/06/2008	-0.411	0.531	-0.770	0.439
30/09/2008	-0.272	0.461	-0.590	0.556
31/12/2008	-0.186	0.586	-0.320	0.751
31/03/2009	-0.009	0.485	-0.020	0.985
30/06/2009	0.000	(omitted)		
30/09/2009	0.743	0.464	1.600	0.109
31/12/2009	0.224	0.390	0.580	0.565
31/03/2010	0.665	0.416	1.600	0.110
30/06/2010	0.290	0.388	0.750	0.454
30/09/2010	0.462	0.394	1.170	0.241
31/12/2010	0.194	0.393	0.490	0.622
31/03/2011	0.791	0.497	1.590	0.111
30/06/2011	0.189	0.387	0.490	0.626
30/09/2011	0.376	0.412	0.910	0.362
31/12/2011	-0.002	0.389	-0.010	0.995
31/03/2012	0.388	0.392	0.990	0.322
30/06/2012	0.221	0.405	0.550	0.585
30/09/2012	0.214	0.426	0.500	0.616
31/12/2012	-0.027	0.449	-0.060	0.953
31/03/2013	0.395	0.396	1.000	0.320
30/06/2013	0.427	0.453	0.940	0.346
30/09/2013	0.145	0.390	0.370	0.710
31/12/2013	-0.030	0.388	-0.080	0.938
31/03/2014	0.485	0.484	1.000	0.316
30/06/2014	0.164	0.388	0.420	0.673
30/09/2014	0.075	0.390	0.190	0.848
31/12/2014	-0.010	0.422	-0.020	0.981
31/03/2015	0.255	0.440	0.580	0.562
30/06/2015	0.111	0.391	0.280	0.776
30/09/2015	0.178	0.414	0.430	0.668
31/12/2015		0 (omitted)		

Note: *p<0.1 ; **p<0.05 ; ***p<0.01

Table 1.9: Robustness Check regression (A)

	(1)	(2)	(3)	(4)
Variables	Coefficients	Coefficients	Coefficients	Coefficients
T/A	-0.101	-0.103	1.373*	0.000
	(0.742)	(0.742)	(0.731)	(1.823)
Crisis	-0.018	-0.019	0.012	-0.009
	(0.275)	(0.275)	(0.270)	(0.389)
Crisis*(T/A)	-0.162	-0.160	-0.152***	-0.283
	(0.817)	(0.817)	(0.801)	(1.130)
ΔInt. Rate Expense (IE)	-0.019**	-0.019**	-0.053	-0.004
	(0.009)	(0.009)	(0.009)	(0.013)
ΔGDP	1.638	1.611	-4.916	7.063
	(6.977)	(6.978)	(6.844)	(12.050)
ΔCapital Expenditure (CE)	0.247***	0.267***	0.205***	0.356***
	(0.026)	(0.026)	(0.026)	(0.042)
ΔDebt to Asset Ratio	3.934***	3.943***		9.561***
	(0.375)	(0.376)		(0.762)
ΔCurrent Ratio (CR)	0.364*	0.366*		0.946***
	(0.203)	(0.203)		(0.383)
ΔLong-Term Debt		0.000	-0.001	
		(0.000)	(0.000)	
ΔAssets			3.373***	
			(0.419)	
ΔLiabilities			2.694***	
			(0.179)	
Constant	-0.027	-0.026	-0.468***	-0.133
	(0.228)	(0.228)	(0.225)	(0.516)
R-sq within	0.012	0.012	0.051	0.024
R-sq between	0.087	0.087	0.052	0.077
R-sq overall	0.013	0.013	0.051	0.025

Note: *p<0.1 ; **p<0.05 ; ***p<0.01

Table 1.10: Robustness Check regression (B)

	(1)	(2)	(3)	(4)
Variables	Coefficients	Coefficients	Coefficients	Coefficients
Δ(T/A)	14.441***	14.440***	20.341***	28.208***
	(0.534)	(0.527)	(0.540)	(0.953)
Crisis	-0.042	-0.042	-0.025	-0.190
	(0.550)	(0.155)	(0.150)	(0.234)
Crisis*Δ(T/A)	-13.787***	-13.789***	-12.441***	-26.256***
	(1.574)	(1.525)	(1.467)	(2.075)
ΔInt. Rate Expense (IE)	-0.018*	-0.018*	-0.046***	0.001
	(0.009)	(0.009)	(0.009)	(0.012)
ΔGDP	9.486	9.458	3.513	15.792
	-22.176	(6.859)	(6.593)	(11.645)
ΔCapital Expenditure (CE)	0.137***	0.137***	0.011	0.223***
	(0.027)	(0.026)	(0.025)	(0.050)
ΔDebt to Asset Ratio	5.152***	5.162***		10.550***
	(0.372)	(0.368)		(0.703)
ΔCurrent Ratio (CR)	0.664***	0.665***		1.815***
	(0.199)	(0.197)		(0.358)
ΔLong-Term Debt		0.000	-0.001*	
		(0.000)	(0.000)	
ΔAssets			8.382***	
			(0.421)	
ΔLiabilities			2.285***	
			(0.172)	
Constant	-0.049	-0.048	-0.096	-0.019
	(0.393)	(0.087)	(0.083)	(0.156)
R-sq within	0.053	0.1297	0.1237	0.1062
R-sq between	0.238	0.2622	0.2298	0.2004
R-sq overall	0.055	0.1318	0.1254	0.1081

Note: *p<0.1 ; **p<0.05 ; ***p<0.01

References

Adkins, L. C., Campbell, R. C., Chmelarova, V., & Hill, R. C. (2012). The Hausman Test, and Some Alternatives, with Heteroskedastic Data. *Essays in Honor of Jerry Hausman Advances in Econometrics*, 515-546. doi:10.1108/s0731-9053(2012)0000029022

Baker, S., Bloom, N., & Davis, S. (2015). Measuring Economic Policy Uncertainty. doi:10.3386/w21633

Besanko, D., & Thakor, A. V. (1987). Competitive equilibrium in the credit market under asymmetric information. *Journal of Economic Theory,42*(1), 167-182. doi:10.1016/00220531(87)90108-6

Brunnermeier, M. K. (2009). Deciphering the Liquidity and Credit Crunch 2007–2008. *Journal of Economic Perspectives,23*(1), 77-100. doi:10.1257/jep.23.1.77

Campello, M. (2006). Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics, 82*(1), 135-172. doi:10.1016/j.jfineco.2005.04.001

Carmen M. Reinhart and Kenneth S. Rogoff (2009), The Aftermath of Financial Crises, *National Bureau of Economic Research*, Working Paper 14656

Coval, J. D., Jurek, J. W., & Stafford, E. (2009). The Economics of Structured Finance. *SSRN Electronic Journal*. doi:10.2139/ssrn.1287363

Ericson, R. and A. Pakes, (1995), Market perfect industry dynamics: A framework for empirical analysis, *Review of Economic Studies 62*, 53-82

Fassler, K. W. (2007). Macroeconomic Crisis and Firm Performance. Rotterdam: *Erasmus Research Institute of Management*.

Goldsmith, Raymond W. 1969. Financial structure and development. *New Haven*

Gorton, G., & Schmid, F. (2000). Universal Banking and the Performance of German Firms. *Journal of Financial Economics*. doi:10.3386/w5453

Gros, D., & Alcidi, C. (2010). The impact of the financial crisis on the real economy. *Intereconomics,45*(1), 4-20. doi:10.1007/s10272-010-0320-0

Hausman, J. A. 1978. Specification tests in econometrics. *Econometrica* 46: 1251–1271.

Ikapel, O. F., & Kajirwa, I. H. (2017). Analysis of long term debt and financial performance of state owned sugar firms in Kenya . *International Journal of Commerce and Management Research, 3* (2), 108-111.

IMF World Economic Outlook (WEO). (2009). Crisis and Recovery, April 2009 Retrieved July 13, 2017, from http://www.imf.org/external/pubs/ft/weo/2009/01/

Ivashina, V., & Scharfstein, D. S. (2009). Bank Lending During the Financial Crisis of 2008. *SSRN Electronic Journal*. doi:10.2139/ssrn.1297337

Johnston, K. (2017). The Effect of Interest Rates on Business. Retrieved July 21, 2017, from http://smallbusiness.chron.com/effect-interest-rates-business-69947.html

Julie Poznanski, Sadownik, B., & Gannitsos, I. (2013). Financial Ratio Analysis.

Kannan, P., Scott, A., & Terrones, M. (2009). From Recession to Recovery: How Soon and How Strong . *IMF* .

Nakajima, K., & Sasaki, T. (2015). Bank dependence and corporate propensity to save. *PacificBasin Finance Journal*,36, 150-165. doi:10.1016/j.pacfin.2015.12.012

Pindyck, R., & Solimano, A. (1993). Economic Instability and Aggregate Investment. doi:10.3386/w4380

Rajan, Raghuram G., and Luigi Zingales (1998), "Financial Dependence and Growth", *American Economic Review 88*(3), pp. 559-96

Redmond, M., & Van Zandweghe, W. (2016). The Lasting Damage from the Financial Crisis to U.S. *Kansas City FED*

Riley, J. (2015). External Environment: Interest Rates (GCSE) | tutor2u Business. Retrieved July 21, 2017, from https://www.tutor2u.net/business/reference/external-environment-interest-rates

Thornton, P. (2010). The global manufacturing sector: current issues - *CIMA*. Retrieved July 13, 2017

United States Government Accountability Office. (2013, January). Financial Crisis Losses and Potential Impacts of the Dodd-Frank Act. *Government Accountability Office.* Retrieved January, 2013.

Valencia, F., & Laeven, L. (2008). Systemic Banking Crises: A New Database. *IMF Working Papers, 08*(224), 1. doi:10.5089/9781451870824.001

Wie, T. K. (2000). The Impact Of The Economic Crisis On Indonesia's Manufacturing Sector. *The Developing Economies*,38(4), 420-453. doi:10.1111/j.1746-1049.2000.tb00886.x