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AZERBAIJAN STATE UNIVERCITY of ECONOMICS
INTERNATIONAL GRADUATE AND DOCTORATE CENTER

MASTER DISSERTATION

ON THE TOPIC

"AGGREGATE SUPPLY-ORIENTED ECONOMIC GROWTH PROBLEMS: COMPARISON OF THE US AND JAPANESE ECONOMIES"

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MASTER DISSERTATION

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Məcmu təklif yönümlü iqtisadi artim problemləri: ABŞ və Yaponiya iqtisadiyyatlarinin müqayisəsi

Xülasə

Tədqiqatın aktuallığı: İqtisadi artım problemi bəşər tarixində demək olar ki, hər bir ölkənin məruz qaldığı iqtisadi çətinliklərdən biridir. İqtisadi artım sürəti ölkədən-ölkəyə fərqlilik göstərmişdir. Bəzi ölkələr çox sürətlə böyüyərkən, bəzi ölkələrin iqtisadi artımları ləng olmuşdur. Bu səbəblə, beynəlxalq səviyyədə müşahidə edilən artım nisbətlərindəki fərqliliyin səbəblərini izah etməyə istiqamətli olan fərqli artım növlərinin və mənbələrinin incələndiyi işlər görülməyə başlanmışdır. Hal-hazırda ən vacib məsələlərdən biri ölkələrin iqtisadi artım problemlərini və bu problemlərə yol açan səbəbləri tədqiq etməkdir ki, bu məqsədlə iqtisadi artım ilə ona təsir edən əmək, kapital və ümumi faktor məhsuldarlığı kimi komponentlərin araşdırılması zəruri məsələyə çevrilmişdir.Son onilliklərdə, dünyanın böyük iqtisadiyyatların cəmləşdiyi ölkələrində əmək gücü qıtlığının yaşandığını nəzərə alarsaq, bu, mövzunun aktuallığını büruzə edir.

Tədqiqatın məqsəd və vəzifələri: ABŞ və Yaponiyanın məcmu təklif yönümlü iqtisadi artım problemlərinin müəyyənləşdirilməsi, təhlili və bu problemlərə yol açan komponentlərin iqtisadi artıma təsirinin iqtisai-riyazi modelləşdirilməsidir.

İstifadə olunmuş tədqiqat metodları: Bu tədqiqatda ABŞ və Yaponiyanın 1988-2018-ci illər arasındakı illik iqtisadi artımı, əmək, kapital və ümumi faktor məhsuldarlığı OLS modeli çərçivəsində qiymətləndirilmişdir. Bu modeldə, iqtisadi ədəbiyyatlarda ən çox istifadə edilən hesablama metodu olan Neoklassik istehsal funksiyası və Kobb-Duqlas iqtisadi artım düsturundan istifadə olunmuşdur.

Tədqiqatın informasiya bazası:İqtisadi Əməkdaşlıq və İnkişaf Təşkilatı, Dünya Bankı, Mərkəzi Kəşfiyyat Agentliyi, ABŞ Əmək Statistikası Bürosu və Yaponiya Statistika Bürosunun statistika portalları və bir sıra digər rəsmi beynəlxalq internet saytları tədqiqat işinin informasiya bazasını təşkil edir.

Tədqiqatın məhdudiyyətləri:Tədqiqatın ən başlıca məhdudiyyəti bu mövzu üzrə heç bir elmi araşdırmanın olmaması, yəni ABŞ və Yaponiyanın iqtisadi artım problemləri məcmu təklif yönümlü araşdırılmadığından elmi məqalənin olmaması.

Tədqiqatın nəticələri: Modelin nəticələri göstərmişdir ki, məcmu təklif yönümdən kapital, ümumi faktor məhsuldarlığı, xüsusilə də əmək amilinin qıtlığı iqtisadi artım problemlərinin meydana gəlməsində başlıca təsirə malikdir.

Nəticələrin elmi-praktiki əhəmiyyəti: Tədqiqatın nəticələri, ABŞ və Yaponiyanın iqtisadi artımı, istehsal amilləri və digər yaxın məsələlərin araşdırılmasında qaynaq kimi istifadə oluna bilər.

Açar sözlər: iqtisadi artım; əmək; kapital; ümumi faktor məhsuldarlığı.

ABBREVIATIONS

CUSUM of Squares	Cumulative Sum of Squares
CUSUM	Cumulative Sum
DC	Developing Countries
DC	Developed Countries
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
OECD	Organisation for Economic Co-Operation and Development
OLS	Ordinary Least Square
TFP	Total Factor Productivity
UN	The United Nations
USA	United States of America

CONTENT

INTRODUCTION

Actuality of the subject .Economic Growth has been a major research object for both economists and politicians. Researchers are trying to find a new relation between Economic Growth and energy use. However, this relation is in the interaction between Labor and Economic Growth, Capital and Economic Growth, Technological Progress and Economic Growth. Economic Growth is due to growth in production factors such as Labor and Capital, as well as Technological Progress involved in the Re-production process. The problems experienced by such production factors have a negative impact on the Economic Growth of even the largest economies of the world. More production factors mean more Economic Growth. Taking into account the Labor Shortage in the countries of the world, where large economies have been concentrated in recent decades, this shows an urgency of the issue.

Statement and level of studying the problem. A number of other issues have been set sometime recently the think about as well: to view the hypothetical and methodological base of Aggregate Supply and Economic Growth, to recognize arrangements to the issues of Economic Growthwithin the USA and Japan, to identify through econometric models the effect of generation components on the Economic Growthof nations, and to apply Neoclassical Generation Work and the Cobb-Douglas equation which best portray the relationship between Economic Growth and generation components to the study work.

The purpose and task of the research work. As an object of the analysis work, we'll target 2 countries. On the one hand, the US, that has the strongest economy within the world, ranks first in terms of Gross domestic product (GDP). On the opposite hand, Japan merely falls behind the USA in terms of value per capita and is taken into account the third country within the world in terms of GDP. Modelling the impact of production factors on the economic process is the subject of the research work.

Subject and Object of the study. As AN object of the analysis work, we'll target 2 countries. On the one hand, the US, that has the strongest economy within

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Theoretical and methodological basis of research work. In this study, the annual Economic Growth, Labor, Capital and Total Factor Productivity (TFP) of the US and Japan between 1989-2018 were evaluated within the OLS model. In this model, Neoclassical production function and the Cobb-Douglas Economic Growth model, which are the most commonly used calculation method in economic literature, were used

Sources and information base of the study. The Organization for Economic Cooperation and Development (OECD), the World Bank, the Central Intelligence Agency, the U.S. Bureau of Labor Statistics and the statistical portals of the Japanese Bureau of Statistics and a number of other official international websites make up the information base of the research work. Both empirical and theoretical research methods were used in the course of the study.

Limitations of research. Economic growth problem of the USA and Japan has not been researched aggregate supply oriented and the lack of article is basic limitation of this research.

The theory and practical significance of research work. The results of the model showed that in terms of Aggregate Supply, Capital, Total Factor Productivity (TFP), especially Labor factor scarcity have a major impact on the occurrence of Economic Growth problems. The findings of the study could be used as a source in the study of Economic Growth in the US and Japan, Production factors and other related issues.

The scientific novelty of the thesis is as follows:

1. A comprehensive study of the problems of Economic Growth in the United States and Japan, which is a less studied area in the world.

2. The production factors affecting Economic Growth in the USA and Japan were studied in parallel rather than separately.
3. The effect of production factors on Economic Growth was evaluated by means of an econometric model, in contrast to general approaches.
4. It was determined that the dependence between Economic Growth and production factors in both countries corresponds to the specific production function and formula, and forecasts were made for the future.
5. Alternative means that will help solve the problem of Economic Growth have been explored.

Volume and structure of the dissertation.The thesis consists of an introduction, three chapters, nine paragraph, conclusion, 85pages and a list of literature. Within the scope of study, 13 table,15 charts listed. In the list of reference 19 literature and 42 internet sources are indicated.

In Chapter 1, the concept of Aggregate Supply and theoretical methodological aspects of Economic Growth were brought to the attention, the production factors which are components of Economic Growth: Labor, Capital and Technological Progress were explained separately. At the same time, the place and role of Economic Growth in the development of the country's economy has been shown.

In Chapter 2, the USA and Japan economies were reviewed in general and the problems of Economic Growth were identified. Also, both countries were compared within the framework of both macro-economic indicators and growth problems.

In Chapter 3, the impact of production factors on Economic Growth for both the USA and Japan was analyzed by means of an econometric model. Furthermore, the development trends of each variable were shown, existing barriers and ways of their elimination were evaluated. In the end, the outcome of the researchwork was presented and suggestions were made to solve the current issues.

CHAPTER 1. THEORETICAL AND METHODOLOGICAL BASIS OF AGGREGATE SUPPLY AND ECONOMIC GROWTH

1.1.Aggregate Supply and its theoretical and methodological principles in the economy system

Why economic development remains stable in some countries while increasing or decreasing annually in others? In the long-term perspective, Aggregate Output (the total volume of production realized by a country's economy annually) depends only on aggregate supply-oriented factors. If Aggregate Output is determined by the capabilities of the aggregate supply-oriented factors of production existing in the economy, then what does the concept of "Aggregate Supply" mean here?

Aggregate Supply shows the volume of the commodities and services that the country's economy can produce, using the available resources and technology. Aggregate Supply refers to the Aggregate Output that countries are ready to produce. It depends on the capabilities of a country's economy. When making an assessment on a coordinate plane, it is seen that the Aggregate Supply for countries in the long-term perspective (here: time frame from several quarters to several decades) is in a vertical position. We come to the conclusion that the volume of the Aggregate Output here is simply determined by the Aggregate Supply.

The growth of Aggregate Output occurs due to the development of production factors and the increase in productivity. A mathematical formula showing the dependence between the factors of production and Aggregate Output is called Production Function.

Production Function is written as follows:

$$Y = f(N, K) \qquad (1.1)$$

There are two main sources of Economic Growth. To explain this, Production Function is used. For the sake of simplicity, let's say that Labor (N) and Capital (K) are the only factors of production. The equation below shows that Production (Y depends on the factors of production and the level of Technology (A). Sometimes

A is called ”Productivity" as well. It is perceived as a more objective concept than that of ”technology".

$$Y = AF\ (N, K) \qquad (1.2)$$

The more the factors of production, the more it allows you to produce. That is, an increase in Economic Growth occurs when the indicators of Marginal Product of Labor (MPL) (growth of Aggregate Output as a result of a 1-unit increase in labor) and Marginal Product of Capital (MPC) (growth of Aggregate Output as a result of 1-unit increase in capital) show positive rates (Rudiger D., Stanley F., Richard S., 2010).

Formula (1.2) shows the relationship between Aggregate Output and the factors of Production & Technology. Usually, the examples of growth rate are more comprehensible than those of the indicators themselves. Therefore, it would be more useful to use the formula (2) as a function which is connected with growth rates. Thus, we get the basic equation of Economic Growth.

$$\Delta Y/Y = [(1 - \theta)\ \text{x}\ \Delta N/N] + (\theta\ \text{x}\ \Delta K/K) + \Delta A/A \qquad (1.3)$$

explanation of equation (1.3):

economic growth = (labor share x labor growth) + (labour share x capital growth) + technical progress (1.4)

Here, (1 -θ) and θ indicate the specific shares of Labor and Capital in income accordingly. Equation (3) expresses the share of growth production factors and productivity in Economic Growth (Robert J. B.,1999).

The general formula of Production Function is in the form of $Y = AF(K,N)$. However, there are also special formulae like Cobb-Douglas Production Function: $Y = AK^{\theta}N^{1-\theta}$. Taking into account that it is θ= 0.25 in the example of the US economy, the Cobb-Douglas Production Function can be written as follows: $Y = AK^{0.25}\ N^{0.75}$. The Cobb-Douglas Production Function is widely used by economists and researchers since it accurately describes the economy and is mathematically easy to interpret (Eugene S., Wing S., 2001).

The change of Technical progress (*A*) in Production Function involves every kind of development that occurs in productivity except the growth in the factors of

production. Therefore, *A* is sometimes referred to as Total Factor Productivity(TFP). TFP is considered a more neutral concept than that of technical progress. It should be taken into account is that both Economic Growth and growth in the factors of production are measurable, while *A* is not measurable. In this regard, Economic Growth can be calculated on the basis of Labor and Capital factors for the sake of simplicity, but it is necessary to include TFP in the formula so that it is more appropriate and fully reflects the reality.

The reason why other factors of production are not taken into account in Production Function is that Labor and Capital are the most important factors of production. Also, it is done for the sake of methodical simplification. Of course, natural resources and human capital can be of great importance for Economic Growth in terms of time and space. It should also be noted that as the country's territory expands, land expansion contributes to economic development. However, historical experience shows that sustainable development opportunities of such factors of production are limited and can last only a few years. From this experience, capital (physical and human capital) accumulation and technological progress are referred to as the most important factors of production. They say that the Theory of Economic Growth is concentrated on these two factors.

The Theory of Growth in economic literature gained special urgency in two periods: 1) 50-60s of the 20th century; 2) 80-90s of the 20th century. The first period is characterized as the period of the emergence of the Neo-classical Theory of Economic Growth. This theory concentrates on the reason for the increase in Economic Growth, capital accumulation, and its accumulation decisions. According to neo-classicism, Aggregate Output and capital complement each other, and the more capital increases, the more Aggregate Output increases (the marginal value created by capital is positive), revenue is directed to new capital investment and accumulation. As a result, the economy becomes a balanced one. A question arises here. Who will manage capital? The effect of the norm of accumulation on balanced capital and balanced Aggregate Output requires population growth to be taken into account. The increase in the population growth

rate raises the balanced level of the growth rate of Aggregate Output. Though the increase in population growth rate in many developed countries has led to a decline in Aggregate Output per capita, this does not justify itself for countries experiencing workforce shortages and more population (economically active and skilled) are required to manage capital (Rudiger D., Stanley F., Richard S.,2010).

Endogenous growth theory, which occurred in the 80-90s of the 20th century, states that Economic Growth depends on physical and science capital, adding that physical capital influences Economic Growth on the principle of Diminishing Marginal Value. However, this approach is not appropriate for science capital since investment in science accelerates economic progress. Thus, the growing educated and skilled workforce is able to fully and efficiently use the existing capital to bring Economic Growth to its desired trend level. The required level of the labor force has a significant impact on making the country's economy balanced (Barro R. J., Sala-i-Martin X.,2004).

For this reason, it would be appropriate to look over a model that incorporates Labor and Capital. The main point here is that high technology acts as a by-product of Fixed Capital investment. Let's assume that in the economy as a whole, technology is directly proportional to the amount of capital per employee, and technology has a labor-expanding nature. Well, if there is a shortage of labor force in any country, then how will the growth of technology increase Economic Growth? It turns out that for Economic Growth to increase, it is important to increase both the capital and the labor factors at the same time. Since any problem experienced in any of the mentioned factors of production causes the problem of Economic Growth. Such problems in Economic Growth can be interpreted and solved thanks to Aggregate Supply.

1.2.The theoretical and methodological principles of Economic Growth

The problems of Economic Growth has been studied since the mercantilist period. Economists such as Adam Smith, David Ricardo and John Stuart Mill have

made great efforts in this direction. However, the classical approach used to explain the issue of growth is one-sided. The classical school of economics was interested only in the effect of the investment on the volume, that is, the effect on Production Volume, in return, acting from the point of the sufficiency of Aggregate Demand, neglected the income effect of investments. On the other hand, the Keynesian Model for Macroeconomic Balance is also one-sided. When studying the conditions for maintaining this balance together with the revenue balance, which guarantees full employment, Keynes was not interested in the volume effect, focusing only on the income effect of investments, that is, the impact on national income. The Post-Keynesian Growth Model is a synthesis of these two approaches, the classical model and the Keynesian model. Since, in this approach, which is called Harrod-Domar Growth Model for its structure and which is able to examine the long-term growth conditions by dynamizing the Keynesian model which is mainly statistical, both investments (income-generating and volume-expanding effects) are taken into consideration. Harrod-Domar interprets the growth process with capital accumulation (Kaya A.E., Ergül H.,2004)

Interpreting the issue of Economic Growth with physical capital accumulation is far from satisfactory. The fact that factors such as workforce potential and technological development also affect economic development has not been taken into account. The Neo-classical growth model is trying to eliminate the weaknesses of the Harrod-Domar Model by adopting a Production Function which allows substitution between workforce and capital among the factors of production. The growth rate in the mentioned model is determined by population growth with technological development. Technological development is an exogenous force that constantly affects. This force, which exists as if the Sun and rain exist without any contribution of Human, continuously increases the productivity of Labor and Capital at a certain rate.

In the Neo-classical growth model, above all, the hypothesis of Autonomous Technological Development was not satisfactory. It was not a realistic approach to accept that education, research, organization, and high investments could not affect

technological progress. For this reason, technological development was included in growth models. Thus, technological development became an economic function, such as consumption-investment or imports.

This means that there are three important factors that determine Economic Growth:

1. Capital: Capital as a factor of production is a strategic factor that is used both by the state (e.g. state investments) and directly by the public (e.g. private investments).
2. Labor: Labor, which is another factor of production, is mainly a strategic one.
3. Technological development: Here, a factor of growth policy is taken as the basis. The goal is to increase capital and workforce productivity by encouraging new technological development and thus making it possible to use the factors of production in a more effective manner (Kaya A.E., Ergül H.,2004).

With the Industrial Revolution (1750), the countries that made the revolution achieved great development in a short period of time(Hudson P., 1992). At the end of nearly 200 years between the emergence of the revolution and World War II, the national income of Western European countries increased to a large extent. In the period that followed World War II and continued until the world oil crisis of 1973, rapid Economic Growth, increase in productivity and high level of employment were ensured. This period of prosperity for the world economy, which lasted about a quarter of a century, was called the Golden Age.

After the first oil shock in 1973, a period of crisis began in the world. That is, Economic Growth and productivity growth began to decline. After this period, discussions on the sources of growth came up(US State Department of History. Oil embargo,2018).

On the other hand, this rapid and sustainable Economic Growth has not been realized at an equal level among the countries. In other words, the pace of Economic Growth differed from country to country. While some countries were

growing very rapidly, the economic growth of others was sluggish. For this reason, studies have begun to examine the different types of growth and its sources to explain the reasons for the difference in the growth rates observed at the international level.

Economic Growth is defined as continued increases in the level of Aggregate Production over time in an economy. Nominal Gross Domestic Product (GDP) cannot express an increase in growth rate due to a price increase. GDP, cleared of price hikes, price level fluctuations defiled by indices, can better reflect the reality. In other words, GDP, expressed in real terms, will reflect the country's development better than nominal prices and allow for a better comparison between the years. For this reason, it is necessary to use real prices when measuring Economic Growth.

Economic Growth Rate is a rate that shows how many percents of real national income has increased over the previous year. Two methods are followed to calculate Economic Growth (Gordon J.,1999).

- The first is to calculate Real National Income (production).
- The second is to measure the growth in Real National Income per capita.

When calculating the economic growth of countries, the change in the number of commodities and services produced from one year to another is taken into account.

Here, a point should be taken into account: Growth and Development are different concepts. Growth is a fact of quantitative nature, while Development - a qualitative nature. Development also involves Growth and is more comprehensive. Growth is long-term and dynamic. That is, it has to take into account changes and development over time. In other words, there is a change in the economic structure and new needs arise and products of different quality and types are required. That is, it changes the way society consumes. At the same time, it paves the way for and accelerates urbanization movements. Growth indicates a feature that is based on accumulation. If we explain this issue a little bit, the cumulative nature of growth may turn the small relative difference in Economic Growth into large relative

differences in the future. As the growth rate increases over time, even small differences lead to significant changes. The cumulative effect of annual small growths is great.

The high Economic Growth Rate leads to greater ownership of everything. In most cases, in countries with low Economic Growth Rate, problems always arise in slow-growing resource allocation. It can be said that the real decline will lead to many social and economic disadvantages such as education, health, employment, and urbanization.

1.3 Economic Growth modeling for aggregate supply-oriented countries

There are three important factors of production that determine Economic Growth. These are Capital, Labor, and Technological development.

One of the factors that drive production and ensure growth is Capital. The source of Capital is capital accumulation. Capital is the accumulation of means, which a country owns at a certain time and which are produced themselves. In the capitalist economy, Capital is a property and allows its owners to take a share from production. If Capital is described as a set of physical assets such as equipment and factories, then net investments are also new equipment and factories that increase this stock (Kaya A.E., Ergül H.,2004).

Economically, the main task is to determine the total capital stock in terms of economy, by attributing a large number of machines and equipment, each of which is spread over different geographical areas, differing from one another, and produced in different time frames by different methods, to the same classification. To do this is supposed to be quite difficult. To be able to talk about the simple concentration of heterogeneous capital stock, a common measure is needed, which allows each of the physical capital units of different characteristics to be transformed into another and then accumulated. The standard solution implemented for this purpose is to evaluate a capital stock. However, this calculation should be made taking into account either the production costs of

capital in the past or its earnings in the future. One method in this regard is the calculation of the present value of the expected capital income.

An increase in the amount of capital in the economy increases the volume of output. For example, a farmer who produces using technology will get more products than a farmer who produces without the use of technology. Capital stock is an increase from one year to another as long as the capital stock is higher than depreciation. However, any investment in order to increase capital stock will not be added to capital stock until the project is completed.

Recently, economists have begun to give different meanings to the concepts of Capital and Investment. For example, in the economy, the concept of Social Capital in general for bridges, ports, and roads is used, and the indirect effects of such capital are mentioned even if it does not directly join Production. Another definition is Human Capital. It is made up of investments in human power.

Economic Growth is determined depending on the quantity and quality of the workforce. The size, structure, and Growth of a country's population are that the most vital factor moving economic Growth since the structure and amount of the population produce workforce provides. The scale of the community will have an effect on the quantity of output per capita. The rise within the workforce needed for professional life is a vital supply of GDP growth. Not everybody who makes up the population doesn't type the workforce. Workforce Participation Rate has accumulated speedily with the inclusion of girls within the last twenty years (Freeman R.B.,1987).

There are also difficulties in the calculation of Labor stock since there are big differences between the levels of skills, experience, and education of labor in the economy. Due to this difficulty, simple models based on the rules of growth move from the concept of homogeneous labor and perceive labor as a fixed percentage of the population. Also, it is assumed that the population, hence, labor increase at a fixed rate and with an impact from the outside (Lindbeck A., Snower D.J., 1987).

Another factor that determines Economic Growth is technology. Technological development is one of the important elements used to explain

Economic Growth, and its importance has recently been further emphasized in the literature on Economic Growth. Briefly, it can also be said that technology is a tool that affects Capital and Labor productivity. In other words, the main factor that increases productivity in the combination of production factors is Technology. It is an important factor that will lead to rapid growth in Production Volume of that country, as it will ensure better utilization of resources and more productive processing in a country.

Technological development can be described as the emergence of a new method of production or a new product. For example, it can often be said that the general factor productivity can be due to innovations made in production methods, that is, the effective organization or management of firms. Mass production technology can be given as an example of Technological Development. One of the biggest technological advances is the idea of mass production through Henry Ford's moving assembly line. Mass production has increased the productivity of Labor and Capital used in the automotive industry. As a result, it spread to other branches of industry. Ford's innovation appeared in the Highland Park factory in the USA, in 1913. It regulated the movement of the employees of the factory wandering from one place to another to staying in the same place and assembling car parts in the moving assembly line. That is, the invention provided that the product was brought to the front of the employee on a moving line. With this technological advancement, Ford has led to a significant reduction in the average working time of its employees. Thanks to this innovation, the amount of Labor to collect the car was reduced, and in addition, the cost per unit of the car was reduced due to greater production.

Another development in automotive manufacturing technology appeared in the 1990s. This production system, called Simple Production, has created an increase in product range and quality while reducing costs per unit by providing innovation in production methods.

It is possible to classify Technological Development from different points of view. Due to the contribution of Technological Development to growth, we can

divide it into two - inclusive and non-inclusive technological development. Non-inclusive technological development is explained as productivity increases that arise through improvements in technological development, management, and organization. Inclusive technological development occurs in machinery and equipment, being related to the realization of investments. Each equipment that goes into production will be more productive than its predecessor, as it includes the latest technology. Hence, the Capital factor is of heterogeneous nature (Lucas R.E.,1990).

It is also possible to consider Economic Growth as an increasing function of Labor (*N*), Capital (*K*), and Technology (*A*). The increase in the sources of growth is expressed in the form of

$$Y = f(\Delta N, \Delta K, \Delta A) \quad (1.5)$$

During the growth period, the ratio of production factors to each other is changing (Berndt E.R., Christensen L.R.,1973). The population, hence, Labor is constantly growing. In this case, increasing production per labor is possible only with an increase in the capital/labor rate. This means that Labor is provided with more Capital. The result gives us an understanding of productivity, which shows the contribution of raw materials to output at the end of this period. In technical terms, this is expressed as the ratio of two values to each other. Productivity is a concept that determines the activities of factor combinations. Bringing together, organizing and improving the quality of factors in a way that ensures high productivity raises Economic Growth Rate. Hence, Economic Growth is determined in dependence on the increase in Productivity and resources.

Productivity changes are both the result and the cause of a large number of dynamic factors in the economy (technological development, physical and human capital accumulation, entrepreneurship, organizational measures, etc.). There are many factors involved in Production, so simply Labor and Capital productivity and TFP are handled by simplifying and evaluations are made on them.

In connection with the aging of the population on a global scale, we live in a unique time. With the change in past birth and death rates, current birth rates are

falling, life expectancy is increasing, and all this leads to a change in the global age structure. The aging of the population is a change in the age structure of the population, a decrease in the share of children and young people in that population and a gradual increase in the share of older people (60 or over 65 years). The global aging cycle is also referred to as Demographic Transition (DT). In this transition, the structure of the age groups of the population is changing, death and birth rates are decreasing, the expected life expectancy after birth and the ratio of children and young people in the population is decreasing, while the ratio of the elderly in the general population is increasing. In this context, the aging of the population nowadays is one of the important topics that many countries are interested in. Aging and Demographic Transition (DT) of the population at global and national levels result in the emergence of many economic, social, demographic, etc. problems. The most important of the problems caused by the aging of the population is the change in Labor Supply. Since the age component of the population changes with the aging of the population, the influence of those who do not participate in economic activities and do not participate in workforce increases, as a result of which Labor Supply is changing. In other words, along with the increase in the number of people in the age group of 60 and over in the age structure of the population, the number of working-age population is also decreasing (Nagarajan R., Teixeira A., Silva S.,2013). The change in the age structure of the population, that is, the aging of population, is affecting the overall Labor Supply, the productivity of old-age Labor, the employment structure, wages income, savings, production and consumption, and, most importantly, the labor markets, Economic Growth, and the employment structure. In this regard, the age structure of the population is a very important external variable affecting Economic Growth. On the other hand, in addition to the effects of elderly population growth on labor markets and Economic Growth, the impact on health and social protection systems is very important. The aging of the population is a condition that is associated with an increase in life expectancy and a decrease in childbirth. In countries, the proportion of elderly dependence in the overall population (the

number of people aged 65 and above per 100 people in the age group of 15-61 years) increases, while the proportion of young dependence (the number of people aged 0-14 per 100 people in the age group of 15-61 years) decreases. Thus, the overall dependency ratio continues to increase as well. In this context, reasons such as low birth rates, especially in developed countries (DCs) and a gradual decrease in population growth due to this, have increased the rate of elderly dependence, creating a structure of the elderly population (Nicole M., Kathleen M., David P.,2004).

In society, individuals` work, participation in production, meeting their economic needs, and their savings vary according to their life-cycles. Individuals, especially at a young age, have a high level of production, consumption trends and savings, while in old age, participation in production and most importantly, savings are greatly reduced. Throughout people's life expectancy, especially in periods when their income is higher and they participate in Production, their savings is higher. The reason is that they can continue their consumption in old age in retirement periods when their income decreases. This means that as a result of the behavior of the majority of individuals according to the life-long income hypothesis, the overall Aggregate Supply, productivity, income and savings per capita vary according to these trends. Total labor supply, productivity, income and savings per capita are important factors to determine Economic Growth. Among these factors, the age group, especially in terms of Labor Supply and savings per capita, are of great importance. Labor Supply and savings per capita of those, who are 60 or over 60 are lower than those of the adults of the working age. In this regard, when there is no change in productivity and income factors that are important to determine Economic Growth, it is possible that slower growth is realized due to the surplus of the elderly age group. With the increase in birth rate and the decline in child mortality, a new generation is formed. When this generation reaches the age of employment, significant increases in Labor Supply and savings, as well as Economic Growth, are realized.

This chapter deals with the theoretical explanation of the concepts of Aggregate Supply, Production Function, Economic Growth, Labor, Capital, and

Total Factor Productivity (TFP). In the next chapter, a brief description and comparison of the economies of the US and Japan, which are the research objectives of the study, will be given.

CHAPTER 2. THE COMPARISON OF THE ECONOMIES OF THE US AND JAPAN AND CHALLENGES OF ECONOMIC GROWTH

2.1. The analysis of the US national economy and its indicators

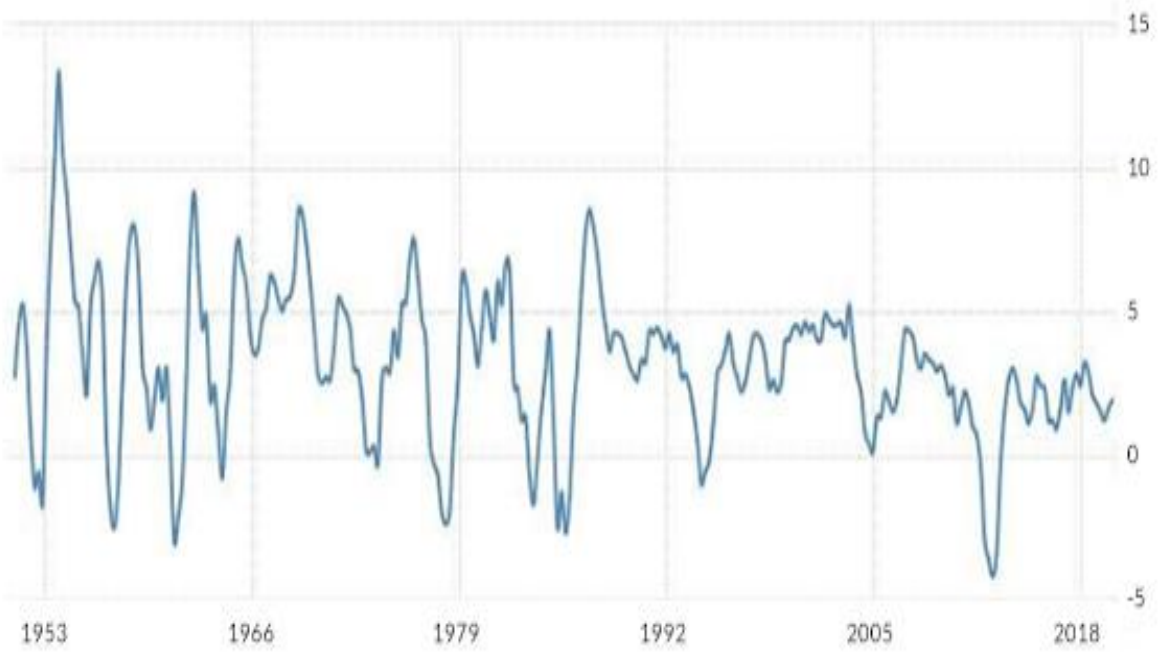
The US has the largest national economy in the world and its GDP makes 22% of global Nominal GDP and 17% of the Gross World Product (GWP). The United States ranks second in the world for its Purchasing Power Parity (PPP)(InternationalThe United Census Bureau, 2018). The US Nominal GDP for 2018 is estimated at $20.5 trillion dollar(US Bureau of Economic Analysis, 2018).The US is a country with a blended economy, a steady GDP development rate, moderate unemployment rate and an abnormal state of research and capital speculation. Its most significant trade partners are Canada, China, Mexico, Japan, Germany, South Korea, and the United Kingdom.

The US has inexhaustible typical assets, a well-created foundation, and high profitability. The US was the fifth country in the world in terms of GDP per capita in 2018 and the 8th country in terms of GDP per capita, PPP(The United Census Bureau). Among the countries of the Organization for Economic Cooperation and Development (OECD), the Americans had the highest average household and salary income, while in 2007, they ranked 2nd and in 2010-4th(Organization for Economic Co-operation and Development, 2018). Since the 1980s, the USA (excluding colonies) has been the world's largest national economy.

The US is the third largest oil and gas producer within the world. It's one in all the most critical mercantilism countries within the world and has the second largest production capability. The US represents 1/5 of the world, producing Output. Not solely will it have the most critical domestic market; however, it additionally dominates the interchange services. The most important monetary market within the world is moreover settled during this country. The world's largest stock market with the market price, the big apple stock market, is additionally here. the amount of Foreign Direct Investment (FDI) within the US country is $ a pair of.4 trillion, whereas the FDI of the North American country is $3.3trillion(Central Intelligence Agency, 2018).

The US is leading within the international rankings in Initiative Capital and global analysis and Development finance. Client disbursal accounted for seventy-one of the country's economy in 2013, that indicates that the US had the biggest client market within the world in which this figure is five times beyond that in Japan. The market has attracted immigrants from everywhere the globe, and also the internet immigration magnitude relation is that the highest immigration ratio within the world.

Chart 2.1. The US, GDP Annual Growth Rate, 1953-2018



Source: | www.tradingeconomics.com, USA, Bureau of Economic Analysis

Chart 2.1. shows that Economic Growth Rate in the US is not stable at all. High and low points on the growth trend line usually follow each other in a wavelike manner. In particular, although the country's economy has been very up-and-down from World War II to the 1970s, this trend has been relatively balanced over the last 40-45 years, except for the Global Financial Crisis of 2008-2009.

Since there was no war except for the attack on Pearl Harbor (December 7, 1941) on the territory of America, during the world wars of the 20th century, the United States was more fortunate in this regard than other warring countries. From 1946 to 1973, Real Median Household Income (RMHI) rose 74%, while the US economy grew 3.8% on average. However, since 1973, the economy has been

characterized by both low growth (2.7% on average) and a stable standard of living with a growth of 10% or 0.2% per annum in Household Income (Carmen D.W., Bernadette P., Jessica S.,2008; The United Census Bureau, 2018).

The biggest recession in recent decades – the 5% decline in GDP from the spring of 2008 to the spring of 2009 - was due to the financial crisis of 2007-2008. Other significant recessions occurred in 1957-58, which reduced GDP by 3.7%. It was followed by the 1973 oil crisis, which caused a 3.1% drop in GDP over the period from late 1973 to early 1975. GDP declined by 2.9% in the recession of 1981-82 (US Bureau of Economic Analysis, 2018).The recent mild recession covers the years 1990-91 when the Aggregate Output fell by 1.3%, but in 2001, during the 8-month stagnation, this figure was replaced by 0.3%. On the other hand, the strongest and long-term growth happened with an expansion of 53% (annual 5.1% on average) from the beginning of 1961 to the middle of 1969, 37% (annual 4% on average) from the end of 1982 to the end of 1990 and 43% (annual 3.8% on average) from the middle of 1991 to the end of 2000 (US Bureau of Economic Analysis, 2018).

It was believed that the Japanese economy would surpass the US economy in the 1970-80s, but this did not happen.

Since 1976, the US has maintained Trade Deficits with other countries, and since 1982 - Current Account Deficits. At the same time, the country's long-standing trade surplus in services was maintained and reached $231mrld in 2013. In recent years, the main economic concerns have been caused by high Household Debt (11 trillion dollars), high Net Public Debt (9 trillion dollars), high Corporate Debt (9 trillion dollars), high Mortgage Debt (more than 15 trillion dollars), high Foreign Debt (debt to foreign creditors), high Trade Deficit, serious disruption of the Net Foreign Investment position in the US and high unemployment rate.

In 2008, the US economy experienced a crisis caused by derivative markets, the mortgage crisis, and the devaluation of the Dollar. On December 1, 2008, The National Bureau of Economic Research announced that the United States of America had entered a recession, based on employment and production figures

along with the third quarter decline in GDP in December 2007. The recession led to a decrease of $840 billion during 2006-2008 and $500 billion in 2009 in the trade sector. At the same time, the personal savings rate reached 5% at the end of 2009 from the lowest level of 1% at the beginning of 2008. The trade deficit rose to $670 billion in 2010, despite the fact that the savings rates circulated around 5%(US Bureau of Economic Analysis, 2018).

Real GDP of the United States increased by 1.7% on average from 2000 to the first half of 2014. In 1980, the country's public debt amounted to 33% of GDP, or $909 billion. Until 1990, this figure increased more than three times, reaching $3.2 trillion (56% of GDP). Although this debt was $5.7 trillion in 2001, the ratio of debt to GDP remained at the level of 1990. The debt level rose rapidly in the next decade to $14.3 trillion in January 2010. Public Debt rose by 100 percent in 2010, despite 80 percent of GDP in early 2009. According to the figures for 2018, Public Debt was 73.8% of GDP(The New York Times, 2018).

China, which has kept 1.26 trillion dollars in Treasury bonds (T-bonds) since 2014, is the largest foreign financier of the Public Debt of the USA.

The distribution of Household Income in the US was uneven during the post-2008 economic recovery period. From 2005 to 2012, income inequality has increased in two of the three metropolises in the USA. In 2005-2011, the median wealth per household the United States fell by 35% - from 106 thousand 591 dollars to 68 thousand 839 dollars(The United Census Bureau, 2018).

The US GDP grew by 2% in the fourth quarter of 2018 compared to the same period of the previous year. The GDP Annual Growth Rate was 3.2% on average from 1948 to 2018, the highest (13.4%) being in the last quarter of 1950 and the lowest (-4.1%) - in 2009. The US Bureau of Economic Analysis (BEA) predicted GDP Growth Rate to trend around 2.6% in 2020.

Current population of the US is 327.2 million and total workforce in the US labor market is equal to 160 million. 6,3 million of workface is in unemployment status. Total unemployment rate in the whole country is 3,9 percentage (US Bureau of Labor Statistics,2018).

Economic processes such as the ups-and-downs in the national economy, especially the crises in recent years, have led to labor shortages in the United States. Although the impact of this type of economic issues on the labor market is not directly noticeable, when examining the country's economic history and current situation, it is clearly seen that these problems are encountered.

Economic processes like the ups-and-downs within the financial system, particularly the crises in recent years, have a diode to labor shortages within the US.Though the impact of this kind of economic problems on the market isn't directly noticeable, once examining the country's economic history and current state of affairs, it's clearly seen that these issues are encountered.

There had been three important levels for the increase of female hard work pressure participation inside the US At a time from the end of the 19th to the 1920s, only a few women worked. Running women have been young and single ladies. When they were given married, they withdrew from the labor market, while there was no need for 2d earnings of their marriage. Those women have been typically employed inside the textile manufacturing enterprise and household jobs. These jobs strengthened women and allowed them to receive a subsistence minimum.

In 1930-1950, female labor force participation increased due to the increased demand for office workers, female university graduates, and other jobs. From the 1950s to the 1970s, women were considered average workers, that is, the second earner in the family after men, and they usually worked as secretaries, teachers, nurses, and librarians. These workers were called "pink-collar workers" (Miltra T.,2002; US Bureau of Labor Statistics,2018).

They say that the mid-1970s was a period of women's revolution in the labor force, formed by various factors. Women have set up a more correct plan for their future in the labor force participation, choosing more suitable specialties in the higher school, preparing to enter the labor market and compete. While the rate of labor force participation in the United States rose from about 59% in 1948 to 66%

in 2005, the rate among women rose from 32% to 59%, and the rate among men fell.

A general theory in the modern economic system claims that the growth within the wide variety of women collaborating in the labor force inside the U.S at the end of the 1960s became due to the new era against pregnancy, birth control drugs and law of the age of majority. Implementation of birth control, building their very own careers and inventing an investment their capital in this field gave women the selection. Women avoided the risks that abate their profession choices by way of determining their birth timings. However, 40% of the population used birth control tablets. This supposed that different elements could help women choose to make investments capital to expand their careers (Howard N.F.,1999).

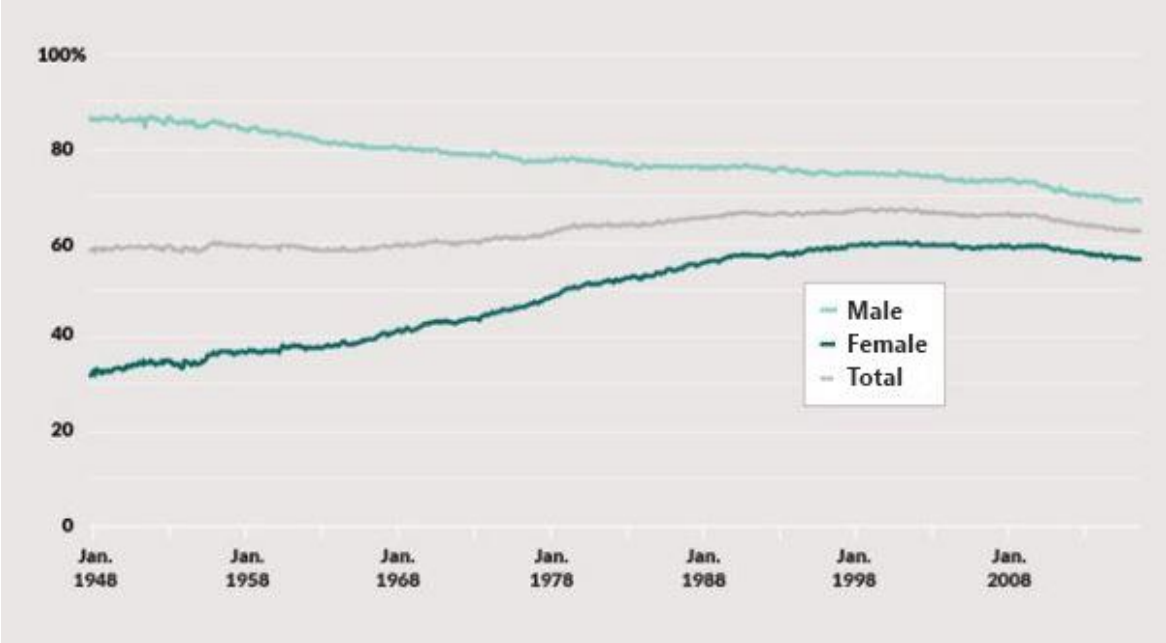
Another aspect which could have contributed to the fashion was The Equal Pay Act of 1963, which ambitions to cast off the unadjusted gender pay hole. Such rules decreased sex- and gender-based discrimination and recommended more women to enter the hard work market with honest wages to assist in raising their children.

The rate of work power investment can be decreased when Population Growth Rate surpasses the rate of working and jobless populace. Labor force investment rate is a segment of long term Economic Growth which is as significant as Productivity. The work power support rate clarifies how the expansion in the joblessness rate happens in parallel with the expansion in business. On the off chance that an enormous number of new specialists enter the work showcase and just a little part will be furnished with work, at that point the expansion in the number of jobless laborers can beat the increment in business.

U.S. Bureau of Labor Statistics has been monitoring the labor force participation rate since January 1948 and forecasted that the rate recorded in that year was only 58.6%. Labor force participation remained at this level until 1965. Starting this year, it began to grow over the next 35 years and reached its highest point in April 2000, 67.3%. What caused a steady increase in the rate? It is said

that the difference in the labor force participation rate is gender-based(US Department of Labor Statistics,2018).

Chart 2.2. US, Female and male labor force participation and overall LFP trend, 1948-2008



Source: |www.bls.govUSA, Bureau of Economic Analysis

It is nearly 70 years that the ratio of male labor force participation is moving on the trajectory of decline. In January 1948, this rate was 86.7%. In April 2000, the ratio of the overall LFP was at its peak, but this figure dropped to 74.9% male LFP. For women, the trend has moved exactly the opposite. While the female labor force participation rate was 32% in April 1948, over the next half-century, it steadily increased to 60.3% and reached its peak in April 2000. In the second half of the 20th century, women entered the workforce, and even after maternity, the trend of staying there increased. Such a change in the female labor force participation rate, although the interest of the male labor force participation has gradually decreased, has helped to increase the overall LFP rate(US Bureau of Economic Analysis, 2018).

Since 2000, the increase in the female labor force participation rate has stopped. The ratio for male labor force participation has continued to decrease. Hence, a question arises: What is the reason for the decrease since 2000?

The most obvious reason for the decrease in the overall LFP rate is the aging of the population. Born in 1946-1964, the "Baby Boom" generation is a large group of workers whose retirement age coincides with the decrease in the LFP rate, which began in 2000.

In the meantime, the work power participation rate of young specialists (between the ages of 16-24) has been diminishing for a considerable length of time. The decreasing trend in the labor force participation rate for young Americans is explained by the increased education. Consequently, since the interest for graduated of higher schools has essentially expanded in the work advertise, youthful specialists choose to learn at the University in the wake of moving on from school and go legitimately to higher schools. Henceforth, a positive advancement, that is, expanding consideration regarding training, has diminished the work power cooperation rate.

The demographic changes portrayed above, once more, don't clarify all declines in the labor force participation rate. Young laborers' participation has additionally fallen. For specialists in the 25-54 age gathering, the labor force rate declined from 84.4% in April 2000 to 83.1% in December 2007, on the eve of the Great Depression. This figure was 81.3% in 2018(Washington Center for Equitable Growth).

Female labor force participation guided the general growth trend in the labor force in the 2000s. Thus, the decline in female labor force participation in the mentioned years was an important factor in the national trend statement. Understanding why the increase in the female labor force participation rate stands as a key function to reverse the decreasing trend in the national rate. In 1990, the United States ranked 6th in terms of the female labor force participation rate in the 22 high-income countries of the OECD. Until 2010, this indicator fell to 17th place. But why did it stop in the US, while the growth in other high-income countries continued? Studies conducted by some economists suggest that the lack of family-friendly policies such as paid parental leave in the United States is almost one-third responsible for the decline compared to other OECD countries.

While other developed countries adopt and expand their family-friendly policies, the USA remains simply a developed nation without a paid parental leave.

While labor force participation before the Great Recession was down, this downward trend accelerated during the economic crisis. Raw data cannot tell us how much of the recession since the end of 2007 is a continuation of the long-term trends discussed above, and a large part of this recession is caused by the permanent impact of the Great Recession. Violation (structurally and periodically) of these two trends has become an important and highly controversial issue among economists and other labor market analysts.

Some studies on the recent recession show that a large part of this recession is caused by structural forces before the recession, and a small part is caused by a weakening in the labor market due to the Great Recession. In a 2014 study by economist Stephanie Aarons and her staff, a large part of this decline is said to have occurred due to structural forces. According to their calculations, the periodic weakness in the second quarter of 2014 reduced the labor force participation rate by 0.24-1%. In June 2014, the LFP rate was about 3 percent lower than the level before the Great Recession. This shows that the Recession is responsible for no more than a third. The 2012 survey of economist Heidi Shierholz shows that only 1/3 of the decline between 2007-2011 was due to structural forces and 2/3 due to the periodic impact of the Great Recession(Washington Center for Equitable Growth,2018).

An analysis by the White House Council of Economic Advisers (CEA) came to a conclusion - something between these two estimates. Using traditional methods of assessment, the Council decided that about half of the decline from 2007 to mid-2014 was due to the aging of the population, 1/6 was a part of the periodic decline, and the third part was the combination of other structural trends prior to the Great Recession and the consequences of the irreplaceable seriousness of the Great Recession period.

Thus, in parallel with the strengthening of the economy, long-term forces will continue to exert downward pressure on labor force participation, although the LFP

rate will be a place to move upward. Until 2015, the LFP rate continued to be quite balanced and was moving not downward, but sideways.

The number of migrants in the US workforce continues to grow at an increasing pace. If the number of migrants arriving in the USA continues to grow in this way, by 2030, the migrants will make a figure between 1/2 and 1/3 of the country's workforce. In recent years, migrant workers have played an important role in the development of the labor force in the USA, and this role will continue to be important in the coming years. However, the issue of whether incoming migrants are in line with the country's workforce and their impact on the workforce for the future is a matter of debate in the USA. Over the past thirty years, it has been established that foreign workers coming to the country are steadily increasing the labor force of the USA. New migrants arriving in the United States are increasingly educated, and the vast majority of those who migrated to the country in the last thirty years have higher education than the local population. At the same time, in 2000, only 1/3 of the migrants simply have not completed their higher education. Migrants have a large share on both sides in terms of skills that is why they occupy an important place in the workforce of the future (Pew Research Center,2018).

Over the next few decades, migrants will have the largest share in both the high and poorly skilled workforce. Between 2000 and 2030, migrants with higher education in the labor force were projected to rise from 10% to 15%, and college-educated migrants from 14% to 18% (Colby S.L., Ortman J.M.,2015; The United Census Bureau, 2018)

However, many factors that will create a strong demand for migrants suggest a high development expectation. First, migrants in the country will marry. Second, when the "Baby Boom" generation grows old and retire, the latent demand for migrants will increase. Finally, when globalization brings together international labor markets, it will ensure that the USA entrepreneurs will try to recruit foreign workers in all professions.

The aging of the "Baby Boom" generation will slow the workforce growth, which will increase the tax on workers who support social assistance for pensioners and create a potential barrier over productivity growth. It was recorded that between 2004-2014, the number of people aged 55 and above grew by 4.1% on average during the year. On the contrary, the number of employees aged 25-54 increased by only 3.5 million, or 0.3% over the year. This trend has slowed the general labor market growth rate(The United Census Bureau,2018).

The aging population will change the rate of dependence on the elderly in the economy. This ratio is expected to rise as the elderly population retires and the birth rate in the US remains low. The reduction in the number of employees who benefit and pay taxes to each pensioner complicates the situation of state aid programs for the elderly, including Social Security and Medical Care. According to economists, tax-paying migrants could help prevent future reductions in such programs.

According to the UN estimate, up to 2050, approximately 47 million migrants will be needed to maintain the stability of the US population and 79 million migrants to keep the 15-64-year-old population stable (Colby S.L., Ortman J.M.,2015; (The United Census Bureau,2018).

The most effective way to increase the number of employees is to increase the number of workforce participants. For this reason, the inclusion of more women in the workforce can be a way to maintain the number of available workers. Female workforce participation increased from 34% in 1950 to 50% in 2002(Official site of US Bureau of Labor Statistics,2018), although this increase was weak. There are other ways to increase the labor force: increase the employment rate of young workers, increase the number of full-time employees, increase the share of the labor of the elderly, increase the number of foreign workers who work temporarily, or increase the most discussed retirement age.

Alternatively, capital investment and new technology could improve employee productivity as well. Increased productivity can help American entrepreneurs remain globally competitive and increase their tax revenues by

ensuring even higher production yields in the face of slow the US labor force growth.

Through the improvement of new technologies, investments in equipment to replace workers, or the development of more efficient production processes, the increase in Productivity enables a small workforce under the current level of productivity to produce as a large workforce. In recent years, the USA has achieved a record level of productivity. This was stated by the U.S. Bureau of Labor Statistics. According to the Bureau, the Annual Productivity Rate increased by 2.7% from 2004 to 2014.

Migrants can also increase Production because migrant workers are much younger and therefore, more productive than older workers. However, it is not clear how many migrants are needed to significantly increase total output. In 1997, the US National Academy of Sciences concluded that migrants made a small but positive contribution to GDP.

To regulate the demographic effects of aging, a large number of migrants will be needed, and to increase the output, migrants will most likely be required to focus on higher skills. However, while the challenges posed by the labor force in the United States are not addressed by more migrants, budget and production shortages will create demand for a large number of skilled migrant workers.

Looking at the migrants immigrating to the United States, many observers believe that this migration could be a solution to the future problems of the country's economy. The generation of "Baby Boom" reaches retirement age and brings with it expectations and challenges such as slowing workforce growth, the emergence of challenges for Social Security and Medical Care, and the growing shortage of workers as nurses and domestic workers to serve the elderly. Another problem such as increasing demand for workers with high technological knowledge in the country can be solved and the potential of using migrants strategically to meet the economic needs of the country is a subject on the agenda.

According to the U.S. Census Bureau, migrant workers have played an important role in the country's labor force. The level of education of migrant

workers continues to show a two-way division, so they are more inclined to go to university to get both college and higher education than the local people. In general, migrants master almost the same professions as local workers. This demographic and professional data is currently predicting that migrants will continue to play an important role in both high and low-skill positions.

As there is a shortage of workers with high technological knowledge and skills to manage technological equipment in the USA, the country creates great opportunities for incoming migrants to study this area and mobilize a large number of resources. In some cases, foreign workers with technological experience from around the world are also called upon to meet this shortage.

It is clear that migration in previous years was an important source of labor force growth, and this is predicted for the years to come. They are able to meet many demands of the labor force, nevertheless, migration is not the answer to the future economic needs of the United States. However, it will maintain its importance.

As is known, Americans leave the labor force in an unprecedented way. The question is: How many of them will return?!

Economists are still trying to calculate how many of the millions of workers who have left the labor force since 2007 have been dismissed due to the poor economy and less suitable jobs, and how many have been dismissed due to demographic factors. If the cause of the decline in the labor force is a poor economy, then by strengthening the economy, it will be possible to bring those workers back to the labor force again. But if this decline is caused by demographic factors, then the best way to do it is to prepare the country for the future in which fewer people will work.

The percentage rate of the labor force in the USA has reached its lowest level since the 1970s: from 66% in December 2007 - when the Recession began - to 62.8% nowadays. If the LFP rate remained stable during this period, there would be more than 8 million Americans in the labor force today(US Economic Policy Institute,2018).

There are two important points here: first, a poor economy is responsible for the decline in the labor force; second, this can be caused by long-term demographic reasons.

In the first, 8 million Americans are unemployed: They want a job, but they have stopped looking for it. Under these circumstances, politicians are thinking about how to regulate the ongoing job crisis.

On the other hand, the mentioned 8 million people left the labor force due to reasons unrelated to economic conditions. The ”Baby Boom" generation goes to retirement in old age. The younger population go to higher schools at an increasing rate. The number of men entering and working in the early years of the working age has further decreased. This trend began in the 1970s. Another long-term trend is the rise in the rates of people between the ages of 50 and 60 to participate in the labor force. These data cause confusion from time to time: if Americans work longer in their lives, then how can the aging population is an important leading force of the decreasing labor force? Although it is true that older Americans work more than ever, they are less likely to work than younger generations. To understand this, imagine a group of 10 people, consisting of people born between the years 1939-43. In 2003, about 8 of them were working or looking for a job when they were 50 years old. Ten years later, even at the age of 60, 5-6 of them remained in the labor force. These types of demographic changes signify that official unemployment is 6.7% and the economic situation is quite appropriate(New York Times,2018).

The first of the two cases mentioned above speaks to a crisis that should be settled when the economy improves. The second is the chronic factor: if individuals have left the labor force as a result of the reasons that are not identified with the economy, it isn't likely that a more grounded economy will bring them back. Since the work power development is viewed as the main power of any economy, more specialists speak to a little economy with more Production, more Income, and more Consumption, less Labor Force, which is steady.

Numerous financial experts have endeavored to discover the insider facts of this decrease in the labor force with various discoveries. As per the findings of scientists from the Federal Reserve Bank, 2/3 of the decrease in the work power is a statistic, and the lay relies upon auxiliary elements. Be that as it may, financial experts of the International Monetary Fund accuse the weak economy here.

One reason for this misunderstanding is that, in general, there are two unique issues that meddle with one another: the first is: what number individuals would have left the work power if the Recession did not happen? The second is: what number of the general population leaving the work power will return? Five million is a net figure: in actual terms, a higher number of individuals than the individuals who left the work power because of the Recession joined the work power when they moved on from school, came back from maternity leave and resigned. It merits surveying these two distinct circumstances independently.

What numbers of individuals have left the labor force by any means? At the point when the demographic force in the work environment is considered, regardless of whether there is a subsidence or not, there was no doubt that the work power would be littler today. Be that as it may, how little?

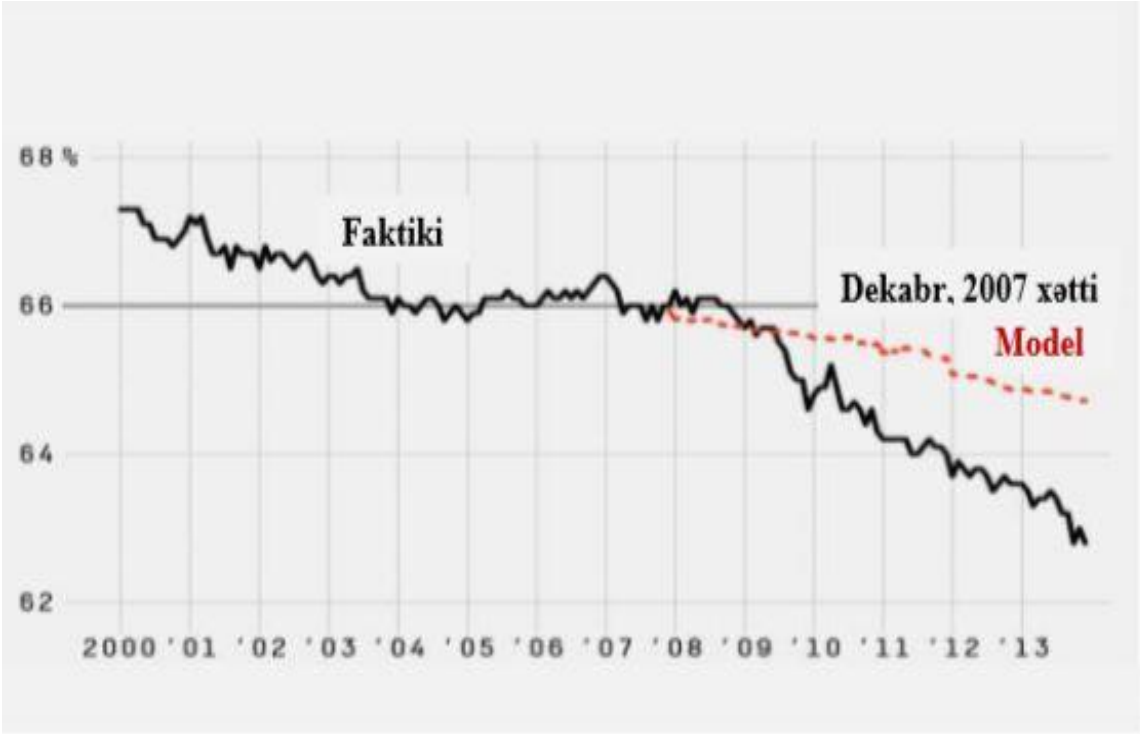
The Bureau of Labor Statistics has divided the labor force participation rates by sex and age. In 2000, the share in the labor force of 16-19-year-old American men was 52.8%, while in 2007, that is, during the Recession, this figure fell to 41.1%. If this decline rate continued, the young male workforce participation rate would fall to 38.5% by 2013. Also, between 2007-2013, the influence of young male decreased by 120 000 people. When taken together, it says that there is a quarter to one-fourth decline in nearly a million young male workforce, even in a healthy economy, with a lower participation rate and population(Official site of US Bureau of Labor Statistics,2018).

If the Recession did not occur, we can also assess how the overall workforce would be. As shown in Chart 2.3, under these assumptions, the overall LFP rate would fall from 66% in 2007 to 64.7% by the end of 2013. In other words, demographic data and long-term trends suggest that about 3.2 million people out of

8 million are missing in the labor force. These people left the labor market regardless of the economic situation(NASDAQ,2018).

Prior to the Recession, the U.S. Bureau of Labor Statistics in 2007 established a more detailed model that included age and sex, along with race, and this model showed that there would be a more modest decrease in the LFP rate among the Americans, that is, it would fall to 65.7% by 2013. Numerous post-Recession efforts showed differences in their accurate assessment. Almost all models showed that even if there was no Recession, the labor force had decreased by several million(NASDAQ, 2018).

Chart 2.3. Labor force participation rate (with a mutual comparison of recession and demographic impact), USA, 2000-2014



Source: www.bls.gov | USA, Bureau of Economic Analysis

In Chart 2.3, the ”Actual" trend line shows the participation rate in the current decreasing labor force in the country, that is, caused by the recession and demographic problems in the United States. The "Model" trend line means the workforce participation rate, which is supposed to arise if the recession does not occur.

How many people came back?What is really important is that more than 5 million people will join the workforce again. It is quite difficult to respond to this question. The USA has never faced such a high rate of long-term unemployment before. At the time of labor force reduction, there was no such severe recession. This makes it difficult to predict how people leaving the workforce during the Recession will react when the labor market returns to its previous state.

It is known that some people are less likely to return to the labor force. People who receive money for disability assistance rarely return to work. Since the beginning of the Recession, the number of Americans receiving such assistance has reached 1.8 million. This is partly because the population is getting older and older workers are more likely to be disabled. It is considered to be a poor economy that drives people to receive disability assistance as a reason for much of this growth.

It should be noted that these disabilities are not considered fake. At times when the economic situation was good, workers with real disabilities were able to find jobs, but in times of high unemployment, those people face difficulties in finding jobs because companies are trying to be more selective. The calculations show that 1.1 million people more than expected received disability assistance, simply based on the principles of aging. This calculation is similar to the approach used to calculate the labor force reduction rate due to demographic reasons. By applying the degree of disability before the Recession to the current population, it is possible to calculate how many people will receive disability assistance if the Recession does not occur.

There are up to four million “missing workers”. What will happen to them? About one million of them are younger than 25 years old and most of them are in college and high school. Most of the mentioned population will enter the labor force at the same time. Another 1 million people are 65 and older. They will be replaced by a new generation, which will enter the same labor force as their historical examples (“Baby Boom”). Thus, in the coming years, 2 million workers are expected to join the workforce.

Nearly 2 million Americans who are still in the initial periods of their working lives remain beyond labor force. There is very little information about who they are, what they are doing, how many of them are left-idle workers waiting for the construction of a new building, and how many of them are the second earner of the family. Whether workers re-participate in labor force depends on the strength of the economy in the coming years(The New Yorker official site,2018).

As the economy develops, 2-4 million out of the 8 million “missing workers” are expected to return to the labor force. This means a large number of people. If all of them are thought to be unemployed, then unemployment will be between 7.8-9%, which is even lower than the worst level of the Recession, which says that the economy has not improved sufficiently(The Atlantic Journal, 2018).

The uncertainty of this assessment reflects Labor Market Fluidity. Economists generally talk about the unemployed, who are divided into two, influenced by ”periodic“ forces (normal ups-and-downs of the economy) and ”structural" forces such as demographic factors. The strong economy in the late 1990s and early 2000s caused a large number of people to enter the labor force. A fairly strong economic recovery could repeat the magic of the 1990s today, even with all the "missing workers" and even those with disabilities back.

There is, however, a terrible possibility: if the recovery is weak, people who are currently hoping for labor force will go further instead. Many of them will go for disability and retirement. 2-4 million workers still accessible by the economic policy will become inaccessible and the decline in the labor force will be permanent.

2.2. The aggregate supply-oriented economy of Japan and their paradox

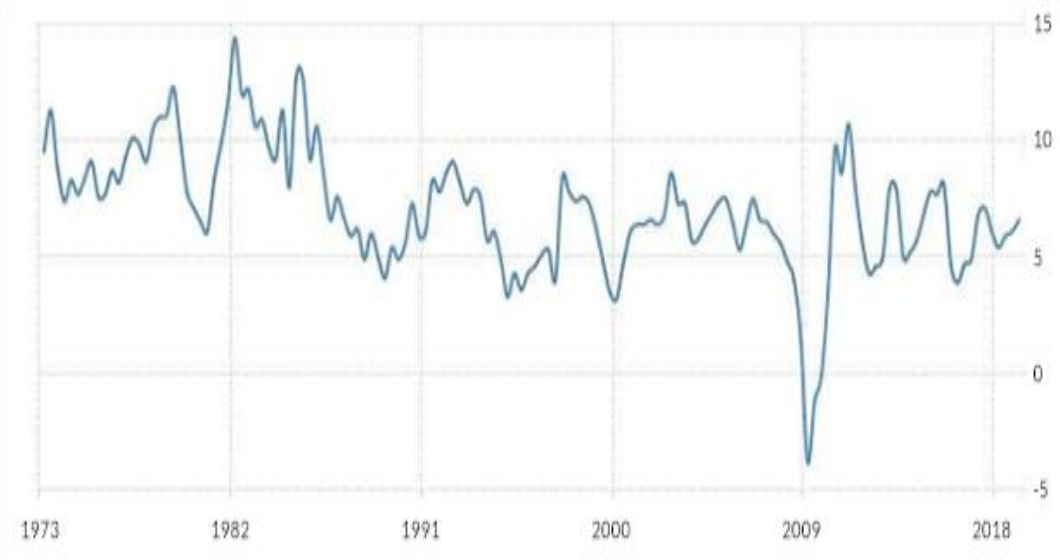
Japan is the second country in the world in terms of Nominal GDP, fourth in terms of Purchasing Power Parity (PPP) and second in terms of development. According to the International Monetary Fund, the country's GDP per capita reached its highest level in 2014 by $37 519(International Monetary Fund, 2018).In 2018, this figure amounted to $39 317. Japan is one of the members of the G7. It is

the third largest car manufacturing country in the world and has the largest electronic commodity industry(International Monetary Fund,2018).

In the face of increasing competition with China and South Korea, Japan today mainly focuses on processing, advanced technologies such as optical tools, hybrid vehicles, and robotics as well as sensitive products. Japan is a country where the ratio of Public Debt of any developed country to GDP is the highest. The economy of the country is faced with a serious problem of population. Statistics show that for the first time in 2015 there was an official decline, which would fall from 127 million to 100 million and lower by the middle of the 21st century(International Monetary Fund,2018).

The economy of Japan is somehow in a similar situation with the US economy. So, there are a lot of fluctuations in the development trend that both countries have. Let's look at the economy of Japan in the sample of Chart 2.4.

Chart 2.4. Japan, GDP Annual Growth Rate, 1973-2018



Source: www.tradingeconomics.com | USA, Bureau of Economic Analysis

Chart 2.4 shows that economic growth trend continues to decline after the 1990s. Excluding 2010, the growth rate was not higher than 5% per annum. In Japan, GDP expanded by 1.6% in the 4th quarter of 2018 compared to the same quarter of the previous year. GDP Annual Growth Rate increased by an average of 2.03% from 1973 to 2018, reaching its highest level in the 1st quarter of 1988 (9.4%) and the 1st quarter of 2009 (-8.8%).

Over the next thirty years of economic development since 1960, Japan has given up its defense spending, enabling rapid economic growth, which is called "the Japanese miracle economy". Under the leadership of the Ministry of Economy, Trade, and Industry, Japan maintained its position as the second largest economy in the world between 1978-2010 with an Average Growth Rate of 10% in 1960, 5% in 1970 and 4% in 1980. In those years, it has even surpassed the People's Republic of China (PRC). In the 1980s, Japan became a highly paid economy. In 1990, Per capita income (PCI) in Japan was either as in many Western countries, or more (Masahiro T. Japan., 1999).

After the silence in development in the late 1990s and the breakdown of the benefit value bubble in Japan, these years were called «The Lost Decade". Therefore, Japan needed to make an enormous Budget Deficit (Japan added trillions of yen to the budgetary framework) to back massive open business programs (Masahiro T. Japan., 1999).

When it came to 1998, the open business extends in Japan were as yet not ready to sufficiently elevate the need to end the stagnation of the economy. The administration of Japan, which was in the condition of wretchedness, attempted "basic change" strategies went for expelling the ideological surplus from the stock and land markets. Lamentably, these arrangements have over and overdriven Japan to flattening between 1999-2004.

In opposition to flooding Money Supply with recently printed cash, the Bank of Japan has stretched out its Money Supply to raise expansion desires. At first, the strategy was not ready to start any development, however it had the option to impact expansion desires at last. Toward the finish of 2005, the economy at long last started to encounter a practical recuperation. With Annual GDP Growth Rate of 2.8% for that year, Japan outperformed a similar rate of the US and European Union for a similar period. Not at all like past recuperation patterns, Domestic Consumption has been a standout amongst the most significant elements of development.

Economists say that the Bankruptcy Law, the Law on land transfer and the development made in tax laws will contribute to the economy of Japan. In recent years, Japan has become the largest global export market for about 15 trading countries.

In addition, stock and real estate prices, which increased in the mid-1980s, caused an economic bubble in the Japanese economy. This bubble went into a sudden decline with the peak of real estate prices in 1991 and the fell of the Tokyo Stock Exchange in 1990-92. The fact that the 1.5% growth in the 1990s in Japan was slower than the growth in other developed big countries, led to ”The Lost Decade". After a decade of low Growth Rate, this period was 20 years(Masahiro T. Japan., 1999). Again, the increase in GDP per capita from 2001 to 2010 surpassed Europe and the United States.

The fact that Japan is a country with increasing investment in the decreasing Labor Force and Physical and Human Capital since the 1970s indicates that it is an economy that is approaching its stable growth rate. With such low growth, Japan's Public Debt makes it difficult for the Government to manage important social welfare expenditures related to the aging society.

Let's take a look at the process of transition from “The Lost Decade” of the Japanese economy to the economy, which is called "Abenomics". As mentioned above, the country's economy grew rapidly in the post-war period: around 10% on average between 1955-70 and around 5% in 1970-80. The decline of the big bubbles, which developed in the real estate and stock markets in the late 1980s, led to slowing growth in the 1990s, which was recorded in economic history as “The Lost Decade"(Masahiro T. Japan., 1999). In the mid-2000s, a slight economic recovery began to descend with a deep recession, as in many parts of the world in 2008-2009. The subsequent recovery was lagged by the Japan earthquake and tsunami of March 2011.

Although Japan is the third largest economy in the world, it is currently facing the problem of weak growth, which began in the 1990s and has a detrimental

impact on the economy, deflation, and high Public Debt along with structural problems.

The Government, led by Prime Minister Abe Shinzo, has launched a radical plan that revitalizes economic wealth. This policy is known as "Abenomics" and is divided into three main groups(Japanese Foreign Relations Consulate, 2018):

Monetary policy - the Central Bank of Japan has expanded its money emission program to the economy to prevent permanent deflation.

Fiscal policy - It is a short-term stimulus set up to reduce large deficits and increase economic activity followed by a medium-term plan to regulate Public Debt.

Structural reforms- It is a growth strategy that enters the labor market with long-term structural reforms and provides for the liberalization of some sectors of the economy.

At the beginning of the 1990s, after the explosion of the asset price bubble, GDP began to slow down, especially in comparison with other giant economies. Although Japan is still the world's third-largest national economy (after the USA and China), GDP in 2012 was only 18% higher than the value in 1991 and is well below that of other G7 economies except for Italy.

If we look ahead, a number of structural problems can hamper growth in the future. This includes a rapidly aging population and a projected workforce with a 40%-reduction in the number of working population by 2050.

In December 2013, the Unemployment Rate fell to 3.7%, falling 1.5% from 5.2% in June 2009, due to strong economic recovery. In 2008, Japan's labor force consisted of rapidly decreasing 66 million workers, 40% of whom were female. The biggest long-term problem of the Japanese labor force is the low Birth Rate. In the first half of 2005, the number of deaths in Japan exceeded the number of births, indicating that the expected decline in the number of the population starting from 2007 has already begun. As a measure against the decreasing Birth Rate, the State is reluctant to lift the migration barriers, despite taking new steps, as migration to

Japan is not customary among the citizens of the country(Japan Bureau of Internal Affairs and Communications Statistics, 2018).

The workforce used to be 65.9 million people in Japan in 2010. Among them, 62.57 million people have been in the employed population category, while 3.34 million received unemployed reputation and unemployment remained at 5.1%. The structure of the Japanese labor market modified into a structure of gradual trade in the 1980s, and this style continued for the duration of the 1990s. The structure of the labor market is affected through 1) populace decline (depopulation), 2) alternative of the "Baby Boom" era that occurred after World War II, 3) extend in the wide variety of women in the workforce, and 4) the growing stage of schooling of workers.

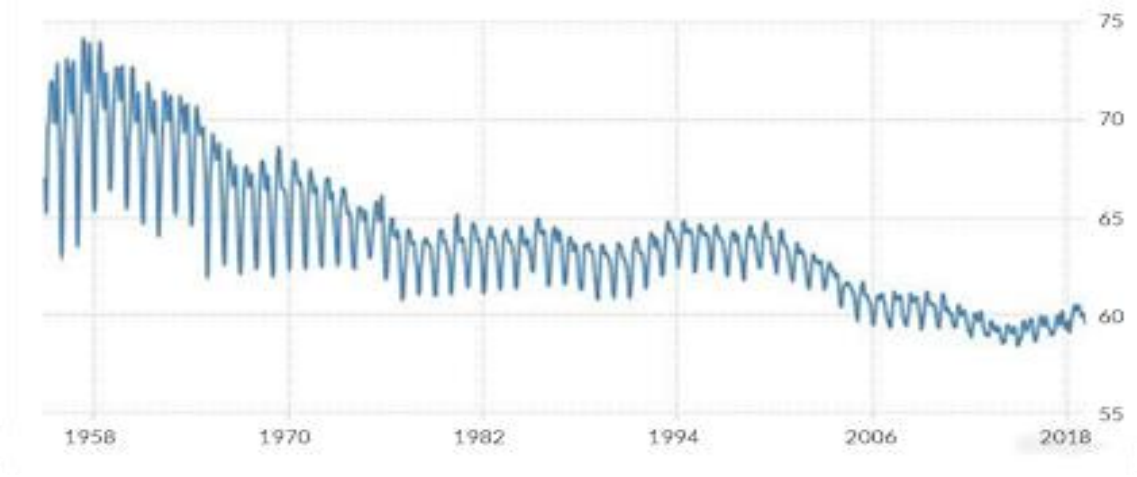
The vital employment structure of Japan is" recruitment of fresh graduates "and"hierarchy ranking", which includes salaries and lifetime employment for the position. For this reason, it is challenging to enter the home labor market, which is open solely to fresh graduates in the country. This market functions very well in Japanese firms.

In addition, Japan moved to a US-type regulation and Capitalism after the economic bubble development, and Japanese firms introduced two types of upsurge: 1) for job performance and 2) for half-time, temporary and irregular employment such as recruitment through Human Resources Department.

Japan is currently facing labor shortages caused by two major demographic problems. First, Population decline (Depopulation) due to the low Birth Rate, which was 1.4 children per woman in 2009. Second, the generation born after World War II, the largest number of people, is now in retirement age. The population aged 15-64 accounted for 63.7% of the total population, while the people aged 65 and older made 23.15% of the total population in 2011. This affected the labor shortage in the physical care of older people and the Japanese government began to bring in foreign workers to take care of the elderly population through bilateral agreements with Indonesia and the Philippines(World Bank, 2018).

Japan's LFP charge was the highest (74%) in June 1955 and the lowest (58.5%) in December 2012, averaging 63.87% between 1958-2018. This indicator is extra simply visible on the Chart 2.5

Chart 2.5. Japan, Labor Force Participation (LFP) Rate, 1958-2018



Source: www.tradingeconomics.com | USA, Bureau of Economic Analysis

Chart 2.5. It shows that Japan is experiencing a problem of continuous decline in the labor force. Although the trend of decline fell rapidly until the beginning of the 1970s, it came to balance in the following years, especially in 1980-90. However, starting from the 2000s, the decline began to continue again. The main reason for this, as we mentioned above, is the aging of the population and low Birth Rate.

Recently, Japan has seriously taken into account returning foreign workers to the country for the second time. When there was a labor deficiency due to the economic boom, it happened in the late 1980s. But this was skipped when the economy deteriorated. The second wave started in 1999 during the labor deficiency caused by demographic change(Mackie V., 2010).

While the post-war economic reconstruction, people born before World War II contained the core of the workforce. These people still grew up in Japan, where they had an agriculture-based economy and little material wealth. Besides, they endured the challenges of war and, as part of their endurance, they accepted to work under challenging conditions. At the end of the 20th century, these people were displaced by the generation born after the war. The newcomers seemed to

have various views on working. The post-war generations were accustomed to accomplishment and had more quality education than their forerunners.

As assumed, these socioeconomic variations affected the performance of employees. Pre-World War II surveys have shown that work is one of the essential features of today's life. Nevertheless, in the 1980s, the percentage of those who thought like this so decreased. A study by the Japanese Management and Coordination Agency (MCA) showed that since October 1, 1986, 2.7 million workers shifted their jobs over a year. According to this study, the number of workers interested in changing their jobs rose from 4.5% in 1971 to 9.9% in 1987. The approach of companies towards older employees also affected the attitude towards work. So, there were fewer tasks for older workers, and they could not even get the rewards that their predecessors received.

The aspects mentioned above: changing jobs and the approach towards older workers led to the point that the said community regularly left the labor force and decided to live the excellent Lifetime Expectancy that they contemplate. These were the key triggers of the adjournment in the labor unit.

Customarily, Japan not just makes individual cases for specific groupings of callings yet, besides, has stringent guidelines on the contracting outsiders. Among the exception classifications were managers implicated in trading activities, full-time researchers affiliated with research and development institutes, professional entrepreneurs, engineers, and other people trained in superior technology, foreign language instructors and other people with rare skills among the citizens of Japan. Authoritatively, in Japan, in 2008, there were 486,000 400 worldwide workers: 8.3% Filipino, 20.4% Brazilian, 43.3% Chinese etc.(Mackie V., 2010).

Despite the current upward trend in the Unemployment Rate in the country, most of the unpopular jobs are not fully staffed up and the domestic labor market is declining. The imported workforce seems to be a solution to this condition offered by entrepreneurs who employ low-paid foreign workers. The fact that foreigners from Asian countries (China, Southeast Asia, and the Middle East) illegally come to Japan, increasing the labor market indicates that the rigid Immigration Law

remains on paper. Japanese companies have also established foreign subsidiaries to generate profits from low-paid foreign workers. This trend began in the 1970s in Singapore. The use of foreign Labor Resources helped to build local infrastructure, launched a technology transfer, and turned some old subsidiary companies and startups into fierce competitors.

The age of the population in Japan is considered to be more than in all other countries, as it ranks 1st in the number of elderly citizens. Not only in rural areas, but also in urban areas, Japan has an “over-aging” society. According to the 2014 estimate, 33% of the population in Japan is 60 years old, 25.9% is 65, and 12.5% is 75 years old and over(Japan Bureau of Internal Affairs and Communications Statistics,2018).The country's 65-year-old and over-population accounts for one-fourth of the total population, and this figure will rise to one-third by 2050(International Longevity Center Japan, 2018).

Due to low Birth Rates and high Life Expectancy, Japanese society is expected to continue to age considerably, and the population began to decline in 2011. A citizen of Japan thinks of Japan as a comfortable, modern country with no population crisis. The Japanese state responded to the concerns of demographic changes about the stresses on the economy and social services, with policies aimed at improving Birth Rate and making the elderly population more active in society (The National Interest, 2018).

The Japanese who are 65 and above, have grown nearly four times over the last 40 years, rose to 33 million in 2014 and accounted for 26% of the country's population. At the same time, the number of children (14 and younger) fell from 24.3% of the population in 1975 to 12.8% in 2014. In 1997, the number of the elderly population exceeded the number of children, as well as in 2014, the sale of diapers for the elderly was more than the number of diapers for children. This change in the demographic structure of Japanese society is called the "aging of the population" and has taken place in a shorter period of time than in any other country(International Longevity Center Japan, 2018).

Taking into account the current Birth Rate, according to future forecasts, by 2060 the population over 65 will make 40% of the total population, and the population will decrease from 128 million in 2010 to 87 million in 2060 (The Guardin, 2018).

The reason for the aging of the people in Japan is that this country has the lowest Birth Rate and the highest Life Expectancy in the world. High Life Expectancy here is 79.4 for middle-aged men and 85.9 for women. Since the total population of Japan decreases due to low Birth Rate, the aging of the population is quickly growing.

Determinants such as food, high-level medical and pharmacological technology have developed living circumstances, reducing the predominance of illnesses. Moreover, peace and accomplishment after the last World War provided to economic growth, providing long life.

Total Birth Rate of Japan (childbirth per woman) has been underneath 2.1 since 1974, and this figure decreased to 1.26, the lowest level in its history in 2005. Some economic and sociological determinants extend the dissolution in childbirth: new and several marriages, unemployment, increase in female labor force participation, decreased salaries and lifetime hiring, just as high gender imbalance and huge expenses for raising a child(Japan Bureau of Internal Affairs and Communications Statistics, 2018).

Despite the fact that most couples have two or more children, an increasing number of young people either postpone or completely reject marriage and parenting. Also, women with children leave their jobs and then go back to low-paid jobs. Between 1980-2010, the percentage of the population never married, although the population continued to grow, rose from 22% to 30%. By 2030, one in four people will not get married even in their real maternal age and fraternal age(Japan Bureau of Internal Affairs and Communications Statistics, 2018).

In 2015, 177 thousand 600 people aged 15-29 directly took care of an elderly family member. Along with this, migration of young people to large cities of Japan, female labor force participation, the gradual increase in the cost of care for

both young and elderly people should bring new solutions including nursing homes and Care Centers for the elderly. Every year, Japan closes 400 primary and secondary schools, turning them into Care Centers for the elderly.

The elderly labor force and the deficiency of young workers have modified the character of employment in Japan, expanding female labor force cooperation since the 1980s. According to the predictions of the U.S. Census Bureau that Japan would encounter a decrease of 8% in the consumer population in 2002 and 18% in its workforce by 2013, however, Japan's labor market was under pressure to meet the demands for employees and had only 100 workers for 125 positions (Market Watch,2018).

The labor force deficiency in 1980-90 drove several Japanese corporations to increase the obligatory retirement age from 55 to 60 or 65. Today, numerous individuals keep on working even after authority retirement. The expansion in the retirement age population puts pressure on the pension system of the state. In 1986, the state raised the retirement age from 60 to 65, which made many people remain in the workforce and some people to poverty. Retirement age may increase even higher later on. A research conducted by the United Nations Population Division in 2000 proved that Japan should rise the retirement age to 77 to keep the equilibrium in the labor market or permit the entrance of 17 million migrants into the country by 2050. A regular inrush of migrants into Japan could prevent further population decrease(Market Watch,2018).

Less desirable industries such as agriculture and construction are more at risk than others. In Japan, the farmer is on average 70 years old, while the majority of construction workers are 55 and older.

If productivity in the country does not increase faster than the rate of decline in the labor force, the elderly population decline will lead to a decrease in the economy. The labor shortage in Japan will decline by 0.7% by 2025, and the country will experience a growth loss of 0.9%.

2.3. The comparison of the US and Japan economy in the case of comparison of key indicators

In Japan, the population is not only decreasing but also aging. This trend was manifested when the number of the population fell sharply in 2011 (from 127.8 million in 2011 to 127.1 million in 2018) and the number of the employed (from 16 to 64 years) fell rapidly. On the contrary, the number of both the total population and the economically active population in the United States is growing. The increase in the population of Japan in the age group of 65 and above has significantly influenced the entry into the labor force of working age people. Conversely, the Employment Rate in the USA has started to decline for both men and women. Japan's labor market regulations help explain the steady growth in per capita output, despite the fluctuations in the population aged 65 and older. Indeed, Japan has been able to adapt to the growth per capita of the United States since 2000(Federal Reserve Bank of New York,2018).

The USA and Japan are experiencing very different population trends. Data from the Organization for Economic Cooperation and Development (OECD) show that the US population has increased by 12% since 2000, while the Japanese population is close to the figure of that year. What is more noticeable is that the Active Population Growth in Japan has been under 9% and more than 12% in the United States since 2000. As a result, while the share of the 65-year-old population in Japan rose from 17% to 23% during this period, this figure rose from 12% to 14% in the US. Nevertheless, the difference in the workforce of these countries is muchless(Investopedia.Comparison of US and Japanese economic balloon,2018; Federal Reserve Bank of New York, 2018).

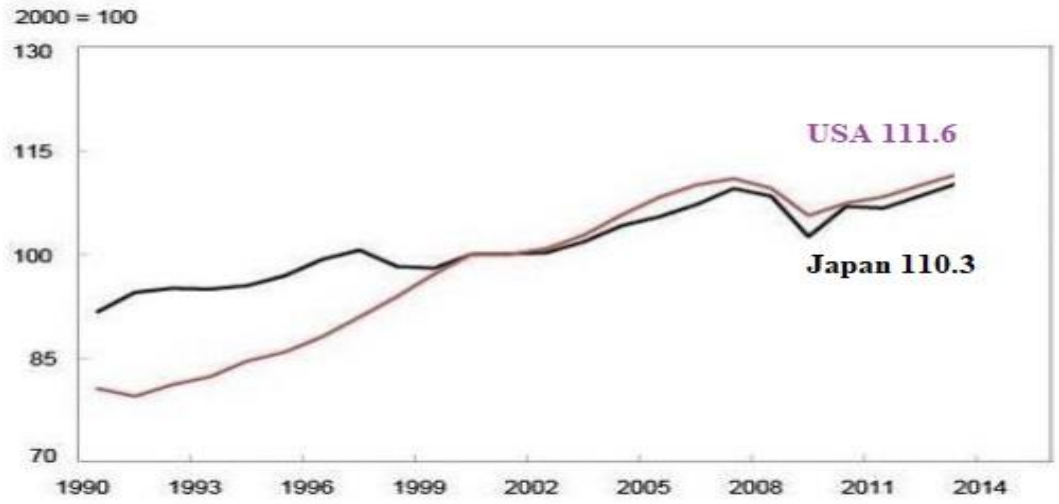
In Japan, the working-age female LFP rate has increased by 6% since 2000, which has increased the labor force by 2%, even in a decrease of 9% of the population. In the US, the female LFP rate has decreased and the labor force has increased by 9%, but this is lower than a 12% growth of the population. While the decline in the male LFP rate in the US was slightly higher, in Japan this indicator maintained its stability at high levels. It should be noted that a large part of the gap

in the female LFP rate, which existed in the two countries in 2000, has disappeared (Federal Reserve Bank of New York,2018).

An increase in the female LFP rate in Japan and a decrease in the female LFP rate in the US have alleviated the economic impact of a wide variety of demographic trends. Although there has been a 21% difference in working-year-old population changes since 2000, the difference in workforce growth is 12%. As the unemployment rate in the US was higher than that of 2000 and lower than the rate in Japan, the difference in employment growth declined by more than 9% (+6% versus -3%).

The substitution trends in the LFP rate have helped to minimize the differences in per capita growth between the two countries since 2000. Over time, the economic growth of a country is determined by the quantity and quality of its Labor and Capital and how workers and capital are used. Lightening the differences in the labor force with various demographic trends has contributed to a very small gap in GDP Growth per capita for the two countries since 2000, as seen in Chart 2.6. The 1990s was a decade of weak growth in Japan compared to the United States, but Japan's GDP, adjusted for population growth, began to closely follow the United States since the time when the US economy grew more than twice as fast (25% versus 10%)(Investopedia, 2018; Federal Reserve Bank of New York,2018).

Chart 2.6. Real GDP per capita, USA and Japan, 1990-2014



Source: https://data.oecd.org | OECD

The economic problem for Japan is to sustain Economic Growth while the population is aging. The UN estimates that the rate of decline in Japan's working-age population has slowed, but it will decline by an average rate of 0.9% from 2015 to 2020. In particular, there are restrictions on how much the female LFP rate will increase upon reaching the same rate in the United States. This would be a severe problem for the Japanese economy as the population, aged 65 and above, is steadily growing and it is estimated that this group will reach its peak by 37% of the total population in 2055(Federal Reserve Bank of New York,2018).

In Table 2.1, important economic indicators on the labor problem of the United States and Japan for 1988 and 2018 were given. Here, taking the mentioned two years is due to the fact that in the third chapter, the time interval in the mathematical model was 1988-2018.

Table 2.1. Comparison of labor statistics in the US and Japan (as a percentage of the total population), 1988 and 2018

Age range	USA		Japan	
	1988	2018	1988	2018
0-14	22	19	22	13
15-64	66	66	68	61
over 65	12	15	10	26
Total	100		100	

Source: http://data.worldbank.org | World Bank

This is clearly seen in the table that due to the low Birth Rate in both countries, the population aged 0-14 decreased. In Japan, this indicator is 6% more than in the US. While the percentage of the population aged 15-64 remained stable in the US, it was registered in Japan at a rate of 7%. The population of 65 and above increased by 3% in the United States, while in Japan it rose to 16%. As a result, Table 2.1. shows that compared to the US, the labor problem in Japan in all three categories is quite deep.

Demographic trends are not so frightening in the United States, even despite the aging of the “Baby Boom” generation. According to the UN forecast of growth by 0.3% in 2015 and 2020, the working-age population is still growing. In addition, aging will be much slower than in Japan, and the 65-and above-aged

population will rise from 15% of the total population to 22% in 2055, which will be lower than in Japan today(Federal Reserve Bank of New York,2018).

CHAPTER 3. THE RESULTS OF THE ECONOMETRIC ASSESSMENT

3.1. Theoretical approach to econometric model

In this section, we will use the method called ”growth calculation framework". The use of this method is based on Total Production Function (TPF), expressed in growth rates. The first step is to divide Output among these factors to obtain individual contributions such as Labor, Capital, and Total Factor Productivity (TFP). In our calculation, we will use a known form of Neoclassical production function:

$$Y_t = A_t L_t^{1-\propto} K_t^{\propto} \qquad (3.1)$$

in the formula (3.1), A_t expresses Total Factor Productivity, L_t– Labor factor, K_t- Capital factor. *“t"* - denotes the specified time zone. In the formula, *“t"* is taken more annually. The superscript “α” indicates Capital-Output Ratio, “1-α” - Labor share (Manuela R., 2015) Using the new form of equality above,

$$(Y_t / N_t) = A_t^{1/(1-\propto)} (K_t / N_t)^{\alpha / (1-\alpha)} (Y_t / N_t) \qquad (3.2)$$

we obtained an Output per capita division for the working-age population. This section requires data set for Output, Capital Stock, working age population and working hours (Manuela R., 2015). (3.2) Let us explain the formula variables separately:

Economic Growth grows by increasing the Labor and Capital factors used in Production or by increasing the Overall Productivity achieved by using these factors together, that is, by Overall Productivity Growth. Within the calculation of Growth, each growth added to Gross Value is allocated to the growth of each production factor (Labor and Capital) and Total Factor Productivity (TFP).

GDP per capita is a measure of the Aggregate Output of a country, which is obtained by dividing GDP by the number of its population. When comparing one country to another, GDP per capita is especially useful. Because it shows the relative performance of countries. GDP per capita not only shows growth in the economy but also reflects growth in productivity.

The concept that must be considered for the Labor factor in the productivity analysis is the total hours of work performed by all people involved in Production. This reflects full-time and part-time, paid and unpaid, overtime hours and non-working hours for official holidays, annual paid vacations, employee discontent, and other reasons.

Capital consists of a number of assets: Information Technology supplies, communication supplies, other machinery and equipment, non-residential structures, transport supplies, programs, other intangible assets, information and telecommunication technologies (ICT), non-information and telecommunication technologies, and metal products.

Growth in TFP is measured as a residual, that is, as part of the growth in GDP, which cannot be explained by growth in the Labor and Capital factors. Traditionally, growth in TFP is known as Technological Progress, but in practice this interpretation should be paid little attention to.

First, part of the technological change is concentrated on the Capital factor, for example, as a qualitative improvement between two products of the same capital asset, and hence its impact on the growth in GDP is based on appropriate factors. TFP contains only physically modified technological change in itself, for example, the effects of better management practice, brand names, organizational changes, and general knowledge.

Secondly, data and resource constraints affect the TFP, preventing accurate measurement of the Labor and Capital factors. In addition, TFP also covers regulatory costs, economies of scale, and the effects resulting from poor competition.

In the econometric model we will build, GDP per capita was taken as Economic Growth. This variable is our dependent variable. Because the left, i.e. the dependent side of the formula (3.2) (Y_t/N_t)expresses Economic Growth. As a Labor factor among free variables, the total working hours performed by the population involved in Production were recorded. Another free variable is Capital. The Capital factor in the model reflects capital productivity. As mentioned, TFP is

included in the model. It should be noted that all variables are in percentage terms of annual growth and the model consists of 31 observations covering 1988-2018. All statistical data matching both countries (USA and Japan) for econometric model were taken from https://stats.oecd.org/.

In the research work, the USA and Japan were modeled separately. As an econometric model, the OLS (Ordinary Least Squares) method was used. At the same time, modeling was carried out in the software package "Eviews9".

3.2. Aggregate supply oriented econometric model of the US economy

The US model consists of 31 observations covering the years 1988-2018. Before building an econometric model for the US, the stability of each of the variables was tested by "Unit Root Test". The results are as stated in Table 3.1 below.

Table 3.1. Unit Root Test, the US model

Unit Root Test (Level, Shwarz Info Criterion, maxlag=7)				
	ECONOMIC_GROWTH	LABOR	CAPITAL	TFP
Intercept				
1% level	-	-	-	***
5% level	**	**	-	**
10%level	*	*	-	*
Trend and Intercept				
1% level	-	-	-	***
5% level	-	-	-	**
10% level	*	-	*	*
None				
1% level	-	-	-	-
5% level	**	**	-	-
10%level	*	*	-	-

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

*** the variable is stationary according to 1% of the recorded level.

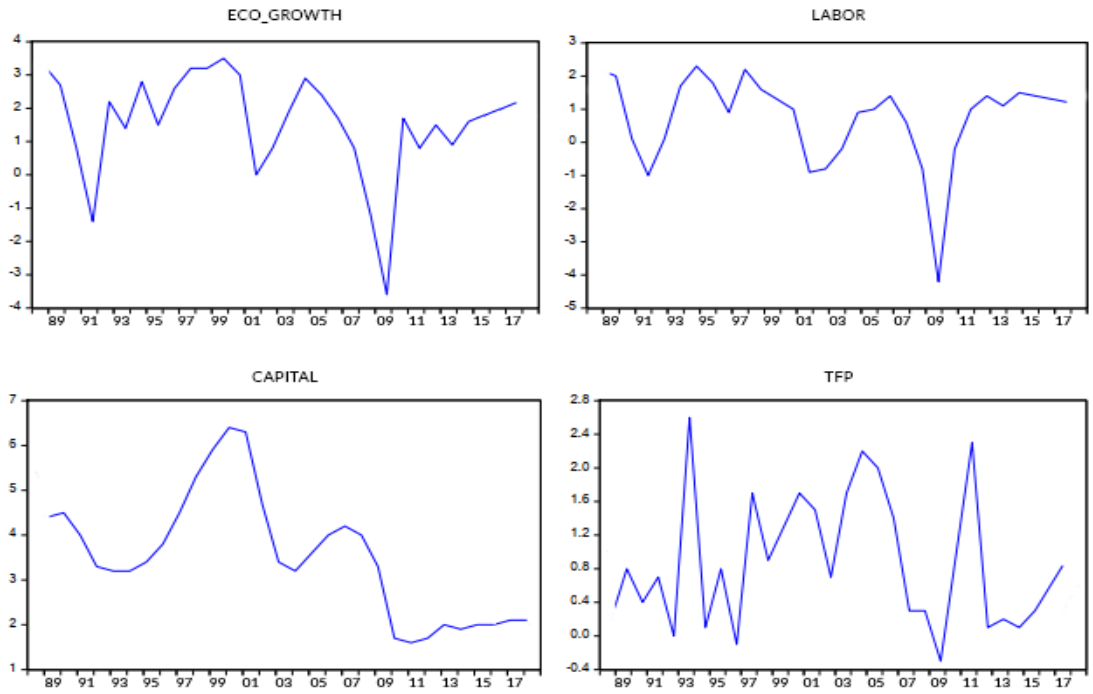
** the variable is stationary according to 5% of the recorded level.

* the variable is stationary according to 10% of the recorded level.

- the variable is not stationary of the marked level.

From Table 3.1, it turns out that each of the variables is stationary at the level. In addition, below are charts of each time-dependent variable.

Chart 3.1. Time-dependent variables, USA 1988-2018



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

The charts show that variables move regardless of time. Since the variables we get are stationary and not time-dependent, we can conveniently build an OLS econometric model. The results of the model are given in Appendix 1.

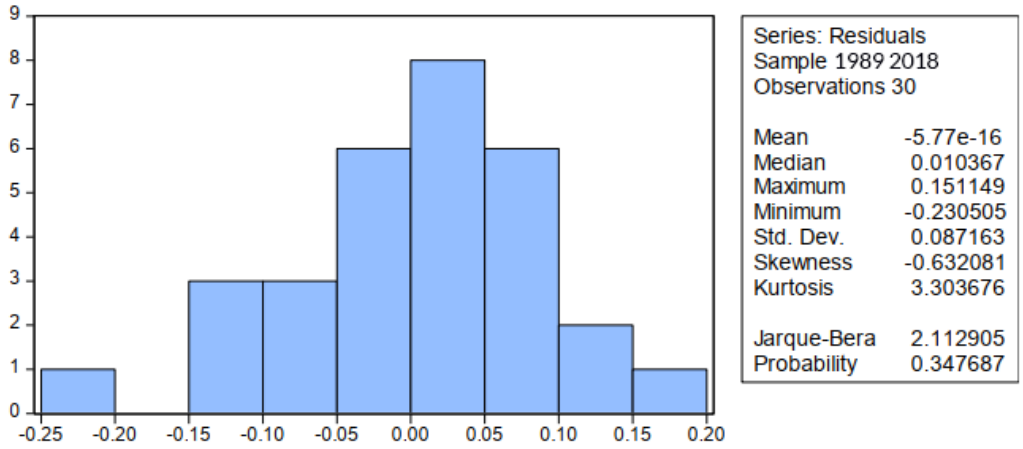
Since t-Statistics of LABOR, CAPITAL and TFP variables and their 1 delay in the model are greater than 2, and their Prob. values are smaller than 0.01 (1%), 0.05 (5%), 0.10 (10%) - the variables are important separately.

The fact that the value of F-statistic is greater than 2, and the Prob. value (F-statistic) is smaller than 0.01 (1%), 0.05 (5%), 0.10 (10%), however, proves that variables are also important together.

The fact that Adjasted R^2 (Adjusted R-squared) is 0.995934, says 99% of the ECONOMIC_GROWTH explains the variables we have included in our model, and at the same time, Adjusted R^2 is quite close to ordinary R^2. This also shows that the model is very strong.

The next step is Residual Diagnostics for the model. The first step we will do here is to check the Normality Test. This is one of the tools that verify the accuracy of the model we have built. The result of the test is as in Table 3.2.

Table 3.2. Normality tests of residuals, the US model



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

The main thing we will pay attention to here is the Jarque-Bera coefficient, its Prob. value, and the numerical average (Mean). In the model, the normal distribution of residuals reflects the reality of the model. For this, the Jarque-Bera coefficient must be greater than 2, while the Prob. value must be greater than 0.05%, this condition is fully met for in our model (Jarque-Bera 2.112905 > 2, Probability 0.347687 > 0.05). The second condition of the normal distribution is that the numerical average of residuals is equal to zero. Here, Mean = -5.77 e-16 indicates that the statistic of the numerical average e is close enough to zero (-5.77 e-16 ≈ 0). Since all three conditions are paid, we can say that the residuals are distributed normally, that is, the model we build with the variables we enter is significant.

Another step in Residual Diagnostics is to check Serial Correlation. In order to overcome this problem, a delay of variables has been added to the model so that the model we originally built had a problem with Serial Correlation. The variables included with one delay are: ECONOMIC_GROWTH(-1); LABOR(-1); CAPITAL(-1) and TFP(-1). Since the t-Statistics of these variables are greater than 2, the Prob. values are smaller than 0.01 (1%), 0.05 (5%), 0.10 (10%), they are

statistically significant. At the same time, these variables eliminated Serial Correlation in the model.

Table 3.3. Serial correlation test, the US model

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.699246	Prob. F(4,18)	0.6025
Obs*R-squared	4.034696	Prob. Chi-Square(4)	0.4013

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/03/19 Time: 11:47
Sample: 1989 2018
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LABOR	0.016666	0.030406	0.548127	0.5903
CAPITAL	-0.024822	0.073879	-0.335988	0.7408
TFP	-0.006556	0.038562	-0.170009	0.8669
ECONOMIC_GROWTH(-1)	-0.261368	0.237026	-1.102699	0.2847
LABOR(-1)	0.260851	0.245464	1.062688	0.3020
CAPITAL(-1)	0.077276	0.094661	0.816344	0.4250
TFP(-1)	0.250386	0.234790	1.066423	0.3003
C	-0.201507	0.192168	-1.048599	0.3082
RESID(-1)	0.480616	0.298365	1.610833	0.1246
RESID(-2)	0.192899	0.301541	0.639711	0.5304
RESID(-3)	0.107222	0.327641	0.327253	0.7473
RESID(-4)	0.135479	0.331034	0.409259	0.6872

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

According to the number of observations, Serial Correlation was checked by four delays (lag). The fact that theRESID(-1), RESID(-2), RESID(-3) and RESID (-4), F-statistic, and Chi-Square Prob. Values are greater than 0.01 (1%), 0.05 (5%), 0.10 (10%) indicates that this model does not have a problem with Serial Correlation. Also, the fact that Durbin-Watson Statistic is close to 2 (1.472328 ≈ 1.5) also inditcates that there is no Serial Correlation.

It is desirable in the model that the residuals are homoscedastic. In Residual Diagnostics, the Heteroscedasticity test showed the following result:

Table 3.4. Heteroscedasticity test, the US model

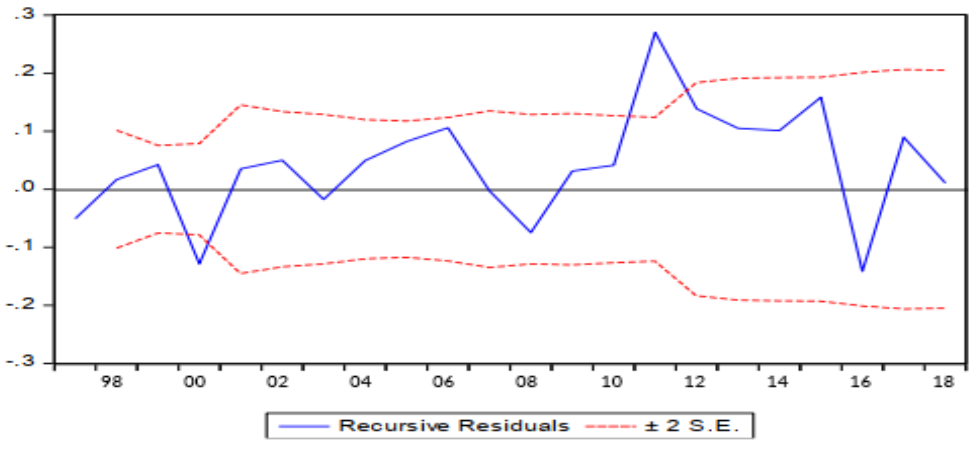
Heteroscedasticity Test: White			
F-statistic	1.043166	Prob. F(7,22)	0.4306
Obs*R-squared	7.476067	Prob. Chi-Square(7)	0.3810
Scaled explained SS	4.630921	Prob. Chi-Square(7)	0.7049

Source: Based on https://stats.oecd.org/| prepared by author in Eviews 9

Since the Prob. value of F-statistic and the Prob. Chi-Square values of Obs*R-squared are greater than 0.05% (respectively, 0.4306% and 0.3810%) here, the residuals are homoscedastic. That is, the variance of residuals is stable. This means that the residuals are normally distributed. Stability tests can be conducted as the required conditions of normality tests are met.

Stability diagnostic tests are used to determine whether the model is stable or not. The main thing to pay attention to in these tests is that the blue pattern line moves inside or outside the given red boundary lines. Let us take a look at the tests:

Chart 3.2. Recursive Residuals test, the US model

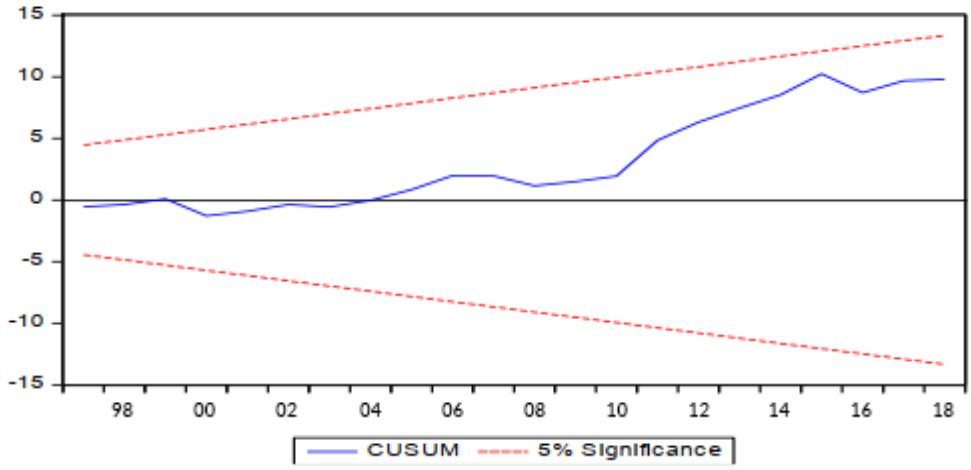


Source: Based on https://stats.oecd.org/| prepared by author in Eviews 9

In the Recursive Residuals test, although the stability of the model was disrupted due to economic problems between 1996-1998 and 2007-2009, stability

in the following years began to move between the boundary lines again. And this is desirable.

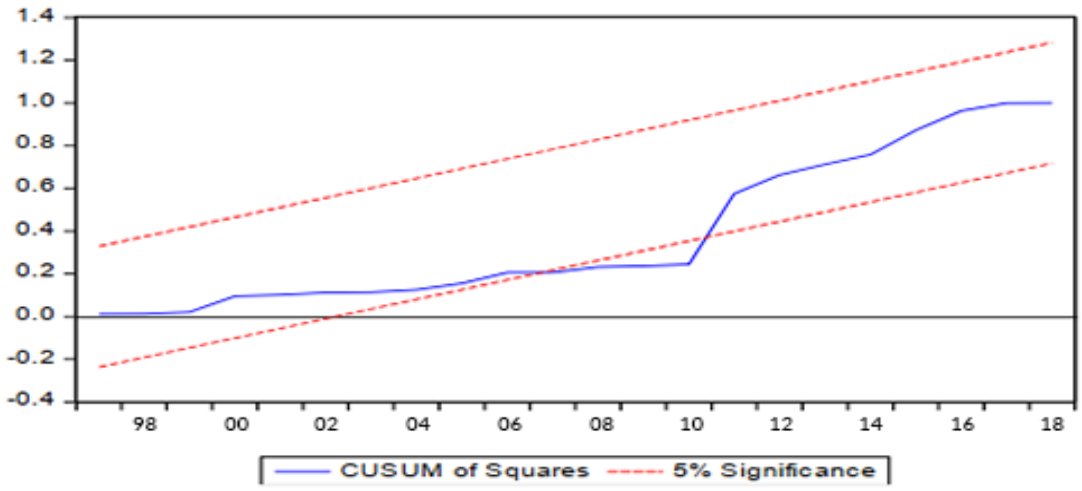
Chart 3.3. CUSUM test, the US model



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

The CUSUM test shows that the model is stable because the model is within the boundary lines.

Chart 3.4. CUSUM of Squares test, the US model



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

The CUSUM of Squares test shows a deviation in the model between 2005-2008. The reason for this is the Global Crisis in those years (mainly 2007-2008).

In addition, it is one of the important steps to check if there is a model-building error in the model. We do this with the Ramsey RESET test.

Table 3.5. The Ramsey Regression Equation Specification Error Test (RESET) test, the US model

Ramsey RESET Test
Equation: AUSA
Specification: ECONOMIC_GROWTH LABOR CAPITAL TFP ECONOMIC_GROWTH(-1) LABOR(-1) CAPITAL(-1) TFP(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.363704	21	0.1871
F-statistic	1.859688	(1, 21)	0.1871
Likelihood ratio	2.545577	1	0.1106

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Here, the fact that theProbabilityvalue of F-statistic is greater than 0.05% proves that there is no model-building error in our model.

Briefly, each of the Stability diagnostic tests indicates that the model is stable. This also means that the model is strong and the variables have been selected correctly.

Since all the conditions listed above are met, we can proceed to the interpretation of the model.

Table 3.6. Evaluation results, the US model

Estimation Command:
==========
LS ECONOMIC_GROWTH LABOR CAPITAL TFP ECONOMIC_GROWTH(-1) LABOR(-1) CAPITAL(-1) TFP(-1) C
Estimation Equation:
==========
ECONOMIC_GROWTH = C(1)*LABOR + C(2)*CAPITAL + C(3)*TFP + C(4)*ECONOMIC_GROWTH(-1) + C(5)*LABOR(-1) + C(6)*CAPITAL(-1) + C(7)*TFP(-1) + C(8)

Substituted Coefficients:
==========
ECONOMIC_GROWTH = 1.01306575917*LABOR + 0.181344744236*CAPITAL + 1.01026533445*TFP + 0.781719044613*ECONOMIC_GROWTH(-1) - 0.77485752104*LABOR(-1) - 0.154428547903*CAPITAL(-1) - 0.771449752102*TFP(-1) - 0.145027523132
ECONOMIC_GROWTH = 1.01 * LABOR + 0.18 * CAPITAL + 1.01 * TFP + C

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Explanation: 1% increase in Labor Productivity increases Economic Growth by 1.01%, 1% increase in Capital Productivity increases Economic Growth by 0.18%, 1% increase in Total Factor Productivity (TFP) increases Economic Growth by 1.01%.

The Labor factor in US Economic Growth is at the same rate as Total Factor Productivity (TFP). Given the current shortage of Labor in the country, the elimination of this problem is a very important and topical issue for the increase in Economic Growth. At the same time, it should be noted that Capital is also used by the Labor force. Since Total Factor Productivity (TFP) is also derived from Capital and Labor productivity, increasing the Labor force will increase both Capital productivity Total Factor Productivity (TFP) as well as Economic Growth. As a result, we can say that the Economic Growth problem for the United States is Labor Force Shortage.

3.3.Aggregate supply oriented economic growth model of the Japan economy

The results of the Stationarity tests of dependent and free variables included in the Japanese Economic Growth model are given in Table 3.7.

Table 3.7. Unit Root Test, the Japanese model

Unit Root Test (Level, Shwarz Info Criterion, maxlag=7)				
	ECONOMIC_GROWTH	LABOR	CAPITAL	TFP
Intercept				
1% level	***	***	-	***
5% level	**	**	-	**
10% level	*	*	-	*
Trend and Intercept				
1% level	***	***	***	***
5% level	**	**	**	**
10% level	*	*	*	*
None				
1% level	***	***	-	***
5% level	**	**	-	**
10% level	*	*	*	*

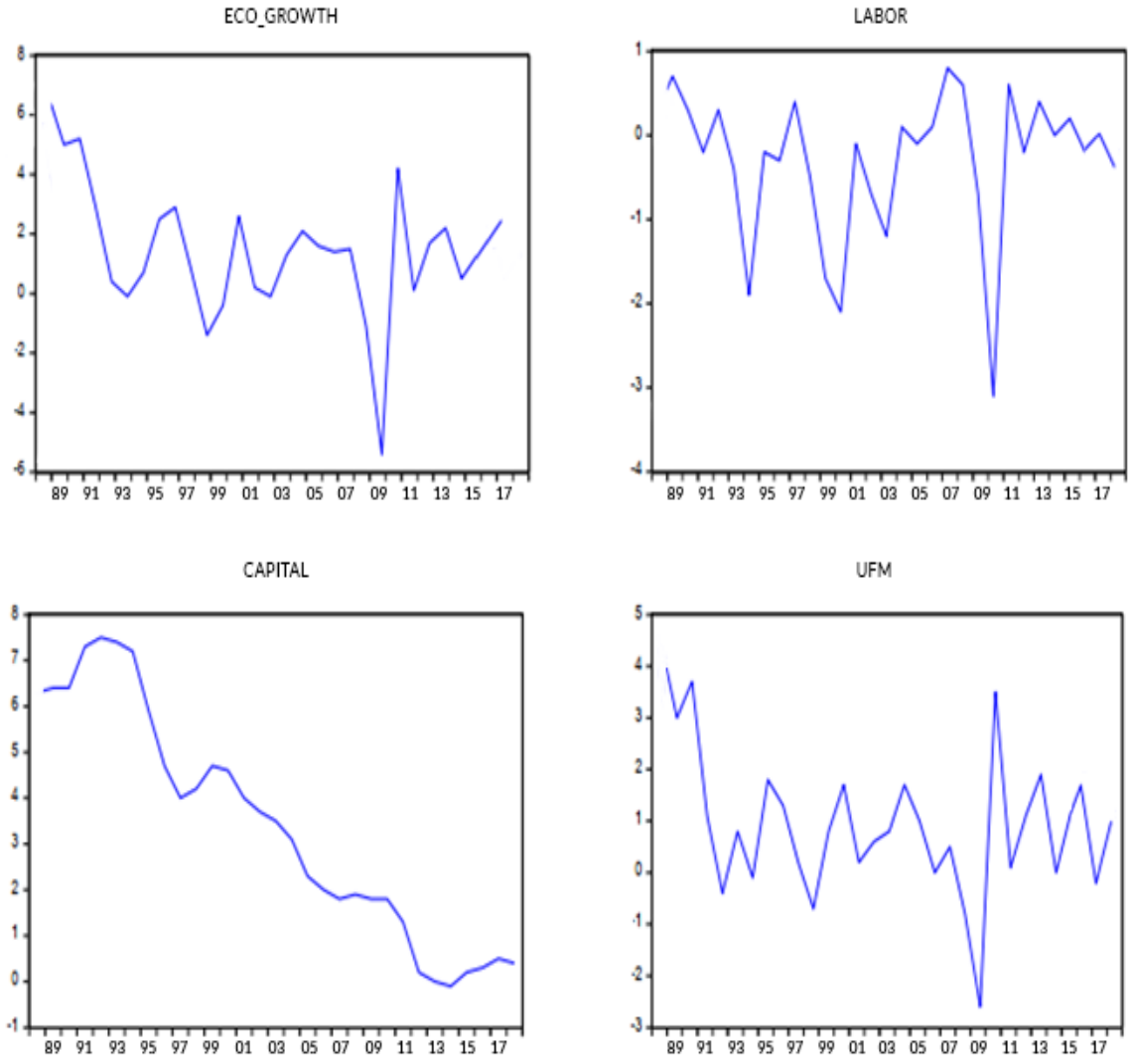
Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

*** the variable is stationary according to 1% of the recorded level.
** the variable is stationary according to 5% of the recorded level.

* the variable is stationary according to 10% of the recorded level.
- the variable is not stationary of the marked level.

The results of the test show that each variable to be used is stationary at levels 0.01%, 0.05%, and 0.10% respectively. The charts of these time-dependent variables are also checked for reliability.

Chart 3.5. Time-dependent variables, Japan 1988-2018



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Other charts, with the exception of the Capital factor, clearly state that the variable to which it belongs is not time-dependent, that is, the variables are stationary. The Unit Root test shows that though the Capital factor is not so stationary in the time-dependence chart, it is stationary in Trend and Intercept and None. With these variables, we can build a model of level OLS (smallest squares),

as the stationarity conditions are met. The model established in this case will give the results in Table 3.8.

Table 3.8. OLS, the Japanese model

Dependent Variable: ECONOMIC_GROWTH
Method: Least Squares
Date: 05/03/19 Time: 19:52
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LABOR	0.946012	0.027661	34.20070	0.0000
CAPITAL	0.262860	0.060857	4.319324	0.0003
TFP	1.008054	0.018732	53.81336	0.0000
ECONOMIC_GROWTH(-1)	0.289701	0.174578	1.659435	0.1112
LABOR(-1)	-0.302337	0.172991	-1.747703	0.0945
CAPITAL(-1)	-0.134567	0.061677	-2.181821	0.0401
TFP(-1)	-0.271966	0.175307	-1.551369	0.1351
C	0.116890	0.045621	2.562170	0.0178

R-squared	0.998811	Mean dependent var	1.506667
Adjusted R-squared	0.998433	S.D. dependent var	2.281399
S.E. of regression	0.090319	Akaike info criterion	-1.747770
Sum squared resid	0.179464	Schwarz criterion	-1.374118
Log likelihood	34.21655	Hannan-Quinn criter.	-1.628236
F-statistic	2640.172	Durbin-Watson stat	2.233493
Prob(F-statistic)	0.000000		

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Prob. value of others, except for the ECONOMIC_GROWTH(-1) and TFP(-1) variables, is smaller than 0.01 (1%), 0.05 (5%) and 0.10 (10%). This is desirable. The Prob. value of exception variables is also taken statistically significant, as the value is also close to 0.10 (10%). This condition can also be considered significant because their t-statistics are also greater than 2 and close to 2.

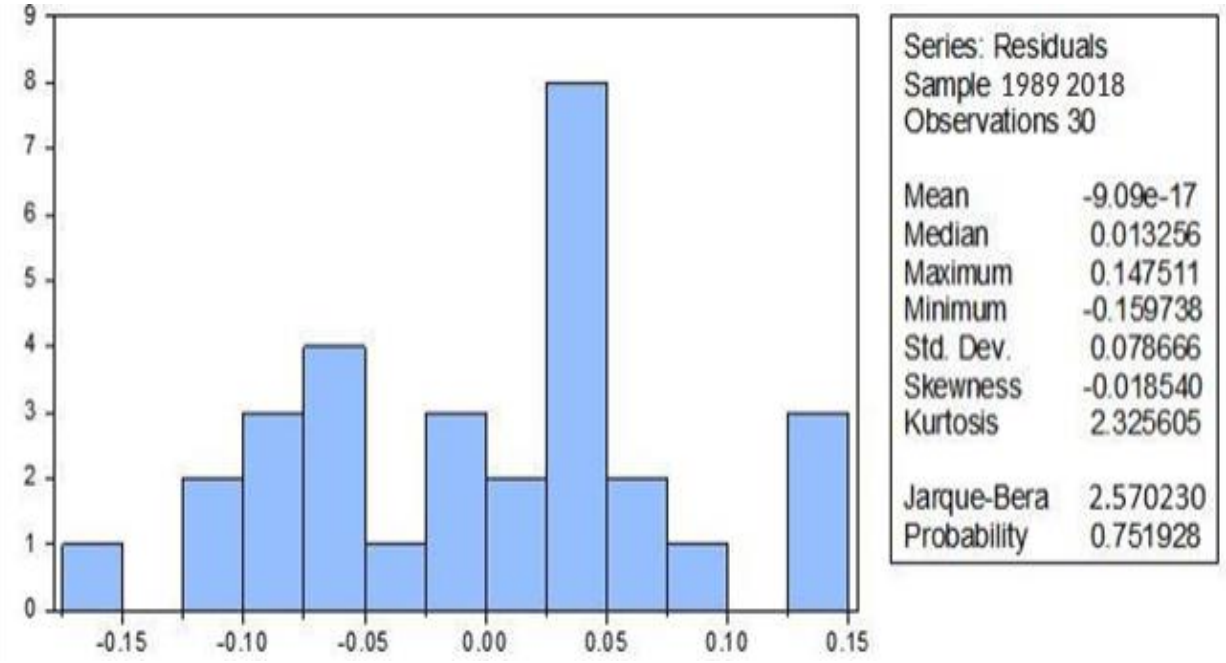
The F-statistic in the model and its Prob(F-statistic) value indicate the joint significance of the variables in the model. Because, F-statistic = 2640.172 > 2, and its Prob. value meets the 0.000000 < 0.05 condition.

R-squared (R^2) and Adjusted R-squared (Adjusted R^2) are great enough (=0.998433). It can even be said that it is equal to 100%. That is, 99% of the

ECONOMIC_GROWTH in the Japanese model is explained by the variables that we have included in the model. This result shows that our model is quite strong.

As we noted in the US model, the next steps are Residual Diagnostics and Stability tests. Tests and results are as follows:

Table 3.9. Normality tests of residuals, the Japanese model



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

In the Normality test, the residuals were distributed normally, since Jarque-Bera = 2.570230 > 2, Propability = 0.751928 > 0.05 and Mean = -9.09 e-17 ≈ 0. That is, this model is of paramount importance in terms of Normality.

Correlation is one of the most common problems in models. The Japanese model also had a Serial Correlation problem, so a delay in the variables was added to the model and re-tested. The model is given in Appendix 2.

Since the F-statistic Prob. value (0.2625) is greater than 0.05 in the test, we can say that one delay variables we have entered overcome the Serial Correlation problem in the model. In the above result, the fact that the Prob. value of RESID(-1), RESID(-2), RESID(-3) and RESID(-4) is also greater than 0.05, proves once again that there is no Serial Correlation problem in the model. This also shows that the model is statistically significant.

The result of the Heteroscedasticity test for variance testing in Residual Diagnostics is as in Table 3.10

Table 3.10. Heteroscedasticity test, the Japanese model

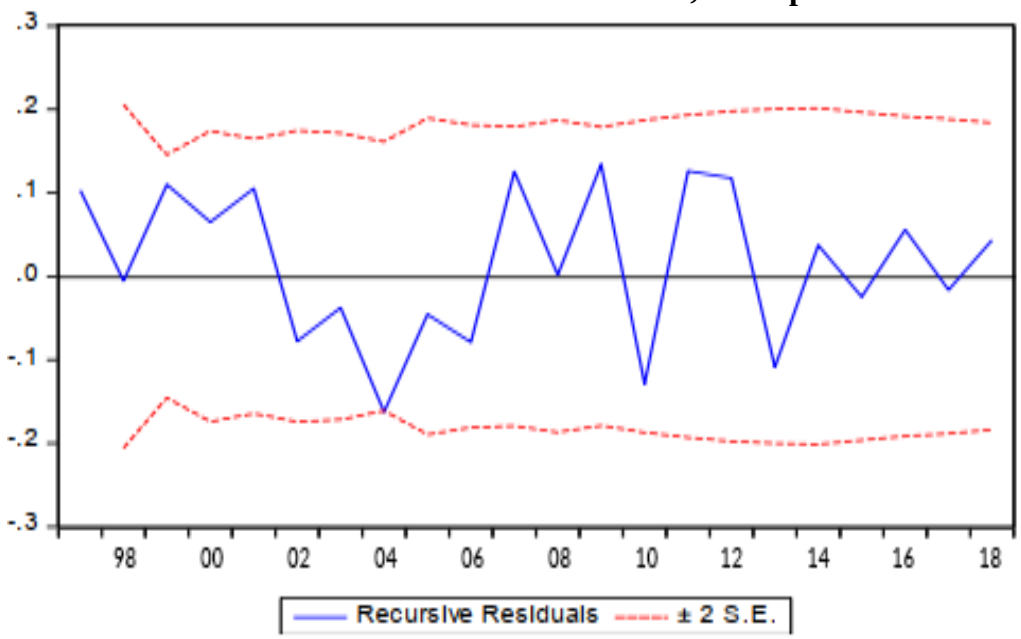
Heteroscedasticity Test: White			
F-statistic	2.053023	Prob. F(7,22)	0.0934
Obs*R-squared	11.85375	Prob. Chi-Square(7)	0.1055
Scaled explained SS	4.225157	Prob. Chi-Square(7)	0.7535

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Here, F-statistic Prob. = 0.0934 is > 0.05. That is, the model does not have the problem of heteroscedasticity. Thus, each condition mentioned in the Residual Diagnostics is met.

When checking Stability Diagnostics in the model, the tests used had the following results:

Chart 3.6. Recursive Residuals test, the Japanese model

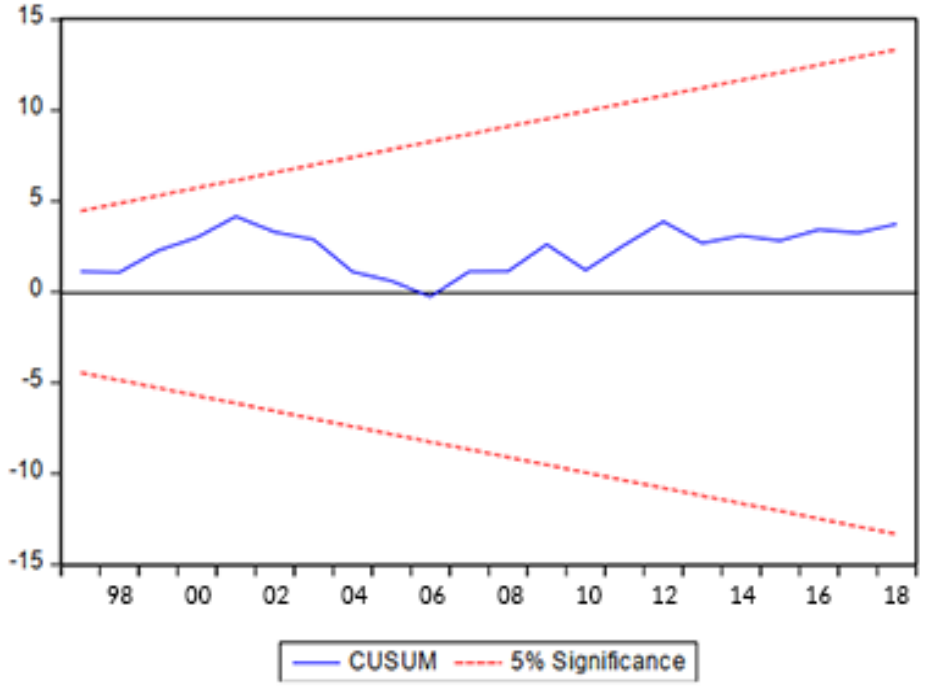


Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

This model is stable due to the Recursive Residuals test as the blue pattern line in Chart 3.6 moves within the red boundary lines. That is, there is no deviation in the model in the specified years.

The CUSUM test is another method of checking the stability of the model itself.

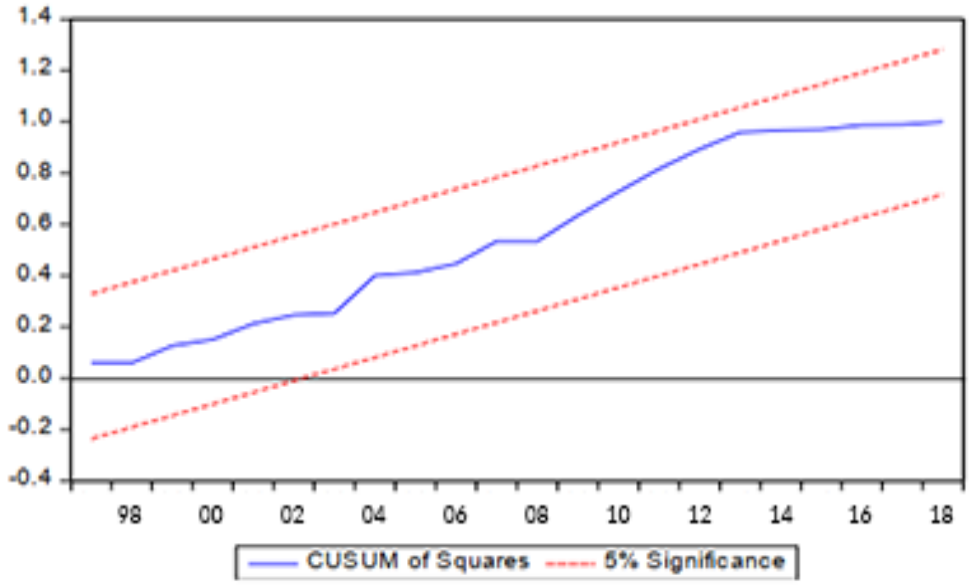
Chart 3.7. CUSUM test, the Japanese model



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

The results of the CUSUM test are quite significant. Thus, the CUSUMline is within the boundary lines and is not very sloping. This is a second test that reflects the stability of the model. Let us also check the Stability Diagnostics with the CUSUM of Squares test.

Chart 3.8. CUSUM of Squares test, the Japanese model



Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

CUSUM of Squares also shows results that are almost in common with the CUSUM test: the model is stable and there is no evasion.

To clarify our ideas, it is imperative to review the Recursive Coefficient test.

Finally, we can finalize the stability test by checking with the Ramsey RESET test to see if there is a model-building error.

Table 3.11The Ramsey Regression Equation Specification Error Test (RESET) test, the Japanese model

Ramsey RESET Test
Equation: JAPAN
Specification: ECONOMIC_GROWTH LABOR CAPITAL TFP ECONOMIC_GROWTH(-1) LABOR(-1) CAPITAL(-1) TFP(-1) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.077990	21	0.2933
F-statistic	1.162062	(1, 21)	0.2933
Likelihood ratio	1.615783	1	0.2037

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Since the Probability value of F-statistic and t-statistic is greater than 0.05 (0.2933) in the Ramsey RESET test, there is no model-building error in the Japanese model we built. As a result, every test made to diagnose stability says that the model is stable.

It is possible to interpret the Japanese model since all conditions such as stationarity, normality, stability, and statistical significance are met. This model is given Table 3.12.

The explanation of the results is as follows:

While a 1% increase in Labor Productivity increases Japan's Economic Growth by 0.95%, a 1% increase in Capital Productivity increases Economic Growth by 0.26%. A 1% increase in Total Factor Productivity (TFP) increases Economic Growth by 1%.

The result shows that the growth of the Labor force in Japan will have a great impact on Economic Growth. Low Capital productivity is due to the insufficient

labor force to manage Capital. Also, if the Labor force increases in the country, the TFP will contribute 1% to Economic Growth. The problems listed by the increase in the Labor force will be eliminated. Therefore, the current Economic Growth problem for Japan is the Labor Force Shortage.

Table 3.12. Evaluation results, the Japanese model

Estimation Command:

==========

LS ECONOMIC_GROWTH LABOR CAPITAL TFP ECONOMIC_GROWTH(-1) LABOR(-1) CAPITAL(-1) TFP(-1) C

Estimation Equation:

==========

ECONOMIC_GROWTH = C(1)*LABOR + C(2)*CAPITAL + C(3)*TFP + C(4)*ECONOMIC_GROWTH(-1) + C(5)*LABOR(-1) + C(6)*CAPITAL(-1) + C(7)*TFP(-1) + C(8)

Forecasting Equation:

==========

ECONOMIC_GROWTH = C(1)*LABOR + C(2)*CAPITAL + C(3)*TFP + C(4)*ECONOMIC_GROWTH(-1) + C(5)*LABOR(-1) + C(6)*CAPITAL(-1) + C(7)*TFP(-1) + C(8)

Substituted Coefficients:

==========

ECONOMIC_GROWTH = 0.946011825804*LABOR + 0.26285950001*CAPITAL + 1.00805445351*TFP + 0.289700518895*ECONOMIC_GROWTH0.134567328522*CAPITAL(-1) - 0.271965979676*TFP(-1) + 0.116889556552

ECONOMIC_GROWTH = 0.95 * LABOR + 0.26 * CAPITAL + 1.00 * TFP + C

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

CONCLUSION AND RECOMANDATION

The research work is divided into two parts. In the first part, the US Aggregate Supply-oriented Economic Growth problems were analyzed, in the second part - those of Japan. The OLS (smallest squares) model was used to analyze Economic Growth and its components (factors of Production: Labor, Capital, and Total Factor Productivity (TFP)) in both countries.

During 1989-2018, both Economic Growth and decline were observed in the USA and Japan. When comparing the results from the point of view of Aggregate Supply, it turned out that although Capital and TFP develop in each monitored country, these countries are currently facing a serious problem of decrease in Labor Force. Thus, the Birth Rates decreased, the rate of aging of the population increased, and Mortality Rate (Death rate) exceeded the Birth Rate. On the other hand, the young population is more interested in education, as the demand for higher education workers in the United States has recently increased, and therefore they do not participate in the Labor Force as long as they study. It should also be noted that although the trend of Male Labor Force Participation (LFP) in the specified countries tends to decline, Female Labor Force Participation (LFP) is growth-oriented.

The result of the study showed that between 1989-2018 the population in the 0-14 age group in the United States decreased from 22% to 19%, in Japan from 22% to 13%. The population aged 15-64 remained stable in 66% in the United States, while in Japan it decreased by 7% and was 61% in 2018. In addition, the 65-year-old population in the United States rose from 12% to 15% of the total population and from 10% to 26% in Japan.

With the help of econometric estimation, the following results were obtained for the US:

- A 1% increase in Labor Productivity increases Economic Growth by 1.01%.
- A 1% increase in Capital Productivity increases Economic Growth by 0.18%.

- A 1% increase in Total Factor Productivity (TFP) increases Economic Growth by 1.01%.

While for Japan,

- A 1% increase in Labor Productivity increases Economic Growth by 0.95%.
- A 1% increase in Capital Productivity increases Economic Growth by 0.26%.
- A 1% increase in Total Factor Productivity (TFP) increases Economic Growth by 1%.

Based on the result of the study and econometric modeling, the following suggestions were made for both countries:

1. Increase the available Labour Force as it plays an important role in Economic Growth.
2. Create conditions for foreign migrants to enter the country and the Labor Market of the country in order to prevent the Labor Force Shortage, adopt relevant laws in this field and facilitate the obtaining of a working visa.
3. Re-involve the aging population in the workforce and raise the retirement age for it. In Japan, the retirement age can be raised much higher than in the US, as the Average Life Expectancy is higher than in the US. If the aging population remains in the Labor Force for a longer period of time, the pension costs spent on this age group and the demand for workers who will take care of them for the elderly population will decrease.
4. Ensure sustainable Economic Growth with existing Capital by creating an educated and highly skilled workforce from the current population.
5. Women face difficulties in entering the Labor Force due to childbirth, while those who enter it postpone the time of birth. For this reason, in order to increase the Birth Rate, the specified female workforce should be assigned a suitable part-time work. This type of Economic Growth will not only increase the Birth Rate, but also increase the workforce.

6. Ensure that more women participate in the Labour Force by creating Gender equality and giving equal pay to women and men in the workplace.
7. In Japan, young workers are given more preference and premium than older workers in companies and enterprises. Such situations demotivate older workers. Re-involve the elderly population in the Labor Force by eliminating such problems.

Elimination of Labor Force Shortages in the USA and Japan is the main solution to the problem of Economic Growth. The increase in Labor Force will create a basis for the development of Economic Growth.

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APPENDIX

Appendix 1. OLS, US econometric model

Dependent Variable: ECONOMIC_GROWTH
Method: Least Squares
Date: 05/03/19 Time: 19:48
Sample (adjusted): 1989 2018
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LABOR	1.013066	0.026989	37.53619	0.0000
CAPITAL	0.181345	0.068493	2.647620	0.0147
TFP	1.010265	0.036267	27.85652	0.0000
ECONOMIC_GROWTH(-1)	0.781719	0.127967	6.108735	0.0000
LABOR(-1)	-0.774858	0.138226	-5.605721	0.0000
CAPITAL(-1)	-0.154429	0.071968	-2.145783	0.0432
TFP(-1)	-0.771450	0.134647	-5.729420	0.0000
C	-0.145028	0.111397	-1.301903	0.2064

R-squared	0.996916	Mean dependent var	1.596667
Adjusted R-squared	0.995934	S.D. dependent var	1.569424
S.E. of regression	0.100073	Akaike info criterion	-1.542648
Sum squared resid	0.220323	Schwarz criterion	-1.168995
Log likelihood	31.13972	Hannan-Quinn criter.	-1.423113
F-statistic	1015.785	Durbin-Watson stat	1.472328
Prob(F-statistic)	0.000000		

Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Appendix 2. Serial correlation test, the Japanese model

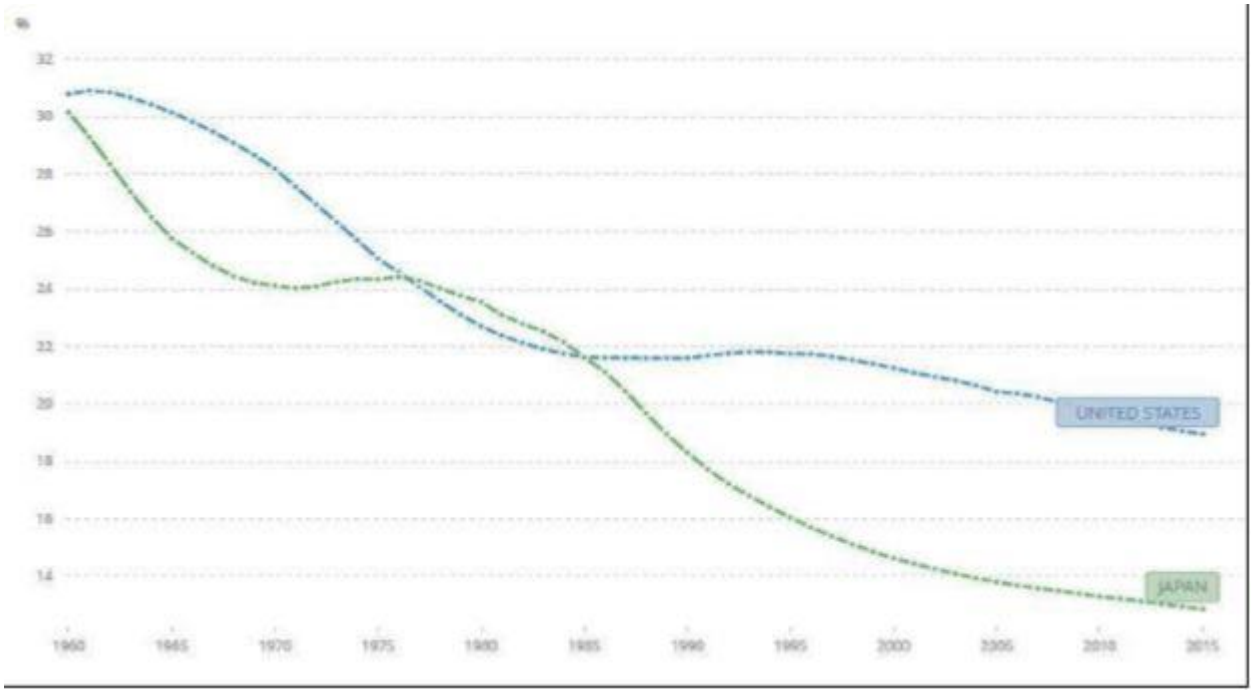
Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.436793	Prob. F(4,18)	0.2625
Obs*R-squared	7.260452	Prob. Chi-Square(4)	0.1227

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/05/19 Time: 00:06
Sample: 1989 2018
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LABOR	-0.014424	0.027545	-0.523653	0.6069
CAPITAL	0.055624	0.063127	0.881141	0.3899
TFP	-0.023103	0.022148	-1.043096	0.3107
ECONOMIC_GROWTH(-1)	0.414515	0.338482	1.224630	0.2365
LABOR(-1)	-0.414698	0.336762	-1.231428	0.2340
CAPITAL(-1)	-0.125422	0.089296	-1.404570	0.1772
TFP(-1)	-0.423124	0.340770	-1.241670	0.2303
C	-0.062835	0.065989	-0.952209	0.3536
RESID(-1)	-0.591819	0.431288	-1.372211	0.1869
RESID(-2)	-0.098406	0.284049	-0.346439	0.7330
RESID(-3)	-0.479584	0.289091	-1.658939	0.1145
RESID(-4)	0.020254	0.266712	0.075941	0.9403

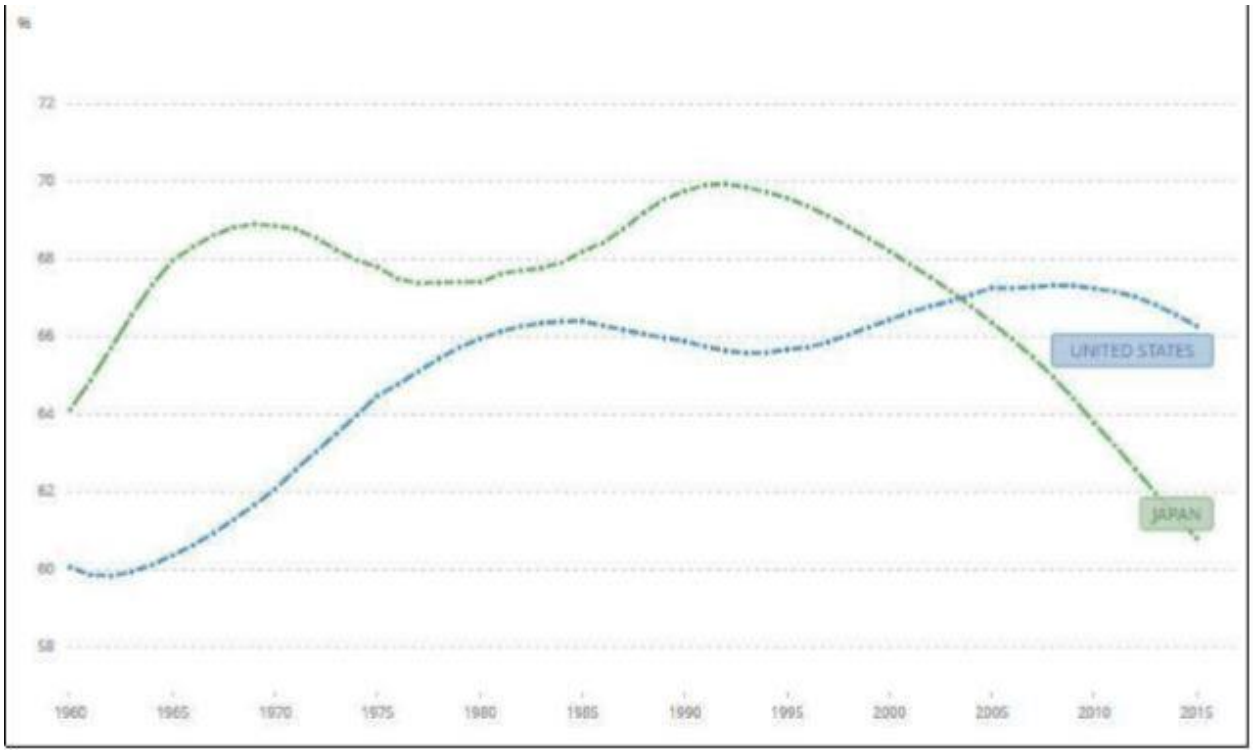
Source: Based on https://stats.oecd.org/ data, prepared by author in Eviews 9

Appendix 3. US and Japan, 0-14 age group (as percentage of total population)



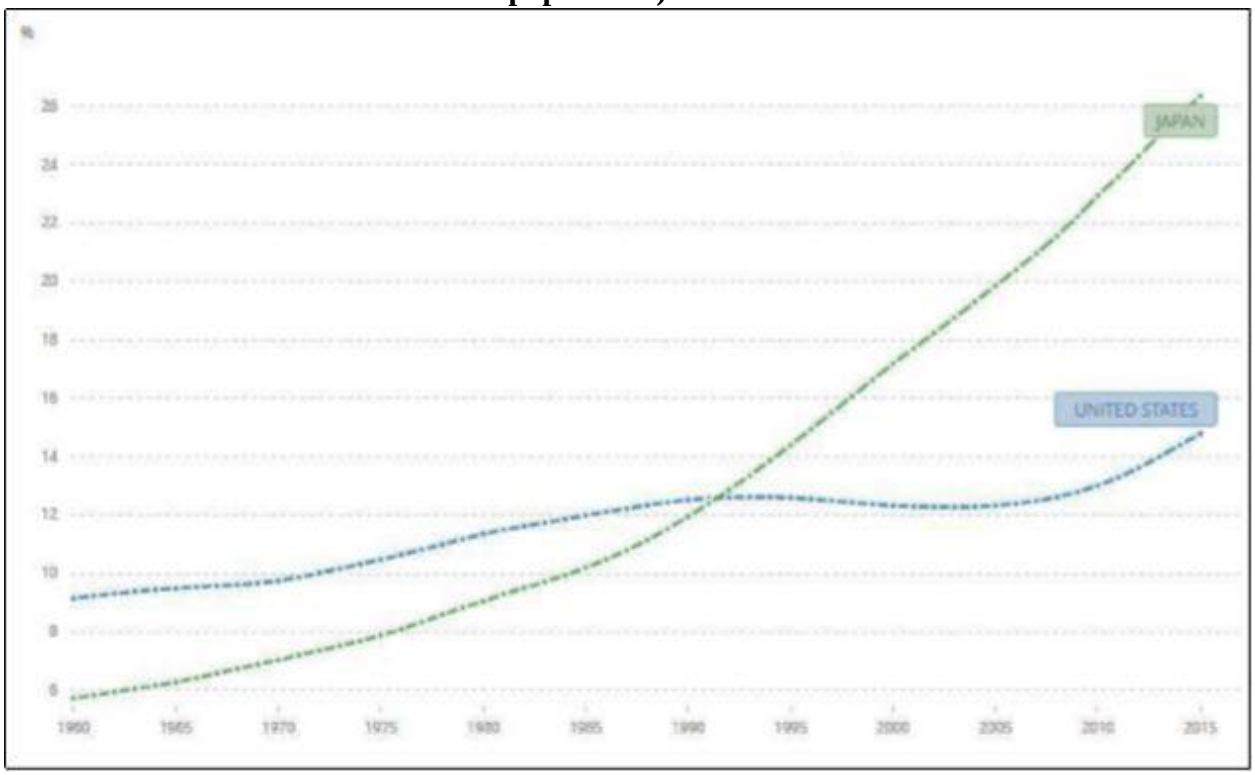
Sources: http://data.worldbank.org | World Bank

Appendix 4.US and Japan, 15-64 age group (as percentage of total population)



Sources: http://data.worldbank.org | World Bank

Appendix 5. USA and Japan, 65 years and older population (as a percentage of the total population)



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