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Faculty of Economics and Management

Department of Economics



Bachelor Thesis

Impacts of Tohoku Earthquake on Japanese economy

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BACHELOR THESIS ASSIGNMENT

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Business Administration

Thesis title

Impacts of Tohoku Earthquake on Japanese economy

Objectives of thesis

The main purpose of the thesis is to investigate several impacts the Tohoku Earthquake in 2011 had and still has upon Japanese economy, domestic and international trade. Analysis of the Japanese economy, comparison to other natural disasters and their impacts on each state economies and examples and suggestions of dealing with regional economy restoration will be provided.

Methodology

The thesis methodology is based on the analysis of information resources using methods of extraction, synthesis, induction, deduction. Data analysis will include, e.g. time series analysis methods depending upon data availability. Also some methods of comparative analysis will be utilized.

The proposed extent of the thesis

40 pages

Keywords

Tohoku earthquake, economy, japan, restoration of economy in the Tohoku area, impacts on japanese domestic and international market

Recommended information sources

Charlotte Benson and Edward Clay, Economic and Financial Impacts of Natural Disasters: an Assessment of Their Effects and Options for Mitigation, available from: <http://www.odi.org/publications/5011-economic-financial-impacts-natural-disasters-assessment-their-effects-options-mitigation>

Charlotte Benson and Edward J. Clay, Understanding the Economic and Financial Impacts of Natural Disasters

Jonas Elmerraji, Financial Effects Of Natural Disasters, available from:

<http://www.forbes.com/sites/greatspeculations/2011/03/15/financial-effects-of-natural-disasters/#5639308f5ca8>

Kevin L. Kliesen, The Economics of Natural Disasters, available from:

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<http://www.oecd.org/japan/thetohokupacificearthquakeeconomicconsequences.htm>

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Declaration

I declare that I have worked on my bachelor thesis titled "Impacts of Tohoku Earthquake on Japanese Economy" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 14th March

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Impacts of Tohoku Earthquake on Japanese economy

Abstract

This thesis focuses on the impacts of Tohoku earthquake and following tsunami on Japanese domestic and international economy. The consequences it had and the consequences that are still ongoing upon Japanese economy are discussed. Descriptive account of natural disasters impacts on economies, dealing with such threats and prevention of these is offered by the literature review. The work includes the analysis of Japanese economy, general familiarization with Japanese market and natural disasters and suggestions of dealing with regional economy restoration based on data evaluation and own ideas.

Keywords: Tohoku earthquake, economy, Japan, restoration of economy in the Tohoku area, impacts on Japanese domestic and international market

Dopady zemětřesení Tohoku na japonskou ekonomiku

Abstrakt

Tato bakalářská práce se zabývá dopady zemětřesení Tohoku a následné tsunami na domácí i mezinárodní ekonomiku. Diskutovány jsou jak dopady, které již odezněly, tak i ty, které přetrvávají. Zmiňovány jsou též ekonomické dopady jiných přírodních katastrof a nastínění toho, jak se s takovou situací vypořádat. Práce pak obsahuje analýzu japonské ekonomiky a obecné seznámení s historií i současným japonským trhem. V neposlední řadě se práce také dotýká problematiky obnovení poškozené oblasti a návrhy na postup při obnovovacích pracích.

Klíčová slova: Zemětřesení Tohoku, ekonomika, Japonsko, obnovení ekonomiky v oblasti Tohoku, dopady na domácí a mezinárodní ekonomiku

Table of content

1. Introduction.....	11
2. Objectives and Methodology.....	12
2.1 Objectives.....	12
2.2 Methodology.....	12
2.3 The Significance of the Study.....	12
3. Theoretical Part.....	13
3.1 Japanese Economy.....	13-14
3.1.1 Early Japanese Economy.....	14-15
3.1.2 Meiji Restoration and industrialization.....	15-17
3.1.3 Japanese Economy after World War II.....	17
3.1.3.1 Recovery of Economy.....	17-18
3.1.3.2 The Dodge Plan.....	19-20
3.1.4 Japanese Economic Miracle.....	20-22
3.1.5 Stagnation of Economy.....	22
3.1.5.1 Bubble Economy/Lost Decade.....	22-24
3.1.6 Abenomics.....	24-25
3.2 Natural Disasters and Economies.....	25-26
3.2.1 Earthquake.....	26
3.2.2 Tsunami.....	26
3.2.3 Impacts of natural disasters on economies.....	26-27
3.2.4 Most Significant natural disasters in a modern history.....	27
3.3 Great East Japan Earthquake 2011.....	27-28
3.3.1 Fukushima Daiichi Nuclear Power Plant Leakage.....	28
3.3.2 Relief and rebuilding Efforts.....	29
3.4 Tohoku disaster and Japanese Economy.....	29-31
3.4.1 Material Damage Losses.....	32-33
3.5 Consequences on Financial Markets.....	33-34
3.6 Effects on Tourism.....	34
3.7 Impacts on Global Economy.....	34
3.8 Comparison of the Tohoku and Kobe Earthquakes.....	35
3.8.1 Kobe Earthquake.....	35
3.8.2 Kove vs. Tohoku Earthquake.....	35-37
4. Practical Part.....	38
4.1 SWOT Analysis.....	38
4.2 Survey on Impacts of Tohoku Disaster on Everyday Life.....	39-44
4.3 Japan's Export Comparison.....	44-46
4.4 Japan's Import Comparison.....	46-47
5. Results and Discussion.....	47
5.1 Regional Economy Recovery Plan Suggestions and discussion.....	47
5.1.1 Short-term regional economy recovery plan suggestions.....	47-48
5.1.2 Long-term regional economy recovery plan suggestions.....	48
6. Conclusion.....	48-50
7. References.....	51-54
8. Appendix.....	54

List of Figures

Figure 1 – Relative Share of World Output.....	17
Figure 2 – Stocks of BOJ in circulation.....	20
Figure 3 – Growth in GDP comparison.....	21
Figure 4 – Nikkei Stock Index.....	23
Figure 5 – Real Estate Price Index.....	23
Figure 6 – Impact of disaster on GDP.....	30
Figure 7 – Effect on Nikkei.....	36
Figure 8 – Effects on price of goods.....	37
Figure 9 – Gender.....	39
Figure 10 – Age.....	39
Figure 11 – Food Price.....	40
Figure 12 – Living Expenses.....	41
Figure 13 – Savings.....	42
Figure 14 – Nuclear Power.....	43
Figure 15 – Charity.....	44
Figure 16 – Per Cent Change in Imports.....	47
Figure 17 – Questionnaire Sample.....	54

List of Tables

Table 1 – Type of capital loss.....	18
Table 2 – Japan’s Exports and Imports.....	31
Table 3 – Comparison of estimates of damage.....	32
Table 4 – Estimates distribution od costs.....	34
Table 5 – SWOT Analysis.....	38
Table 6 – Exports 2011.....	45
Table 7 – Per Cent Change in Exports.....	45-46

Introduction

Economy is an element that runs the world. And economy is defined, composed and run by many partial components seemingly independent on each other, connecting together into a complex unit of interactions defining the markets, economies. The economy as it is widely known may be roughly divided by the area it covers into regional, national and international economy. With regional economy covering the smallest area, national the area on the level of a state or nation and international covering the widest range possible – the economy interactions between countries. It is very important to deal with and discuss all three ranges of economy in this thesis for the purpose of a complex view of the problem discussed as the solution for some problems may vary according to spread of economy area.

The thesis primarily discusses the impacts of natural disasters on economy and the life of habitants of the affected area. Particularly, the Tohoku Earthquake which occurred in the southern Japan in 2011 is the base for this work.

Japanese economy was highly struck by this devastating disaster and for being one of the world's leading economies, it affected the world's trade as well. Roughly six years later, the Tohoku area is still recovering from the consequences and a full recovery is still far from reach. Even though it may seem that the international trade has returned to its previous relatively steady state, on the regional level Japan is still struggling with the aftermath of the disaster. The state has yet to rebuild the houses of the habitants and despite extensive advertisement of Tohoku agriculture and other products, Japanese nationals are very hesitant to re-construct their normal trade relationships with the farmers and factories in Tohoku. The reason for this is a horrifying consequence the earthquake and after-coming tsunami has had – the explosion of one of the reactors in a nuclear power plant in Fukushima. Most of habitants run away from their region of origin afraid of the radiation. However, in already over-populated Japan, there were not many options for those to find sufficient work opportunities etc. Thus, a lot of original habitants returned to the place waiting for the time to solve their difficulties and government to offer special programmes to renew the normal economy and life process. Japan has to deal with natural disasters all its history and we also have more such events all around the world on which we can build rescue plans and try to overcome the effects on economy as quickly as possible.

2 Objectives and Methodology

2.1 Objectives

This thesis is focused on the evaluation of previous cases in which the economies had to deal with a losses caused by natural disasters and implying it to the Tohoku Earthquake disaster and how japanese economy has dealt and keeps on dealing with. It examines the short and long run consequences on the economy. The thesis has four main objectives as follow: to introduce economy itself and focus on japanese economy, to talk about the natural disasters, to imply the specific Tohoku Earthquake consequences on Japanese economy and to evaluate and suggest steps of help with evening the hard economy situation out.

2.2 Methodology

The thesis methodology is based on the analysis of information resources using methods of extraction, synthesis, induction, deduction. Data analysis will include, e.g. time series analysis methods depending upon data availability. Also some methods of comparative analysis will be utilized in order to evaluate of effectiveness of used methods to even out the economy and help to integrate the region back to its place in economy of a state.

2.3 The Significance of the Study

Natural disaster can happen anytime, anywhere on the planet. Unfortunately, it is not in our power to influence the nature and dictate how it should or should not act and when or where should it show us its power. However, what we can influence, is how good we will deal with the aftermath of such an event. The disaster could take everything away from us, not only material but also things of dear sentiment. We would cope with such a losses our own way. But what the material side of thing concerns, we can create a strong community helping each other out in hard times, creating small basic market in the region, receive help from the government. Material things can be handled out. We ought to be prepared to face such event., which would make it way easier to carry it out in the time of need.

3 Theoretical Part

The theoretical part of the thesis deals with the explanation of Japanese economy, its history. The main part is taken to make an economic analyses regarding Japanese economy in relation to Tohoku Earthquake 2011.

3.1 Japanese economy

Japanese economy belongs to the most advanced and wealthiest ones in the world nowadays. Its striking economic progress which changed relatively poor and developing economy which was furthermore badly affected by World War II. into one of the most advanced economy in the world still draws the interest of the greatest experts in the field. Since Japanese economy was the only one that kept rising at a fast pace for over 3 decades at an annual level of around 10%, it is rightfully referred to as a prototypical example of a superlatively applied economic theory on a real market. However, the nineties of the 20th century brought a tough long-term stagnation of the economy which still continues to be a problem nowadays. For over 2 decades, Japan has a very low or even negative economic growth, is struggling with economic problems and keep reporting an annual financial loss. Even though Japan tries to cope with an unrealized economic potential of the country, it still finds itself to be in the red. This rare condition of a sudden turn in economic development remains to be an unsolved mystery attracting the interest of not only Japanese economists since its solution would not only bring a victory to Japan, but also other countries heading a similar direction.

For the purpose of this work, it is important for us to understand the Japanese economy as a whole as the thesis evolves around it. The other essential of the work is of course the impact of natural disasters on an economy. Japan, its people, its economy, Japan as a whole has always been a victim of numerous natural disasters all along its history. Even though the know-how of dealing with its consequences are nowhere to found, and certainly not in the past where only time healed the wounds, it is important for us to understand the Japanese economy from the beginning.

Japanese economy could be partitioned into 3 periods. The early age economy, the economy after Meiji restoration in 19th century and the expansion of the economy after World War II., when it became the first Eastern economy to play an important role in the

world market. I would also like to discuss the so-called Abenomics – economic strategies and changes made under the current prime minister Shinzo Abe, as it influences Japanese, mainly domestic, economy. (Reischauer et al., 2009)

3.1.1 Early Japanese Economy

The early Japanese society was separated into small groups of citizens living in family villages relatively far away from each other. They were, however, mutually dependent and connected through a maritime trade. The change was brought with the arrival of rice cultivation techniques brought to the islands from the continental China. As rice cultivation sites were not easy to establish and demanded utmost efforts of many people, the villages started to grow in order to meet the standards of handling such an agriculture business. But with the bigger area and growing numbers of inhabitants of such villages, the need for leaders arose and thus led to the establishment of constituent states. And as we know from the history, the more power one has, the more power he craves. It did not take long before conflicts and wars began to take place among these states which finally led to the unification, both on the field of politics and religion (year 300 BC). However, the unification was not tight and strong enough yet to talk about a fully functional state.

It was with the arrival of imperial family when the real Japan – the country of the rising sun, was created. Japan as we know it today, still remains to be a Unitary Parliamentary Constitutional Monarchy, so when did the imperials come in? It took some time for them to come to the scene but it finally, around year 645AD, overtook the real and absolute power and definitively centralized all of the influential clans under its wings. As nearly everything, the bureaucracy and political system was taken and anxiously copied from Chinese example and the functional tax system was created for the first time. The application of Chinese political system also brought one important change to the firmly unified religion system with the application of Chinese Buddhism. Buddhism was in fact brought in just for the political purpose because it empowers the emperor as the only eligible head of a state and it brought in the short period of the real political power of the emperor. To the surprise of some, Japanese citizens welcomed Buddhism with an open heart and it became their second nature next to the early established Shinto cult. As Japanese community continued to grow, it was not possible for the emperor to hold the

power to himself and local landlords were established. They gained more and more power over the time and became more independent. With the freedom they felt, the sense of responsibility and loyalty starts to fade away and many of landlorders stops paying given taxes to the central government. This leads us to the establishment of the famous samurai class which was in the charge of protecting the landlords own manors and lands. This marks the first real military power of Japan which leads to the strong decline in the royalty power and creation of the military state under the control of Shogun. The imperial family remained the representative head of the state but the real power was held by warrior class represented by Shogun. The deeply ingrained reverence though, made samurai seek an imperial approval to their action, to the establishment of a military government and officially every important decision was let on the emperor to make (based on the given suggestion and plans). The Kamakura shogunate held its power until the Mongolian attacks on the southern Japanese island of Kyushu in 13th century. Even though both attacks were unsuccessful in the end, it eventually led to the termination of the central Kamakura government. The daimyos still did not give up their powers and their fight among each other for the title of Shogun brought long Sengoku Jidai. The winner comes out to be Tokugawa Ieyasu who establishes a new Edo government at the turn of 16th and 17th century. (Reischauer et al., 2009)

Strict bureaucratic rules are imposed and brought the endsville economic stability. Foreign trade was banned and Japan enters its international isolation for over 2 centuries allowing Japan to create its unique culture.

3.1.2 Meiji restorations and industrialization

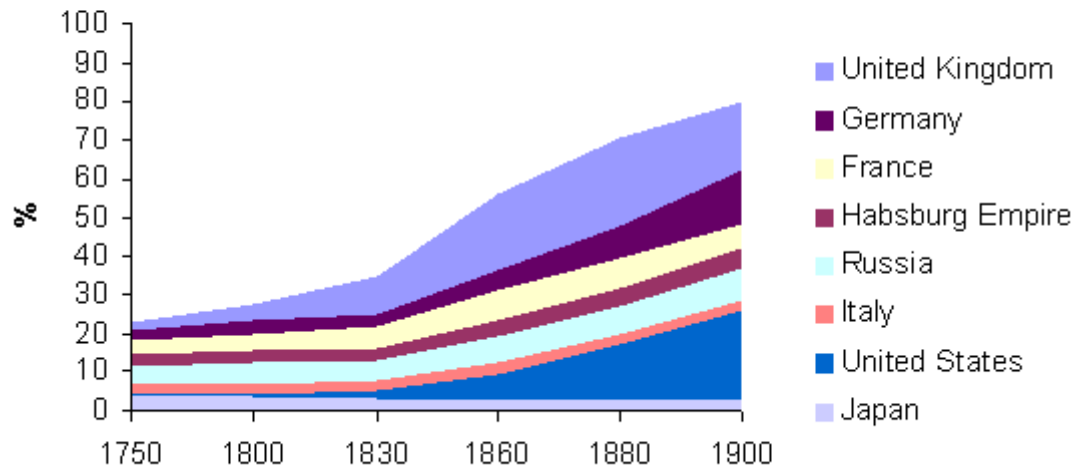
After a long and unsuccessful endeavours of Europeans and Russians to get through the imaginary isolation wall Japan have build around its borders, American Commodore Mathew Perry came to bring it down under the treath of using his combat ships fully loaded with guns if he met any resistance. But this unfair and unwanted invasion has brought even stronger anti-foreigner thinking and eventually led to demonstrations and strong rancour stance towards any foreigners crossing Japan's borders. However, the end of pressure of Americans was nowhere in sight and Japan eventually acquiesced to signing a Japan-US Friendship Treaty. This was not enough for the Americans who demamded even stronger rights in Japan. To the displeasure of most Japanese netizens, Edo

government came to the conclusion that Japan is in high need of modernization and acceded to the commercial agreements with Americans. However these declaration later turned out as an unfunctional and defective. This was the crucial moment in the prewar Japan as these actions raised strong internal unrest and even led to the deposition of Edo government and its replacement with the Government of Meiji. The first important change it has made in its reign was restoring the true and supreme power of the emperor. It is also known as the era of modern militarization, Westernization and most importantly the time of first national parliamentary constitution establishment. (Afe.easia.columbia.edu, 2017)

All these changes closely touched the economic aspects as new technologies and industrial development was rapidly affiliated and Japan has finally, for the first time in its history, opened itself to the international industry and its export articles grew day by day. From the more significant we can name for example textile industry. The other industry that grew rapidly was the section of military industry. In this case though, the articles remained for the domestic use and Japan have used its full potential in leading and winning wars in China or Russia. This export situation remained stable and even grew during the World War I. However, the end of war and Great Kanto Earthquake has brought a period of recession and in the thirties of 20th century Japan resolutely gives everything into the military industry and creates a wartime economy plan as Japan continues on with war conflicts with China. (Reischauer et al., 2009)

Figure 1 - Reative Share of World Output

Relative Share of World Manufacturing Output, 1750-1900



Source: Upload.wikimedia.org, 2017

3.1.3 Japanese economy after World War II.

The end of World War II. brings humiliating defeat and even worse condition of Japan's economy which was raided harshly by the war and just a blurred foundation of it could be found. Japan, under the occupation of US had to rebuild itself from zero and the true Americanization of economy and society takes place.

During the years 1945-1949 Japan adapts a rescue plan made by US and the recovery begins to enable later rapid growth in economy and possession of the title of second largest economy in the world. But dreams doesn't last forever and floating exchange rates slows up the growth and eventually make it stop. (Reischauer et al., 2009)

3.1.3.1 Recovery of economy

We can say that a few years after the end of World War II., even though the Japanese government remained to exist, Japan was not a master to itself. Instead, the SCAP/GHQ with General Douglas MacArthur in lead, held the power and ruled the country. Japan suffered vast damages during the war and lost lots of physical assets, eg.

structures, household assets, industrial materials and machinery or railroad and road vehicles. But the most mourned lost was the lack of energy and inputs that could keep the untouched factories and railroads in work, thus leading to the reduction in productivity to only 20% of its initial production rate during the war. This led to the formation of INFS. The number of illegal workers rises despite high sanctions for working illegally due to a strict legal restrictions. This leads up to further confiscation of physical assets (no worker's rights).

The war has also brought a resistive severe shortages (food shortage became a true issue) leading to a low living standards and rising inflation which required a tight regulations (eg. control of prices). Japan also experiences the highest inflation in its history up until today, which was even higher at black market developing all over Japan due to scarcity of everyday life necessities. Japanese government comply to printing money in effort to reduce unemployment and provide better living standarts. Foreign trade is strictly monitored and private foreign trade fully banned. Products are assigned two or more prices, one for japanese market and other (higher prices) for foreign trade.

(Factsanddetails.com, 2013)

Table 1 – Type of Capital Loss

Type of capital	Loss
Total capital stock	25%
Military planes and ships	100%
Commercial ships	81%
Industrial machines	34%
Urban housing	33%
Buildings and structure	25%
Telegraph, telephone, water supply	16%
Electricity and gas supply	11%
Railroad and other land transportation	10%

Source: Own data processing according to Grips.ac.jp

3.1.3.2 The Dodge Plan

Out of all the problems Japanese government had to handle, rising inflation was the toughest one. With such a high inflation, Japanese economy found itself to be in a vicious circle and lowering inflation rate became a crucial point in stabilizing the economy. SCAP (which was also providing humanitarian help all along its activity in Japan) made a decision and commissioned Joseph Dodge to deal with this situation and bring an effective solution. Joseph Dodge who already had experiences in this particular field came up with a program tailored to Japanese desperate situation called The Dodge Plan.

The DP came in effect in 1949 and concluded a plan of monetary and fiscal policies ought to stop the inflation which in meantime rised to a triple digit. The US aid and lots of subsidies were thought to be the main obstacles which needed to be removed as soon as possible. The basic points DP brought as necessary conditions for inflation stabilization are as follows:

1. Abate subsidies and fukkin loans
2. Stabilization of taxes and unification of exchange rates
3. Balanced budget

The achievement of these objectives proved to be an efficient strategy to lower and eventually stop inflation. Taxation relied primarily on income and corporate taxes with the absence of indirect taxes. The multiple exchange rates were unified at unit \$1 = ¥360. The budget was balanced enough to be in a surplus. In spite the fact that DP was very successful in achieving its purpose, it also brought a severe recession which was however, beat back with the beggining of the Koran War when Japan served as a supply base for the US. (Iyoda, 2014)

Figure 2 - Stocks of BOJ in circulation



Source: Grips.as.jp

The red line in Figure 2 shows the stocks of Bank of Japan notes in circulation and the blue line represents the Tokyo retail price index.

3.1.4 Japanese Economic Miracle

The rapid economic growth Japan experienced after 1950 is a miraculous event which raises the eyebrows even today. The average annual economic growth was around 11% for the following five years. The initial growth is generally attributed to the expanding heavy industry and establishment of keiretsu. The introduction of new technologies and equipment modernization also heavily contributed to the growth. Japan sought itself a leader of technology development in Asia and the technological innovation has been widely supported by the government which provided funds to import foreign technologies. From the most important it were the technologies for automotive industry, electrical industry, the production of synthetic fibers and engineering. It was also the time the so-called Japanese management emerged. It was effective and supported economic growth in long-time spectre. This management is also attributed the triple growth in the gross domestic product Japan experienced in seventies of 20th century. It is characterized with three basic principles:

1. Wages based on seniority
2. The system of lifelong employment
3. Unions reputed the company as its organizational unit

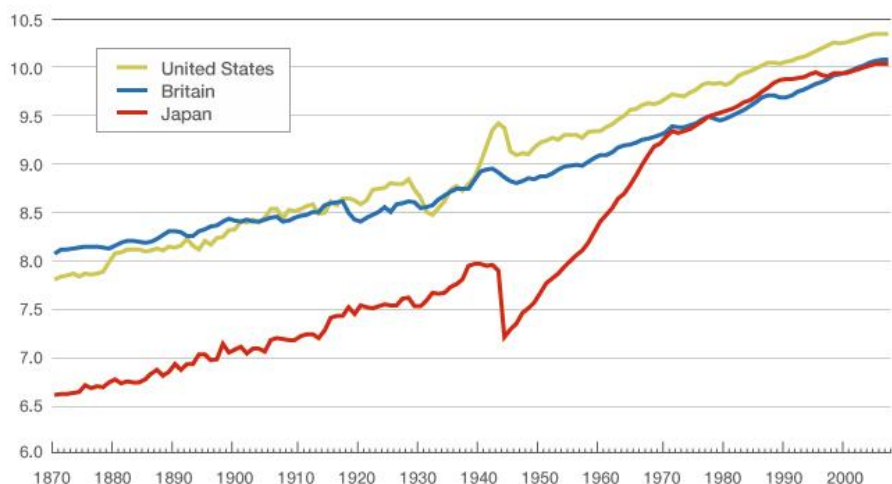
Another important change was an energetic revolution. Before, Japan relied only on the production of coal as its energetic supplier. But with the further development of oil production in the Middle East, the oil prices went down and Japan took advantage of the situation and moved forward to substituting coal for oil. The foreign trade also came in forefront with a rapid growth in export. This leads to the further involvement in international trade and trade liberalization. Thanks to these achievements, Japan is accepted to IMF and agreed to GATT. (Reischauer et al., 2009)

The situation of the labour market has also changed dramatically. The high demand was finally met with a sufficient supply of working places. The economy even faced a labour shortage later on. This caused the increase in wages which resulted in the growth of consumer prices. The expansion in electrical appliances, automobile and synthetic fibers production led to a consumer revolution. (Spacey, 2015)

The increasing pace of GDP growth (10,6% GDP annual growth in years 1966 – 1969) caused that Japan outstripped Federal Republic of German in the GDP volume and took a 2nd place in economic power ranking.

The era of Japanese economic miracle brought birth to many famous companies which are now worldwide corporations and leaders in the particular markets. We could name Toyota Motor Corporation, Honda Motor Company, Matsushita Electric Industrial Company – Panasonic and Sony. The founders of such companies remain to be business heroes in Japan even today.

Figure 3 - Growth in GDP comparison
 Growth in Real Per Capita GDP in Japan, Britain, and the US, 1870–2008
 (Natural log of per capita GDP in 1990 international Geary-Khamis dollars)



Source: The Maddison-Project
 (<http://www.ggd.net/maddison/maddison-project/home.htm>, 2013 version).

nippon.com

Source: Ggdc.net

In the Figure 3 we can observe how rapid the growth of Japanese economy was in the post war area when in years 1945 to approximately 1973 when the GDP per capita rose from 7.4 to 9.8 graphed in the figure in relation to those of US and Great Britain.

3.1.5 Stagnation of economy

3.1.5.1 Bubble economy/Lost decade

Bubble economy found a way to Japan in late eighties of 20th century and The Plaza Accord is believed to be the initiation of it. The Plaza Accord signed in 1985 was an agreement made by G5 and it sought to adjust US dollar to Deutsche Mark and Japanese Yen. The US dollar was depreciated towards these currencies to enhance the competitiveness of American goods on world markets. (Thebubblebubble.com, 2012) The price of the dollar dropped to half of its initial value within the first year of the policy. The great influence the sudden and abrupt change of the exchange rate had on the economy is undeniable and many viewed the further appreciation of undervalued yen as a well-deserved situation. However, the desired effect to lower exports from Japan to USA did not come and USA called for another G6 meeting. The outcome was a decision to apply an expansionary monetary policy in Japan in efforts to strengthen US dollar against Japanese yen. As a result of such monetary expansion BOJ applied in 1986, the discount rate settled at a record-breaking low of 2.5%. Japanese banks then started to provide loans at such a rate to wide range of subjects. This led to enormous real estate inflation due to speculative mania. The massive trading and higher prices are believed to continue forever. The bubble though, has its borders and it is surely going to crush one day. With the time and optimism the certain drop comes bringing in the bear market – that happened in 1990 putting in the economy miracle unrewarded. (Novotný, 2009) All those events led up to what we call Lost decade when Japan lost on competitiveness not only in Asia and where the Zombie companies were born. (Barsky, 2009) Companies became unable to pay back loans they got to speculate on real estate

trade leading to their bankruptcy. Following this situation, banks also got to troubles as they could get the receivables back and lead to credit crunch. (Roštínský, 2012)

Figure 4 - Nikkei Stock Index



Source: Thebubblebubble.com

The Figure 4 shows the line of Nikkei Stock Index which skyrocket escalates in the nineties.

Figure 5 - Real Estate Price Index 1



Source: Thebubblebubble.com

The Figure 5 shows the comparison in real estate price in commercial and residential buildings. We can observe that both of the line again highly escalates in the nineties/twenties.

All these events led Japan to its Lost decade, the period of economic depression. Although lesson sometimes compared to the financial crisis in US 2008. The BOJ could have acted earlier than it did and important role was also played by its aging populations. (Kuepper, 2016)

3.1.6 Abenomics

Abenomics is the abbreviation for economic policies set by prime minister Shinzo Abe who is in the service since 2012 and appeal to reclaim decades of stagnation. Main goal is to achieve 2% inflation thanks to expansionary monetary policy which has a strong potential to success in this case because of the previous low inflationary pressure.

To make the program success, the three arrows may be met. (Council on Foreign Relations, 2017)

1. Monetary easing – with aim of making export more desirable, up to ¥70 trillion was printed and brought into the market circulation. Also, the money was released to satisfy the need to increase price of goods in efforts of breaking the deflationary cycle.
2. Setting of new government spending programs in efforts of servicing the government debt – Japanese government spends more in favour of public works (large portion goes to infrastructure in preparation of Tokyo Olympics 2020), welfare (aging population) and lowering the debt to boost the economy.
3. Spur private investment – implementation of various policies to strengthen economic competitiveness. To fulfill such an achievement, five separate goals have been set. Those includes lowering corporation tax, increasing percentage of women workers, strengthen export based on culturally interesting goods, openness to foreigners and foreigner workers in Japan and generally lowering the barriers for example in foreign investment.
 1. Lowering corporation tax – in hope of making the business more available, the corporation tax has been lowered to 24%
 2. Increasing the percentage of women in labor process – what has already been mentioned, Japan's population is unstopably declining which is one of the major problems the Japanese economy meets. Up until today, it stays a normal process that married women stays at home being full-time

housewives. And this also remains a dream of many Japanese women thus Japan has one of the lowest percentage of woman in workforce – 42.9% of women participate in the labor force (2014) even though Japan is a highly developed country. (Tofugu.com, 2014) Japanese labour participation is still a strongly man world and according to various researches as well as my own experience, there are still cases where women are looked down at and only 7.3% of companies has female on a leadership, 11.1% serving on managerial position and only 8% representation in the lower house of parliament (Lewis, 2015). This arrow wants to promote workship to more women providing higher number of childcare facilities. (Keleher, 2015)

3. Strengthen export – mostly bound to culture oriented goods. This also includes measures taken to promote tourism in Japan such as reducing visa restrictions.
4. Openness to foreign workers – As we learned before, Japan never was a country opened to foreigners. In the modern history only a very limited number of foreign workers were let in (mostly professors or highly educated experts) and even those could not achieve a permanent residence permit most of the time. Student should not be left behind as well as more scholarships for foreigners are being opened.
5. Limiting of regulation – opening to free trade, lowering of foreign investment regulations. (Kurt, 2017)

Only time will show whether Abenomics really work or not. However, it's unique way of 'spending its way into growth' has all world excited about the true outcomes and its consequences on the long-run economy situation. (Tofugu.com, 2014)

3.2 Natural disasters and economies

Natural disasters not only have a serious impact on lives of people living in the affected area but also on economies. One of the most common disasters leading to huge losses could be earthquakes, hurricanes or windstorms, floods, avalanche or landslides. Tsunami also preach a catastrophic scenario although it is not as common. The occurrence of natural disasters shows a growing tendency in history - that may also come as a result of

better measuring instruments which are more precise. However, the increasing number has been obvious with significant disasters. (Garrett, 2015)

3.2.1 Earthquake

Earthquake is caused by movements of tectonic plates which may even cause the breaking of the ground. The movement sends seismic waves through the ground causing it to shake. Those waves serve as a measure to establish the power of the quake and as a presentation tool, the Richter magnitude scale is used world-widely. According to Richter scale we can say that earthquakes with magnitude around 2.0 are commonly not felt by most people and are classified as micro-earthquakes. Earthquakes with higher magnitude of 5.3 may be called moderate and those with 6.3 magnitude as strong ones. (Spence, Sipkin and Choy, 2017)

3.2.2 Tsunami

The movements of the tectonic plates are also a main cause to tsunami. Tsunami can be described as long and fast waves with various strengths. There are dozens of small tsunamis measured yearly mainly on the opened sea where only precise measuring instruments could recognize them. However, tsunami is a big threat to coastal areas. Those caused by strong underwater quakes most often bring significant damages to the area and losses of lives. (Petranek, 2007)

3.2.3 Impacts of natural disasters on economies

The impacts of natural disasters on economies are undoubtable whether we speak of short or long run impact. However, the level of negative impacts are also affected by the level of development of each economy. Firstly, the short run impacts are stronger than the long-run ones are but it still possess a very adverse consequences no matter of how developed the economy is. The vulnerability of economy to natural disaster may be declining in countries experience transformation such as Caribbean or Bangladesh. (Benson, Clay, 2003)

The losses caused by disasters are interconnected and all-together influences the economy – the growth of GDP or the level of state debt. The primary economic consequences right after the disaster may count the unavailability of clean water, collapses of infrastructure or disruption of energy supplies. Each of those then affect the prices of

goods. For example, the damages to the infrastructure cause a distortion of trade – prices of food or crude oil rises. Companies have to limit its production, thus leading to high unemployment. All those factors significantly reduce consumer demand. (Benson, Clay, 2003)

3.2.4 Most Significant natural disasters in a modern history

Some of the most significant natural disasters of a modern history are listed below. One of worst occurring was Haiti Earthquake 2010 which took life of over 200 000 people and led to one of the highest financial donations from other countries reaching up to US \$120 million. The other one listed is Hurricane Katrina 2005 affecting Gulf Coast and damages reached over US \$81 million. East Africa Drought in 2011 lead to severe lack of food and famine which threatened around 12.4 million people. Probably the worst one according to losses of lives is the Yangtze river floods back in 1931 which robbed nearly 3.7 million people of life. Finally, lets mention Tohoku Earthquake and Tsunami 2011 which will be described further on. (Josef, 2013)

3.3 Great East Japan Earthquake 2011

The destructive earthquake and tsunami occurred in March 11th2011 in north-eastern area of Japan referred to as Tohoku earthquake/disaster after the area it occurred at – Tohoku area consisting of six prefectures – Fukushima, Miyagi, Iwate, Aomori, Yamagata and Akita. Japan has always been affected by numerous earthquakes as it lies on the Ring of Fire – the sites of seismic activities which stand behind more than 90% of all earthquakes. (National Geographic)The earthquake was measured to be magnitude 9which makes it the 4th largest earthquake recorded and led to devastating tsunami. The effects of such a strong quake were felt even in Norway. To add to this, the tsunami caused damage to Fukushima Daiichi Nuclear Power Plant leaking radioactive materials infecting water. The cost of damages caused by the incident rose up to US \$253 billion making it the most expensive natural disaster in a history and number of victims climbed to 15 894 deaths (mostly caused by drowning), other 6152 injured and over 2000 people missing. With the great damage done to the buildings and infrastructure (127 290 of buildings damaged and

other 747 989 partially collapsed), 228 863 people ended up living in temporary shelters.(Paul-Choudhury, 2011)

The tsunami waves started to attack the shore an hour later after the main earthquake occurred and the highest of them were 39 meters high and were able to travel 10 km.

3.3.1 Fukushima Daiichi Nuclear Power Plant Leakage

Major problem with large-scale consequences was the leakage occurred in Fukushima Daiichi nuclear power plant as aftermath of tsunami. It damaged the cooling system of all 3 reactors the Daiichi power plant consisted of as power supply was cut off. This led to melting of the reactors and high leakage of radioactive materials 4th to 6th days after the earthquake. The rescue plan suggested cooling the reactors down with water which eventually secured the stability. The water cooling/afterwards the recycled water was used, lasted to December. The fear of radioactivity still lasts and several measures have been taken. The highest risk was carried on by radioactive water leakage into the rivers and even sources of drinking water. There is no doubt that the radioactivity affected the area a lot. Deformed vegetables and fruits can stand as a proof. (World Nuclear, 2017) Unfortunately, in long run point of view, deformed animals such as fish could be observed as well. Luckily enough, there have been nearly no notifications of sickness cause by radiation or deaths yet.However, one of the power plant ex-workers has recently filed to sue TEPCO over leukemia. (Japan Times, 2017)

The Fukushima Nuclear Power Plant is managed by Japan's biggest power company - Tokyo Electric Power Company, referred to as TEPCO. After the 2011 incident its shares decreased 60% in value and a severe distrust emerged among Japanese citizens even though the researches shows that the management of the situation was carried out the best possible way. The distrust and worries led Japanese to set up numerous protests against nuclear power which led to a success when government closed all nuclear power plants in country for it to undergo various safety tests and only three of them were reopened in 2012. Even this caused massive protests and in response the government did quite a naive statement that it will eliminate all nuclear power plants in country by year 2040.(Japan Times, 2015)

3.3.2 Relief and rebuilding efforts

In the reaction to the disaster, the emergency command was set up by the prime minister at the time Kan Naoto and the first hours after the earthquake Over 100.000 workers of Japanese Self-Defense Force were mobilized and sent over to the area of need. International relief was also received. Firstly by US whose personnel placed in the military station all over the country were available to help in relief efforts and rescue missions. Search and rescue teams were sent from nearby countries such as China, South Korea, Australia or India. Countries all around the world united to help the way it could. Whether it be a financial help from economically developed countries or material help of those which could not afford more – India provided 22 tonnes of woollen warm blankets and clothes for people in the shelters, Israel sent humanitarian worker forces, Malaysia teams of medical doctors, Maldives 90.000 cans of tuna, Mongolian’s citizens donated their monthly wages to relief efforts, Russia natural gas supplies, Pakistan food, milk and water, Uzbekistan beer in bottles. (En.wikipedia.org, 2017) Once again the world showed its incredible hospitability and capability of co-working in time of the need. Out of private donations let’s mention Son Masayoshi’s donation (CEO of Softbank) of \$120 million and dedication of yearly annual salary to charities for the rest of his life.

Kan’s government also assembled special economic recovery committee to deal with the consequences of the earthquake called the Reconstruction Agency. The Reconstruction Agency was established in February 2012 and sought to deal with coordination of reconstruction work assignment in relation to rebuilding the area affected by the earthquake completely in 10 years and given \$115 billion in support. It was reported that the debris is almost reconstructed to its original state in 2015 in Sendai and the area can be fully inhabited. That information could be speculated as many are still not able to return home. (Reconstruction.go.jp, 2017)

3.4 Tohoku disaster and Japanese economy

Due to enormous damages caused by the earthquake and following tsunami, the overall losses could not be predicted at first as the nuclear accident also add its bill on the situation. The expectations were that the losses would not affect the economy seriously in a

long-run point of view according to previous disasters experiences. Furthermore, the economy was boosted by the expenses on reconstruction. On the other hand, the still-rising high state debt was of concern. What we also need to take into consideration is that Japan already was in a financial crisis when the earthquake happened. For comparison, in the first quarter on 2009 the GDP declined by 9.3% and in the first quarter of 2011 the GDP only fell by 0.3%. This down-falling deepened continuously though when in second quarter it fell by 1.7% due to drop in private consumption and construction building works. The private consumption fell again by 0.5% in third and 0.4% in fourth quartile of 2011.

The drop in GDP continued on the whole year. As the main reason for this we recognize the mentioned decline in private consumption and relatively slow incentives for renewal made right after the disaster by government. For the strong Yen, the foreign investment and demand stagnated and also private investments made by Japanese almost stopped. The regional supply chain was disrupted which certainly affected the whole country's supply and exports as well which fell by 5.5% in the second quarter.

(Soumu.co.jp, 2012)

In the immediate reaction to the disaster the stock markets dropped and this continued on few weeks. The Nikkei Index dropped as much as 8.2%. This situation gradually got better until other big lap in August when the fall was 8.9% - but that is believed to be an impact of action on world's stock exchanges. The overall outcome was the worst since the eighties of 20th century. (Stuchlikova, 2012)

Figure 6 - Impact of disaster on GDP

	FY2011(2011,4~2012,3)		FY2012 (2012,4~2013,3)	FY2013 (2013,4~2014,3)
	First half	Second half		
Impact on GDP in the affected areas Decline in production due to damage to private plants & equipment	▲1.25~▲0.5	▲1.25~▲0.5	▲2.25~▲1.25	▲2.25~▲1.25
Impact on GDP in the non-affected areas via supply-chain connections	▲0.25	—	—	—
Impact on recovery of damaged stocks (assuming a scenario where recovery takes 3 years) Increase in production corresponding to the gross fixed capital formation	2~3	3~5	6~9.5	5~7.75
Total impact on GDP	0.5~2.25	2~4.25	3.75~8.25	2.75~6.5
In percent of real GDP (annualized)	0.25~0.75%	0.75~1.5%	0.75~1.5%	0.5~1.25%
Damage to stocks (Social Capital, Housing, private plants & equipment)	16~25 trillion yen (about 1% of all stock)			

Source: Meti.go.jp

As mentioned above, the disaster befell the production of means of transport and electric devices. These create one third of exports (means of transport production fell by 8% and electric devices up to 14.2%). The foreign demand for these was low even before the earthquake, again because of the strong yen. Fear of radiation also affected the export of food (-11.6%). The overall drop in exports was 2.7%.

The main import article was fuel (the demand rose by 25.4%) – especially crude oil that is used in thermal power stations (the production rose to replace the power produced in nuclear power plants). The overall import rose by 12.1%.

Table 2 – Japan’s Exports and Imports

Regions	Exports				Imports				
	March	April	May	June	March	April	May	June	
USA	-9.9	-16.5	14.1	15,6	-9,7	13,7	3,7	-7,6	
EU	-7.6	-9.3	12.4	10.2	-10.8	20.1	-5.4	1.4	
East Asia	-9.9	-2.0	0.1	6.2	0.8	-0.7	2.4	1.9	
Rest of the World	-11.9	-9.2	13.8	14.4	-5.6	3.1	2.9	-0.6	
Total	-8.0	-7.0	4.5	8.6	-1.5	1.8	3.2	0.3	
Exports					Imports				
Commodity	March	April	May	June	Commodity	March	April	May	June
Intermediate products	-6.5	4.6	-6.6	-1.8	Raw materials	-5.0	1.5	1.5	1.1
Vehicles	-26.6	-32.3	34.1	34.5	Intermediate products	3.0	8.9	0.4	-3.4
Consumer goods	-11.3	-26.7	25.7	27.8	Foodstuff	-4.9	13.0	-1.7	-2.9
IT products	0.6	-7.8	6.4	2.9	Consumer goods	-7.3	-3.2	1.0	11.1
Capital goods	-5.6	2.0	2.8	3.6	IT products	-3.4	0.0	4.8	1.0
Total	-8.0	-7.0	4.5	8.6	Capital goods	-2.7	2.9	2.8	-0.3
					Total	-1.5	1.8	3.2	0.3

Source: Ffj.ehess.fr

3.4.1 Material Damage Losses

Most of the damages are attributed to be a consequence of tsunami. Even though the earthquake was of an enormous power, the damage it brought was not as significant, partially because of the anti-earthquake building measures which are being used in almost every building in Japan whether private or public and are of the highest standard in the world. The damages also occurred as the secondary effects of earthquakes surfaced, such as liquefaction of dried up rivers courses. It was estimated that 128 530 houses were definitely destroyed and other 240 332 damaged partially. The highest percent of damages out of affected prefectures was recorded to be Miyagi with over 80 000 of destroyed and 135 000 half-destroyed buildings followed up by Fukushima prefecture.

Table 3 – Comparison of estimates of damage

	<u>Cabinet Office</u> Disaster Management	<u>Cabinet Office</u> Economic Analysis
<u>Buildings</u>	¥10.4 trillion	¥11-20 trillion
<u>Infrastructure facilities</u>	¥2.2 trillion	¥2 trillion
<u>Lifeline facilities</u> (supply of water, electricity, etc.)	¥1.3 trillion	¥1 trillion
<u>Others</u> (agriculture, forestry, fisheries)	¥1.9 trillion	¥2 trillion
<u>Total</u>	¥16.9 trillion	¥16-25 trillion

Source: Sciencedirect.com

The table above shows estimation of damage costs of the Great East Japan earthquake disaster in four different fields. Firstly, the building damages which include residential buildings with land, machinery and factories. Secondly, the infrastructure line including facilities like roads, airport or rivers. Followed by lifeline facilities such as water supply lines or electricity. And lastly the group containing agriculture, forestry and fisheries production. The buildings damages were the most costly with ¥10.4 trillion of the damage costs and up to ¥20 trillion of costs in the economic scale and the total number of

costs carried through damages was estimated to be up to ¥25 trillion economic wise. (Motoki, Noda, 2012)

3.5 Consequences on Financial Markets

The general assumption that the domestic currency depreciates when the output of production decreases, proved to be true with the Tohoku disaster. Most of the investors moved to relocate their financial assets from Yen to other, at the time saver currency. Thus, Yen depreciates and the worldwide demand for it declines. Values on stock markets and paper valued dropped adding to financial instability of both Japanese and world markets. However, something good to add to the situation was, that Japan possess large reserves of foreign exchange – approximately \$1.29 trillion and these reserves helped to fight the depreciation in the first moments after the disaster as the foreign currency reserves could be sold so that the flow of money appreciates domestic currency.

(Thelegalexchange.wordpress.com, 2012)

It was Japanese investors that helped to boost the market and caused Yen to appreciate in efforts of repatriation. The other factor that helped Yen to appreciate is the carry trade.

(Streetlightblog.blogspot.cz, 2011)

From the time of the occurring to July 2011 there were 258 companies going bankrupt as a result of the disaster, unable to pay back liabilities to the banks. The expected financial cost for reconstruction is amounted to ¥23 trillion partitioned into 10 years of which 80% is due to 5 years. To cover these expenses, the tax was increased, the governmental shares sold and spending cut.

To stabilize the financial market, market liquidity was provided by the BOJ. The economy has been lifted by the rebuilding works at the expense of already astronomical national debt. (Waldenberger, Eilker, 2013)

Table 4 – Estimates distribution of costs

	Amount	Share	
		of (B)	of (C)
Property and Life Insurances (estimated)	2,295 bil. yen	9.3%	10.2%
TEPCO	151 bil. yen	0.6%	0.7%
Government	16,133 bil. yen	65.7%	72.0%
Donations	298 bil. yen	1.2%	1.3%
Total (A)	18,877 bil. yen	76.8%	84.2%
Damage through property losses	-16,900 bil. yen		
Costs for cleanup operations	-845 bil. yen		
Income losses 2011	-6,822 bil. yen		
Total losses 2011 (B)	-25,412 bil. yen		
Income losses for 2011 and 2012	-4,670 bil. yen		
Medium-term losses(C)	-23,260 bil. yen		

Source: Sciencedirect.com

3.6 Effects on Tourism

The negative impacts on the tourism also create losses in the Japanese financial sphere. Not only the Tohoku area was damaged thus tourists would and could not visit the area, the fear of radiation and further additional quakes was enormous and would stop many to even enter Japan. These reason disadvantage domestic tourism as well. The worst scenarios however, were not fulfilled and in July 2011, the number of foreign visitors only dropped by 36%. The domestic demand for travel and tourism only fell by 2% in the first three months after the quake and by July returned to its normal numbers. The outbound tourism dropped by 9.1% in March 2011 and is showing rising tendency since. (eturbonews.com, 2011)

3.7 Impacts on Global Economy

As the key ports were closed due to tsunami and Fukushima airport destroyed and nearby one closed, the global supply chain has been interrupted. The main problem was in unavailability of semiconductor equipment in which Japan manufactures around 20% (for example NADN flash or sub-components for aircrafts and automotive industries). Many production factories have been shut down – such as those of Honda, Toyota or Mitsubishi. (Amadeo, 2016)

3.8 Comparison of the Tohoku and Kobe Earthquakes

In this chapter, the comparison of two biggest earthquakes to hit Japan in the post-war history is carried out.

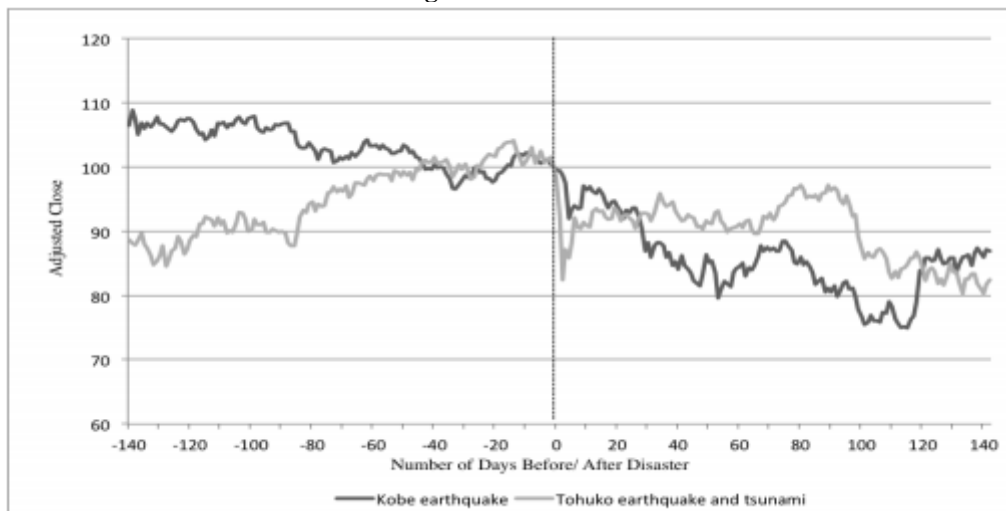
3.8.1 Kobe Earthquake

Kobe, the capital city of Hyogo prefecture was hit by earthquake on 17th January 1995. The earthquake is also known as the Big Hanshin Earthquake and had the magnitude of 7.2. There were over 6 430 casualties and the material damage was enormous. Some parts of Kobe city and the epicentre of the quake – Awaji nearly perished. Around 200 000 buildings were demolished and as a biggest loss on infrastructure we mention the destroyed Kobe port which served as one of the main transportation and trade hub. Kobe earthquake is also famous for the high rescue anticipation and financial aid provided by Yakuza clans all around Japan.

3.8.2 Kobe vs. Tohoku Earthquake

Japanese government was criticized for its slow reaction to occurring of the Kobe Earthquake. One of reason may be the collapsed government centres due to the quake but also difficult bureaucracy system which made it difficult to communicate between prefectural and national levels of government. It took almost four hours to mobilize the teams of Self-Defense Forces. While, as already mentioned, the reaction to Tohoku Earthquake was as fast as it could be and within one hour after the occurring, the rescue teams were mobilized and started being dispatched to the area. (Stajvaňová, 2015). The Dead and Missing people number was around 6 400 for Kobe and 19 996 for Tohoku Earthquake. Kobe area made up 12.4% of GDP while Tohoku area – not as industrialized, only for 7.8%. (Econfix.wordpress.com, 2011)

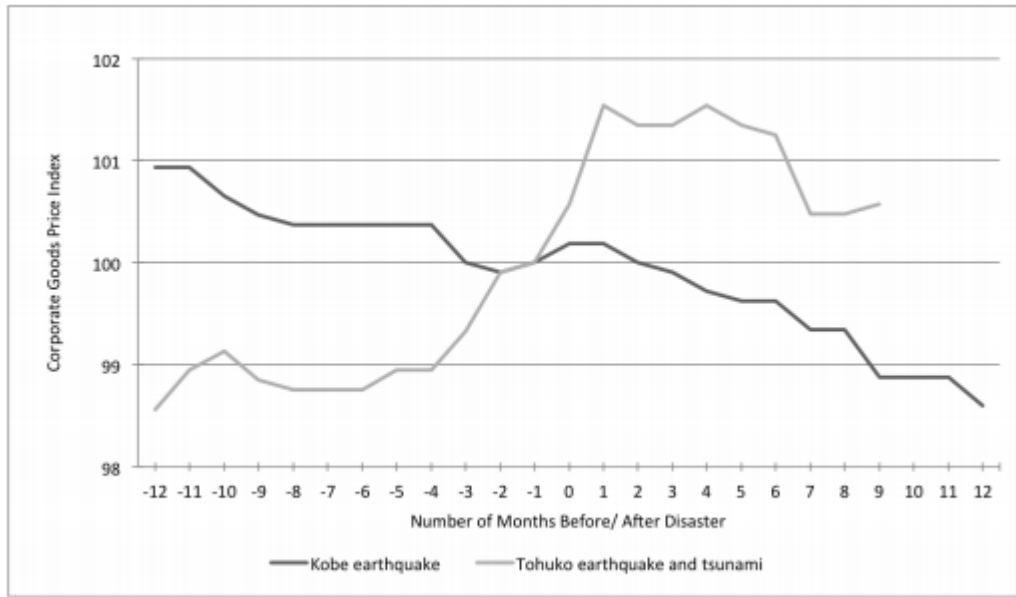
Figure 7 - Effect on Nikkei 1



Source: Rieti.go.jp

Figure 7 shows the Comparison of effects the earthquakes had in Nikkei. With the thicker line representing Kobe earthquake and the lighter one standing for Tohoku disaster.

Figure 8 - Effects on price of goods



Source: Rieti.go.jp

The table 8 shows the comparison of effects of corporate goods price index.

4 Practical Part

4.1 SWOT Analysis

SWOT Analysis can help us understand and summarize what was already written about – implied on the Tohoku disaster. SWOT analysis consists of four characteristic groups – strengths, weakness, opportunities and threats and can show us what could be improved and what to be aware of. (Fallon Taylor, 2017)

Table 5 – SWOT Analysis

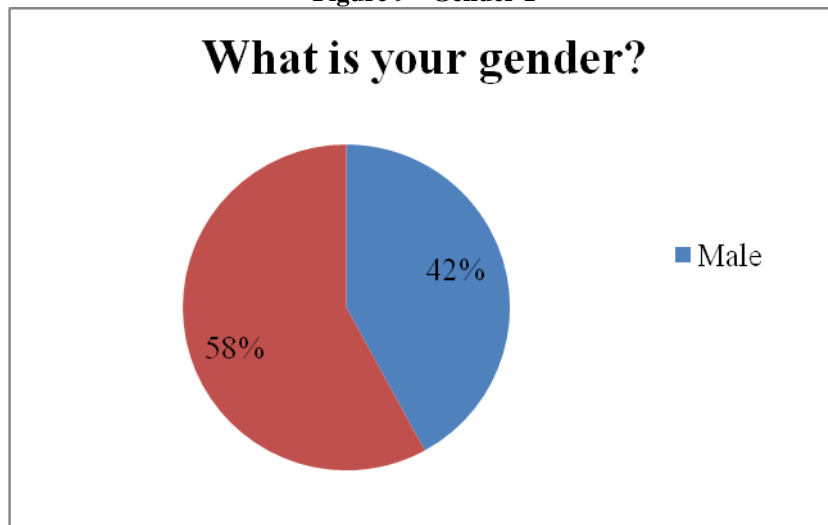
STRENGTHS <ul style="list-style-type: none">- the strength of resisting buildings and infrastructure- quick reaction of government- quickness of rebuilding of infrastructure- the immediate mobilization of rescue resources	WEAKNESSES <ul style="list-style-type: none">- low percentage of insured households (less than ¼ insured)- the safety of nuclear plant must be assured and the future of nuclear power plants reconsidered
OPPORTUNITIES <ul style="list-style-type: none">- stronger building companies + establishment of new ones- technology evolution- better quality of safety devices	THREATS <ul style="list-style-type: none">- possibility of such a strong quake hitting Tokyo – need de-concentration political headquarters- repeated occurring of such disasters due to Japan’s position on the Ring of Fire- increase of national debt

Source: Own data processing according to: Edc-connection.ebscohost.com

4.2 Survey on Impacts of Tohoku Disaster on Everyday Life

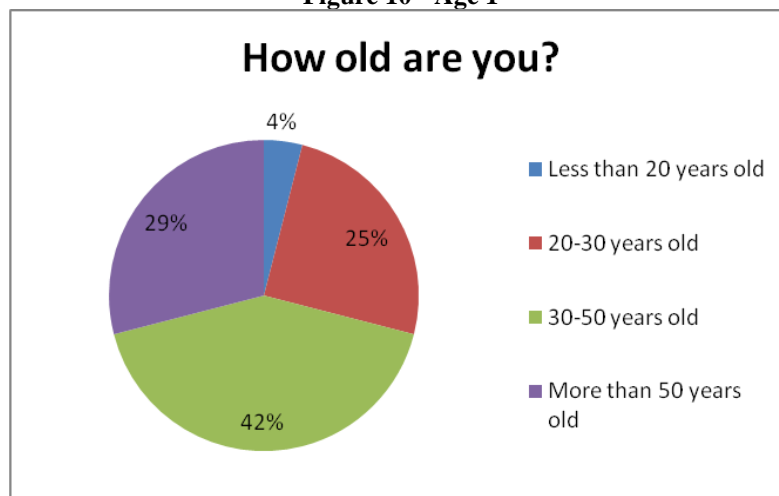
In order to delineate the impacts the disaster had on everyday life of Japanese, the survey is carried out. A sample of 100 Japanese living across Japan (Tokyo, Saitama, Kyoto and Miyazaki) was used to conclude the survey consisting of seven questions. The question and their outputs are as displayed below.

Figure 9 - Gender 1



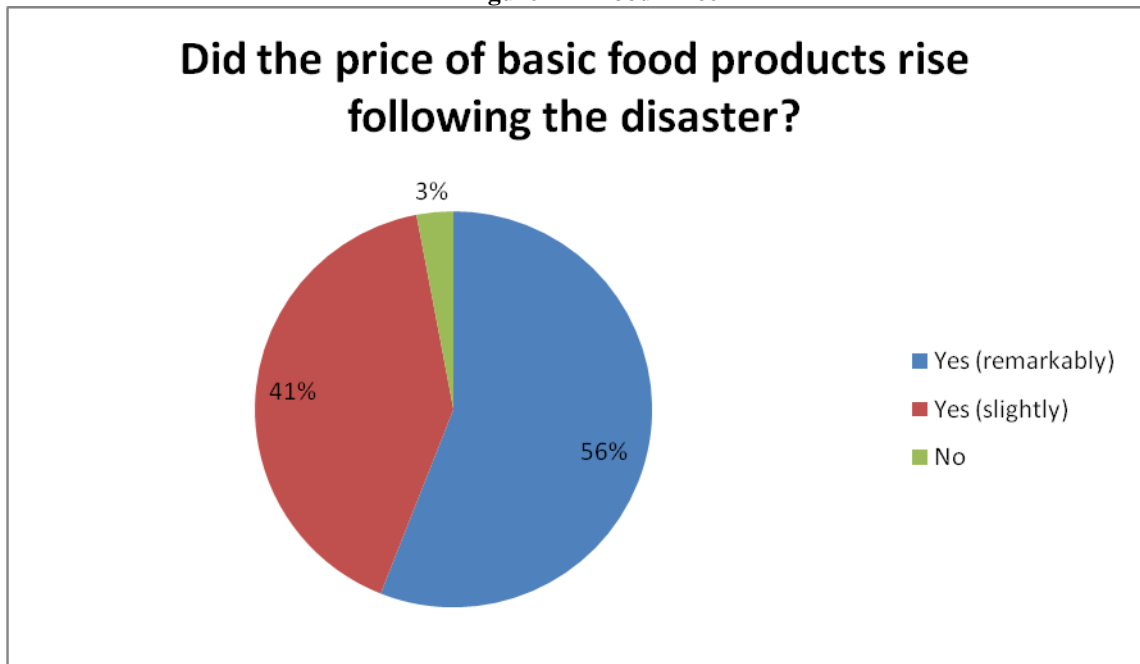
The survey was attended by higher percentage of female attendees who made up for 58% and remaining 42% was contributed by males.

Figure 10 - Age 1



The most respondents belong to the 30-50 and more than 50 years age groups. The lowest participation was contributed by the less than 20 years old group.

Figure 11 - Food Price



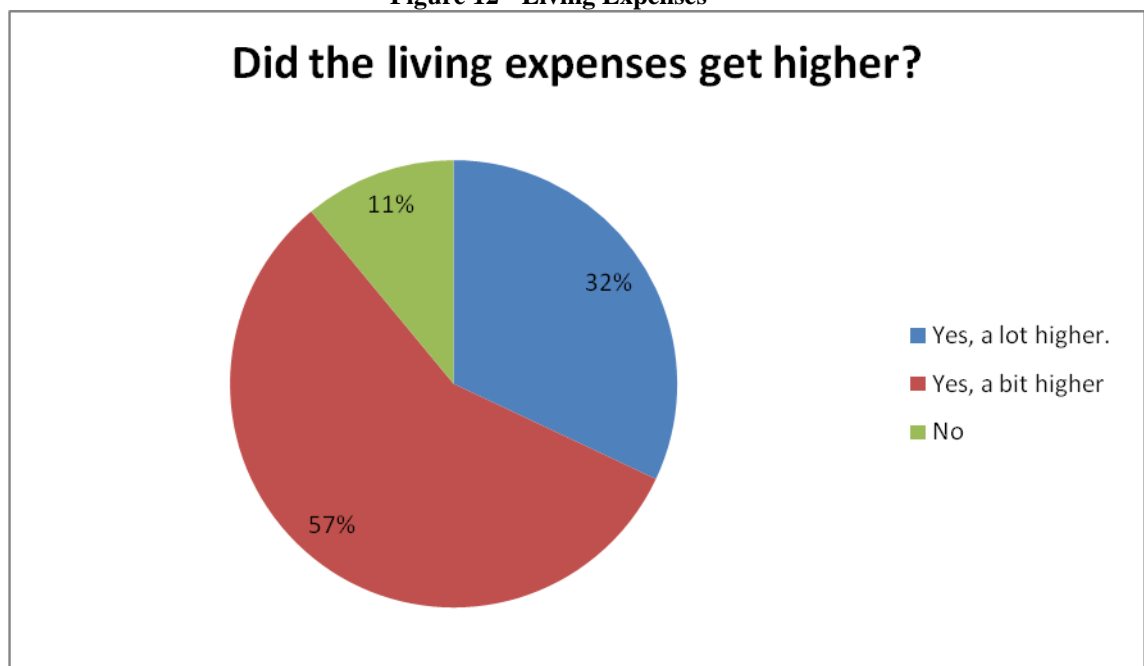
From the survey done on this question we see that most people (56%) observed remarkable upward change in the price of basic food products. Slight change was than taken into account by 41% of the respondents and the rest of 3% said they did not observe a change in the prices.

The Tohoku region is highly agriculturally developed area with Aomori prefecture being a leader on producing agricultural products in Japan. Among its main articles we count rice and apples. Rice produced in Aomori cover up 40% of Japan's rice production. The other prefectures do not stand behind as the area is famous to being a home to farmers on the Honshu Island. As other agricultural articles we can mention wheat, soybean, onions, potatoes or radish and cucumbers. Japan is a huge consumer of nearly all of these articles – mainly than rice and soybean followed up by wheat, onion and radish.

The fertile soil used for farming was destroyed and infected with high salinity which unable nearly anything to grow in the soil. And so, not only was the 2011 year's harvest gone in the quake and tsunami but the damages were so massive most of the soil was destroyed and un-usable in the agricultural process. Other factor that put even more weight onto the situation was the leaking of nuclear materials from Fukushima power plant.

People automatically became afraid to buy anything originated in the area in fear of nuclear contamination. This situation also affected fisheries a lot as there were a lot of reports on finding a degenerated fish due to radiation poisoning etc. Japan had to substitute all those products with imported goods which add up on the price and resulted in higher prices in consumer goods and even basic food products. (Kingshuk, Sasada, 2014)

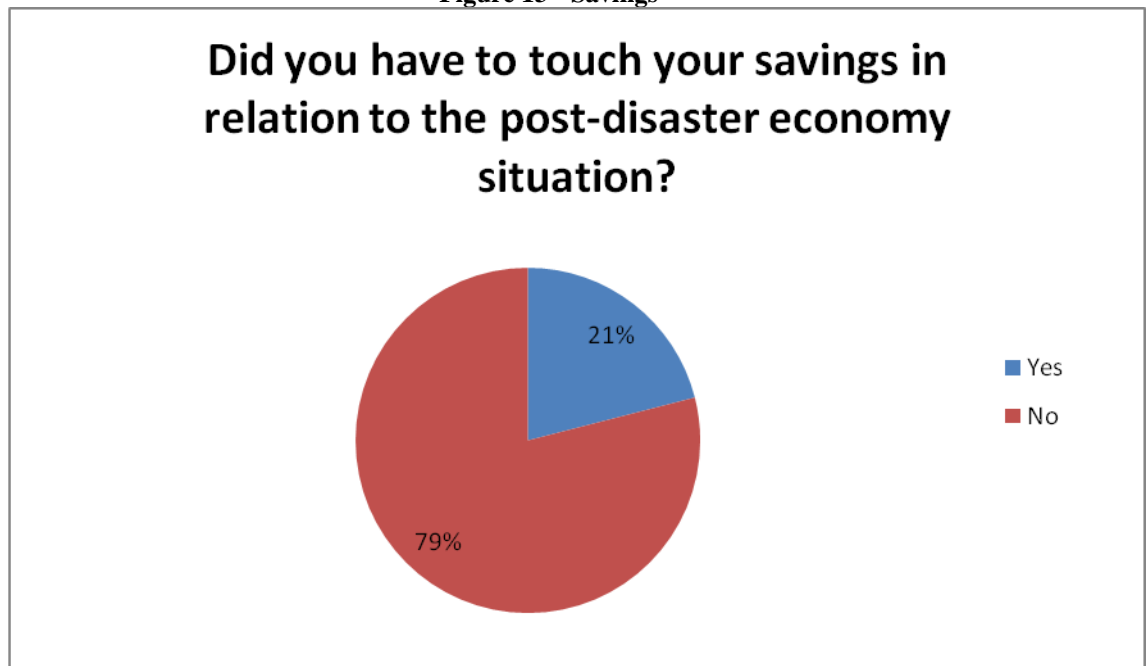
Figure 12 - Living Expenses



The next question on whether the living expenses rose after the disaster shows that 57% recognized a small rise in the expenses, other 32% a higher changes in the expenses and 11% almost no change.

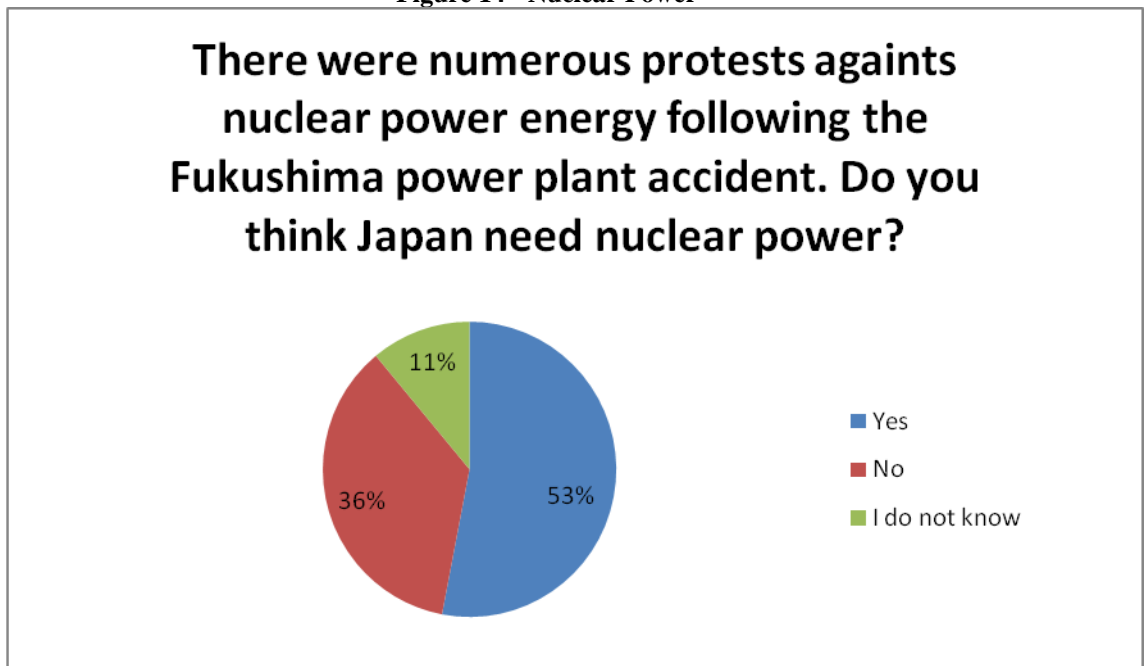
Following the closure of nuclear power plants all around Japan, the electricity prices went up. Japan already was among top importers of gas and crude oil in the world and those imports only got higher with the need to get more thermal power plant produced energy/electricity. The implementation of tax hikes is amongst other factors that cause the living expenses go high.

Figure 13 - Savings



Following question asked whether it was necessary to touch the private savings in order to maintain habitual standard of living. The answer was mostly unite with 79% respondents agreed that there was no reason to spend the saving in relation to the disaster. Other 21% had to touch the savings they had either to maintain the living standard or to support family members who were directly affected by the disaster.

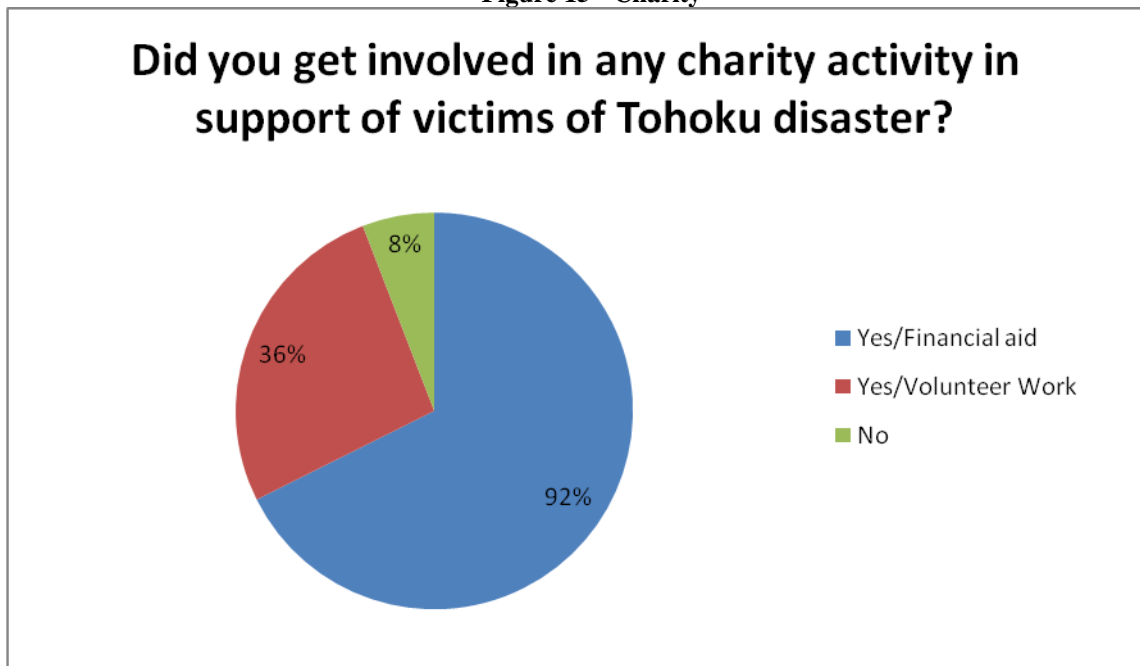
Figure 14 - Nuclear Power



From the graph above we conclude that 53% of respondents agree that Japan needs nuclear power plants to cover up electricity need of their country while 36% refuses nuclear power and believes that Japan can go on without any nuclear power. 11% of the sample did not know what to think about it.

According to research it would be very difficult for Japan to retreat from nuclear energy. Japan lacks commodities required for energy production in thermal power plants and imports 84% of its energy requirements. Japan has relied on nuclear energy for a long time with over 50 reactors placed around the country (only 24 of them are in work now, other are waiting for approval), producing 30% of the country's electricity. The fact that during normal running of the nuclear power plant, they are usually safe and actually emit a lot less emissions than widely used thermal power plants are to take into consideration. On the other hand the innovation on safety tools needs to be concluded to minimize the risks of nuclear materials leakage or even explosion even more.

Figure 15 - Charity



The last item in the questionnaire was designed to show the units of people and willingness to help. And this assumption turned out to be very true with 92% of respondents being involved in some kind of charity making financial donations, other 36% being involved as volunteers in rebuilding and relief projects. Only 8% of respondents did not contribute to any kind of charity related to Tohoku disaster.

The high anticipation in rescue works was also allowed due to great marketing moves where for example people had an opportunity to go volunteer to the area for a weekend when they had days off (government funded tours like that were also available). Universities were offering trips to the affected area where the students anticipated in some kind of volunteer programmes. There was almost no popular celebrity who has not anticipated own charity programmes and volunteer tours (they personally attended) or they gifted the sales of current works to the victims of the disaster. Yakuza also participated in the rescue activities sending in trucks and ships full of water, food, blankets, diapers, batteries and other essential of daily life. (Adelstein, 2011)

4.3 Japan's Export Comparison

In this chapter, the task of comparison of exports in years 2009 to 2013 is concluded to see whether there were significant changes in exports in the year of the disaster and if there were any consequences on following years. There is a sample of a table for year 2011 (the

table is carried out for years from 2005 – 2015) showing the items and values concluded in the research to get a per cent change between the years. The per cent of share of the commodity in a total value of exports is calculated.

Table 6 – Exports 2011

(Thousands of US Dollars, %)

Item	Value	Year to Year Per Cent Change (%)	Share of the Commodity in a Total Value of Exports
Total	820 793 168	7.0	100.0
Food	4 212 430	-3.6	0.5
Industrial Supplies	210 216 773	9.6	25.6
Capital Equipment	437 281 318	8.2	53.3
Consumer Non-Durable Goods	5 409 227	5.9	0.7
Consumer Durable Goods	113 357 436	-0.9	13.8
Others	50 315 984	6.6	6.1

Source: Own data processing according to: Jetro.go.jp

The table shows a big loss in Food category exports as well as Consumer Durable Goods Exports. As was mentioned in the theoretical part of this thesis, the food/agricultural industry was affected a lot due to damaged farming land which has a high percentage in the Tohoku region. Among the Consumer Durable Goods there are especially remarkable losses in Passenger Cars industry which was at loss of 3% in 2011 compared to 2010. Other hurt branch is that of music instruments and toys production whose exports lowered by 6% in 2011 mainly than due to damaged manufacturing factories.

Table 7 – Per Cent Change in Exports

(Thousands of US Dollars, %)

YEAR	Total Value of Exports	Year to Year Per Cent Change (%)
2006	647 290 458	8.2
2007	712 734 968	10.11
2008	775 917 548	8.86

2009	580 786 595	-25.2
2010	767 025 013	32.1
2011	820 793 168	7.0
2012	801 334 629	-2.4
2013	719 204 861	-10.3
2014	694 270 280	-3.5
2015	625 067 631	-10.0

Source: Own data processing according to: Jetro.go.jp

The table above shows the results for Year to Year Per Cent Change for years from 2005 – 2015. As we can observe, the only two numbers positive are those values of 2010 and 2011 year. The year to year change values will be used to determine whether there is a significant difference between the values or not. The analysis is carried out through Student's T-Test.

The Student's T-Test was done with a significance level $\alpha=0.05$. The Null hypothesis was set as follows.

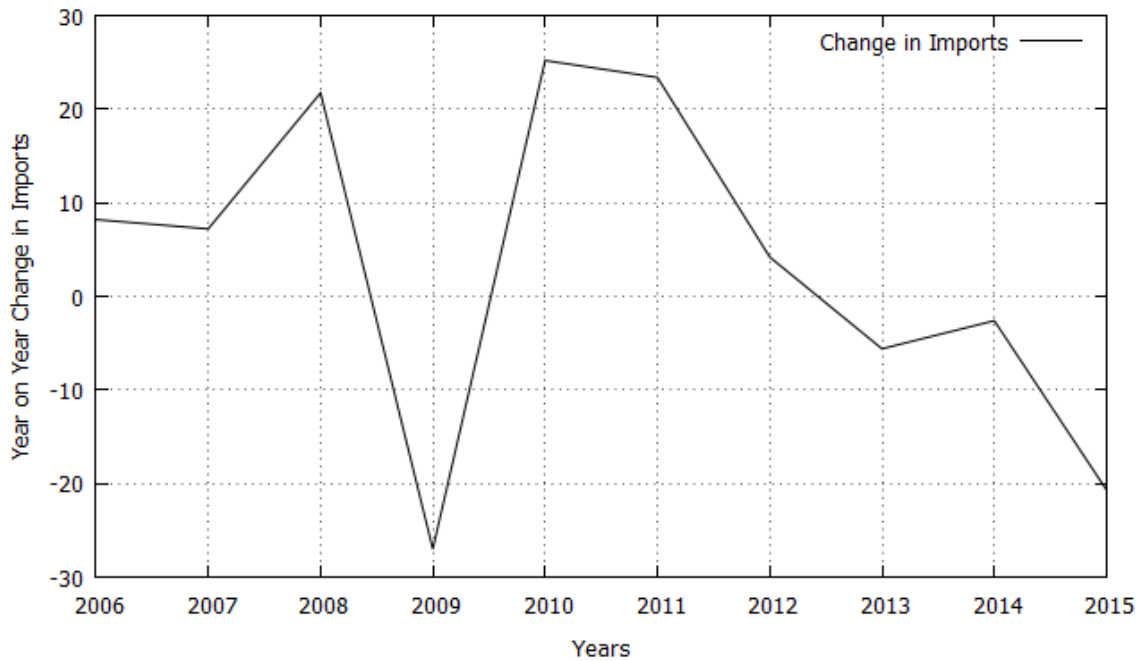
Null hypothesis: There is no significant difference between the per cent year to year change in years before and years after the disaster.

Concluding the task shows us that the p-value = 0.3039. According to a rule that if p-value $>\alpha$ than we accept the Null hypothesis, we decide to accept Null hypothesis. Therefore the conclusion is that there is no significant difference between the per cent year to year change in year before and after the disaster.

4.4 Japan's Import Comparison

The table below shows the results gotten from comparing the total value of imports for each given year (from 2006-2015) – the Year on Year Change in the imports. The lowest value of imports was recorded to be in 2009 when Japan was struck by the deep financial crisis.

Figure 16 - Per Cent Change in Imports



Source: Own data processing according to:

Student's T-Test was used to understand whether there is a significant difference between the imports in years before and after the disaster. The Null hypothesis is defined as follows:

Null hypothesis: There is no significant difference between imports in years before and years after the disaster.

The p-value = 0.4500 and according to rule stating that if p-value $> \alpha$, than we accept the Null hypothesis – we accept the Null hypothesis. Therefore, there is no significant difference between imports before and after the disaster.

5 Results and Discussion

5.1 Regional economy recovery plan suggestions and discussion

This chapter comprise of suggestions on how to help the regional economy to recover from the disaster

5.1.1 Short-term regional economy recovery suggestions

It is crucial to ease the financial situation to people affected by the disaster. This could be achieved by providing unemployment insurance to distressed households upon a pre-determined period of time. Also, the temporary relief in paying of mortgage or any other

kind of best should be provided. The biggest companies in the region should be given the highest and the earliest to receive government aids as it could provide more working positions and its collapse would make it harder for smaller businesses to sustain. The focus should be put firstly on reconstruction of infrastructure as it is the key in getting in aid or rescue teams, starting reconstruction works etc. And last but not least, setting up a well-functioning insurance market is essential. (Birch, 2013)

5.1.2 Long-term regional economy recovery suggestions

The process of a community restoration needs to be stable. As of now, when the area is being slowly reconstructed and is at level that allows people to return, the integration of the community needs to take a place. For a smooth faster recovery of regional economy it is needed to ensure people that the area can and will function again as a whole again. Thus, the comeback of original or arrival of the new businesses is necessary. Because where there is business, there are people. If the business just left the area and do not return back or new one are not established, the residents will also leave eventually. People facing the aftermath of disaster seeks at least low functionality of the market at the place of disaster as a hope that everything will get better. This also means that the housing should be built relatively quickly so the opposite situation does not arise and businesses do not go bankrupt and have to leave the place due to no labour force available. The business also brings in the chance of economic growth or a possibility of various start-up projects which would be partly funded by government as economic recovery expenditures. The first step therefore should be the effort to get business back to the area thanks to government funding.

Setting of new policies regarding the building safety (if there is any new development) to ensure all households meet the highest safety standards possible. Ensure people that the research on developing safety tools making buildings more resistant towards earthquakes is still on-going. (Baker, 2010)

6 Conclusion

The economic analysis carried out in the thesis has shown that even though the damages were extensive, casualties on life unbelievably high and psychological consequences long-lasting, the consequences on Japanese economy itself were not as high in the long-run

point of view compared to for example Kobe earthquake in 1995. This is credited mainly to the fact that Tohoku area had its share in the national GDP only 7% while in Kobe case it was over some 12% and the city was highly industrialized.

The aftermath of the disaster was so terrifying that it was necessary for the government to immediately inject around ¥15 trillion to assure financial stability and market liquidity. The government speedy reaction is to praise whether for fast acting on financial acts but also for mobilizing Self-Defense units and managing rescue works. In comparison to Kobe quake, the government was also quick and unhesitant in receiving foreign financial or material aid which helped the survivalist from the place of disaster to find at least some comfort, water and food.

Among the primary problems to be faced there was the huge problem with infrastructure damage which decelerated rescue plans, delivery of various supplies and later on inclusion back to into the business operations. The supply chains of water and electricity were disrupted and highly insufficient. Other urgent problem was the water scarce which was so significant that the small makeshift showers built in the shelters were guarded and everyone was only allowed to shower at a certain rate.

The earthquake and tsunami reached 10 km inland destroying the debris and nearly everything the tsunami washed. Not only were the ports destroyed but also Fukushima airport and other important roads fell victims too. Tohoku is mainly an agricultural area being recognizes as one around Japan. The prefecture of Aomori is one of the biggest suppliers of agricultural articles such as onions, radish, wheat, rice and soybeans in Japan. However, not only the land has be displaced, the fertile soil has been poisoned, had too high salinity levels thus had to be costly imparted by soil from unaffected places such as high hills etc. According to the concluded survey, 56% of responded said the upward change in food prices were remarkable. Also many manufacturing factories were located there for example some of the top Japanese automotive factories like Honda or Nissan.

The harmed Fukushima Daiichi Nuclear Power Plant caused leakage of the agricultural articles to go back on the market as people feared the radioactivradioactive materials that contaminated the water and soil. Low levels of radioactivity were measured in the air at Fukushima Power Plant. This made it furthermore difficult for ity. The leaking in Fukushima Power Plant caused extensive protests against nuclear power and led government to close all nuclear power plants around Japan for it to undergo various safety

tests and innovations. This resulted in high mineral fuels and crude oil imports as Japan had to substitute up to 30% of nuclear plant produced energy with thermal plant produced energy. However, it seems very unlikely that Japan would desist from nuclear power despite the protests as that would be too costly and thermal power plants daily produce much more pollution.

Despite the rough downfall of Japanese yen it was able to appreciate relatively quickly thanks to repatriation efforts and through huge foreign exchange reserves held by Bank of Japan. The expansionary monetary policy was established aiming to secure and improve market liquidity. Short-run consequences were mainly lower export levels, higher import level (mainly for the mineral fuels/crude oil and food) and lower consumption. As was witnessed after the disaster, the insurance market is not sufficient. New programmes are expected to emerge and more people are expected to insure their properties.

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8 Appendix

The sample of the questionnaire is provided.

Figure 17 - Questionnaire Sample
Survey on Impacts of Tohoku 2011 on Everyday Life

1. **What is your gender?** / 性別は何ですか?
Female/女 Male/男
2. **How old are you?** / おいくつですか?
>20 20-30 30-50 <50
3. **Did the price of basic food products rise following the disaster?** / 東北地方太平洋沖地震によって食べ物のいくらは上がったのですか?
Yes, remarkably/はい, とても Yes, remarkably/はい, とても No/いいえ
4. **Did the living expenses get higher?** / 生活費は上がったのですか?
Yes, remarkably/はい, とても Yes, remarkably/はい, とても No/いいえ
5. **Did you have to touch your savings in relation to the post-disaster economy situation?** / 貯金を使う必要ありましたか?
Yes/はい No/いいえ
6. **There were numerous protests againts nuclear power energy following the Fukushima power plant accident. Do you think Japan need nuclear power?** / 原子力発電所のエネルギーがなくても日本が行けるだと思えますか?
Yes/はい No/いいえ I do not know/わかりません
7. **Did you get involved in any charity activity in support of victims of Tohoku disaster?** / 何かの事前代替を応援しましたか?
Yes, financial aid/はい, 財政援助 Yes, volunteer/はい, ボランティア No/いいえ