



Too Big to Fail Applied to Non-Financial Companies

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Abstract

This chapter develops a methodology to evaluate if a non-financial firm is “too big to fail” moreover we tested and applied the approach to 3 large European firms. The methodology consists in using the principles of the special regulation of financial firms in the USA plus a brief qualitative analysis. According to our analysis: Volkswagen Group is structurally “too big to fail” as many employments in Germany (and the world) depend on the continuity of its operations, Royal Dutch Shell is indirectly “Too big to fail” as its bankruptcy could collapse the London Stock Exchange, finally we believe that Anheuser-Busch InBev is not “Too big to fail” as the firm is rather a collection of firms that one entity.

13.1 Introduction

Resilience comes from the Latin “resilió” that literally means jump back, rebound or recoil. Initially the term was used in material sciences as the relation between “stress” and “strain” of a material, more specifically, it deals with the energy that can be applied without permanent distortion. In the last 50 years the term has spread to many different sciences including environmental sciences, economics, psychology, anthropology, and business. However, there is not a universal accepted definition of what resilience is. (McAslan, 2010)

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© Der/die Autor(en) 2022
J. Schellinger et al. (Hrsg.), *Resilienz durch Organisationsentwicklung*,
https://doi.org/10.1007/978-3-658-36022-1_13

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According to McAslan (2010) most definitions of resilience include the following characteristics: It deals with abnormal events and threats, it is a positive feature—it is good to be resilient—it is about being prepared, it is about desire—and commitment—to survive, it is about adaptability, it is about learning from experience (own and others’) and finally it requires a collective and coordinate response to those threats and events.

Under this framework we can agree that, in the short history of the specie, the homo sapiens has proved to be resilient, however corporations and social structures have not. Empires have grown and collapsed (Wikipedia, 2021a, 2021b), cities have appeared, peaked and declined (Kane, 2011), firms have thrived and failed (Statista, 2020a, 2020b).

Unfortunately—given its particularities—the financial system has a shown limited resilience (Wikipedia, 2021a, 2021b). The nature of banking and insurance is mutuality. Banks provide security to their investors (depositors) by keeping their assets safe. To do that, Banks allotabcate their client’s resources in several projects and firms, directly¹ or indirectly². In principle, when one project or a firm fails the income generated by other projects will cover the cost incurred, so the depositors are protected. The group takes care of the individual.

However, it is possible that several projects fail at the same time. By nature, regional banks tent to have a portfolio “over exposed” to the local economy, so when a deep recession hits an area, banks can suffer dramatically and, in some cases, can go broke. In principle, when this happens, its investors (depositors) will lose part or the whole amount of their investments. Which can be catastrophic for many, especially for small investors that can lose access to their savings and even to their current accounts³ like it happened in Argentine in 2001 (Gutierrez & Montes-Negret, 2004), in the USA during the Great Depression (Ganzel, 2003) and later during the Saving and Loans Crisis (Federal Reserve History, 2013) or in the UK after the bankruptcy of Northern Rock (Peachey, 2017).

In theory, when a single bank goes bankrupt, it should not affect the whole economy, as it has a tiny fraction of depositors⁴. However, after such event, two effects can trigger more problems. On one side, as investors observe that one bank fails, they start to worry that other banks would suffer the same fate. In this case, the natural behaviour is to pull out their investments (deposits) from banks to prevent the loses⁵. Unfortunately, this behaviour acts as self-fulfilling prophecy as banks—by nature—do not have enough liquidity to cover all its deposits. The second effect concerns indirect investments. Some of the investors of a bank are other banks, that could get into troubles if a bank goes bankrupt. For example, let’s assume that the real estate is booming in Spain: as housing prices goes up the number of transactions and the yields increase: it becomes attractive. If a Swiss bank wants to participate in this “good” business, it could go to Spain and sell mortgages in that

¹By lending in traditional instruments such as mortgages, personal credits, etc.

²By buying bonds from firms or governments.

³Current account allows people to make payments and to receive their salary.

⁴Although, it is an individual tragedy for its investors.

⁵“Bank Run”.

country, however this is inefficient, burdensome, and expensive. However, by buying debt or equity of a Spanish bank, heavily invested in real estate, the Swiss bank actually participates in booming market. In other words, it is expose to the real estate market of Spain.

As banks grow, their relative importance increases up to point that their bankruptcy becomes a major trouble to the economy. If a very large bank—or a very interconnected bank—goes bankrupt, the wave shock may affect the local and even the world's economy like it happened with the bankruptcy of Creditanstalt Bank (Kangas, 2019) or Lehman Brothers (Harvard Business School, 2020). Therefore, when one big bank (or insurance) gets into trouble, the State has to save it in order to avoid financial chaos. Such banks are “too big to fail”⁶.

Of course, owner, board and management of those banks understand that they are in a very privileged situation: if they make a profit, they will rip big benefits (Dividends, high salaries, great perks and big bonus) however if they lose the State will save the organization. So, they have incentives to engage in higher risks, or what economist call “Moral Hazard” (Kenton, 2020).

Politically speaking—specially in a democracy—the “Too big to fail” is a huge problem. On one side it is imperative that a large financial institution is saved from bankruptcy, on the other side saving it, could collapse governments or put in peril a re-election bid. In order to avoid this conundrum, legislators and regulators have developed a series of regulations that, in principle, would prevented financial institutions to be in the position to be rescued. In other words, make the financial system resilient.

Having said that, in general, firms dislike regulation. It hampers its ability to do business, it makes its operations more expensive, it takes control out of shareholders and managers. Therefore, it is very important, whether a financial institution is declared, or not, “Too big to fail”.

Until now, we have only spoken about financial firms. It occurred to us that this concept of “Too big to fail” could be applied to other type of firms, not only financial firms.

We imagined that the bankruptcy of some firms could have disastrous consequences in the economy of a region or a country. So, the idea of the thesis was to create a framework based around the special regulation of financial firms and apply it to three different very large non-financial companies: Volkswagen Group, Royal Dutch Shell, and AB InBev. Moreover, we calculate what was the probability of default of each one of those firms in March 2020 and in April 2020 (At the peak of the “first wave” of the Corona-virus pandemic)

In the 2nd chapter of this paper, we present the financial framework that we used to measure the firms and in the 3rd chapter we applied to three very large firms. In chapter 4th we briefly analyse possible consequences of large bankruptcies for individuals and communities. In chapter 5th we present our results and in chapter 6th our conclusions.

⁶The proper name is “Global Systemically Important Financial Institutions”.

13.2 The Financial Framework

Financial regulations set thresholds to financial institutions. Often these regulations exist in different levels depending on the size of the company and the field they work in. Example of this is Basel III regulatory framework, which sets minimum capital requirements for market risk (Bank for International Settlements, 2020). The goal of these regulations is limiting the risk taking of financial institutions and for institutions that work in especially risky markets have a guarantee that they do not bankrupt from one deal gone wrong.

13.2.1 Dodd-Frank Wall Street Reform and Consumer Protection Act

Dodd-Frank act was a U.S. federal law that became effective in 2010 in the aftermath of 2007–2008 subprime mortgage crisis. The core idea of the law was to increase financial stability and consumer protection by setting various regulations to financial companies. Main provision included in the law set where holding reserve accounts, annual stress tests and oversight from the Financial Stability Oversight Council (History.com, 2018).

Nearly entirety of Dodd-Frank act was designated towards financial companies, however it did include a section that applied for nonbank financial companies. Section 113 set thresholds to these companies that if passed they would have to be under surveillance. Stage 1 thresholds are:

- \$50 billion in total consolidated assets
- \$30 billion in gross notional credit default swaps outstanding for which a nonbank financial company is the reference entity
- \$3.5 billion of derivative liabilities
- \$20 billion in total debt outstanding
- 15 to 1 leverage ratio of total consolidated assets (excluding separate accounts) to total equity
- 10 percent short-term debt ratio of total debt outstanding with a maturity of less than 12 months to total consolidated assets (excluding separate accounts)
- If a nonbank financial company meets the requirement of total consolidated assets and one other, they will be subject to stage 2 and 3. Stage 2 includes the Council conducting in depth analysis of the company in question. If the Council sees that the company could pose a threat to U.S. financial stability it will enter stage 3. Stage 3 builds on stage 2 and will determine if the company in question will be subject to supervision from the Board of Governors. The Council believes that the whole procedure cannot be reduced to a formula, therefore each review is an individual process (Financial Stability Oversight Council, 2010). In short, if a nonbank financial company has over \$50 billion in total consolidated assets and passes any other threshold, they will be subject for review which will decide whether the company is to be under supervision from regulators.

- A nonbank financial company is defined as a financial institution that offers various banking services but does not have a banking license. The Dodd-Frank act states that if 85% of the annual gross revenue comes from financing activities they are considered as a nonbank financial company (Chen, 2020).

13.2.2 Credit Ratings

Borrowers' creditworthiness is measured with credit rating. It is often a number or a rank which displays how likely an entity is going to back their loans. Credit rating agencies such as Standard & Poor's, Moody's and Fitch assess credit scores and evaluations for corporations and companies (Kagan, 2020). For companies' higher credit score is an advantage, that means they have high possibility of paying the loan back and translates into lenders asking lower interest on the loan. Credit ratings also affect the share price of a company, high rating is a sign of properly managed financials.

Since credit rating is an indicator of how likely a company is going to pay back their loan it can be used as an indicator of how well the company is performing. Company with good credit rating should have a positive forecast and company with a bad rating a negative forecast. If we assume that investors are rational, they should not invest in a company with a bad credit rating. If they still do invest in a company with bad credit rating the credit rating does not reflect the risk. As an example, the investor could think that a company is "Too Big to Fail" and therefore consider investing into it as non-risky. Example of such company could be General Motors who received a \$50 billion bailout in 2009 and was recently given a credit line from the U.S. Senate due to the COVID-19 crisis (Shepardson & Klayman, 2020). General Motors has historically had below average credit rating (Moody's, 2020). Company like General Motors could be defined as "Too Big to Fail" and if the investors believe in this the bad credit rating does not reflect the actual risk.

All three main Credit Rating Agencies (Table 13.1) have the same ratings, albeit with different names. Everything below Lower Medium Grade (BBB- Fitch/Standard & Poor's or Baa3 Moody's) is often considered as non-investment grade or "junk" (Fidelity Learning Center, 2020). Prime and High Grades are often only given to wealthy established countries, for an example European Union bonds are considered Prime or AAA (European Commission, 2020).

13.2.3 Altman's Linear Discriminant Model

Altman's Linear Discriminant Model or often referred as Altman Z-score model was developed in 1968 to evaluate manufacturing companies. The original data was gathered from over 60 manufacturing companies. The formula measures a Z-score of a company which displays the likeliness of a default risk. The formula is as follows:

Table 13.1 Three main credit rating agencies. (Quelle: Basar, 2019)

No	S&P	Moody's	Fitch	Meaning and Color
1	AAA	Aaa	AAA	Prime
2	AA+	Aa1	AA+	High Grade
3	AA	Aa2	AA	
4	AA-	Aa3	AA-	
5	A+	A1	A+	Upper Medium Grade
6	A	A2	A	
7	A-	A3	A-	
8	BBB+	Baa1	BBB+	Lower Medium Grade
9	BBB	Baa2	BBB	
10	BBB-	Baa3	BBB-	
11	BB+	Ba1	BB+	Non Investment Grade Speculative
12	BB	Ba2	BB	
13	BB-	Ba3	BB-	
14	B+	B1	B+	Highly Speculative
15	B	B2	B	
16	B-	B3	B-	
17	CCC+	Caa1	CCC+	Substantial Risk
18	CCC	Caa2	CCC	Extremely Speculative

Three main Credit Rating Agencies Quelle: (Basar, 2019)

$$Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$$

Equation 1: Altman's Linear Discriminant

And the variables are defined as:

A = Working capital/total assets

B = Retained earnings/total assets

C = EBIT/total assets

D = Market value equity/book value LT debt

E = Sales/total assets

The result of the formula is a Z-score, what we can use to evaluate companies. The critical Z-score value is 1.81, every score below that means that the company has a high default risk. Z-scores above 2.99 mean that the company has a low default risk (Altman, 2000). Altman's model can be used for same purposes as credit ratings but is designed to especially evaluate manufacturing companies. A company with a bad Z-score should not be a good investment since it has a high default risk. Good Z-score is an indicator of good standing (CFI, 2020).

13.2.4 Merton Model

Robert Merton developed a model to assess the credit risk of a company examining company's equity as call options for their assets in 1974. This so-called Merton Model gives a company probability of default within given time frame (Merton, 1974). The model Robert Merton developed is widely adopted by analysts and investors.

The model framework was taken from Hull (2015).

The model calculates what is the value and the volatility of the assets of a public-traded firm based on the volatility of its equity, in other words, it shares. This is particularly important in a world where the value of the firm is fundamentally intangible assets. By using the property of "limited" liability the model assumes that the firm is call option for the shareholders. If the assets are higher than the debt of the firm, shareholders do not "exercise" the option, otherwise they lose their investment in favour of the debt holders. Therefore, we can write the payoff of a shareholder as:

$$E_T = \max(V_T - D, 0)$$

Where E_T is the market value of the firm V_T is the value of the assets of the firm and D the debt that the firm must repay in the following months.

According to Black-Scholes-Merton formula the value of the company's equity today is:

$$E_0 = V_0 N(d_1) - D e^{-rT} N(d_2)$$

where;

$$d_1 = \frac{\ln\left(\frac{V_0}{D}\right) + \left(r + \frac{\sigma_v^2}{2}\right)T}{\sigma_v \sqrt{T}}; \quad d_2 = \frac{\ln\left(\frac{V_0}{D}\right) - \left(r + \frac{\sigma_v^2}{2}\right)T}{\sigma_v \sqrt{T}}$$

The variables are defined as:

V_0 = Value of company's assets today

V_T = Value of company's assets at time T

E_0 = Value of company's equity today

E_T = Value of company's equity at time T

D = Debt repayment due at time T

σ_v = Volatility of assets (assumed constant)

σ_E = Instantaneous volatility of equity.

$$\sigma_E E_0 = \frac{\partial E}{\partial V} \sigma_v V_0 = N(d_1) \sigma_v V_0$$

Where is $N(x)$ is cumulative probability distribution function of the standard normal distribution. This creates a non-linear system of equations that we can solve numerically for V_0 and σ_V moreover the model provides further information like the probability of default that equals $N(-d_2)$.

Volatility of equity can be calculated by using historical returns or by using the implied volatility of the options on the stock. Notice that calculating *market value* of assets from a firm is remarkably difficult as there is no market for those assets, furthermore value can be intrinsic to a firm: a process may have a positive value in one company but it could be worthless for any other organisation.

13.3 Evaluating the Firms

As we mentioned 3 very large European-based conglomerated were tested. We selected the largest firm by sales Royal Dutch Shell (RDS), the largest European car manufacturer Volkswagen Group (VW) and the largest brewer in the world Anheuser-Busch InBev (AB InBev) based in Belgium. (Ponciano, 2019)

13.3.1 Dodd-Frank Wall Street Reform and Consumer Protection Act

None of the case companies meet the 85% requirement but they do have significant amount of activities in the financing sector. For an example, currency swaps are necessary for companies doing business around to world.

If we look at some of the stage 1 thresholds and apply them to case companies, we can see that they clearly pass the thresholds (Table 13.2).

All the case companies are big enough that they would be subject to review from the Council. Dodd-Frank act is not designed to evaluate financial of the case companies, but it does give an idea of how large they are. A financial company with over \$50 billion in consolidated assets could pose a threat to the U.S. economy, then the case companies could also pose a threat.

Section 113 also considers socioeconomic impact a nonfinancial company could have in a certain area. For an example points D and E:

Table 13.2 Section 113 of Dodd-Frank Act/Case Companies, Appendix A

	VW Group	RDS	AB InBev
Total Assets > \$50Bn	\$ 494,808,480,000	\$ 399,194,000,000	\$ 232,103,000,000
Derivatives > \$3.5Bn	\$ 2,148,120,000	\$ 7,184,000,000	\$ 5,574,000,000
Debt > \$ 20Bn	\$ 206,153,640,000	\$ 62,798,000,000	\$ 160,199,000,000
10% Short-Term D	49.28%	39.57%	21.51%

Own designed with date from the firms

- (D) The importance of the company as a source of credit for households, businesses, and State and local governments and as a source of liquidity for the U.S. financial system
- (E) The importance of the company as a source of credit for low-income, minority, or underserved communities, and the impact that the failure of such company would have on the availability of credit in such communities

When evaluating a nonbank financial company, the Council must consider the company's importance as source of credit for different communities. The company could also be a major source of income for certain communities in a certain area, meaning that its failure could impact local economy (Congress, 2010). Obvious example of this are the factories of Volkswagen Group. These factories often employ over 50% of the location's residents (Volkswagen, 2020). Royal Dutch Shell has various operations across the globe, for an example their subsidiary Shell Nigeria. Oil and gas industry cover 75% of Nigeria's overall government revenue. Shell Nigeria is a major contributor in Nigeria because of this, but also because of the local supply chains, local content and social investments which are a stream of income for the locals (Shell Nigeria, 2020). Grupo Modelo the leading brewer in Mexico, also subsidiary of AB InBev, covers 57% of the local market share according to research firm Euromonitor International (Mexico Now, 2019). All the case companies have operations in areas where, if operations would halt, they could harm the local economy, potentially destroy it.

Since Dodd-Frank act was designed for financial institutions applying it to the case companies does not give concrete information regarding financial standings. However, the case companies do share characteristics with financial institutions such as derivatives. Applying the metrics set by section 113 to case companies shows that they would most definitely be further reviewed by the Council. It is an indicator that the case companies could harm the economy and possibly "Too Big to Fail".

13.3.2 Credit Ratings

Volkswagen Group and AB InBev are both between Upper Medium and Lower Medium Grade, whereas Royal Dutch Shell is considered High Grade. Outlook is stable, so credit rating is not subject to change. Based on this Royal Dutch Shell is likely to pay its debt back, Volkswagen Group and AB InBev below to the riskier investment grade which means they are not as likely to pay their debt back (Table 13.3). Given that the credit rating of

Table 13.3 Credit ratings of case companies 2019

	Standards & Poor's	Moody's	Fitch	Outlook
Volkswagen Group	BBB+	A3	BBB+	Stable
Royal Dutch Shell	AA-	Aa2	AA-	Stable
Anheuser-Busch InBev	A-	Baa1	BBB	Stable

Source: S&P, Moody's and Fitch

Volkswagen Group and AB InBev is at Lower Medium Grade it does support the theory that they would be “Too Big to Fail”, credit rating of Royal Dutch Shell on the other hand is in good standing.

13.3.3 Altman’s Linear Discriminant Model

Given that Altman’s Linear Discriminant Model is design for manufacturing companies and the case companies do not solely rely on manufacturing it does not fully represent the default risk of a case company. The case companies do still manufacture as a core of their business so it does support the credit rating theory and can be used to evaluate financial standing of a case company.

When examining Table 13.4 throughout 2015–2018 both Volkswagen Group and AB InBev have Z-score of below 1.81. According to this they would have a high default risk. Royal Dutch Shell has Z-score of above 2.99 on every year expect for 2016, which indicates that they have low default risk. The results are alike credit ratings, where Volkswagen Group and AB InBev fell into Lower Medium Grade and Royal Dutch Shell is considered High Grade.

13.3.4 Merton Model

Finally, we calculated the probability of default based on 2019 results with 2 different historical volatilities:

- 1) January and February of 2020.
- 2) April 2020
- 3) Risk-free rates of a specific country represent the theoretical return of a zero-risk investment (Statista, 2020a, b).

As can be seen from Table 13.5 $N(-d_2)$ or the probability of default is close 0%, meaning that it is unlikely for any of the case companies to default within the next year. These calculations were done with volatilities before COVID-19 became a pandemic. If we calculate volatilities by using data from April 2020 the volatilities are as follows: Volkswagen Group 74.296%, Royal Dutch Shell 82,785% and AB InBev 52,98% (Yahoo Finance,

Table 13.4 Z-Scores of case companies

Z-Scores	2015	2016	2017	2018
Volkswagen Group	1.419	1,487	1,420	1,491
Royal Dutch Shell	3.497	2,681	3,353	3,784
AB InBev	1.523	0.759	1,022	0,942

Own designed with date from the firms

Table 13.5 Merton model results companies volatility January-February 2020

	VW Group	RDS	InBev
E (Million)	104'740 €	£143'773	62'900 €
σ_E	27,851%	24,013%	28,69%
D (Million)	113'722 €	£61'415	92'362 €
T (Years)	1	1	1
Risk Free rate (rf)	1.10%	2.10%	1.20%
V₀ (Million)	217'218 €	£203'912	154'160 €
σ_V	13%	17%	12%
d₁	4.968	7.297	4.537
d₂	4.834	7.127	4.420
N(d₁)	1	1	1
N(d₂)	0.999999329	1	0.999995056
N(-d₁)	3.385E-07	1.476E-13	2.857E-06
N(-d₂)	0.0000670%	0.0000000%	0.0004940%
Expected Loss %	0.0000017%	0.0000000%	0.0000113%
Expected Loss (millions)	0.00192 €	£0.00000	0.01045 €
Recovery Rate	97.48%	97.73%	97.71%

Own designed with date from the firms

2020). For Volkswagen Group and Royal Dutch Shell, the volatilities have tripled and as for AB InBev doubled. We can then perform the calculations for Merton Model with new volatilities.

Looking at the $N(-d_2)$ values from Table 13.6 we can see that they have increased massively. For Volkswagen Group the probability of defaulting on debt is 5.6%, for Royal Dutch Shell 3.8% and for AB InBev 1.0%. The recovery rates of the case companies have also massively dropped from near 100%. These two examples show what kind of impact volatility in market can have on a company's probability of default.

According to the Merton Model calculations in Tables 13.5 and 13.6 the probability of default for case companies is rather low. Even in highly volatile market during global crisis the probability of default is in single digits. A multibillion-dollar company having a probability of defaulting on its debt over 1% is massive. As seen in 13.2.1 Sect. 13.2.1 these companies can easily affect the economy of a local community.

Other point to take is how massively volatility in the market affects the probability of default rate. As seen from tables Tables 13.5 and 13.6 when volatility in the market doubles or triples the probability of defaulting on debts increases by thousand times.

13.4 Social Impact

A critical step on the analysis is the social impact that a bankruptcy of a large firm can have in the regular people. After all—bottom line—they will suffer the consequences of an economic crisis (unemployment) or a rescue plan (tax payments).

Table 13.6 Merton model results companies volatility April 2020

	VW Group	RDS	InBev
E (Million)	104'740 €	£143'773	62'900 €
σ_E	74.30%	82.79%	52.98%
D (Million)	113'722 €	£61'415	92'362 €
T (Years)	1	1	1
Risk Free rate (rf)	1.10%	2.10%	1.20%
V₀ (Million)	216'350 €	£203'462	154'092 €
σ_V	37%	59%	22%
d₁	1.957	2.360	2.516
d₂	1.588	1.769	2.299
N(d₁)	1	1	1
N(d₂)	0.943909178	0.961573536	0.989244585
N(-d₁)	2.515E-02	9.146E-03	5.927E-03
N(-d₂)	5.6090820%	3.8426460%	1.0755420%
Expected Loss %	0.7717025%	0.7482119%	0.0747838%
Expected Loss (millions)	877.600 €	459.510 €	69.070 €
Recovery Rate	86.24%	80.53%	93.05%

Own designed with date from the firms

13.4.1 Impact of a Large Default on Households and Individuals

When a company defaults, its employees lose their jobs. Sometimes the company has prepared an aid package which allows its employees to survive without a job for certain period. In some situations, there are jobs available, and unemployment will not last long. It is also possible that another company acquires the defaulted company, meaning that most of the jobs remain but under different management. Biggest problem happens when a large company defaults or closes its offices or factories within a concentrated area. This results into numerous workers starting to seek a job with similar expertise. Some of them will find a new job, some will relocate for jobs, and some will remain unemployed. In this particular topic size matters a lot to both local and country's government.

Unemployment affects the government's financial position: it reduces income as tax revenue decreases while it increases spending as more people demand benefits. Large layoffs can also distress the real estate market: when many people sell their houses simultaneously, due to unemployment or having to move to another city, housing prices decline. This directly decreases the value of property in the area. In longer term, reduced streams of income for the government impact the social infrastructure as funding for roads, schools and healthcare becomes scarce. Reduced quality of social infrastructure further deters new potential residents from arriving. Of course, in the event to a severe economic downturn or recession this is even further amplified.

Two common approaches for governments to tackle such situation are creating new jobs or bailing out the company, both having one thing in common: they cost money. Creation of new jobs sometimes happens naturally: another company sees the area as a busi-

ness opportunity and opens a new facility. The government can also offer financial enticements for expansion of already existing local businesses or brand-new ones. Whether the job creation happens naturally or by financial enticement it is slower method when compared to bailing out a company. Bailout keeps operations running without an immediate impact on the local economy. The key metric that governments should examine when a business is on the brink of failure is short-term and long-term impacts of such a failure. If the overall costs of the firm's collapse exceed the short-term costs, it is more valuable for the government to save the business as such in other words the firm becomes "Too Big to Fail".

13.4.2 Impact of a Large Default on Local Communities

In 2012 a Finnish telecommunications company Nokia shut down its only Finnish factory located in Salo. All its 1,700 manufacturing workers were laid off (Ilta-Sanomat, 2012). The city of Salo has around 50,000 residents, so laying off of 1,700 people does not seem massive. However, Nokia was the largest taxpayer in the city of Salo, moreover its presence in the town created a lot of indirect jobs in other businesses like stores, restaurants, and entertainment. Most of the social infrastructure in Salo was built with the income from Nokia. During 2000s, when the plant was larger, the factory of Nokia caused most other factories in the area to shut down. During that time Nokia was the largest mobile phone manufacturer in the world, therefore it was able to offer better benefits than any other local employer. Eventually Nokia and the businesses around were the only employers in the city of Salo. The city had generated massive amount of income from Nokia during its in prime and was able to keep the social infrastructure intact with the reserves.

In spite of this the prices of real estate have kept going down and the population has kept decreasing since the shutdown (Järvinen, 2012). The city of Salo has been trying to create a new network of technological companies around Nokia's legacy. Salo IoT Park Oy offers financial incentives for companies wanting to start business in Salo (Lehto, 2017). From outsider's perspective the shutdown of Nokia's factory in Salo did not "kill" the city. However the public image of the city has vastly changed since the factory was shutdown. Prior to 2012, Salo was considered wealthy city with good social infrastructure and attractive for new families. In 2020 the only attraction the city has is cheap real estate. The city has to offer financial incentives to attract new businesses. The city was never able to return to its former condition, if we use this as a metric the factory of Nokia was "Too Big to Fail" for city of Salo.

Walmart is an American retail company that operates grocery stores globally. They are the largest employer in the world, employing 2.2 million employees (Walmart, 2020). Apart from Walmart employing 1.5 million employees in the U.S. their stores have massive impact on small towns. A study shows that opening a Walmart store can cause up to 14 local stores closing in a small town. Another study in Iowa argued that small towns lost nearly 50% of retail sales after a Walmart was opened. This is not necessary a problem

since Walmart's stores benefit the local customers with low prices and they provide increased tax revenues for the towns. The problems occurs when Walmart decides to close down a store, as it can leave a town without a grocery store (Staley, 2017). The market position of Walmart gained by economies of scale allows it to have monopolies in small towns. The size of Walmart creates a unique issue where small local governments are in favor of keeping a store open but cannot offer meaningful incentives to affect Walmart's opinion. This makes Walmart "Too Big to Fail" for small towns, since without them there might not be stores (Kenton, 2019).

The automotive bailout of 2009 was one of the largest bailouts of its time. In late 2008 General Motors Company, Chrysler and Ford Motor Company asked the Congress for a bailout. General Motors and Chrysler were on the brink of bankruptcy and facing a potential loss of over 1 million jobs. Ford did not suffer from the same issues but asked to be included to stay relevant in the competition. The Government ended up investing up to \$80 billion in General Motors and Chrysler. The bailout helped creating 340,000 additional jobs (The Balance, 2020). The automotive industry bailout is an example for the government seeing a company as "Too Big to Fail". General Motors and Chrysler were given bailout in form of investments to keep the operations running and avoiding massive lay-offs. The U.S. Government saw potential bankruptcy as a larger harm than bailing them out.

13.5 Overall Results

13.5.1 Volkswagen Group

If we believe in the hypothesis that a rational investor would not invest into company with bad financial ratings, Volkswagen Group would be "Too Big to Fail". Credit rating of Volkswagen Group is Lower Medium Grade on the average. Economic uncertainty increases the volatility of Volkswagen Group massively which directly increases their probability of defaulting by over 1,000 times to 5.6% according to Merton Model. Volkswagen Group passes the thresholds of Dodd-Frank act which indicates that they would be subject to review from the Council if their main source of income came from financing activities. If we add all this up, Volkswagen Group does not seem like a good investment unless the investor thinks that failure of the company is not possible. In other words, the investor thinks that Volkswagen Group is systematically too important or "Too Big to Fail".

Given that Germany is reliant on automotive industry and Volkswagen Group is one of the country's largest employers they are in a position of great importance. States such as the Lower Saxony have over 10% ownership in Volkswagen Group and rely on their income. Adding to this the "Dieselgate" scandal which showed that Germany is not in a position where it can lay big fines on Volkswagen Group further support the theory of importance.

Even if Volkswagen Group defaulted and would stop all its plants the world would likely not run out of cars. Some jobs would be rescued but given the massive size of Volks-

wagen Groups operations millions would be lost. In Germany alone, cities like Wolfsburg would have its income reduced next to zero. Based on this it is reasonable to say that Volkswagen Group is “Too Big to Fail” and if facing failure would be bailed out by the German government or European Union.

13.5.2 Royal Dutch Shell

Financially Royal Dutch Shell is in a good standing. They have and have historically had good credit rating. According to Merton Model during times of normal volatility Royal Dutch Shell has 0% change of defaulting on its debts. During times of extreme volatility, the change of defaulting on debts increases into 3.8%. Much like Volkswagen Group, Royal Dutch Shell also passes the thresholds set by Dodd-Frank act and would be subject to review from the Council if financing activities were their main source of income. If we again assume the behaviors of a rational investor, he will invest in Royal Dutch Shell based on financial ratings.

Royal Dutch Shell is a massive company. Its market capitalization could affect the entire London Stock Exchange. Unlike Volkswagen Group, Royal Dutch Shell is not concentrated to a single area or business sector. Their operations are spread across the globe in different sections of the oil and gas industry. Most of these operations are ran by subsidiaries of Royal Dutch Shell.

If Royal Dutch Shell were to go bankrupt, it would likely be bailed out. It is obvious that many local communities rely on the operations of Royal Dutch Shell, however these are already in the form of subsidiaries and could be easily absorbed by other companies. They are spread across different sections of the oil and gas industry, so failure of Royal Dutch Shell does not have massive dent on one industry. If a massive amount of people were to be laid off, they would have different expertise and be at completely different locations, so it would not have effect on one concentrated area. Only reason for government to bailout Royal Dutch Shell would be the effect it would have on London Stock Exchange. Having potentially massive impact on all companies listed on London Stock Exchange. If we examine Royal Dutch Shell from the perspective of their operations, they cannot be determined as “Too Big to Fail”. The potential of billions being wiped off London Stock Exchange, and how it would affect other listed companies would cause so much harm that it would be intervened by the government, means that Royal Dutch Shell is “Too Big to Fail”. Much of this reasoning is based around the domino effect that market crashes have, especially on the funds that have invested into Royal Dutch Shell in a way or another.

13.5.3 Anheuser-Busch InBev

Credit rating of AB InBev is Lower Medium Grade. Unlike Royal Dutch Shell and Volkswagen group, the uncertainty of economy did not have as heavy impact on Ab InBev vo-

latility. According to the Merton Model their probability of defaulting on debts was at 1%. Like previously mentioned companies, Ab InBev passes stage 1 thresholds and would be subject to review from the Council. If we use the hypothesis of rational investor, he will not invest in Ab InBev based on financial ratings.

AB InBev has a massive market share of nearly 30% of all beer sold worldwide. The sales are however split across over 500 brands and are manufactured across the globe in different factories. So much like Royal Dutch Shell, these factories work as an independent entity utilizing the supply chain of AB InBev.

Operations of AB InBev are spread into different brands and locations, this allows them to be easily absorbed. Smaller companies cannot offer similar supply chain to giant like AB InBev but can still gain value from absorbing different brands. The breweries of AB InBev are vastly spread, so possible shut down of factories does not cause loss of jobs in a concentrated area. Another point to consider is that consumer does not recognize AB InBev they notice the label in the beer bottle. This means that even if AB InBev sold Budweiser to another company the consumer probably would not notice it, therefore causing no brand damage. The bulk beer sales which is main source of income for AB InBev has also decreased in recent years, while craft beer sales have increased. This means that the demand for AB InBev's biggest products has decreased. AB InBev was built by acquisitions of different beer companies; it was not fueled solely on organic growth. If we factor all this in it is reasonably to say that AB InBev is not a "Too Big to Fail" company. It would cause disruptions in certain areas, but they are not big enough to affect economy. In case of bankruptcy the various brands could be auctioned, the nature of the business does not rely on complicated synergies. Bailout of a beer company would also cause moral controversy, the general idea of using taxpayer money to rescue a company focused on creating alcohol is not attractive for governments.

13.6 Conclusions

"Too Big to Fail" is a concept linked to financial institutions. The idea that company would be so large and interconnected, that its failure would be catastrophic for the economy can however be expanded to non-financial companies as well. According to Forbes the largest companies in the world are still financial institutions (Murphy et al., 2021), but non-financial companies like Royal Dutch Shell can be compared to them in terms of sizes and revenues. The key distinctions of large financial companies were always that once one would fail, others would fail like dominoes. This really was not a concern until the events of 2007–2008 subprime mortgage crisis when the 5th largest investment bank in the U.S. declared its bankruptcy. The event of Lehman Brothers bankruptcy nearly brought down the entire U.S. Economy, it also made regulators realize how interconnected and large these financial institutions had grown. In the aftermath of the crisis most of those big financial institutions were regulated and put under an oversight of a financial stability

council to prevent events such as this happening again. In other words, special regulation was put in place to make the financial system more resilient.

All regulations set and oversights were only designed to financial institutions. Over 10 years later, the COVID-19 pandemic raises the question on whether non-financial companies should have been regulated also. As of May 2020, only 5 months after 1st COVID-19 case, the U.S. Government has already exceeded the bailout budget of subprime mortgage crisis by a far margin. This raises the main research question of the thesis; Can a non-financial company be “Too Big to Fail”? and how could it be determinate whether it is or is not?

Even if large non-financial engage into similar actions as financial institutions such as derivatives, their main source of income is still selling goods and services. This limits usage of financial regulations directly on non-financial companies. Nonetheless, the reasons on why the financial regulations were put in the first place are the same: protect consumers, society, and the economy.

If a “Too Big to Fail” company fails, its value drops to zero. This event causes a cascade of losses that could destroy the economy and the society. The other solution is that the government absorbs the losses of the company so it does not end up in bankruptcy and if the short-term cost of bailing out the company is less than the damage it could cause it probably should. This example can be turned into a framework, that can be used to determine whether a company would be “Too Big to Fail”. If its failure would start a cycle of economic downturn, it can be considered “Too Big to Fail”. Factors such as how concentrated are the employees of the company add severity or accelerate the process.

When the fundamentals of this framework are applied to non-financial companies, we can clearly see that some firms have grown so large that their failure would cause similar effects to the economy as financial institutions bankruptcy.

Germany being reliant on the automotive industry, puts Volkswagen Group in a position where they can be considered “Too Big to Fail”. The company employs a massive number of employees directly and indirectly, the loss of those jobs would trigger a recession in Germany. To make matters worse, the factories of Volkswagen Group are often the largest employees in the location where they are situated making the whole are dependable on them. A VW bankruptcy would directly cut the income streams of multiple cities and would disturb quality of life. Royal Dutch Shell is another large company that can also be considered as “Too Big to Fail”. They, unlike Volkswagen Group, are spread into different sectors of the oil and gas industry. Royal Dutch Shell is the largest company in the London Stock Exchange by a far margin. Its failure would wipe of billions of pounds from the London Stock Exchange and directly affect all other companies listed causing a financial meltdown. Having said that, being a large company does not automatically qualify it as “Too Big to Fail”. On paper, AB InBev has market share of nearly 30% of all beer sold globally. AB InBev is formed from hundreds of different beer brands. These beers are brewed in different factories and in different locations. The nature of the business means, that if AB InBev were to default, they could sell their different brands as individual units. Jobs and value would be lost, but it would not cause a major economic catastrophe.

If governments acknowledge that certain non-financial companies can also be “Too Big to Fail” it can end up saving taxpayers’ money by preventing their failure through special regulation or by preventing them from becoming so big. Hopefully this actions will create a more resilient economy.

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