THE DETERMINANTS OF THE JAPANESE ECONOMIC GROWTH (1960-1990) AND THE CAUSES OF ITS RECESSION (1990-2009)

by

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DEDICATION

I dedicate this work to:

–My parents

–My brothers

–My sisters

–My friends

ACKNOWLEGMENT

I express my deep gratitude and my warmest thanks to Professor LEU Gwo-Jiun Mike, my supervisor, for having kindly directed this report, but also and especially for the benevolent orientations, suggestions and rich counsel that he lavished on me.

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ABBREVIATIONS

OECD: Organization for Economic Cooperation and Development

IMF: International Monetary Fund

GATT: General Agreement on Tariffs and Trade

ASEAN: Association of Southeast Asian Nations

BOJ : Bank Of Japan

JGB : Japanese Government Bond

ODA: Official Development Assistance

GFCF: Gross Fixed Capital Formation

GDP: Gross Domestic Product

GNP: Gross National Product

R&D: Research and Development

MITI: Ministry of International Trade and Industry

ADF: Augmented Dickey-Fuller

ABSTRACT

The Japanese economy, after spectacular performance in the decades following World War II, has been surprisingly weak now for more than two decades.

This report is, on the one hand an empirical analysis of the determinants of economic growth in Japan during the period 1960-1990 and, on the other hand an attempt to explain the causes of its disappointing performance in the years 1990s and 2000s. It highlights the methodology of endogenous growth models to identify factors in the growth of Japan. The study shows that the Gross capital formation, the labor and technology have a positive impact on Japan's growth over the period 1960-1990. The result also shows that the economy is affected negatively by the discount rates, the financial crisis and the appreciation of the yen during the years 1990s and 2000s.

The policy recommendations of this study are: a) Japan must maintain a high rate of employment in order to have a high participation rate of labor b) The sector of research and development of Japan needs to be strengthened to maintain the high

level of technology c) The policy of investment of Japan needs to be strengthened d) Japanese economy needs mechanisms to reduce the impact of crises on its economy.

CHAPTER 1: INTRODUCTION

1.0 Background of the study

Finding the best way to boost the economic activity is the subject of intense debate in most of the countries. Over the last hundred years, most countries have experienced significant economic growth in historical terms. A quick overview shows that the phenomenon of rapid economic growth began about two centuries. This growth is manifested by a continual increase in aggregate real income, production, consumption of goods and services, not only in level but also per capita. Each generation gets used in richer countries to a standard of living higher than those of previous generations. Indeed, the improved standard of living of the population and ensuring social welfare are the ultimate goals of government. Whatever the policies, these objectives cannot be achieved without sustained economic growth. The economic growth is synonym of production of goods and services, creation of jobs and wealth. It ensures when well used, the economic, social and human prosperity. For all these reasons, the understanding of growth, its mechanisms, its determinants and its sources has always been a major concern of

policy makers and designers of economic policies. It is clear that economic growth is not a panacea for the country's problems, but it facilitates the implementation of public policies that complement the shortcomings of growth. In short, the growth is a necessary condition but not sufficient to ensure social welfare.

After World War II, in Japan, the necessity to ensure strong economic growth and sustainable development has emerged as a solution to many social problems that undermine the country. We must remember that Japan has suffered considerable losses during the war. In 1945, the Japanese production represented barely a third of that before the war. The human loss amounted to 1.85 million (about 4% of the entire population), and 680 thousand injured or missing. The exports have collapsed and represented only 10% of exports before the war. Japan is a group of islands and its commercial fleet is almost completely destroyed. Prices doubled between 1946 and 1949 creating a climate of high inflation. In addition of the damages, all the colonies are lost, cutting Japan's from its traditional supplies sources (ore, coal) and leading to the repatriation of thousands of settlers of Formosa, Manchuria and Korea.

In 1952, Japan was a "less-developed country". Through a high economic growth the country experienced a transition from a country of low GDP to a country of high GDP during the post war period especially in the 1960s. Japan was able to become the first developing country, in the postwar-era, to achieve the status of developed country. The period between 1962 and 1972 was particularly good. The GNP doubles for the first time between 1960 and 1965, and again between 1966 and 1970. The economy grew at a rapid pace, exceeding 10% per annum during the 1960s. Meanwhile the growth rate of Japan is three times that of Western powers and eventually Japan became the economy with the second largest GDP in the world in 1968. By the 1960s, the country became the second industrial power of the World, before becoming the second commercial power in the 1970s and the first financial power in the 1980s. We have to note that it is from the remnants of an industrial infrastructure that had suffered widespread destruction during World War II that Japan developed its economy. The Japanese economic miracle is the name given to the economic and cultural boom in Japan after the war. This expression, used in the media environment of the 1980s, refers to the economic and cultural

boom of Japan which managed to establish itself among the greatest with the Asian political economy where the years 1950-1960 saw the Japanese electronic and Optics replace the German and American products.

The achievements of the country of the rising sun, especially in the economic field are impressive and attract the attention. Indeed, Japan has succeeded in a short time interval, a miracle that many countries failed to realize in the centuries. After its cruel defeat in the Second World War with losses that any other country in the world has undergone, Japan not only managed to recover but also emerged as an economic power. Indeed, by revitalizing its infrastructure, enhancing its capacity to import and export and its access to American technology, the country experienced the dramatic "Miracle Growth" between 1953 and the early 1970s. The Miracle Growth was the completion of a protracted historical process involving, as Edward Denison and William Chung showed, increased labor input, increased capital stock, advances in knowledge, reallocation of resources away from agriculture, and economies of scale which took decades and decades to realize. The unprecedented rhythm that the

Japanese economy has performed annually for three decades has been studied by economists in the world and is presented as an example for developing countries.

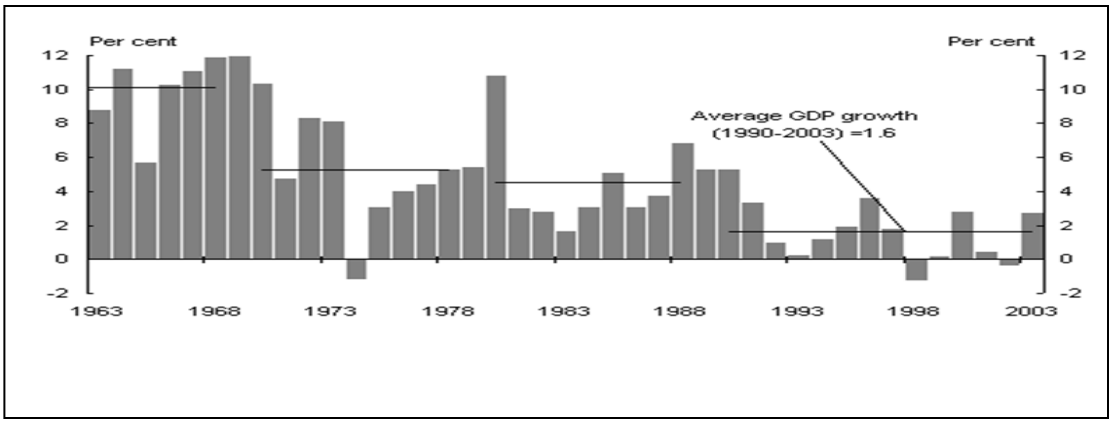
However, the last decade of the twentieth century did not close in beauty the exceptional postwar period of growth. On the contrary, it opens with the most serious economic and financial crisis of the half-century. After four years of speculative euphoria, the Japanese discovered the fragility of their financial strength, based on land values and stock market totally illusory. The values of lands were exceptionally high and the values of interest exceptionally low. This situation led to a position in which credit was both easily available and extremely cheap. In 1989, the prices in the stock market and in real estate rose to extravagant levels: the Nikkei index has tripled in four years (1985-1989), as are lands that are exchanged at more than 16 million yen / m2 (€ 124,300 / m2) on average in the central business districts of Tokyo. The asset inflation has become after four years a scourge. Not only it has degraded housing conditions, but it threatens to impact on overall prices. The authorities decide then to tighten the credit for "breaking" the bubble. It follows a drop in the Nikkei (down from 38 915 to 14 485 points between 1989 and 1994),

and land prices (-70% in central Tokyo), causing a destruction of wealth at an unexpected extent: in total, approximately 840 000 billion yen (€ 6525 billion), a year and a half of GDP, volatilized between 1990 and 1996. This led to a massive crash in the stock market and a debt crisis (a large proportion of the debts that had been run up turned bad, which in turn led to a crisis in the banking sector, with many banks being bailed out by the government). Thus, after decades of "miracle" since the World War II, Japan's economy abruptly declined in 1990s and has stagnated since. The recession will last more than ten years and led to the phenomenon known as the "lost decade".

Similarly, the first decade of the twenty-first century has ended with poor economic performance to such an extent that China has robbed its place of the second creator of wealth of the planet. Indeed, with a strong recession in 2009 (-5.12%), Japan's economy has recovered in 2010, growth reached 3.9%, but that did not allow Japan to keep its second position facing China's rapid ascent.

Investigating the Japanese economy, we can conclude as figure 1 shows that After World War II, this country experienced a sustained expansion. GDP growth averaged around 10 per cent in the 1960s, 5.2 per cent in the 1970s, and 4.6 per cent in the 1980s, slowing because the economy had essentially caught up to the levels of other OECD countries.

Figure 1: Japanese GDP growth



Source: CEIC database.

As it can be seen in the table below, the average per capita GDP growth rate is high during the 1950s and 1960s, began to drop since 1970s, and fell considerably in the 1990s and 2000s. The bursting of the bubble economy in 1990 inaugurated a new cycle. Indeed at the beginning of this year, stock prices plummeted, followed by

sharp declines in real estate prices. This marked the start of a series of major economic recessions (collapse of the bubble economy).

Table 1: Average annual growth rate of real GDP of Japan

1946-1955	10.90%
1955-1973	9.60%
1973-90	3.90%
1990-2000	0.50%
2000-2009	0.60%

Sources: Economic Planning Agency, *National Income Statistics.*

The question thus arises acutely, why Japan had economic performance superior to those of other countries and had in a short time caught up with the western powers. The other question that arises is why the economy has abruptly ceases to grow, what explains this economic crisis.

These issues have been the subject of numerous investigations. For example, Mitsuo Saito (1999, pp.23-151) in his book *The Japanese economy* has attempted to provide an answer to the question by identifying the causes of the high economic growth on the demand side on the one hand and on the other hand, on the supply side, and by doing a simulation of an econometric model. Regarding the recession of the Japanese economy there are many points of view. For example while a lot economists argued that the slump reflects *problems with financial intermediation,*

low rate of return to capital due to over investment (Ando, 1998), *inadequate policy responses* (Posen, 1998), (Krugman, 1998) explained that Japan was stuck in a *liquidity trap.*

1.1 Objective of the study

Following Saito, (Krugman, 1998) and many other economists who were interested in the questions above, this study also attempts on the one hand to provide an explanation to the economic performance of Japan during the period 1960-1990 and, on the other hand tries to find the causes of the disappointing performance during the period 1990-2009.

This study will use the endogenous growth theoretical framework to develop multi-equations structural model to derive the relationship between economic growth and its determinants variables. In doing this, the study will consider macroeconomic variables such as gross capital formation, Inflation, education, exportations, human capital accumulation, research and development expenditure, interest rate, exchange rate. The study will use Regression techniques to estimate the real per capita GDP

growth rate and trace the channels through which the above factors could influence economic growth.

1.2 Research Questions and hypothesis

This study will investigate three main questions:

1. What is the impact of macroeconomic variables such as education, exportations, labor, interest rate, exchange rate, technology, inflation on the real per capita GDP growth rate in Japan during the postwar period?

2. What are the causes of the Japanese economic slump of the 1990s and 2000s?

3. Based on the investigations of question 1, what are the possible channels through which the factors could affect growth in Japan?

In order to answer the first question, this study will test the following hypotheses:

1. Changes in real per capita GDP growth rate of Japan are directly and positively related to the gross capital formation.

2. Changes in real per capita GDP growth rate of Japan are directly and positively related to the export.

3. Changes in real per capita GDP growth rate of Japan are directly and positively related to the labor participation rate.

4. Changes in real per capita GDP growth rate of Japan are directly and positively related to the human capital.

5. Changes in real per capita GDP growth rate of Japan are directly and positively related to the Banking Credit.

6. Changes in real per capita GDP growth rate of Japan are directly and negatively related to the inflation.

7. Changes in real per capita GDP growth rate of Japan are directly and positively related to the technology.

8. Changes in real per capita GDP growth rate of Japan are directly and positively related to the growth rate of population.

9. Changes in real per capita GDP growth rate of Japan are directly and negatively related to the oil shocks.

To answer the second question, this study will test the following hypotheses:

1. Changes in real per capita GDP growth rate of Japan are directly and negatively related to the appreciation of the yen during the period of recession.

2. Changes in real per capita GDP growth rate of Japan are directly and negatively related to the increase of the central bank discount rates during the period of recession.

3. Changes in real per capita GDP growth rate of Japan are affected by the 1990s financial crises.

1.3 Significance of the study

This study is an addition to the literature of empirical studies of Japanese economic growth and will make the following contributions:

Develop a model that will find the variables that affect the growth rate of the Japanese economy.

Unlike the previous studies, this study will consider two periods: the period of economic growth (1960-1990) and the period of the decline of the Japanese

economy (1990-2009). It will analyze at the same time the determinants of the Japanese economic growth and the causes of its collapse.

This study is expected to contribute to the empirical literature of Japanese economic growth by applying appropriate econometric techniques to test the structural model in order to trace the possible channels through which the macroeconomics variables influence the Japanese economic performance.

1.4 Organization of the study

The remainder of this study is organized as follows: **Chapter 2** analyses the features of the Japanese economy. **Chapter 3** is devoted to the economic growth during the post war period and to the explanation of the causes of the recession in growth during the 1990s and after.

Chapter 4 reviews the literature on economic growth theories, with emphasis on the new growth theories, as well as the recent empirical growth studies conducted on the Japan economy. **Chapter 5** focuses on the theoretical framework and the specification of the growth model used in this study. **Chapter 6** presents the

methodology and the empirical testing and analyzes and interprets the results of the regression. **Chapter 7** presents the conclusions, the policy recommendations and prospects for Japan economy.

CHAPTER 2: THE PROFILE OF THE JAPANESE ECONOMY

Japan (Nihon in Japanese, "Land of the Rising Sun"), East Asian state located off the coast of Russia and Korea, consists of four main islands oriented along an arc northeast - southwest (Hokkaido, Honshu, Shikoku, Kyushu) and more than 6,800 smaller islands. Japan's total area is 377,837 sq. km. Located on the largest island, Honshu; Tokyo is the capital and largest city of the country. The population of Tokyo accounts for one-fifteenth of the total population of Japan.

In Japan, the sea (umi) and the mountain (yama) are never far apart. The mountain covers three-quarters of the country. Forests account for the largest portion of the nation's surface area. It covers 66.4 percent of the nation's area. The farmland is 12.8 percent of the total area of Japan. Together, forests and Farmland cover approximately 80 percent of the nation.

In terms of the demography, in 2009, Japan's population was estimated at 127,510 with a birth rate the lowest in the world: 8.5 births per 1000 inhabitants. Japan's population was the tenth largest in the world. The population density is 342

inhabitants per sq.km. In **table 2,** it is seen that the population density of Japan is very high.

The annual population growth which was 0.25 percent between 1990 and 1995 fell to 0.22 percent for the period 1995-2000. It continued to decline and even became negative for the period 2005-2009 as the t**able 2** shows. Population growth in Japan has primarily been driven by natural increase which became negative from 2005 (**see table 3**). Since the 1970s the birth rate has followed a steady downtrend, reaching 9.6 in 1993. After an increase in 1994 (10), it fell again to 8.4 in 2005. The general decline in the birth rate is partly attributable to the rise in the average age at which women bear their first child. The fertility rate was in 1995 1.42 children per woman. It continued to decline, and was 1.37 in 2009 (**see table 3**). The death rate was 9.1 in 2009. After the World War II, life expectancy at birth in Japan climbed sharply, and with 86.44 years for women and 79.59 years for men in 2009, was the highest in the world.

As the **table 2** shows, the younger age population and the elderly (65 years and over) were respectively 13.3 percent and 22.7 percent of the total population in 2009.

Table2: Trends in population

Years	Population (in thousands)	Composition of ages (in percentage) under 14	15-64	more than 65	increase rate of annual average	Density of population (per square km)
1960	94,302	30.2	64.1	5.7	0.92	253
1965	99,209	25.7	68	6.3	1.02	267
1970	104,665	24	69	7.1	1.08	281
1975	111,940	24.3	67.7	7.9	1.35	300
1980	117,060	23.5	67.3	9.1	0.9	314
1985	121,049	21.5	68.2	10.3	0.67	325
1990	123,611	18.2	69.5	12	0.42	332
1995	125,570	16	69.4	14.5	0.31	337
2000	126,926	14.6	68	17.3	0.21	340
2003	127,687	14	67	19	0.16	342
2004	127,776	13.9	66.6	19.5	0.07	343
2005	127,756	13.6	65.3	21	-0.02	343
2006	127,770	13.6	65.5	20.8	0	343
2007	127,771	13.5	65	21.5	0	343
2008	127,692	13.5	64.5	22.1	-0.06	342
2009	127,510	13.3	64	22.7	-0.14	342

Source: Statistics Bureau, MIC; United Nations; Ministry of Health, Labor and Welfare.

Table 3: Demographic Statistics

Year	Birth rate (per thousands)	Death rate (per thousands)	Infant mortality rate (per thousands)	Natural increase rate (per thousands)	Total fertility rate	Life expectancy at birth (years)	
						Males	Females
1950	28.1	10.9	60.1	17.2	3.65	59.57	62.97
1955	19.4	7.8	39.8	11.6	2.37	63.6	67.75
1960	17.2	7.6	30.7	9.6	2	65.32	70.19
1965	18.6	7.1	18.5	11.4	2.14	67.74	72.92
1970	18.8	6.9	13.1	11.8	2.13	69.31	74.66
1975	17.1	6.3	10	10.8	1.91	71.73	76.89
1980	13.6	6.2	7.5	7.3	1.75	73.35	78.76
1985	11.9	6.3	5.5	5.6	1.76	74.78	80.48
1990	10	6.7	4.6	3.3	1.54	75.92	81.9
1995	9.6	7.4	4.3	2.1	1.42	76.38	82.85
2000	9.5	7.7	3.2	1.8	1.36	77.72	84.6
2001	9.3	7.7	3.1	1.6	1.33	78.07	84.93
2002	9.2	7.8	3	1.4	1.32	78.32	85.23
2003	8.9	8	3	0.9	1.29	78.36	85.33
2004	8.8	8.2	2.8	0.7	1.29	78.64	85.59
2005	8.4	8.6	2.8	-0.2	1.25	78.53	85.49
2007	8.6	8.8	2.6	-0.1	1.34	79.19	85.99
2008	8.7	9.1	2.6	-0.4	1.37	79.29	86.05
2009	8.5	9.1	2.4	-0.6	1.37	79.59	86.44

Sources: Ministry of Health, Labor and Welfare.

After the presentation of the country and its demography we will now in this chapter analyze the characteristic of its economy.

2.1 An economy poor in natural resources

In terms of natural resources the archipelago is poor. Japanese nature offers little in terms of energy and mining. As the **table 4** shows Japanese reserves and production of coal and oil, and production of iron ore are less abundant than those of the other countries like Australia, Canada, China, former USSR, and USA.

The mineral resources of Japan are varied but limited. Limestone, copper, lead, zinc and quartzite are extracted in sufficient quantities to meet domestic demand. Coal is the only raw material present in substantial quantities. It is extracted in eastern Hokkaido, Fukuoka and Kyushu. They are, however, poor coal and the extraction is difficult. Japan produces no bauxite, magnesium, nickel ore, and phosphate rock.

The energy resources are almost not available and the country relies on imports for 80% of its energy. Its energy self-sufficiency rate is 19% but dropped to 4% if we exclude nuclear energy (compared to that of France is 50%). Its dependence is extreme towards the Middle East in terms of crude oil, where it imports 87% of its

consumption, which requires this country to deal with instability in the region. Beside, Japan has no a developed refining tool.

Table 4: Mineral resources and production

Countries	Resources in Coal (Billion metric ton	Production (million metric tons)	Reserve in crude Petroleum (million metric tons)	Production (million metric tons)	Production In Iron-bearing ores (thousand metric tons)
	1977	**1972**	**1978**	**1990**	**1993**
Australia	249.3	157.2	0.3	38.7	70.3
Canada	24.7	49.2	0.8	135.6	23.7
China	1,011	796.6	2.7	203	86.1
Brazil	11.6	3	0.2	46	—
USA	2,804.80	746.7	3.8	602.9	34.9
UK	—	70	1.4	135.2	0
Germany	230.5	141.1	0	4.7	—
Former USSR	6,790	434	8	740.7	133.6
Japan	8.6	6.7	0	1.2	0

Sources: United Nations (1981, 1994b, 1993)

2.2 High GDP

Japan ranks considerably higher in GDP. In **table 5**, Japan's GDP is the second largest in the world. In 1950, the level of GDP of Japan was about 4% of that of USA, while it is rose to 21%, 40%, and 60% of the USA value in 1970, 80, and 91, successively. For three decades, overall real economic growth had been spectacular - a 10% average in the 1960s, a 5% average in the 1970s, and a 4% average in the

1980s. In the 1990s, growth slowed markedly, averaging just 1.7%, largely because of the after effects of inefficient investment and an economic bubble in the late 1980s that required a protracted period of time for firms to reduce excess debt, capital, and labor. However Japan's level of GDP remained the highest behind the United States GDP.

Table 5: Total Gross Domestic Product of selected countries (in billions of US dollars)

	1960	1967	1970	1980	1990	1991	2000	2009
Australia		30.60	41.57	150.78	314.51	329.96	416.92	924.84
Belgium	11.65	19.99	26.34	125.11	202.56	207.67	232.37	471.16
Canada	41.09	64.76	86.30	268.89	582.72	598.20	724.91	1336.06
China	61.3	72.05	91.50	189.4	356.93	379.46	1198.48	4985.46
Brazil	15.16	30.59	42.32	235.02	461.95	407.33	644.70	1573.40
Germany			208.86	919.60	1714.47	1808.60	1900.22	3330.03
France	62.65	119.46	146.98	691.14	1244.45	1244.06	1327.96	2649.39
United Kingdom	72.32	111.18	124.79	541.91	1012.57	1055.84	1477.58	2174.53
Japan	44.30	123.78	205.99	1070.99	3058.03	3484.77	4667.44	5068.99
Korea, Rep.	3.89	4.70	8.899	63.83	263.77	308.18	533.38	832.511
Thailand	2.76	5.63	7.08	32.35	85.34	98.23	122.72	263.77
United States	520.53	825.05	1024.8	2767.5	5754.8	5943.2	9898.8	14119

Source: world Bank indicators

2.3 An industrial economy

Japan is one of the most industrialized countries in the world and its industrial structure has undergone a major transformation in the half-century since the end of World War II. **Table 6** gives the industrial composition of employment and GDP over time. We see that the primary industry which accounted for 19.3 percent of employed persons and 5.9 percent for GDP in particular has fallen dramatically since 1970, when Japan experienced a long-standing rapid economic growth. For 34.0% of employed persons and 43.1% for GDP, the secondary industry's share of employed persons and GDP also began to decline gradually during the 1980s. The Japanese economy has strongly "tertiarized". The tertiary industry which accounted for 46.6 percent of employed persons and 50.9 percent for GDP have risen consistently.

In 2005, the primary sector provided 1.5% of the production, the secondary sector 26.8% while the tertiary sector was 71.7%. The tertiarization is mainly due to the development of telecommunications and financialization.

Table 6: Changes in Industrial Structure

	persons Employed			Investment (GDP) (%)		
Year	Primary industry	Secondary industry	Tertiary industry	Primary industry	Secondary industry	Tertiary industry
1955	41	23.4	35.5	19	33.7	47
1960	32.7	29	38	12.8	40.8	46.4
1965	24.7	31.5	43.7	9.5	40	50
1970	19	34	46.6	5.9	43	51
1975	13.8	34	51.8	5.3	38.8	56
1980	11	33.6	55.4	3.5	36	60
1985	9	33	57.3	3	34.9	62
1990	7	33	59	2.4	35.4	62
1995	6	31.6	61.8	1.8	30.4	68
2000	5	29	64.5	1.7	28.5	70
2005	4.8	26	67	1.5	26.8	71.7

Source: Statistics Bureau, MIC; Cabinet Office.

Japan is among the world's largest and most technologically advanced producers of motor vehicles, electronic equipment, machine tools, steel and nonferrous metals, ships, chemical, textiles, and is home to some of the largest and most well-known multinational corporations and commercial brands. Japan holds very large market shares in high-technology industries such as electronics, industrial chemicals, machine tools, electronic media and (in recent years) aerospace. Construction has

long been one of Japan's largest industries. The automobile, machinery and electronics industries are the largest and a major driving force within Japan's industrial sector.

Industry is concentrated in several regions, in the following order of importance: the Kanto region surrounding Tokyo, especially the prefectures of Chiba, Kanagawa, Saitama and Tokyo (the Keihin industrial region); the Nagoya metropolitan area, including Aichi, Gifu, Mie, and Shizuoka prefectures (the Chukyo-Tokai industrial region); Kinki (the Keihanshin industrial region); the southwestern part of Honshu and northern Shikoku around the Inland Sea (the Setouchi industrial region); and the northern part of Kyushu (Kitakyushu).

The main industries are:

a) Mechanical industries, key sector

● Shipbuilding

Japan is the world leader since 35 years. It produces on its own 40% of world production (30% to Korea becoming a formidable competitor)

●The construction of automobile represented by Toyota, Nissan, and Honda firms: second place worldwide for the production. Japan is on its own 20% of cars produced worldwide (about 8 million cars a year). It is a sector that the country has recently chosen to develop highly because of its expansion and its ripple effect on many industries. Boom from the 50s, today it is a key sector which exports a lot (to the U.S first) but also has a large domestic market.

b) The boom of high-tech industries: new pole of growth

●The high-tech

It is thanks to the crisis of the 1970s that Japan began a reorientation of its industrial: all of its strong industries (heavy, mechanical) facing the crisis, tougher competition and lower demand sustained, Japan began to invest more in high technology, convinced that these sectors were those of the XXI century.

Japan has become a great power in high-tech industries and this sector became important for the country which gradually abandoned the common technologies and sectors with low yields.

The high-tech industries are:

–Electronics: semiconductors, consumer electronics, watches, optics,

–Office automation and Telecom: printer, photocopier, computer

–Robotics

c) Heavy and traditional industry

●Steel

Although declining (production record in 1973), the Japanese steel industry has been since 1993 the world leader (USSR collapse) followed by China and the U.S. The growth of the steel industry has been extraordinary in years from 1950 to 1973, from the Korean War, resulting in a boom in production. It will be the basis of the power of auto and naval construction.

●The chemical industry

●The industry of aluminum

Japan is first a great industrial power: in 1996 the secondary sector was 1 / 3 of assets and 40% of GDP (share down slightly, the maximum was reached in the 80s). It is therefore an economic model based on the industry, very different from the Anglo-Saxon model centered on services. The power of this industry is the

foundation of Japan's success and it is because of this that Japan became a commercial and financial power.

Table 7 shows the rank of Japanese transnational Company (TNC) in terms of their ownership of foreign assets in 1999. The largest Japanese transnational which is Toyota, is ranked as the sixth largest transnational in the world, and the third largest in the automobile sector. However, the degree of transnationality is greater in companies such as Honda, which owns almost 60% of its assets outside Japan. By 1996, Toyota was in the top three, almost quadrupling its market share to 9.4%. In the top 10 were Nissan (5.4%), Honda (4.0%) and Mitsubishi (3.3%). In the case of Honda, its global market share has increased 20 times since 1966 and it was the world's leader in construction of motorcycle. Sony was the world's largest company in audio and video equipment and Fujitsu was in the top three of the world's computer manufacturing (Toyo Keizai, 1999).

As the **table 8** shows, in all sectors, there is an increasing move by Japan's transnational towards overseas production. Since 1985, the overseas production has been multiplied by four. Indeed, between 1985 and 1995, the growth rate in Japan's

overseas production was twice that of both the United States and Germany. At the industry level, between 1992 and 1996, Japanese overseas production doubled in chemicals, industrial machinery, iron and steel and precision tools. The main sectors are electrical machinery (19.7%) and transport equipment (24.9%).

Table 7: Japan's Top TNCs Ranked by Ownership of Foreign Assets (Billions of dollars and numbers of employees)

Corporation	Industrial sector	Asset		Sales		Global rank by foreign assets	
		Foreign	Total	Foreign	Total	all tnc's	by sector
Toyota	Automotive	41.8	105	50.4	88.5	6	3
Nissan Motor	Automotive	26.5	57.6	27.8	49.7	17	7
Sony Corp.	Electronics		48.2	40.3	51.1	21	2
Mitsubishi Corp.	Diversified	21.9	67.1	41.5	120.4	22	1
Honda Motor	Automotive	21.5	36.5	31.5	45.4	24	8
Mitsui & Co Ltd	Diversified	17.9	55.5	52.3	132.6	35	2
Matsushita Elect.	Electronics	12.2	62.7	23.6	59.7	55	6
Hitachi Ltd.	Electronics	12	76.6	19.8	63.8	56	7
Fujitsu Ltd.	Electronics	11.2	38.8	14.1	37.7	59	9
Mitsubishi Motors	Automotive	9.1	25.1	10.9	28.3	70	13
Bridgestone	Tyres	7.2	13.3	9.8	16.7	93	2
Canon Electronics	Electronics	7	22	14.6	21.2	96	11
Toshiba Corp.	Electronics	6.8	44.9	14.6	41.3	98	12

Source: United Nations Conference on Trade and Development (UNCTAD) (1999)

Table 8: Comparative Growth of Japanese Manufacturing Production

Overseas Percentage of Domestic Production

	1985	1992	1993	1994	1995	1996	1997
Japan	100	206.7	246.7	286.7	300	386.7	433.3
United States	100	156.6	150.6	156.6	172.9		
Germany	100	109.6	128.3	138.5	141.6		

Comparative growth in overseas production

All manufacturing (Index 1985 =100, all countries)

Source: MITI (1998).

2.4 An important role of the state

Japan is a liberal state. However the State plays an important role. Its actions have helped initiate new industries, cushion the effects of economic depression, create a sound economic infrastructure, and protect the living standards of the citizen. It organizes and directs the Japanese economy toward the goals that seems to be the best. The State is thus on the origins of Japan's economic development with the desire of the state since MEIJI, to build a great power capable of escaping foreign domination.

The Ministry of Finance have played an important role, for instance in their targeting of investments funds. It establishes low interest rates and, by thus reducing the cost of investment funds to corporations, promotes industrial expansion.

The Ministry of Transportation is responsible for supervision of all land, sea, and air transport.

The Ministry of Construction is in charge of supervising all construction in Japan and Japanese construction abroad. Its responsibilities also include land acquisition for public use and environmental protection as it related to construction.

The Ministry of Health and Welfare is responsible for supervising and coordinating all health and welfare services, and the Ministry of Posts and Telecommunications is responsible for the postal service and electronic communications.

MITI (Ministry of International Trade and Industry) plays a fundamental role in the economy. MITI's role has been especially strong in the shaping and directing of industrial policy, often in close consultation with private enterprise.

It is responsible for the regulation of production and the distribution of goods and services. It develops plans concerning the structure of Japanese industry. MITI has

several special functions: controlling Japan's foreign trade and supervising international commerce; ensuring the flow of goods in the national economy; promoting the development of manufacturing, mining, and distribution industries; and supervising the procurement of a reliable supply of raw materials and energy resources. In terms of information it collects data on technology and foreign markets, translates it and provides a database to the companies. It defines the priority sectors, organizes the restructuring and mergers, facilitates the rapid adaptation of the Japanese economy and ensures the shift to high-tech activities. On the commercial side, it regulates the competition, sets standards. It contributes to the tremendous trade surplus.

In the period directly following the war its aim was reconstruction and the achievement of economic independence. In recent years, MITI has become less interventionist and its policy focus has gradually changed to structural adjustment and technology policy (see also Okimoto, 1989).

2.5 Significant weight of foreign trade

While in the 60s Japan had a deficit with most of its trading partners, it became the third commercial power of the world behind the U.S. and Germany with about 9% of global exports in the 80's. It has become more and more open, occupying an important position in international trade. Its economic power relies traditionally on the strength of its exports. Japan is the fourth country for its exports (after China, Germany and the United States) and the fifth for its imports (behind the United States, China, Germany and France).

It is the second largest importer of raw materials and energy: oil, gas, coal, uranium, iron, bauxite, copper, wool. This represents 25% of its purchases. Suppliers: Saudi Arabia, Indonesia, China, Australia. It is the first world importer of food, including seafood, meat, wheat, corn (U.S. No. 1 supplier). Exports are machinery, vehicles and high tech. Automobiles (15% of exports absorbed by U.S. 45%), motorcycles, boats, office equipment, machine tools and electrical engineering and electronics are the most important positions. In heavy industries steel sales dominate.

The main trading partners of Japan:

►The East Asia is the first outlet of the country (40 to 50% of sales). This shows the importance of the area for Japan.

►The U.S. is another key trading partner of Japan (25 to 30% of exports). It is the American market which absorbs the bulk of Japanese industrial products. U.S. imports from Japan are concentrated within three main categories. The Japanese exportations to U.S. have consisted of passenger cars and parts; computers and components; office machinery parts; and electrical machinery (primarily video cameras).

The economic policy of U.S. aimed to access Japan's markets. It consists of promoting two-way investment, stimulating domestic demand-led economic growth, promoting economic restructuring, improving the climate for U.S. investors, and raising the standard of living in both the United States and Japan. The U.S.-Japan bilateral economic relationship - based on enormous flows of trade, investment, and finance - is strong, mature, and increasingly interdependent. Japan is a major market for many U.S. products. The United States exports products including chemicals,

pharmaceuticals, films and music, commercial aircraft, nonferrous metals, plastics, and medical and scientific supplies.

►In recent years Japan became more established in Europe with growing trade that is fast but still represents only 15%, Germany and the UK are first partners, while trade with France remains modest.

Japan is beneficiary with almost all its partners. Only trade with oil producing countries is in deficit and some countries such as China.

Table 9: Foreign trade statistics (In billions of dollars)

Years	Total Exports	Total Imports
1979	108.87	92.53
1980	117.13	126.73
1985	191.41	159.05
1990	311.254	267.832
1995	443.996	347.864
2000	464.692	395.527
2005	636.611	542.38
2006	677.782	677.782
2007	733.111	670.065
2008	807.207	723.705
2009	895.228	877.887

Source: World Bank Indicator

In terms of trade as shown in **table 9**, Japan has recorded a trade surplus continually in recent years.

2.6 A Country with Strong International Economic Relations

Since the nineteenth century, Japan has a special place in international relations. Indeed, a long time influenced and subject to the Chinese empire by the system of tribute, Japan under the Meiji period will develop a new strategy in the region where the model is based on the development and Western modernization. In fact, after the Meiji Restoration (1868)**,** the government and people fully recognized the importance of introducing the advanced civilization of the Western countries and developing international trade with them.

Japan attaches importance to "economic diplomacy" (keizai Gaikou). That is to say that Japanese diplomacy considered important the development of foreign trade for economic recovery and economic independence. Diplomatic efforts have enabled Japan to achieve its accession to the OECD to participate in the system of the IMF and GATT, and finally to achieve accelerated economic growth. The GNP has

doubled in just over a luster and then continued to grow at a rate of 10% to 14% per annum until the late sixties. As the Japanese economy has risen to world leadership, foreign policy was based on the principles: respect of the United Nations, cooperation with the liberal countries and maintaining a strong position in Asia.

Attaching importance to ASEAN as a regional system, Japan has begun to focus on regional cooperation with that organization. Japan has increasingly expanded its influence in Asia. By cooperating with the United States as a member of the developed countries, Japan has given full weight to opinions from Asia.

ODA is a symbol of Japan's international contribution. The total official development assistance from Japan has increased dramatically from 1986 to 1988 (34% annual average), and in 1989 Japan became in absolute value the first provider of official development assistance worldwide.

With the rise of imperialism in the twentieth century, Japan was involved in several conflicts and is counted among the vanquished of World War II. Under the American protectorate, Japan will be frequently put to the test in an area that will have two major Communist powers: China and North Korea. Now threatened by the

nuclear ambitions of North Korea, and having latent conflicts with China, the country has deployed for the first time in 2009, a missile shield.

2.7 A country with high rate of savings and investment

One of the characteristics of the Japanese economy is the high rate of savings which supported the high rate of investment. Indeed, one key to Japan's successful economic performance has been its high rate of savings. The high savings have financed the high rate of investment which is the basic supporting factor for the economic growth of the 1950s, 1960s, and the early 1970s, and helped meet capital shortages abroad during the post-1973 era of stable growth.

Japan's saving rate was one of the highest in the world. Table 10 shows the gross domestic savings as percentage of the Gross Domestic Product (GDP). It shows that the rate in the 70s, in the 80s and the early 90s had been higher than any other developed country.

For example in 1970, Japanese share of gross domestic saving in GDP, accounting for 40.36 percent, was higher than 18.39 percent for the United States, 21.13 percent for the United Kingdom and 26.69 percent for France.

Investment has always played a central role in the Japanese economy. Its rate rose steadily, peaking in 1970s. In fact, as the table 11 shows, in 1970s and 1980s, Japan outran most of the developed countries.

Table 10: Gross domestic savings (% of GDP)

	1970	1975	1980	1985	1990	1995	2000	2005	2008
United States	18.39	18.42	19.79	17.54	16.31	16.86	16.71	14.14	12.47
United Kingdom	21.13	17.8	20.06	19.64	18.06	17.03	15.81	13.63	14.05
Germany	29.03	21.06	20.51	19.50	23.09	22.69	22.12	22.17	24.92
France	26.69	23.85	22.22	18.28	21.17	19.70	21.36	19.46	19.82
Brazil	20.12	22.87	21.09	24.35	21.40	16.50	16.48	19.81	20.87
Canada	24.06	23.22	24.83	23.23	21.04	21.95	25.98	25.79	24.68
Belgium	30.24	25.32	21.81	18.79	24.67	24.55	25.42	25.77	24.88
China	28.92	30.19	34.82	34.27	39.13	43.53	37.52	47.62	51.76
Japan	40.36	32.87	31.41	31.75	33.66	29.74	26.89	24.95	23.75
Korea, Rep.	15.16	20.15	23.90	30.55	36.43	36.57	33.41	32.38	30.03
Thailand	21.16	22.12	22.88	25.51	33.83	35.35	31.46	30.32	31.47
Australia	31.17	25.23	26.39	24.26	25.42	21.67	22.40	23.12	25.69

Source: World Bank Indicators

Table 11: Investment (% of GDP)

	1970	1975	1980	1985	1990	2000	2005	2008
Australia	31.46	25.77	25.96	26.39	27.36	24.35	25.56	27.51
Brazil	20.54	26.83	23.34	19.20	20.16	18.25	16.20	19.91
Canada	21.51	24.97	22.98	20.91	20.91	20.23	22.07	23.13
China	29.02	30.16	35.19	38.34	36.14	35.11	42.09	44.04
France	26.45	23.22	24.20	19.22	22.52	20.46	20.32	22.04
United Kingdom	20.09	19.25	17.59	18.24	20.18	17.65	17.05	16.65
Japan	39.12	32.86	32.32	28.36	32.72	25.43	23.56	23.60
Thailand	25.57	26.73	29.14	28.24	41.35	22.83	31.44	28.87
United States	18.01	17.43	20.26	20.29	17.66	20.57	19.88	17.42

Source: World Bank Indicators

CHAPTER 3: THE ANALYSIS OF THE JAPANESE ECONOMIC GROWTH

Japan has experienced in recent decades a major economic development, which began really in the 1950s. Indeed, the pre-war nation experience has provided several important legacies. On the one hand, the Tokugawa period (1600-1867) which bequeathed a commercial sector to burgeoning urban centers, a relatively well-educated elite, a productive agriculture, a nation closely united with a marketing and financial systems highly developed, and national infrastructure roads and, on the other hand, the development of the industry during the Meiji period to such an extent that Japan could fight for world power, were important prelude to the post-war growth. Moreover, the level of investment was very high and that until the 80s. The investment in capital which averaged more than 11% of GNP during the prewar period has risen about 20% of GNP in the 50s and more than 30% by the late 60 and 70s. During the economic boom of the late 1980s, the rate was still hovering around 20%. Japanese firms have imported the latest technology to develop the industrial base. In the 70s and 80s, Japan has improved its industrial base through authorization technology, procurement of patents, and imitation and improvement of

foreign inventions. In the 80s, the industry has intensified its research and development, and many companies have become famous for their innovation and creativity.

During the decades 60, 70 and 80, the Japanese growth reached almost the double what was observed at this time in Europe or in the United States. The market share of Japan in the world trade rose from 1.8% in 1953 to 10% forty years later, making the country the second largest commercial power, behind the United States, at a level substantially identical to that of Germany. However, the too expansive management of the economic policy by the Japanese authorities (rates too low, too high deficits while growth was sustained) led to the formation of a bubble in asset prices. The explosion of the bubble in the early 90s marked the end of one era and the beginning of a period that was later dubbed "the lost decade." This name has its origins in the too slow response of public authorities to the crisis. The establishment of an expansive fiscal policy, the fall in rates, the launch of a non-conventional monetary policy to thwart the emergence of a liquidity trap, the support to the banking sector arrived whenever too late or at the wrong moment. In these

circumstances, Japan experienced a period of extremely low growth marked by a complete shutdown of the engine of credit and debt reduction in the private sector that the public sector tried to curb by increasing massively its deficit. The measures taken however proved to be ineffective, failing to restart the economic machine and stop the deflation.

In this chapter, we will do an analysis of Japan's economic growth in two sections. The first section analyzes the economic growth in postwar Japan and the second analyzes the recession of the Japanese economy during the period 1990-2009.

3.1 The economic growth in postwar Japan

There is a clear demarcation in the growth trend before and after the year 1973. The period from the end of the World War II until 1973 is known as the rapid growth era with real GDP per capita rising at 8 per cent annually on average, while the period after this year until 1990 can be designated as the “slow growth era” with real GDP per capita rising at about 4 per cent annually. In this section, we will be, in a first

time concerned with the basics of the Japanese growth model and in a second time we will analyze the different periods of growth.

3.1.1 Basics of the Japanese growth model

●An interventionist state

The state invests in the areas it considers vital to guarantee the national independence. Despite its limited resources, it curries out or subsidizes the necessary infrastructure for communications, intervenes directly in the extraction of raw materials and creates large pole of heavy industry (steel company Yahata). But these expenses dig the public deficit. The state then gives its companies to private individuals or companies from 1880. Abandoning its role as an entrepreneur, it practices a supple guiding of the economy, based on close ties of public-private cooperation.

In the mid '50s, the state intervention is no longer intended to finance the economy, but it coordinates the private action, especially concerning economic policy (investment, industrial strategies).

MITI: Ministry of Industry and Commerce, founded in 1949, plays a key role.

It controls the action of public banks, which help finance investment in the industry; it intervenes in the direction of investment and in the definition of key industries, priority, or in restructuring.

This collaboration between state and private firms has been made in the goal of a strong industrial growth, sometimes to the detriment of other aspects of development (standard of living of households, purchasing power, housing conditions, and pollution on the environment).

●A dual economy

What characterized the prewar Japanese economy is reflected even more pronounced after the war:

► On the one hand, a modern sector composed of large firms that play an increasing role in global markets.

► On the other hand, a traditional sector composed of small businesses, artisans, workers that use little capital but a cheap workforce. This traditional sector is bound by traditional outsourcing contracts with large firms.

Small businesses are numerous in traditional industry (silk, toys), but there are also small modern enterprises (high growth global markets) that subcontract for large groups.

It is this second sector that absorbs the surplus of the cheap labor and which in times of difficulty, supports economic shocks (such as firing or retaining workers without paying them, or by reducing wages).

One finds this dualism in the statutes of workers:

There is a primary labor market with stable employment ("Lifetime"), wages that increase with seniority (that keeps the workforce) in large firms.

A second labor market, more subject to market forces, more flexible, formed by employees of small businesses, women, older workers.

The disposal of mines and enterprises also promotes the concentration of the economic activity. In the absence of a capital market, it is the financiers who acquire public goods. Among these groups are Mitsui, Mitsubishi, Sumitomo and Yasuda, who have built their financial power on international trade, through their powerful

sôgô shôsha[1]. The state encourages their concentration by facilitating mergers and giving them a privileged access to the bank credit. From the 1920s, these groups become zaibatsu[2], diversified conglomerate concentrating the industrial potential of the country. Early in the twentieth century are already in place the principles of the dual economy, so characteristic of Japan: on the one hand, conglomerates closely related to banks, dominant industrially and endowed with *sôgô shôsha*, providing the commercial interface upstream (purchase of raw materials) and downstream (marketing of product) of the production; on the other hand, an armada of small and medium enterprises, the more often subcontractors of the zaibatsu, which play the role of safety valve during economic downturns.

●A highly regulated financial system

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[1] Major trading companies, in the heart of conglomerates, providing today three main functions: trade intermediation function in the export, function of information (with an extensive network of business intelligence and technology abroad) and financial intermediation function (trade credits for exports).

[2] Literally, it is a "financial clique."Pejorative word designating Japanese oligopolies (Mitsui, Mitsubishi, Sumitomo, Yasuda), family groups controlling, through a Honsha (holding), a series of companies linked by crossed participations (each company holds shares of other companies of the group).

The financial system which has been established in the Meiji period also aims to ensure a tight state control over industrial development. Instead of encouraging the emergence of stock markets as in the Anglo-Saxon countries, the choice falls on credit bank as the main source of financing the corporate. This allows the state to better control the flow of the financial supplies towards the industry, rather than leaving the initiative to shareholders. Japanese banks are able to supply cheap credit thanks to abundant savings maintained at very low rates. The State looks after the proper functioning of the device by strong savings incentives (promotion of the virtues of frugality to the households) and by controlling the allocation of credit to industries that it intends to develop.

●The role of savings and investment

The takeoff of the Japanese economy in late 19th century is characterized by a high savings rate, which contributes to play an important role in financing the development after the war. National savings has essentially financed the growth.

Over the years, savings are also favored by real estate, high land prices in urban areas, to access the property. These savings help to finance business investment.

It was a factor of power of using these savings, but the loans from banks have been a factor of fragility in the sense that private firms might know too much debt, leading to change the orientation of the investment. But, the central bank guaranteed the repayment of debts of priority, which encouraged them to take risks.

The investment rate (GFCF / GDP) in Japan is the highest among industrialized countries; it reached in the early 70s up to 35%.

This increase of the investment is accompanied by very rapid productivity growth: Between 55 and 70, the hourly labor productivity increased by 8% annual rate.

It is the link to this very high rate of investment which permits to modernize industrial equipment and to substitute capital for labor.

●Post-war Economic Reforms

To revive the economy and democratize the country several reforms have been imposed.

Agricultural reform (1945): The American occupation authorities imposed a major agrarian reform because they believe that the misery of the peasant population and lack of land had favored the war and the logic of territorial expansion. Thus, as soon

as 1945, changes were noted on the agricultural system with a redistribution of land for the benefit of micro-property. The agrarian reform promulgated in 1946 has been implemented from 1947 to 1949.

Labor market reform (1945): Americans realize that Japanese workers have very little bargaining power, which is explained historically by the importance of hierarchical relationships. They reform by imposing a collective bargaining, the right to strike (that the Japanese use very quickly), and social protective regulations (working hours, paid leave).

Zaibatsu dissolution (1945): It is these companies that drove economic development during the Meiji era and after the First World War I. Under the instigation of the American, upheavals have been noted in the industrial system with a legislation inspired from U.S. antitrust laws and the dissolution of zaibatsui.

It should also be noted that a policy of financial stabilization with the "Dodge Plan"[3] adopted in 1949 stabilized the Japanese currency. The technical and financial

[3] Dodge Plan in 1949 is to rebalance the budget, curb loans to rebuild and restore stability in the yen. We return to relative stability in prices, slow inflation without actually hindering the economic recovery, driven by mechanisms that are similar to the Marshall Plan.

assistance of the United States with a large workforce, skilled, and low wages have helped establish an audacious economic policy to help restart the economy.

3.1.2 The factors of the high economic growth of Japan

From 1950 to 1955

This period corresponds to the Korean War. It resulted in high military demand and triggered rapid reconstruction of the Japanese economy. The purchase of strategic materials by the U.S. has increased very rapidly. Many companies enjoyed the US military procurement boom and accumulated profits. The total sum of special procurements for the Korean War from 1950 to 1955 amounted to $3.55 billion. This was about 44% of foreign currency received by Japan as payment for exported goods. By 1952, Japan restored the real GDP level to a level comparable with that of 1935. After the Korean War ended (1950-1953), the Japanese economy fully benefited from the sustained development of the world economy.

Most researchers agree that the postwar Japanese economic development started from 1955, in which year the economy restored the pre-war peak level of production.

The era of high economic growth: 1955-73

During that period the Japanese economy had grown rapidly. It was during this period, that Japan catches up most of Western countries, and as early as 1968, the Japanese economy became the second largest economy in the capitalist world, as measured by GNP, after the United States of America. The high and rapid growth of the economy in this period changed various features of Japanese society. In the 1960's, the average real growth rate of the Japanese economy was more than 10%. This figure is far higher than that of any of the western countries.

We now turn to the explanation of the causes of the rapid economic growth during this period.

In his work, *the Japanese economy*, **Mitsuo Saito** found that the private consumption, government consumption, gross investment, exports and imports are the causes of this economic performance. Indeed, According to a growth accounting

analysis on the demand side, he found, out of 9.7% of GDP growth in the period 1960-73, the contribution of the private consumption, government consumption, gross investment, exports and imports are respectively 5.7%, 0.7%, 4.0%, 0.9%, -1.5% (**see table 12**). On the supply side he explained the high economic growth by the contribution of three interrelated factors; labor, capital, and technology. Aggregate demand factors of the economy, huge demands from an increasing number of populations in Japan and export to foreign countries supported the rapid economic growth. **Table 13** shows the contribution of each factor to the 9.6% of GDP growth rate. With 3.4%, the contribution of private capital stock was higher than that of labor, 1%, and that of public capital stock, 0.4%, indicating that during the 1960s the rapid growth of private capital propelled the economy with great vigor on the supply side as well as on the demand side. The contribution of the technical progress which was 4.8% was very high and was about one-half of the GDP growth rate.

Table 12: The analysis of real GDP growth, 1960-1973, by the growth accounting method

	Private consumption	Government consumption	Gross Investment	Exports	Imports	Total GDP
Share of Component in GDP growth (%)	58	7	41	9	-15	100
Contribution of component to GDP growth (%)	5.7	0.7	4	0.9	-1.5	9.7
Growth rate of a component (%)	8.9	4.9	14.9	14	14.9	9.6

Source: Mitsuo Saito (2000): *the Japanese economy*, p.61

Table 13: The analysis of real GDP growth, 1960-1973, by the growth accounting method for the supply side

	Labor	Private Capital Stock	Public Capital Stock	Technical Progress	Total GDP
Share of component in GDP growth (%)	10	35	4	50	100
Contribution of each component To GDP growth (%)	1	3.4	0.4	4.8	9.6
Growth rate of each factor	1.7	8.6	12	4.8	

Source: Mitsuo Saito (2000): *the Japanese economy*, p.61

Edward Denison and **William Chung**, also, in their work for *Asia's New Giant*, found that increased labor, increased capital stock, advances in knowledge

contributed more to growth. Other factors they found are reallocation of resources away from agriculture, and economies of scale. As the **table 14** shows, labor, capital, and changes in productivity contributed respectively 1.85, 2.10, and 4.82 to the 8.77 percent average annual rise in real national income. Thus these three factors accounted for more than half of the economic growth. Contributing for 1.97 percentage points, the technological change was the most important source of productivity change. Just slightly less important were economies of scale, representing the ability of industry to attain more efficient size as the Japanese market grew. Improved resource allocation, mainly the movement of resources out of agriculture, contributed another 0.95 percentage point to growth.

In his explanation of the Factors in the High Rate of Growth of Japan, **Miyohei SHINOHARA**, in his work, "Factors in Japan's Economic Growth", distinguished two kinds of factors: the postwar factors and the long-term factors.

Among the postwar factors identified by shinohara we can cite:

●Sharp decrease of military expenditures: Indeed, after the war, the proportion of military expenditures decreased greatly. According to the national income statistic the

defense expenditures which amounted to 157.7 billion yen, represented only 5.9 per cent of 2,683 billion yen spent by the Government on goods and services in 1960. We can consider that the difference was employed for investment, thus accelerating the economic growth.

●Technological innovation

In the years 1956-1961, there was an important progress in technological innovation. It played an important role in quickening the pace of economic growth. Indeed, there is no gainsaying the facts that the massive introduction in a short period of technology from abroad has contributed to the faster growth since 1956.

●Labor force**:** The rate of increase in labor force is related with that of gross national product. The high rate of increase in the labor force has contributed to the high rate of Japanese economic growth.

The others postwar factors are Government's role, Roles of labor unions, land reform and inflation.

The Long-term factors are:

Financial structure and investment behavior: the entrepreneurs' strong interest in investment has contributed to the rapid growth of the Japanese economy attained in the postwar period.

The others Long-term factors are the role of small-and-medium enterprises, the saving ratio**,** the dual structure and export growth potential.

According to **Saburo OKITA** in his work, "economic growth of postwar Japan", nine factors are primarily held responsible for the high rate of growth of Japanese economy and are:

The postwar recovery factors which involved: strong desire for rehabilitation; abundance of under-utilized high quality technicians and labor; backlog of purchasing power accumulated during the war; low capital output ratio.

●Technological innovations: the technological innovations acted as important stimuli and have greatly influenced the course of Japan's economic growth in the postwar economy of Japan.

●Reduction in military expenditures: the decrease in unproductive military expenditure has been an important factor of the high postwar rate of growth**.**

Increase in the rate of investment: The high rate of investment contributed for maintaining a high rate of growth of Japan.

●Abundant supply of labor: The abundant labor force had a favorable impact on the high rate of growth of Japan.

●Increase in supply of capital goods from domestic sources: the modernization of the industrial structure, especially, the expansion of capital goods production has been one of the most important factors of the Japanese growth.

The other factors are smaller business fluctuations, Institutional factors, and favorable international environment.

Although the Japanese rapid economic growth was achieved primarily by labor, capital, and technical progress, this is not to say that the economic policies and planning had no role in the process. The Japanese policy-making authorities played a major role in the economic development. The main policies were those of Yoshida and Ikeda.

The policy called the Yoshida Doctrine shaped the postwar economy of Japan. The policy was aimed to set economic reconstruction and development. Prime Minister

Yoshida Shigeru called the father of modern Japanese economy developed this policy during the early period of the Korean War. All forces have been concentrated on the reconstruction of the economy while saving the military expenditures and leaving the defense to the U.S. Army.

In addition to the Yoshida Doctrine, Ikeda, who is seen to be the most important figure in Japan's rapid growth has implemented policies that contributed greatly to the later Japan's rapid economic performance with an average growth rate of 10.8 percent in the late 1960s and drove the economy to become the second largest in the world by the year 1968. The Yoshida's plan was aimed to double the income earned by the Japanese workers and set a high living standard from the period of 1961 to 1970 by greatly increasing the amount of investments made by the central government to both private and public firms.

The Ministry of International Trade and Industry (MITI) was another political factor that greatly influenced the growth and was mostly responsible for the industrial growth in Japan.

Table 14: Sources of growth in Japan, 1953-71 (percent)

Sources	Contribution to Growth
National income growth rate	8.77
Labor	1.85
Employment	1.14
Hours	0.21
Age-sex composition	0.14
Education	0.34
Unallocated	0.02
Capital	2.1
Inventories	0.73
Nonresidential structures and equipment	1.07
Dwellings	0.3
International assets	0
Land	0
Productivity change	4.82
Advances in knowledge	1.97
Improved resource allocation	0.95
Economies of scale	1.94
Irregular factors	-0.04

Source: Hugh Patrick and henry Rosovsky (eds), *Asia's New Giant: How the Japanese Economy Works* (Brooking, 1976), p.94

The era of rapid economic growth ended in the early 1970s, when Japan's economy underwent a sudden slowdown due to two external events. In 1971 the United States abandoned the system of fixed foreign exchange rates that had been in place since World War II. This change caused the value of the yen to rise, and consequently, Japanese exports fell.

In 1973 an increase in crude oil prices caused recessions in countries around the world; in Japan it causes panic among the consumers who feared shortages and price increases, inflation, and a sudden slowdown in the growth rate.

The era of slower growth: 1974 to 1990

After becoming the second economy in the world with strong economic growth in the 1960s, Japan despite the disappointing performance of 1974-1975 and 1980 due to oil price shocks has managed to maintain a relatively high growth and that until 1990. Indeed, the oil crisis in 1973 had an enormous effect on the Japanese economy since Japan had depended on the supply of oil for driving its economic growth. The Inflation soared in the economy and unemployment problem arose, causing Japan to go into a recession for a short period of time. However, the Japanese government by its tight money policies achieved successful recovery.

The economy after the oil crisis stabilized due to government's quick response and high technological level already achieved. Average annual growth for the period was about 4 percent which was less than half the rate that prevailed in the previous

twenty years. So, this period is called in Japan the era of stable growth. This is a highly inappropriate term in two senses. First, there was nothing unstable about the high-growth era; it was unusually high. Second, "stable" could be taken to mean steadier, but growth between 1974 and 1984 was not particularly steady.

As the **table 15** shows all three factors, labor service input growth, capital service input growth and total factor productivity (TFP) growth contributed weakly to the growth. Among the three factors, the decline in capital service input growth is the largest and appears to be the main cause of the low growth during this period.

The key to recovery was the boom in exports of cars, electronics, and other products, which grew far more rapidly than imports. The contribution of exports to the economic growth during this period was very important. The **table 16** shows that since 1974 the share of growth due the expansion of net exports of goods and services has often been high. In fact, the net exports expansion contributed 38 percent of all growth in the economy between 1980 and 1985.

Table 15: GDP growth and its decomposition for the Japanese economy

	1975-80	1980-85	1985-90
Real GDP Growth	5.69%	3.92%	4.91%
Contribution of Labor Service Input Growth	1.35%	0.81%	0.68%
Contribution of Man-hour Growth	0.87%	0.31%	0.38%
Contribution of labor quality Growth	0.48%	0.51%	0.30%
Contribution of Capital Service Input Growth	1.98%	2.12%	2.46%
Contribution of Capital Quantity Growth	2.06%	1.72%	1.87%
Contribution of Capital Quality Growth	-0.08%	0.40%	0.59%
TFP Growth of the Whole Economy	2.37%	0.98%	1.77%
TFP Growth of the Manufacturing Sector	1.13%	1.25%	1.01%
TFP Growth of the Nonmanufacturing Sector	0.74%	-0.11%	0.80%

Source: K. Fukao, S. Hamagata, T. Inui, K. Ito, H. U. Kwon, T. Makino, T. Miyagawa, Y. Nakanishi, and J. Tokui, "Estimation Procedures and TFP Analysis of the JIP Database 2006 Provisional Version," paper presented at the 3rd Meeting of the EU KLEMS Consortium, May 17-9, 2006, Valencia.

Table 16: Contribution to GDP

Year	GNP Growth rate	Percentage points of GNP Growth due to net export	Share of GNP growth due to net exports
1973	7.9	-3	-27.5
1974	-1.4	1.2	….
1975	2.7	1.9	71.1
1976	4.8	1	20.9
1977	5.3	0.9	16.9
1978	5.2	-0.9	-14.8
1979	5.3	-1.4	-20.9
1980	4.3	3.4	79.8
1981	3.7	1.5	40.9
1982	3.1	0.3	9.7
1983	3.2	1.5	46.3
1984	5.1	1.3	25.7
1985	4.7	1	21.2

Source: Economic Planning Agency, Annual Report on National Accounts, 1987 (Tokyo: EPA, 1987), pp. 118-121.

3.2 The recession of the Japanese economy (1990-2009)

Thus, throughout the 1990's, the Japanese economy has been preyed to a number of economic crises. The average annual growth rate of per capita GDP was 0.5 percent in the period 1991-2000. Many economists have tried to explain the crisis with the standard tools of economic analysis. There are several factors that have been cited by economist analyst to explain the Japanese slowdown.

In this section we will emphasize on the financial crisis, the yen appreciation, the liquidity trap and the inadequate policy responses to explain the extended slump in Japanese economic activity over the 1990s.

3.2.1 Growth affected by financial crises in the 1990s

GDP growth in Japan was marked by serious financial crises in the 1990s, as shown in the **figure 2** below. Indeed, during the 1990s, Japan experienced an unprecedented a triple crisis, stock market, real estate, and banking. The origin of the Japanese banking crisis of the 1990s is a period of cost of capital and interest rates abnormally low. During the years 1985-1989, have been combined the sharp appreciation of yen after the Plaza agreements[4], a flexible monetary policy, the rise of the stock market, a boom in investment and rising of land prices. Nikkei Average index of stock prices tripled in value from 1985 to the end of 1989, as shown in

[4] The Plaza agreements are agreements on the exchange rate signed on 22 September 1985 between the United States, Japan, West Germany, the United Kingdom and France. These countries agreed to intervene on the foreign exchange market to depreciate the U.S. dollar against the yen and the Deutsche Mark.

Figure 3. And as can be seen from **Figure 4**, urban real estate prices in Japan's six largest cities tripled between 1985 and 1991.

The rising of the prices of stock and real estate has seemingly strengthened the soundness of the corporate balance sheets and, mostly, the banks. So, companies have been heavily indebted, acquiring real estate and financial assets through access to credit virtually unlimited and very inexpensive. Hence, the swelling of a bubble of over-investment and, a weakening structure of corporate balance sheets. Facing the bubble in asset prices, the government responded by tightening monetary policy raising interest rate from 2.5% in April 1989 to 6% in August 1990. After the increase, the market collapsed. The Nikkei stock market index fell more than 60 percent—from a high of 40,000 at the end of 1989 to under 15,000 by 1992.

Alan D. Brunner and Steven B. Kamin in their in work, "Determinants of the 1991-93 Japanese recession: evidence from a structural model of the Japanese economy" showed that shocks to asset prices (land and stock values) consistently depressed the output. They conclude that the collapse of asset price was an important factor in the recession.

Real estate prices also plummeted during the recession—by 80 percent from 1991 to 1998 (Herbener 1999).

Thus, from 1990 to 2002, GDP growth was around 1.5% on average, whereas it had been about 4% over the previous decade. The triple crisis - stock market, real estate, banking - has led to the "lost decade", during which have increased corporate bankruptcies and banking difficulties. The deteriorating labor market and deflation (underlying negative inflation from 1999) have maintained the weakness of domestic demand and increased the real burden of debt.

In addition, played a significant appreciation of the yen (1990-1995) and external shocks (1997-98: Asian crisis; 2001: Internet bubble burst). The country has experienced negative growth in 1998, when the Asian financial crisis occurred.

Indeed, the Asian crisis of 1997-1998, has led to the bankruptcy of prestigious financial institutions (among the largest banks: Hokkaido Takushoku, in 1997, Long Term Credit Bank and Japan Credit Bank in 1998) and causes a decline in GDP by 1.8% in 1998.

Figure 2: GDP growth of Japan (in %)

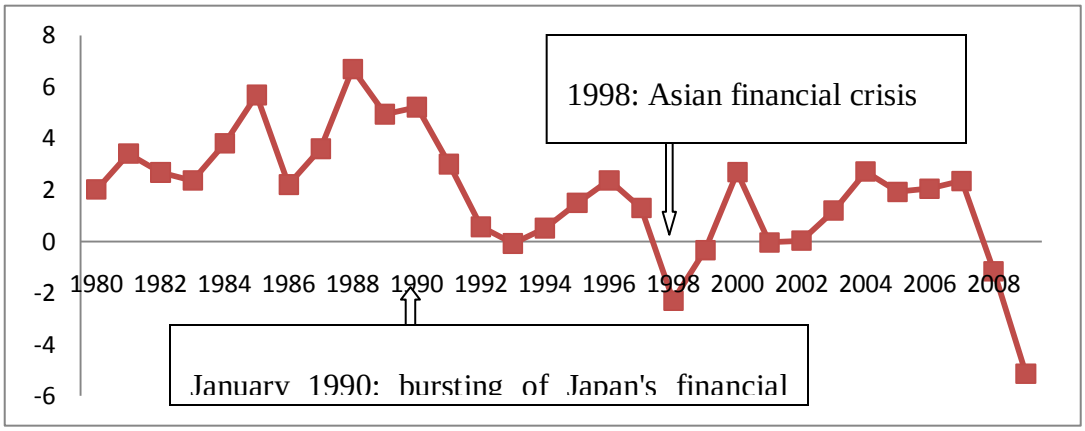
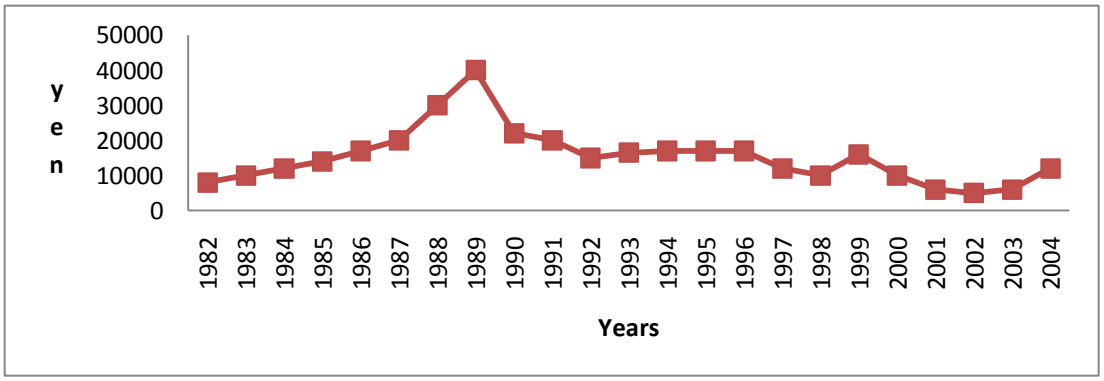
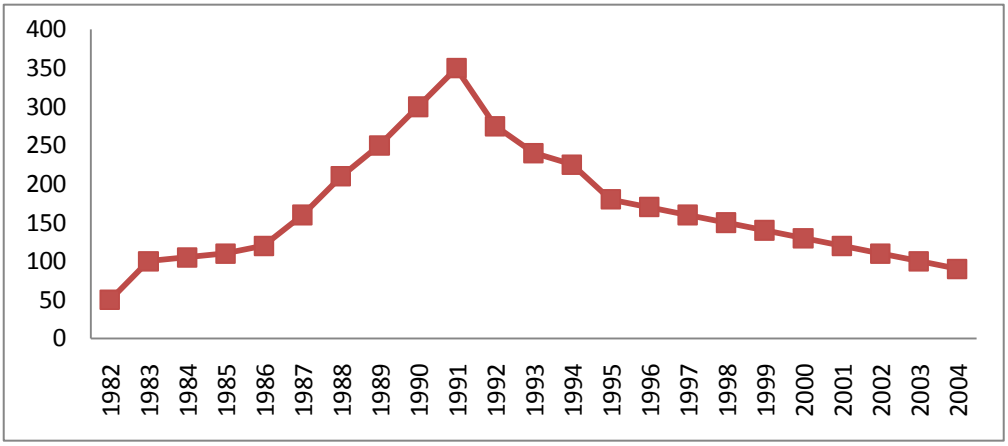


Figure 3: Nikkei 225 Stock Index Average (Yen)



Source: Nihon Keizai Shimbunsha (Japan Economic Journal)

Figure 4: Urban Land Price Index (1982=100)



Source: Japan Real Estate Institute.

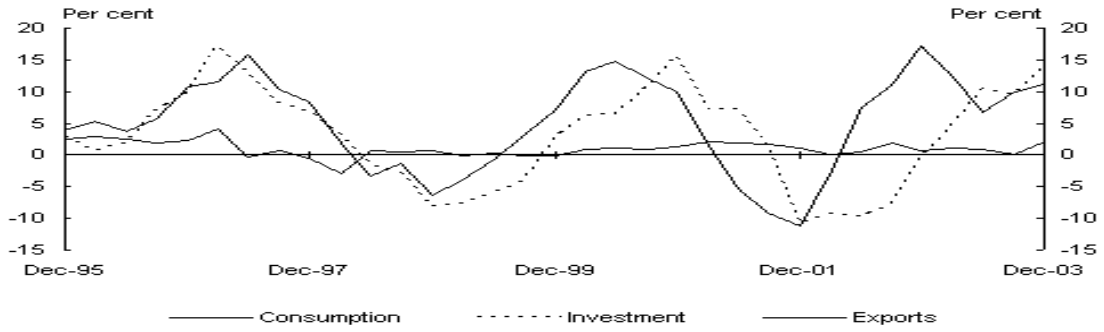
In brief, as it can be seen in the **table 15** and figure 6 below, the poor results in the 1990s have been due to a combination of factors including low investment, gloominess of consumption, drop in exports and poor economic management.

Table 17: comparison of the average annual growth of GDP and its components by sub-periods

	GDP	Private consumption	Housing investment	companies Investment	Public demand	Exports	Imports
1980-1990	3,8%	3,5%	2,7%	7,3%	2,5%	4,7%	6,6%
1990-2003	1,5%	1,5%	–2,2%	0,6%	2,1%	4,2%	3,2%
1998-2003	0,9%	0,8%	–2,1%	0,7%	0,8%	4,2%	2,8%

Source: ESRI

Figure 5: Japanese exports, investment and consumption (Through the year)



Source: CEIC database.

With the exception of Japan, in the mid-1990s, all developed countries that experienced a banking crisis in the early 1990's come out of it, after taking appropriate measures, that are the "socialization of losses "and restructuring imposed

by the state. The amount mobilized was significant: more than 10% of GDP in Finland, 8% in the United States, 5% in France and Sweden.

The fact that the financial crisis in Japan lasted come from a double phenomenon. Firstly, the crisis arose from a stock market crash and real estate more important than in other countries. Second, unlike other countries, Japan has long delayed restructuring of the banking system, which was done under the leadership of the State, from 1998.

3.2.2 Growth affected by the appreciation of yen

The rising value of the yen is blamed for Japan's recession. It is said that an appreciated yen reduces the competitiveness of export goods in overseas markets, thereby decreases the overall exports.

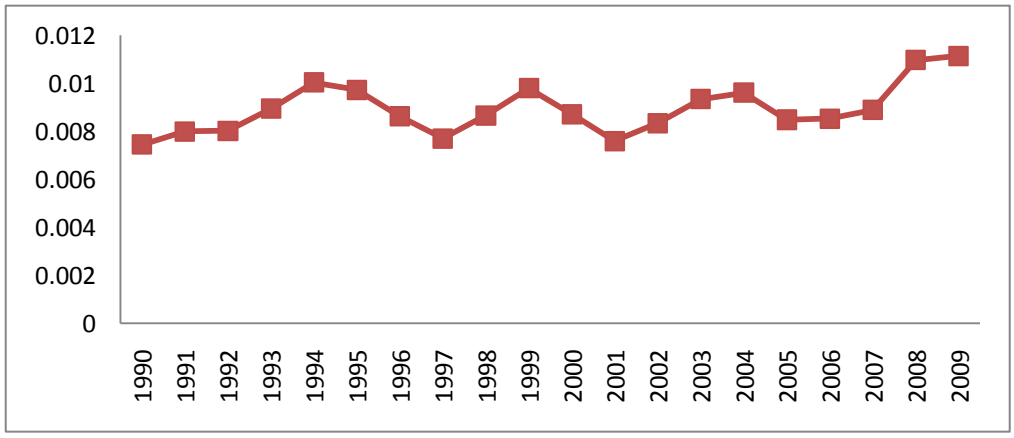
Alan D. Brunner and Steven B. Kamin showed that during the recession 1991-93, unpredictable movements in exchange rate played an important role in accentuating the downturn. During this period the appreciation of yen has led the drop in contribution of the exportations.

Tamim Bayoumi by using a VAR model found that a 10 percent increase in the real exchange rate lowered the output by about 0.2 percent, reflecting the relatively closed nature of the Japanese economy.

By the 1992 the effects of yen appreciation became so strong that net exports began contracting, constituting a drag on the economy.

After a decline of the yen against the dollar since 2001, it has been observed a sharp rise from the mid-2008. The yen has appreciated 15% against the dollar from the Lehman Brother, September 15, 2008, and mid-February 2009. Thus, the exports have dropped by 27% in November 2008, 35% in December, 45.7% in January 2009 and 49.4% in February, the biggest drop since 1980.

Figure 6: Evolution of the dollar / yen



Source: International Monetary Fund

3.2.3 Growth affected by the liquidity trap

An alternative view, which focuses on monetary policy, holds that Japan was stuck in a *liquidity trap* (Krugman, 1998).

The liquidity trap is a situation where the elasticity of money demand is very large: a change in interest rates implies a significant change in money demand. This situation is likely to occur when the interest rate is low (between 0 and 1%). Indeed, when the prevailing interest rate is low, economic agents know the interest rate will not fall much more and the probability that the rate rises is high. Therefore, they prefer to hold money rather than bonds. The price of these varies inversely with interest rates. If the interest rate rises, then bond prices fall. Capital losses are likely when the interest rate is low. The more this rate approaches zero the more the preference of money to the detriment of bonds.

In Japan the Monetary policy were impotent to stimulate demand and raise spending since interest rates were already at the lowest point possible, no one would normally be willing to hold bonds with negative yields over (zero interest-bearing) money.

In this context, the weakness of the investment is due to very low capital return, taking account in particular of the indebtedness of companies: this could explain their inability to respond to low interest rates since 1992. One solution in principle would be to impose negative interest rates, and then the problem is that no agent would buy bonds that paid less than deposits without interest or assets in cash. The solution would be to get by monetary policy increasing inflationary expectations, implying negative real interest rate ex post. There would be a transfer of the excess of savings on the consumption and investment, and reactivated, allowing a resumption of Keynesian demand and return of the economy to full employment capacity.

Paul Krugman (1999) argues that "Japan's huge productive capacity remains unused because consumers and businesses just don't spend enough" (Krugman, 1999:2). He underlines the issues of liquidity trap. The low interest rates combined with declining birth rates and lack of immigration brings the prospects of lower expected returns on capital.

All these have reduced investment demands, while crisis deepening forced households to save more. Krugman suggests that it should supplement deficits spending with an aggressive monetary policy and the Bank of Japan should both pump money into markets to undermine deflation, which will bring some inflation (Krugman, 1999:2). Krugman has borrowed the concept of Keynes called liquidity trap, a situation in which interest rates has fallen to certain level when liquidity-preference may become crucial in the sense that households prefers cash to holding a debt which yields low interest rates.

3.2.4 Growth affected by inadequate policy responses

The managing of the consequences of the bursting of the economic bubble has severely shaken the Japanese economic growth. Indeed, the attitude of the Japanese authorities against the general crisis of solvency of the banking system is at the heart of this long recession.

Following the collapse of the stock market, the government does not respond immediately. In 1991, the Bank of Japan began to lower its rates. Investors can then

borrow money at a rate approaching 6%. Between 1991 and 1995 it reduced its rate by 1 point per year on average, but that was not enough to save the Japanese economic system. Given the risks of bankruptcy the central bank should put the hand in pocket to recapitalize some banks. In the mid of the 1990s, the Bank of Japan injected 200 billion yen in the banking system, created to take over the debt of the real estate societies of credit. Despite the government efforts, bankruptcies and deflation (decline of the price index) continued. In 1995, the rate of the central bank has lowered significantly to 0.5%. But the crisis of 1998 reveals the extreme fragility of any bank intermediation. It intervenes as a warning to the authorities and banks, showing how the banking system, asphyxiated by its losses, depends on the supply, unconditional and cheap, liquidity from the central bank. Forced to see that the situation does not improve, the officials of the central bank took the decision from 1999, to practice the policy of zero rates, defusing thus the risk of systematic crisis.

Given the depth of the banking crisis, the Bank of Japan responded late and too cautiously. It has underestimated the recessive and deflationary risks. In these

circumstances, the monetary policy has proved to be ineffective to revive the economy and counter the deflation. On the one hand, between 1991 and 1993, the impact in real terms of the drop in rate has been attenuated with disinflation. On the other hand, to avoid further risk-taking and considering their very poor balance sheet situation, the banks have less and less used the liquidity provided by the central bank to meet the demand for the credit which, be that as it may, remained low: either they retrocede it to them, or they placed it in treasury securities. Ultimately, the liquidity that the bank of Japan has injected generously to rate zero were mainly recycled in the form of government bonds, which remuneration was small. This phenomenon of the private sector eviction drives the economy into a vicious circle: the credit channels are frozen, the recession worsens generating a flow of new bad debts. The situation of liquidity was thus formed: the massive supply of liquidity at no cost by the central bank has no effect on the level of the activity and prices, ultimately making monetary policy ineffective.

The table 18 below shows the macroeconomic situation of Japan during that time.

Table 18: Macroeconomic Data

	GDP growth rate percent	Discount Rate Percent	Consumer Price Index	Unemployment Rate
1985	6.40	5	87.40	2.6
1986	4.44	3	88.00	2.8
1987	4.18	2.50	88.11	2.8
1988	6.76	2.50	88.71	2.5
1989	7	4.25	90.72	2.3
1990	7.31	6.00	93.41	2.1
1991	5.80	4.50	96.52	2.1
1992	2.56	3.25	98.21	2.2
1993	1	1.75	99.00	2.5
1994	1.10	1.75	100	2.9
1995	1.20	0.50	100	3.2
1996	2.55	0.50	100	3.4
1997	2.12	0.50	102	3.4
1998	-1.17	0.50	102.5	4.1
1999	-0.64	0.50	102	4.7
2000	-0.14	0.50	101.5	4.8

Source: International Financial Statistics Yearbook 2001

CHAPTER 4: REVIEW OF LITERATURE

Several factors are identified by economists as the determinants of long-term economic growth. The question is what are the forces of economic growth and how can public policy enhance it? According to Adam Smith the forces of growth were released by freeing market agents from external restrictions. For him development would be spurred by the increasing size of markets, as well as increasing returns and externalities due to a rising division of labor. David Ricardo early in the nineteenth century emphasized investment in machinery as a cause of the increase in per capita income. Also for Karl Marx investment in machinery and capital accumulation are the major sources of growth. John Stuart Mill, by contrast, emphasized on education and the sciences as engines of growth. Schumpeter (1935) in particular perceived economic growth as a process of "creative destruction" in which some actors gain and others lose.

The problematic of growth disappears from the scene for a long period where the allocation of resources (and not their creation) becomes the principal object of curiosity of economists (Walras, Keynes, Debreu ...).

The pioneering work of Ramsey (a dynamic general equilibrium model, 1928) has in fact remained unknown until the year 1960. The issue of growth has been revived later, with the work of Keynesian Harrod (1939) and Domar (1946). But the revival has really happened following two articles published by Robert Solow (1956).

After having disappeared in the 1970s, there was a resurgence of theories of economic growth in the 1980 following the works of Paul Romer and Robert Lucas. These works had put the role of "ideas" and human capital in the heart of the issue of growth: The endogenous growth theory. This approach has been accompanied by numerous empirical studies seeking to evaluate the importance of these factors.

Economists are also increasingly focusing on financial intermediation, openness to trade, foreign investment, stability (instability) macroeconomic and sociopolitical.

This literature review focuses on two points: the first deals with the theoretical analysis and the second with the empirical studies.

4.1 Theoretical analysis on the factors of economic growth

Understand the sources of growth, work begun by the pioneer Robert Solow (1957), relayed by E. Denison (1967) and D. Jorgenson (1980), is now a common practice to quantify the major factors of growth. And that's in this quest that the concern to understand its determinants and interactions is born.

In his founder article of 1956, which earned him the Nobel Prize in Economics in 1987, Robert Solow demonstrates how the growth of capital stock, growth in the labor force and especially the technical progress affect the level of production and growth in time. In his model, growth in capital stock is financed by savings in a vision now dated financial system. The growth of the labor force is determined by demographic reasons. Technical progress is a way of reallocation of labor and capital. The stock of capital is the essential determinant of the function of production. It rises through investment. It diminishes naturally by depreciation. There is a stationary capital stock for which investment and depreciation are equal. Investment is not long-term source of growth. Rather, it is the technical progress which essentially explains the long term growth.

Mankiw, Romer, and Weil postulate that the accumulation of traditional factors alone is not sufficient to explain all the problems of growth. Hence the adoption of a broader vision of capital by considering human capital, in a distinct way. By introducing this new factor, total factor productivity (TFP) decreases, intuitively, its share in explaining growth. This is the famous "Solow residual corrected."

This extension of the Solow model implies that the income share of physical capital cannot be alone, an accurate measure of the overall importance of capital. A broader measure of capital increases the possibility that differences in capital intensity can explain, after all, differences in per capita income between countries.

An important prediction of the neoclassical model is that the levels of product of countries with equivalent technology tend to converge to a given level, when these countries are in a stationary state. Recent work has shown that this hypothesis of unconditional convergence does not appear to be consistent with empirical evidence.

Nevertheless, the idea of conditional convergence is supported when one takes into account the effects of investment rates and policies on growth[5].

The dependence of the growth of exogenous technical progress in the neoclassical model and the apparent incompatibility of the unconditional convergence hypothesis with the current data, have incited investigations of alternative models of growth. Thus, endogenous growth models generate a link between public policy and long term growth, assuming production functions with constant or increasing returns in reproducible factors.

In reaction to the shortcomings of neoclassical growth theory and its inability to explain some observed facts, the mid-80s saw the emergence of a group of models explaining the long-run growth endogenously by the relaxation of the assumptions of diminishing returns of the capital and in making the technical progress endogenous to the model. It is in this context that Paul Romer (1986, 1990, and 1994) publishes article showing that technological change is endogenous. The technology is therefore a by-product of economic activity and is one of the

[5] This is the case for example in studies conducted by Barro (1991), Barro and Sala-i-Martin (1992), Khan and Kumar (1993), Mankin, Romer and Weil (1992)

fundamental sources of growth. With Lucas (1988), they assume increasing returns of knowledge and human capital. The new knowledge and new technologies result from investment in human capital (education and training), in the use of specialized personnel (R & D staff) and equipment. New knowledge, with innovation (Aghion and Howitt, 1992) and public infrastructure (Barro, 1990)[6] constitute the three significant Sources of Growth.

Romer considers that the accumulation of knowledge is a factor of endogenous growth. The accumulation of knowledge produces positive externalities. He used the theory of "learning by doing" already formulated by Arrow (1962) which considers that it is in producing a firm acquires experience and therefore knowledge. A company accumulates knowledge that allows it to be more efficient, but also this knowledge serves other firms, by imitation effect or through the "turnover" of a workforce who benefited from the expertise. The accumulation of knowledge has a private productivity (the one the company benefits), but also a social productivity (the one which benefits the whole economy and society).

[6] It is important to note that these factors have already been identified in the literature before, but it is the first time that they are formalized and modeled.

In contrast to the accumulation of knowledge, models based on the accumulation of technological capital more generally insist on the issue of Schumpeterian creative destruction and its impact on the labor market (Aghion and Howitt 1992) or simply on the specialization of the economies and the persistent gap of differences of development (Romer 1990). So it is innovation and R&D which are the residual factor: the more R&D efforts are important, more growth is strong, and inversely.

The first endogenous growth model with human capital is formulated by Lucas (1988), who, rather than introducing the stock of knowledge in the form of externalities, as Romer (1986), considers accumulative knowledge and private ownership, providing an individual incitation to education. Economic growth depends largely on individual efforts and social training, which themselves depend on the ability to save and therefore to forgo current consumption to invest in education.

Although the fathers of the theory of endogenous growth namely Romer and Lucas rejected the role of the state, they accept, however, that the State should encourage

long-term growth. The question is not whether the state should intervene or not in economic activity, but how and how far can he intervene.

In 1990, Barro shows that public expenditure is directly productive and should therefore be considered as a factor in the production function. The public sector contribution to growth includes expenditure on education (to increase human capital) and research and development, but also the infrastructure for transportation and communication. Like other accumulations, these expenditures have a cumulative effect: it increases the growth, broadening the tax base, induced an increase in government revenue and thus public spending, growth factor. This theory leads to demonstrate the need for continued public investment in a difficult situation. These theories are called endogenous growth theories because they seek to explain the growth by variables determined endogenously in the model. The main contributions of these theories consist of, in the one hand, the introduction of education and replacing the narrow vision of capital as physical stock by a broader concept including the knowledge and the stock of knowledge accumulated in the nation, thus the human capital and consequently the role of education is emphasized.

On the other hand it consists of the introduction of the possibility of externalities. These externalities that arise from the dissemination of knowledge and external benefits of human capital contribute to hinder the diminishing returns on physical capital accumulation. The development of research and development and the innovation process, a central factor in these models depends, or may be influenced by public policies (tax incentives, protection of intellectual property rights, provision of infrastructure services, etc.). The consequence of this is that the rate of long-term growth may be influenced by government intervention. The state has an important role to play in determining the rate of economic growth in the long term.

4.2 The empirical studies on the factors of economic growth

The 1990's saw the publication of several empirical works on growth factors. Indeed, the emergence of the new endogenous growth theory has led to focus empirical research on the determinants of growth. In this section we will review the results from empirical studies on explanatory factors of the economic growth.

Human capital

The term ‘human capital’ refers principally to workers’ acquisition of skills and know-how through education and training. The majority of studies have measured the quality of human capital using proxies related to education (e.g. school-enrolment rates). Human capital has been seen as the main source of growth in several endogenous growth models as well as one of the key extensions of the neoclassical growth model.

Since the early 1990s, the empirical literature on the role of human capital in economic growth is full of contradictory results. The major recent contributions to the empirical literature on the role of human capital in economic growth began with an expanded version of the neoclassical growth model of Solow (1956) and Swan (1956) proposed by Mankiw, Romer & Weil (1992). In their model, they take as a measure of the rate of investment in human capital the proportion of the potential labor force enrolled in secondary education. The result of their estimation (on 98 countries) shows that human capital positively and significantly affects the economic growth. The estimation (on 79 countries) of Islam has the same result but

unlike that of Mankiw, Romer &Weil (1992), the coefficient becomes non-significant for the subset of middle-income countries. Benhabib & Spiegel (1994) without assuming the constant returns to scale and by using Kyriacou (1991) data show that the effect of human capital is not significant. Pritchett (1996**)** by using data from Barro and Lee (1993) and Nehru, Swanson & Dubey (1995) finds negative and sometimes significant effects[7].

Some developments of the theoretical literature on endogenous growth have proposed to remove the human capital from the production function (or to relativize the role it plays) and introduce it directly into the modeling of the growth of technical progress. It is not to consider human capital as a homogeneous factor of production in physical capital or labor but a wealth, for the production of knowledge and innovation. This type of model is mainly inspired by the theoretical article of Romer (1990). Much of the literature, in fact, neglects the possible heterogeneity of the effect of human capital between countries or different periods.

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[7] The difference between the estimates of Benhabib & Spiegel (1994) and Pritchett (1996) is mainly due to the explicit introduction of the amount of work by the firsts and to the expression of the human capital stock by value by the second (using the rate of return to education treated as a price).

Andreosso-O'Callaghan (2002) presents econometric work using panel data for the years 1980, 1990 and 1997 covering 10 Asian countries (China, South Korea, India, Indonesia, Japan, Malaysia, Philippines, Singapore, Thailand and Vietnam). After his econometric work, the author finds that human capital (which is approximated by the rate of literacy or schooling) plays an essential role in the production, and thus in the growth of these countries. Aghion and Cohen (2004) also present regressions in panel data, considering a wider group of countries (110 countries), which the period of observations is from 1960 to 2000. By approximating human capital by the number of years of education of the workforce, they also found that the accumulation of this factor positively affects growth.

one of the most surprising results of empirical studies of human capital and growth is that when the study sample is limited to OECD countries, the effect of human capital or education on economic growth is not significant, sometimes zero or even negative (Islam, 1995). We found a good example in Barro (2001), whose estimation of the effect of its preferred measure of human capital (higher education

of men) is 0.0000 when his growth regression is limited the sample of OECD countries**.**

Public expenditure

In endogenous growth models, public expenditure is a factor of growth as the human capital. However, in general, the empirical evidence of the nature of the relationship between public expenditure and economic growth are controversial. Devarajan, Swaroop and Zou (1996), for example, could not emphasize a significant relationship between growth and level of expenditure (measured by their share in GDP). The empirical literature on the effects of the composition of expenditures has also produced mixed results. Barro (1997) found that public expenditure on consumption as a percentage of GDP (calculated by subtracting defense spending and education) were negatively correlated to growth. Unlike, Devarajan, Swaroop and Zou (1996), showed a positive relationship between public consumption expenditure (measured by current expenditures as a percentage of total expenditures) and economic growth. Caselli, Esquivel and Lefort (1996) also note the existence of

a positive effect of public expenditure as a percentage of GDP (net of expenses and Military Education) on growth. Easterly, Loayza and Montiel (1997) have found no significant effect of the public expenditure in consumption on the GDP growth in Latin America.

Among the cross-sectional analysis the most recent include those of Landau (1983), Kormendi and Meguira (1985), Barro (1991), Arthur (1991). Landau working on 104 countries found a negative correlation between growth rate of per capita income and the share of public consumption in gross domestic product. Kormendi and Meguira working in 47 countries over the period 1950-1987 found a weakly positive impact, but not significant of the public consumption on growth. Barro, working in 98 countries over the period 1980-1985 found a negative impact of the civil government consumption on growth: a 1 percentage point increase from this expenditure in national income depresses the rate of average annual growth income per head by 0.12 points. Public investment (including education and defense) has however a positive impact on growth, but statistically insignificant. Barro finds that this result does not necessarily mean that public investment has no effect on growth.

Arthus, working out of 21 OECD countries over the period 1980-1989, finds no positive effect of total public expenditure on growth. However, he highlights an effect of the level of public spending on research - development on the growth rate of gross domestic product. On the whole, the econometric works recently carried out in cross-sectional appear to indicate that the type of expenditure has to be distinguished. While public consumption expenditures have a negative impact on growth, this impact is not highlighted in the case of investment expenditures in the broad sense (including education and research). The latter generally have a positive impact, though often not significant.

Aschauer, Munnell, and other authors use the estimation on time series to measure the impact of public investment on economic growth. ASCHAUER D.A (1989a, 1989b) initiated the empirical research on the impact of public investment on growth. The model used is an aggregate production function in which output is a function of labor, private capital and public capital. He obtained, using data on U.S. rate of return of public capital extremely high, estimated between two to five times higher than that of private capital. In addition, he noted that the accumulation of

public capital has a positive effect on private investment. His findings suggest that active strategy of public investment can help grow. He says that if public investment is made in the areas where the public sector is competing with private enterprise, it is likely that it will oust them.

Munnell AH (1990a) re-evaluating the original estimations of Aschauer (1989) and the work of Holz-Eakin (1988) found that the impact of global public capital on the output and productivity of the private sector is very important. For him, an increase of 1% of the stock of public capital causes an increase of 0.34% of production.

REINHART and KHAN (1990) found that public investment has a statistically and insignificant effect on growth, and that the role of private investment was much more important in the process growth. However they estimate that it is possible that public investment has a positive effect on growth. The effect may come from the infrastructure (roads, electricity, telecommunications, and schools).

Trade openness

Trade openness has been used extensively in the economic growth literature as a major determinant of growth performance. Openness is usually measured by the

ratio of exports to GDP[8]. There is a substantial and growing empirical literature investigating the relationship between openness and growth.

During the 70s, most empirical work used cross-sectional regressions on a selection of countries. The correlation coefficients were made either between export growth and GDP, or between an index representing the opening or trade policies and long term growth. Most of these studies have established a positive relationship between openness and growth.

Dollar (1992), Barro and Sala-i-Martin (1995), Sachs and Warner (1995), Edwards (1998) and Greenaway et al. (1998), using cross-sectional regressions, found that the distortions due to state intervention in trade led to low growth rates. Ben-David (1993) and Sachs and Warner (1995) have also shown that only in open economies that we could observe an unconditional convergence. Sachs and Warner (1995) found that countries with open political grew at a rate of 4.5% annually in the years

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[8] However, another measure, maybe more appropriate, is proposed by Sachs and Warner (1995). According to this, an economy is considered to be quite open if it satisfies the following five criteria: (a) average quota and licensing coverage of imports are less than 40%, (b) average tariff rates are below 40%, (c) the black market premium is less than 20%, (d) no extreme controls are imposed on exports, and (e) the country is not under a socialist regime.

1970 and 1980 and in contrast relatively closed countries had a growth rate of only 0.7%. They note however that a strong relationship is difficult to find and justify. Frankel and Romer (1999) use a method of instrumental variables including geographical features, and confirm that international trade has an important and significant impact on growth.

Harrison (1996) arrived at similar conclusions using a variety of indicators of openness. In making estimates of different methods (cross-section fixed effects, average over five years, first differences), the results suggest a positive relationship between openness and growth. However, it is not all measures of openness that were significant, despite the fact they were mostly of positive sign.

Rodriguez and Rodrik (2000) criticize and question the results of four studies major. The authors have established that the positive correlation between openness and growth found in the work of Dollar (1992), Ben-David (1993), Sachs and Warner (1995) and Edward (1998) were not robust.

Innovation and R&D

Innovation and R&D activities can play a major role in economic progress increasing productivity and growth. This is due to increasing use of technology that enables introduction of new and superior products and processes. This role has been stressed by various endogenous growth models, and the strong relation between innovation/R&D and economic growth has been empirically affirmed by many studies (see Fagerberg, 1987; Lichtenberg, 1992; Ulku, 2004).

Inflation

Other empirical studies have revealed that the macroeconomic environment affects economic growth. Indeed, the influence of the macroeconomic environment on long term growth has been an important area of investigation in terms of analytical and empirical. In a recent contribution to this literature, Fischer (1993) has found empirical evidence for a large group of countries a positive relationship between growth and macroeconomic stability. Regarding the relationship between inflation and economic growth, in general, the correlation is negative. De Gregorio (1991),

using a sample of 12 countries in Latin America over the period 1950-1985, has found a negative relationship between the level of inflation, the variability of inflation and growth Latin America. Similarly Barro (1997), in a regression over the period 1960-1990, also found that inflation had a negative effect on growth rates of output per head (and on the share of investment in production). However, this effect is not significant, an increase in average of the inflation of 10 percentage points per year reduces the growth rate of real GDP per capita from 0.2 to 0.3 percentage points per year. According to the Tobin-Mundell effect, a high anticipated rate of inflation contribute to lower the real interest rate and causes an adjustment of the portfolio of real monetary asset to physic asset, contributing to an increase in the volume of investment and growth. According to Fischer (1993), inflation is a good indicator of the credibility and the ability of government to properly manage the economy of a country: a government by a high inflation rate has lost control of his economy.

Exchange rate

Empirical studies raise the strong negative relationship between the variability of exchange rates and economic growth (Bosworth, Collins and Chen [1995]). There may have long-term consequences that go beyond the impact commonly practiced in the short term, on the competitiveness of companies in the country. An overvaluation tends to slow growth, while a significant undervaluation, although it is not excessive, will cause the acceleration of growth (Collins and Razin [1997]).

Lahrèche-Révil [1999] uses a distortion index of average real exchange rate during the period. It is the ratio of the real exchange rate observed at the rate calculated from an equilibrium relationship of long-term of the Balassa model, estimated in section in each of the years available (1960-1993) and for a sample of approximately 80 countries. It appears that the overall real exchange rate has little influence on growth and depreciation tends to accelerate it. The econometric analysis confirms the variable sensitivity of growth with the real exchange rate according to the initial level of development.

Financial Systems

The relationship between economic growth and the financial sector has been studied in more detail with the work of Goldsmith (1969) and McKinnon (1973). According to these authors the financial sector plays an important role in the process of economic growth. The econometric studies on determinants of growth show that the level of financial intermediation is a good indicator of economic growth long term. Goldsmith (1969) studied, using the value of financial intermediary assets to GDP, the data available for 35 countries between 1860 and 1963 and finds that there is a certain parallelism between financial development and economic growth. However, the study of Goldsmith suffers from several weaknesses. It does not take into account all the factors that influence economic growth, does not examine whether financial development is associated with the increase of productivity and capital accumulation. Similarly, in this study the size of financial intermediary chosen may not properly measure the functioning of the financial system. The last major weakness is that the correlation between the size of the financial system and economic growth does not identify the direction of causality.

King and Levine (1993a, 1993b, and 1993c) studied 80 countries over a period from 1960 to 1989 and examine all financial factors that may affect the long term growth. The authors found a robust correlation between the degree of financial development and growth, investment and efficiency of capital. Financial development may also be linked to development of financial markets. Atje and Jovanovic (1993), from a study involving 75 countries, conclude the positive influence of financial markets on growth.

Many other empirical studies (Polak, 1989, Patrick, 1996; Demirguc-Kunt and Levine, 1996) confirm this link between financial development and growth.

CHAPTER 5: THEORETICAL FRAMEWORK AND MODEL SPECIFICATION

5.1 Theoretical Framework

We assume a Cobb-Douglas production function (Hadjimichael and Ghura, 1995b, 1995c) given by:

$$\mathbf{Y= A_0 (A_pK_p)^{\alpha} *(A_hK_h)^{\beta}*(A_LL)^{1-\alpha-\beta}} \quad (1)$$

Where:

Y: Real GDP

L: labor

K_P and K_h: stocks of physical capital and human capital respectively

A_0: Coefficient of technology and global efficiency associated to the base period

A_0, A_h, A_L: Coefficient of technological intensity in physical capital, human capital and labor, respectively

Defining the coefficient of the global efficiency of the economy by:

$$\mathbf{A=A_L (A_0A_p*A_h^{\beta})^{1/1-\alpha-\beta}} \quad (2)$$

The equation (1) can be rewritten:

$$Y=K_p^{\alpha}K_h^{\beta}*(AL)^{1-\alpha-\beta} \quad (3)$$

Where:

A represents the intensity factor and the level of technology achieved by the economy.

The labor and the global efficiency coefficient grow by following equations:

$$L=L_0e^{nt} \quad (4)$$

$$A=A_0e^{gt+xq} \quad (5)$$

Where

n: the rate of natural population growth

t:time

g: the growth rate of technical progress

x: the vector of factors or policies that may affect the level of technology or efficiency of the economy

q: the vector of coefficients relating to policies and other variables

Given S_g and S_h the shares of national income invested in physical and human capital respectively.

We assume for the reason of simplicity of the model, the rate of depreciation of human capital and physical capital are the same (δ=5%). Consequently, physical capital and human capital are accumulated according to the following functional form:

$dK_p/d_t = S_pY-\delta K_p$ (6)

$dK_h/d_t = S_hY-\delta K_h$ (7)

We assume that k_p and k_h represent the stock of physical capital and human, respectively, per unit of actual work.

$k_p=K_p/AL$

$k_h=K_h/AL$

$y=Y/AL$

In rewriting the functions of production and accumulation per capita we have:

$\mathbf{y=K_p^a k_h^b}$ (3')

$dk_p/d_t =S_py-(n+g+\delta)k_p$ (6')

$\mathbf{dk_h/d_t =S_hy-(n+g+\delta)k_h}$ (7')

In the steady state, levels of physical and human capital per capita are constant. So equations (6 ') and (7') are zero and we have, after substitution:

$k_p^*=(S_p^{1-\beta}*S_h^{\beta}/n+g+\delta)^{1/1-\delta-\beta}$ (8a)

and

$k_h^*=(S_p^{\alpha}*S_h^{1-\alpha}/n+g+\delta)^{1/1-\delta-\beta}$ (8b)

Substituting (8a) and (8b) in (3 ') and taking the logarithm, we have:

$Ln(y^*)=(-\varepsilon/1-\varepsilon)Ln(n+g+\delta)+(\alpha/1-\varepsilon)Ln(s_p)+(\beta/1-\varepsilon)Ln(s_h)$ (9)

Where $\varepsilon=(\alpha+\beta)$

Hence, taking the log of y=Y/AL and replacing A by its expression in (5), we obtain:

$Ln(y/L)=Ln(A_0)+gt+X\theta-(-\varepsilon/1-\varepsilon)Ln(n+g+\delta)+(\alpha/1-\varepsilon)Ln(S_p)+(\beta/1-\varepsilon)Ln(S_h)$ (10)

Where $(\varepsilon/1-\varepsilon)$, $(\alpha/1-\varepsilon)$, $(\beta/1-\varepsilon)$ are the elasticities of per capita income relative to population growth and the share of income invested in physical capital and human respectively. The sum of the elasticities in comparison to S_p and S_h is equal to the elasticities in comparison to $(n+g+\delta)$

Finally following Mankiw, Romer and Weil (1992), the evolution of the product per capita to the level of steady state can be described by:

$$\mathbf{dLn(y)/dt=\lambda\,[Ln(y^*)-Ln(y)]} \qquad (11)$$

Where $\lambda = (n+g+\delta)\,(1-e)$ is the speed of adjustment, and y the current income per capita

The equation (11) implies that

$$\mathbf{Ln(y^*)=(1-e^{\lambda t})Ln(y^*)+e^{\lambda t}(Lny_0)} \qquad (12)$$

Where: y_0 is the income per capita at the initial period t_0.

Simplifying y_0 in (12) and substituting, we obtain:

$$Lny-Ln(y_0)=(1-e^{\lambda t})[-(\varepsilon/1-\varepsilon)Ln(n+g+\delta)+(\varepsilon/1-\varepsilon)Ln(s_p)+(\beta/1-\varepsilon)Ln(s_h)+X\theta-Ln(y_0)+gt+Ln(A_0)] \qquad (13)$$

The adjustment coefficient (the speed of convergence) is obtained by the following formula (Ghura et Hadjimichael, 1995):

$$\mathbf{\lambda=Ln(1+T.\eta)/T} \qquad (14)$$

T is the time's period considered. In this work, it covers the years 1960-1990 for the period of economic growth and the years 1990-2009 for the period of the economic recession of Japan.

The variant of equation (13) is:

$$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 EXPT_t + \beta_3 L_t + \beta_4 SET_t + \beta_5 DR_t + \beta_6 BC_t + \beta_7 INFL_t + \beta_8 PA_t + \beta_9 N_t + \beta_{10} OILC_t + \beta_{11} FC_t + \beta_{12} EXR_t + U_t$$

5.2 Specification of the model

The equation that we will estimate is GDP per capita growth. For this equation, the developments are described in the previous section.

Taking into account the theoretical framework and the review of literature, the model we will estimate for the Japanese economic growth for the period 1960-1990 will be specified as follows:

Model 1: the factors explaining the Japanese economic growth

$$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 EXPT_t + \beta_3 L_t + \beta_4 SET_t + \beta_5 BC_t + \beta_6 INFL_t + \beta_7 PA_t + \beta_8 N_t + \beta_9 OILC_t + U_t$$

Similarly, taking into account the theoretical framework and the review of literature, the model we will estimate to explain the Japanese recession will be specified as follows:

Model 2: the factors explaining the Japanese recession

$$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 INFL_t + \beta_3 EXR_t + \beta_4 DR_t + \beta_5 FC_t + U_t$$

We use this model to assess the relative importance of various factors in causing Japanese recession.

CHAPTER 6: METHODOLOGY, EMPIRICAL TESTING AND RESULTS

We focus on this chapter, on the methodological aspects of our subject, on the empirical testing and on the analysis of the results of our regressions.

6.1 Methodology

We use a quantitative approach to observe the relationship between Japanese economic growth and the macroeconomics variables. The objective is firstly, to determine, the factors that influence economic growth of Japan and secondly to determine the causes of its recession. The data we use are time series data and are from the World Development Indicators, International Financial Statistics, International Monetary Fund and Bank of Japan.

The effects of macroeconomic variables on economic activity are generally analyzed using endogenous growth models. To show these effects, a linearized production function of Cobb-Douglas is estimated.

We start our study by specifying the function of economic growth. Then, after doing the different tests (heteroscedasticity test, serial correlation, stationary test and Johansen Tests for Cointegration), we estimate the models by using Stata (software Econometrics) and analyze the results.

Econometric Methodology

We are here dealing with time series. We study the unit root properties of the variables, because as Gonzalo (1994) has shown in the presence of unit roots in the time series data, none of the usual test statistics for the ordinary least square regressions have standard distributions. We use the augmented Dickey-Fuller unit root tests (see Dickey and Fuller (1979) and (1981)).

The ADF test entails estimating the following regression equation (with an Autoregressive process):

$$\triangle y_t = c1 + \omega y_{t-1} + c2\, t + \sum_{i=1}^{\rho} di \triangle y_{t-1} + v_t$$

In the above equation, y is the relevant time series, $\triangle$ is a first-difference operator, t is a linear trend and v_t is the error term. The above equation can also be estimated without including a trend term (by deleting the term c_2 t in the above equation).

If $\omega = 0$, then there is no unit root.

We preceded with the Johansen (1991) framework of cointegration tests, after we use the vector auto regression (VAR) to estimate our two models.

6.2 Empirical Testing

Model 1: the factors explaining the Japanese economic growth

This model focus on variables that could affect positively Japan's economy since the objective is to find the factors in Japan's economic growth. Theoretically, as we noted it in Chapter 3 the spectacular performance of Japan in the decades following World War II is mainly linked to the contribution of three interrelated factors; labor, capital, and technology. However we have introduced the variable related to oil price shocks to explain the relative decline in growth in years 70s and 80s. After

having accepted these variables and taking into account the theoretical framework, the model to estimate becomes:

$$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 EXPT_t + \beta_3 L_t + \beta_4 SET_t + \beta_5 BC_t + \beta_6 INFL_t + \beta_7 PA_t + \beta_8 N_t + \beta_9 OILC_t + U_t$$

Definitions of variables and methods of the determination

The variables used in the model are the following:

GRGDP: Growth Rate of Gross Domestic Product (GDP) per capita derived from World Bank Indicators and OECD National Accounts data files. The Gross domestic product per capita (GDP per capita) is an indicator of wealth and living standards and is based on constant local currency. It is obtained by dividing GDP by midyear population. It is the dependent variable of the model. This variable is used because the growth models lead to explain the growth rate and not the GDP level. And even on the econometric point of view, it will reduce the difficulties of data processing

associated with non stationary variables; although there are cointegration techniques to treat these variables.

GCF: Gross Capital Formation (% of GDP) derived from World Bank Indicators and OECD National Accounts data files. Gross capital formation (formerly gross domestic investment) is composed of change in inventories, Acquisition of valuables, Gross fixed capital formation (Building and construction, Machinery and equipment etc).

EXPT: Exports of goods and services (% of GDP) derived from World Bank Indicators and OECD National Accounts data files. Exports of goods and services include the value of all goods and services abroad provided to the rest of the world. The data includes the value of goods, freight, insurance, transport, etc. As a percentage of GDP, we can better understand the share of exports in the economy of the country.

L: Labor [9] derived from World Bank indicators and International Labor Organization. It is here the rate of labor supplied for the production of goods and services during the period 1960-1990.

SET: School enrollment, tertiary (% gross) derived from derived from World Bank Indicators. It refers to post-secondary education, third stage, and third level, requires, as a minimum condition of admission, the successful completion of education at the secondary level. The main institutions that provide it are Colleges, universities, institutes of technology and polytechnics.

We will consider this variable as the human capital in our study.

BC: Banking Credit (% of GDP) is derived from World Bank Indicators. It is the domestic credit provided by the banking sector and includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The sector of bank is composed of monetary authorities and deposit money banks, as well as other banking institutions.

[9] Here labor refer to participation rate and is percentage of total population ages 15 and more.

INFL: Inflation (annual %) derived from International Monetary Fund, International Financial Statistics and data files. It is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

PA: Patent application is derived from World Intellectual Property Organization (WIPO). It represents is a legal means to protect the results of scientific research and technological development. The fundamental purpose of a patent is to grant a monopoly for several years during which the inventor or any person who received the rights from it to exploit the invention or control the use of it against payment.

This variable represents in our model the technology.

N: Population growth (annual %) is derived from total population. It is Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage.

OILC: Oil shock $\begin{cases} 1 \text{ for the year of oil shock} \\ 0 \text{ otherwise} \end{cases}$

Heteroskedasticity Test

There is heteroscedasticity when the variances of the variables examined are different. This notion of heteroscedasticity is opposed to that of homoscedasticity, which corresponds to the case where the variance of the error of the variables is constant.

H_0: homoskedasticity

H_1: heteroskedasticity

Table 19: Result of the Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1)	0.07
Prob > chi2	0.7914

Since the p-value is not significant, we accept H_1 and conclude there is no heteroskedasticity.

Serial Correlation test

H_0: there is no autocorrelation

H_1: there is autocorrelation

Table 20: Result of the autocorrelation test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.156	1	0.6927

Since the p-value is not significant, we accept H_1 and conclude there is no serial correlation.

Stationarity test

When using time data, it is essential that they maintain a constant distribution in time. This concept of stationarity should be checked for each series in order to avoid artificial regressions for which results could be "significant" when they are not. If a series is non stationary, we can convert it into stationary series by differentiating it. To examine the presence of unit root, the test of Dickey-Fuller (ADF) is used.

Determination of the order of integration of series

We start by testing the null hypothesis of unit root on the series in first difference DGRGDP (first difference of GRGDP), DGCF (first difference of GCF), DEXP

(first difference of EXP), DL (first difference of L), DSET (first difference of SET), DBC (first difference of BC), DINFL (first difference of INF), DPA (first difference of PA), and DN (first difference of N).

The results are given in the table 21 and show that the first differences of the series are stationary.

Now we apply the Dickey-Fuller tests on the series GRGDP, GCF, EXP, L, SET, BC, INFL, PA, N, and OILC.

The results are given in the table 22 and show that the series GCF, EXP, SET, BC, INFL and PA are not stationary. But the series GRGDP, N and L are stationary. Indeed, except for variables **GRGDP, L** and **N** the estimated value of the ADF statistics for each of these series is higher than the critical value at 5%.

Consequently:

►the series GCF, EXP, SET, BC, INFL and PA are integrated of order 1

►the variables GRGDP, L and N are integrated of order 1 if they are lagged by 1 year.

Table 21: ADF test on the variables D(GRGDP), D(GCF), D(EXP), D(L), D(SET), D(BC), D(INFL), D(PA), D(N)

Variables	t-ADF	1% Critical Value	5% Critical Value	10% Critical Value	observation
D(GRGDP) Lags 0	-6.89	-3.73	-2.99	-2.62	Stationary
D(GCF) Lags 0	-3.44	-3.75	-3	-2.63	Stationary
D(EXP) Lags 0	-5.26	-3.72	-2.98	-2.62	Stationary
D(L) Lag 0	-6.22	-3.723	-2.98	-2.62	Stationary
D(SET) Lags 0	-3.59	-3.75	-3	-2.63	Stationary
D(BC) Lags 0	-4.89	-3.72	-2.98	-2.62	Stationary
D(INFL) Lag 0	-5.77	-3.73	-2.99	-2.62	Stationary
D(PA) Lags 0	-5.9	-3.75	-3	-2.63	Stationary
D(N) Lags 0	-3.64	-3.71	-2.98	-2.62	Stationary

Table 22: ADF test on the variables GRGDP, GCF, EXP, L, SET, BC, INFL, PA, N

Variables	t-ADF	1% Critical Value	5% Critical Value	10% Critical Value	observation
GRGDP					
Lags 0	-3.28	-3.72	-2.98	-2.62	I(0) Stationary
1	-2.52	-3.73	-2.99	-2.62	I(1)
GCF					
Lags 0	-2.26	-3.75	-3	-2.63	Non stationary
EXP					
Lags 0	-1.87	-3.71	-2.98	-2.62	Non stationary
L					
Lags 0	-4.22	-3.71	-2.98	-2.62	I(0) Stationary
1	-2.31	-3.72	-2.98	-2.62	I(1)
SET					
Lags 0	-1.64	-3.75	-3	-2.63	Non stationary
BC					
Lags 0	-0.27	-3.71	-2.98	-2.62	Non stationary
INFL					
Lag 0	-2.38	-3.72	-2.98	-2.62	Non stationary
PA					
Lags 0	1.39	-3.75	-3	-2.63	Non stationary
N					
Lags 0	-3.64	-3.71	-2.98	-2.62	I(0) Stationary
1	-1.84	-3.72	-2.98	-2.62	I(1)

Note that for the dummy variable OILC we don't need to do the stationary test

Tests for Cointegration

Another test to do when working with time series is that of cointegration. The aim is to detect if variables with a unit root have a common stochastic trend. If it is the case, there is an equilibrium relationship in the long term between the variables; and the linear combination of two variables from non-stationary series is stationary. In such situation, the formulation in difference leads to model misspecification and terms of correction of errors must be added.

Johansen test for cointegration

Trace test

It is a test of the ratio of maximum of likelihood consisting in calculating the following statistic

TR= -T$\sum_{i=q+1}^{N} \log (1 - \lambda i)$

The null hypothesis tested is: r $\leq q$, i.e. there are at most r vectors of cointegration.

This test amounts to test the rank of the matrix π_p since testing the existence of r vectors of cointegration amounts to test the null hypothesis: $R_g (\pi_p) = r$.

Johansen (1988) showed that under the null hypothesis, the statistic TR has for asymptotic law the law of:

Trace$[\int_0^1 W(r)dW'(r)\,(\int_0^1 W(r)W'(r)dr)^{-1}\int_0^1 dW(r)W'(r)]$

Where W is a Brownian movement of matrix of variance-covariance the identity matrix.

We reject the null hypothesis of r relations of cointegration when the statistic TR is greater than its critical value.

We have three cases:

– R_g (π_p) = 0. This means that r = 0: there is no cointegration relationship. In this case, X_t is integrated of order 1 but not cointegrated. It is then possible to estimate a VAR model on ΔX_t.

– R_g (π_p) = r, with 0 < r < N: This means that X_t is cointegrated of rank r and then there are r relations of cointegration. An error correction model can then be estimated.

– R_g (π_p) = N. In other words, r = N, i.e. that π_p is of full rank. In this case, X_t is stationary and there is no relation of cointegration. A VAR model can be directly estimated on X_t.

The null hypothesis is rejected if the trace statistic is greater than the critical value. Start by testing H_0: r = 0. If it rejects, repeat for H_0: r = 1. In our case we repeat until H_0: r = 8 and we reject at the 5% level the null hypothesis of r relations of cointegrations (4.495 > 3.76)

So, the results of the trace test show that we are in the third case i.e. r = N. There is no relation of cointegration. A VAR model can be directly estimated on X_t.

Table 23: result of the trace test for the model 1

Trend: constant			Number of observation = 29			
Sample: 1962 – 1990			Lags = 1			
maximum				trace	5% critical	1% critical
Rank	parms	LL	eigenvalue	statistic	value	value
0	9	-790.8		254.46	192.89	204.95
1	26	-758.53	0.89	189.92	156	168.36
2	41	-733.14	0.82	139.14	124.24	133.57
3	54	-713.25	0.74	99.36*1	94.15	103.18
4	65	-700.36	0.58	73.59	68.52	76.07
5	74	-688.97	0.54	50.81	47.21	54.46
6	81	-680.4	0.44	33.68	29.68	35.65
7	86	-672.18	0.43	17.23	15.41	20.04
8	89	-665.81	0.35	4.49	3.76	6.65
9	90	-663.56	0.14			

Model 2: the factors explaining the Japanese recession

In this model, we will focus on variables that could affect negatively Japan's economy since the objective is to find the causes of the slump. Theoretically, as we have mentioned it in Chapter 4 the disappointing economic performance of Japan is mainly linked to the financial crisis and the appreciation of yen. After having accepted these variables and taking into account the theoretical framework, the model to estimate becomes:

$$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 INFL_t + \beta_3 EXR_t + \beta_4 DR_t + \beta_5 FC_t + U_t$$

Definitions of variables and methods of the determination

The variables used in the model are the following:

GRGDP: GDP per capita growth (annual %) derived from World Bank Indicators.

GCF: Gross capital formation (% of GDP) derived from World Bank Indicators. Formerly known as gross domestic investment the gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.

INFL: Inflation (annual %) derived from International Financial Statistics and International Monetary Fund and as it is shown above is measured by the consumer price index.

EXR: Exchange Rate derived from International Monetary Fund. In general, the exchange rate is the relative price of one currency against another.

DR: Discount Rates of central bank (%) derived from the bank of Japan. The discount rate is the cost of borrowing from the central bank. The Japan central Bank discount rate is the interest rate charged by the Bank of Japan on loans to banks.

FC: Financial crisis $\begin{cases} 1 \text{ for the year of financial crisis} \\ 0 \text{ otherwise} \end{cases}$

Heteroskedasticity Test

H_0: homoskedasticity

H_1: heteroskedasticity

Table 24: Result of the Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1)	7.05
Prob > chi2	0.0079

Since the p-value is significant, we reject H_0 and conclude that there is heteroskedasticity.

Serial Correlation test

H_0: there is no autocorrelation

H_1: there is autocorrelation

Table 25: Result of the autocorrelation test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.004	1	0.95

Since the p value is not significance at 5%, we accept H_1 and conclude that there is no serial correlation.

Stationarity test

Determination of the order of integration of series

The results are given in the table 27 and show that the first differences of the series GRGDP, GCF, INFL and EXR are stationary.

The results given in the table 26 show that the series GRGDP and GCF and are not stationary, the series INFL and EXR are stationary when there are lagged by 1 year; the variable DR is stationary with or without lags.

Consequently:

- ►the series GRGDP and GCF are integrated of order 1
- ►The variables INFL and EXR are integrated of order 1 if they are not lagged by 1 year.

Table 26: ADF test on the variables GRGDP, GCF, INFL, EXR, and DR

Variables	t-ADF	1% Critical Value	5% Critical Value	10% Critical Value	Observations
GRGDP					
Lags 0	-2.02	-3.75	-3	-2.63	I(1)
1	-2.95	-3.75	-3	-2.63	I(1)
GCF					
Lags 0	-0.96	-3.75	-3	-2.63	I(1)
1	-1.11	-3.75	-3	-2.63	I(1)
INFL					
Lag 0	-2.32	-3.75	-3	-2.63	I(1)
1	-3.01	-3.75	-3	-2.63	I(0) stationary
EXR					
Lags 0	-1.89	-3.75	-3	-2.63	I(1)
1	-3.71	-3.75	-3	-2.63	I(0) stationary
DR					
Lags 0	-3.96	-3.75	-3	-2.63	I(0) Stationary
1	-10.59	-3.75	-3	-2.63	I(0)

Table 27: ADF test on the variables D(GRGDP), D(GCF), D(INFL), D(EXR)

Variables	t-ADF	1% Critical Value	5% Critical Value	10% Critical Value	observations
D(GRGDP)					
Lags 0	-3.05	-3.75	-3	-2.63	stationary
D(GCF)					
Lags 0	-2.57	-3.75	-3	-2.63	
1	-3.33	-3.75	-3	-2.63	Stationary
D(INFL)	-4.32	-3.75	-3	-2.63	Stationary
D(EXR)	-3.39	-3.75	-3	-2.63	Stationary

Note that for the dummy variable FC we don't need to do the stationary test

Tests for Cointegration

Johansen test for cointegration

Table 28: results of the trace test for the model 2

Trend: constant			Number of observation = 18			
Sample: 1992 – 2009			Lags = 1			
maximum				trace	5%critical	1%critical
rank	parms	LL	Eigenvalue	statistic	value	value
0	5	-87.6		137.67	68.52	76.07
1	14	-63.49	0.93	89.45	47.21	54.46
2	21	-41.44	0.91	45.35	29.68	35.65
3	26	-27.34	0.79	17.16*1	15.41	20.04
4	29	-20.9	0.51	4.26	3.76	6.65
5	30	-18.76	0.21			

Like for the model 1, the results of the trace test show that we are in the third case i.e. r = N. There is no relation of cointegration. A VAR model can be directly estimated on X_t.

6.3 Results analysis

All estimation results were obtained from Stata software. The considered threshold for the interpretation of results is 5%. It is the threshold of statistical significance. We say that a coefficient is significant if the probability level is less than 5%.

In this section, we will in a first time, present and analyze the results of model 1 and those of Model 2 in a second time.

Model 1: the factors explaining the Japanese economic growth

$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 EXPT_t + \beta_3 L_t + \beta_4 SET_t + \beta_5 BC_t + \beta_6 INFL_t + \beta_7 PA_t + \beta_8 N_t + \beta_9 OILC_t + U_t$

As we highlighted it in the precedent chapters, this model tries to find empirically and by using a vector-autoregression (VARs), the determinants of the Japanese spectacular performance in the decades following World War II,.

The following table presents the result of the estimation of the model.

Table 29: Result of the estimation of the model 1

GRGDP	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
L1.	-0.2	0.08	-2.42	0.01	-0.37	-0.04
L2.	-0.25	0.08	-2.97	0.003	-0.42	-0.08
GCF	**0.64**	**0.17**	**3.7**	**0**	**0.3**	**0.98**
EXPT	-0.17	0.25	-0.7	0.48	-0.66	0.31
L	**0.82**	**0.23**	**3.46**	**0**	**0.35**	**1.27**
SET	-0.00	0.17	-0.02	0.98	-0.337	0.331
BC	**-0.06**	**0.01**	**-5.07**	**0**	**-0.087**	**-0.038**
INFL	-0.3	0.11	-2.52	0.01	-0.51	-0.06
PA	**3.13E-05**	**8.06E-06**	**3.89**	**0**	**0.00**	**0.00**
N	-0.21	0.62	-0.34	0.73	-1.43	1.01
OILC	-1.58	1.13	-1.4	0.16	-3.81	0.64
_cons	-55.28	12.78	-4.32	0	-80.33	-30.22

The results of the estimation of econometric model allow us to draw the following conclusions about the effects of different variables on the real per capita GDP growth rate of Japan.

●Real per capita GDP growth rate and the gross capital formation: Our results show that this variable is important in determining growth of Japan. They confirm that the capital formation is an engine of growth. This variable is an outcome not only from the savings effort in the country but also the level of development of its financial sector, so it sums up the country's policies in encouraging savings, investment and

development of the financial sector for efficient channeling of savings into investment. Our results confirm those of several empirical studies, in particular the one of **Edward Denison** and **William Chung** highlighting the importance of this factor for economic growth in Japan. Furthermore the results of the model support the hypothesis that gross capital formation is positively related to growth rate. The effect is statistically significant at 5%. In terms of interpretation, we can say that gross capital formation positively and significantly influenced the economic growth of Japan over the period 1960-1990. An increase of 1% of the gross capital formation increases the growth of Japan by 0.6%.

●Real per capita GDP growth rate and the export: this variable of economic policy is one of the most studied in the empirical literature. Even if there is tendency to conclude a positive correlation between trade openness and growth, there is no really strong evidence. In our estimation this variable is not significant and tends to have a negative effect. This result is not in accordance with our hypothesis.

●Real per capita GDP growth rate and the labor: this variable is significant and has an important explanatory power. This result is not surprising; in all empirical studies

on economic growth of Japan we found that variable. The labor positively affects growth because it remains a factor of production. The results of the model support the hypothesis that labor is positively related to growth rate. The effect is statistically significant at 5%. The interpretation we can give is that the labor participation rate positively and significantly impacted the economic growth of Japan over the period 1960-1990. It confirms, in particular, the results of Edward **Denison** and **William Chung, and MIYOHEI SHINOHARA** showing that the high rate of increase in the labor force has contributed to the high rate of Japanese economic growth. The results showed that an increase of 1% of the labor increases the growth of Japan by 0.8%. In fact, the first of the Japanese growth factors was an abundant supply and cheap, quality labor. Japan's labor was highly educated and well-equipped to absorb and master modern technology. Japan's labor force contributed significantly to economic growth, not only because of its availability and literacy but also because of its reasonable wage demands. Immediately after World War II, the transfer of numerous agricultural workers to modern industry resulted in rising productivity and only moderate wage increases. As population growth slowed and the nation became

increasingly industrialized in the mid-1960s, wages rose significantly. However, labor union cooperation generally kept salary increases within the range of gains in productivity.

●Real per capita GDP growth rate and the human capital: here represented by tertiary school enrollment, this variable has a coefficient that is not significant at the 5% level. This could be explained by the fact that it has to be combined with life expectancy. Indeed, in addition to the life expectancy it is the indicator of human capital. The results of the model did not support the hypothesis that economic growth is positively affected by human capital. This result is not consistent with those obtained in many studies, but is in accordance with the works of Benhabib & Spiegel (1994) and Kyriacou (1991) that showed that the effect of human capital is not significant.

●Real per capita GDP growth rate and Banking Credit: the results showed that the Banking Credit negatively and significantly affects economic growth. This result is not in accordance with the hypothesis that Banking Credit has a positive impact on the Japanese growth.

●Real per capita GDP growth rate and inflation: the results of the model accept the hypothesis that economic growth is negatively affected by inflation. The effect is statistically significant at 5%. An increase of 1% in inflation reduces the growth of Japan by 0.28%.

●Real per capita GDP growth rate and technology: the empirical results also support the model hypothesis that technology and growth are positively related. The effect is statistically significant at 5%. The interpretation is that the advance in technology positively and significantly affected the economic growth of Japan over the period 1960-1990. It is not surprising given the importance of the use of technology in accelerating growth. This result is consistent with those obtained by **MIYOHEI SHINOHARA** and **SABURO OKITA** showing that the technological innovations acted as important stimuli and have greatly influenced the course of Japan's economic growth in the postwar economy of Japan.

●Real per capita GDP growth rate and growth rate of population: the results of the model did not support the hypothesis that growth rate of population is positively

related to growth rate. However, the effect is not statistically significant at 5%. The technology was the third factor of the Japanese growth. In the years following World War II, and under conditions similar to those at the time of the Meiji Restoration, Japan actively set about acquiring advanced technology from abroad.

- Real per capita GDP growth rate and oil shocks: the results of the model showed that oil shocks affect the Japanese economic growth.

Model 2: the factors explaining the Japanese recession

$GRGDP_t = \beta_0 + \beta_1 GCF_t + \beta_2 INFL_t + \beta_3 EXR_t + \beta_4 IR_t + \beta_5 FC_t + U_t$

This model examines the reasons for the slowdown in activity in Japan empirically using a vector-autoregression (VARs).

The following table presents the result of the estimation of the model

Table 30: Result of the estimation of the model 2

GRGDP	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
L1.grgdp	-0.23	0.31	-0.74	0.45	-0.83	0.37
GCF	0.15	0.18	0.83	0.40	-0.20	0.50
INFL	0.82	0.60	1.38	0.17	-0.34	1.98
EXR	**-15.90**	**4.65**	**-3.42**	**0.001**	**-25.02**	**-6.79**
DR	-0.07	0.32	-0.22	0.82	-0.70	0.56
FC	**-3.33**	**0.812**	**-4.1**	**0.00**	**-4.92**	**-1.73**
_cons	12.42	7.78	1.6	0.11	-2.83	27.68

The results of econometric estimation using the VAR model allow us to draw the following conclusions regarding the factors explaining the Japanese economic slump of the 1990s.

● the exchange rate negatively and significantly influence the Japanese economic growth. This result confirms the one of Tamim Bayoumi which shows that increase in the real exchange rate lowered the economic growth of Japan. Indeed, our study shows that an increase of 1 in exchange rate leads to a decrease in real per capita

GDP growth rate by **15.90**. The empirical results support the model hypothesis that the appreciation of the yen causes the Japanese recession.

●The variable financial crisis negatively and significantly influenced the Japanese economic growth. This result is not surprising and confirms the argument that the collapse of asset price was an important factor in the recession. Indeed a year of financial crisis is followed by a decrease in real per capita GDP growth rate by **3.33**. The empirical results support the model hypothesis that the financial crises causes the Japanese recession.

● the discount rates negatively influence the Japanese economic growth. The hypothesis of Changes in real per capita GDP growth rate of Japan are directly and negatively related to the increase of the central bank discount rates during the period of recession is verified. However, the effect is not statistically significant at 5%.

CHAPTER 7: CONCLUSION AND POLICY RECOMMENDATIONS

7. 1 Conclusion

In this study, we tried to answer two important questions of the economy of Japan, namely what are the determinants of its performance and what are the causes of its recession. In the first question we are mainly concerned with the study of the factors that contributed to the nation's swift economic growth in the postwar year. In the second question, the objective is to determine the extent to which various factors contributed to the Japanese recession.

We started with a description and an analysis of the characteristics of the Japanese economy over the period 1960-2009. The salient facts identified are the followings: an economy poor in natural resources, an economy with High GDP, an industrial economy, an important role of the state, significant weight of foreign trade, a Country with Strong International Economic Relations and a country with high rate of savings and investment. We then in a third chapter analyze performance during the postwar period and the disappointing performance during the 1990s of the Japanese economy. We have devoted a chapter to review the theoretical and

empirical literature on economic growth factors. The theoretical framework and the model specification have been described in chapter five. The chapter six has been devoted to the methodology, the empirical testing and to the analysis of the results after having quantified the effects of the considered variables on the growth of Japan.

The results of our estimates highlight three important factors as reasons for Japan's economic performance during the period 1960-1990. It has been found that during that period, the increased labor, the increased capital stock, and the advances in knowledge have been instrumental in explaining growth, further bolstering economic theory on this subject.

The results of our estimates also highlight the reasons for the marked slowing of growth in Japan in the 1990s. It shows that during the period 1990-2009 the appreciation of the yen, the financial crisis and the discount rate were instrumental in the decline of the Japanese economy.

These results we get are for the most part consistent with those obtained in empirical studies of this kind.

7. 2 Policy Recommendations

Lessons from the results presented in previous chapter show how growth can be accelerated if the government acts on a particular factor.

Based on the results of model 1 this study will do the following recommendations:

→Policy of maintaining a high rate of employment must be established in order to have a high participation rate of labor.

→Technology policy should be improved by promoting research and development because R&D is a vital source of technological progress. As it is shown the advances in technical know-how has played in important role in the Japanese development since the end of World War II.

→The investment promotion policy needs to be strengthened.

The results also show how some decisions can lead to slump in growth and measures have to be taken.

Based on the results of model 2 we will do the following recommendations:

→The mechanisms of anticipation and prediction of the crisis should be created to lessen their impact on the economy.

→Japan must learn from its lost decade: not fundamentally remedy weaknesses in the financial sector amount to compromise the smooth functioning of monetary and fiscal policies and expose the economy to adverse shocks later. In this regard, priority should be given promptly to the identification of losses to assets affected. Public funds can help to recapitalize the banking sector, if banks are unable to raise sufficient capital in the market.

→A strict control of fluctuations in the yen against the dollar must be established in order to prevent the negative effects of its appreciation on growth.

7. 3 Limitations of the study and prospects for future research

Limitations

We have to note that our study on the determinants of Japan's economic growth did not permit to grasp all possible aspects of the factors of economic growth. Certain variables such as the government policy, the economy of scale, the effect of weather on farming, the household saving, the private consumption etc. have also been

identified as the factors of Japanese economic growth in other studies but not taken in account in this present study.

The other major difficulty encountered is related to the availability of data. Indeed for some variables the data are available only from 1990. This lack of data is a limit to our study because it would have been more complete in the presence of variables such as research and development, infrastructure, public investment, private investment and foreign direct investment for a more exhaustive explanation of the factors of economic growth in Japan.

The gap between the reality and the results of our estimate result precisely from the omission of certain variables that may affect the growth of the economy of Japan.

Prospects for future researches

A unique and universal recipe to guide policy makers in growth does not exist, according to a recent study by the World Bank that recommends abandoning the simple formulas and research always disappointed of "optimal practices" in favor of a more thorough economic analysis of what, in each country is stubbornly barriers to

growth. According to the same study of the World Bank: “Any process of growth is punctuated by the appearance and the removal of successive barriers”, therefore, a future study aimed at identifying obstacles to Japanese economic growth and showing how to eliminate these obstacles is necessary because it is in relying on the domain that bridle the more the growth that a country would have more luck to harvest the fruits of its efforts.

We're not going to finish this study without mentioning the natural disaster that hit Japan in 11 March 2001. The great earthquake in eastern Japan, the most powerful ever recorded in Japan, caused the worst disaster in the history of the country since the World War II. The earthquake and subsequent tsunami caused massive casualties and economic damage of great magnitude. Japanese authorities estimate the amount of damage to public facilities, housing and private fixed capital between 3.3% and 5.2% of GDP of 2010. In addition to the usual risks that may weigh on global trade, exchange rates and commodity prices, considerable uncertainty surrounds the outlook in Japan, in particular as regards the duration of supply disruptions in

electricity, the problems at the Fukushima nuclear power plant or the magnitude of public spending on reconstruction and timing. Therefore it is extremely difficult to predict when the economic rebound will occur and what will be the effect.

The earthquake hit Japan when the country seemed to have returned to a phase of expansion after the economic downturn occurred in the latter part of 2010. The immediate aftermaths of the terrible disaster are no doubt huge, extending beyond the regions devastated by the earthquake and tsunami. In fact, the damage suffered by the plants in the Tohoku region has disrupted supply chains of major industrial products beyond the borders of Japan, particularly in the automotive sector. However, the experience of disasters that hit Japan and other developed countries in the past suggests that the short-term negative impact on economic output will be followed by a recovery as the reconstruction effort.

Following this present study, others studies could focus, given the magnitude of economic damages, on the consequences of this catastrophe and the measures to be taken to prevent the Japanese economy to enter in a prolonged recession from 2012.

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APPENDICES

Table 31: The variables of the model 1

Year	GRGDP	GCF	EXPT	L	SET	BC	INFL	PA	N	OILC
1960	11.04	39.12	10.72	60.12	24.33	60.3	5.4	53876	0.9	0
1961	11.04	39.12	9.27	60.12	24.33	59.78	5.4	53876	0.89	0
1962	7.89	38.12	9.43	60.11	24.33	76.07	6.77	53876	0.93	0
1963	7.37	39.12	9.03	60.11	24.33	82.9	7.66	53876	1.01	0
1964	10.51	39.12	9.49	63	24.33	83.97	3.84	55556	1.04	0
1965	4.68	37.12	10.51	60.1	24.33	88.07	6.59	60796	1.07	0
1966	9.63	39.12	10.57	63.1	24.33	89.97	5.08	62962	0.91	0
1967	10.05	39.12	9.65	63.2	24.33	90.32	3.97	61721	0.93	0
1968	12.5	40.12	10.11	64.1	24.33	87.35	5.37	71114	0.33	0
1969	10.17	39.12	10.55	63.2	24.33	87	5.24	77132	2.06	0
1970	3.11	39.12	10.66	61.2	24.33	137.3	7.67	100513	1.13	0
1971	3.36	35.84	11.56	61.2	24.33	150.8	6.27	78425	1.28	0
1972	6.9	35.62	10.44	62.2	24.33	163.9	4.96	101328	1.4	0
1973	7.14	38.17	9.9	63.2	24.33	161.3	11.61	115221	0.82	0
1974	-3.09	37.41	13.42	60.2	24.33	157.5	23.18	121509	1.9	1
1975	1.45	32.86	12.63	60.2	24.33	168	11.74	135118	1.6	0
1976	3.2	31.92	13.37	62	24.33	173.7	9.41	135762	0.73	0
1977	3.39	30.93	12.92	62	24.33	176.5	8.14	135991	0.96	0
1978	4.32	30.99	10.97	63	24.33	182.7	4.18	141517	0.9	0
1979	4.6	32.58	11.41	63	24.33	187.6	3.72	150623	0.84	0
1980	2.01	32.32	13.51	63.2	30.87	193.1	7.8	165730	0.78	1
1981	3.41	31.24	14.49	63.2	30.87	198.8	4.91	165730	0.73	0
1982	2.67	29.94	14.29	63.4	30.87	209.2	2.73	165730	0.67	0
1983	2.36	27.95	13.72	63.8	30.87	218.7	1.89	227708	0.68	0
1984	3.8	27.83	14.82	63.5	30.87	223.7	2.25	256195	0.63	0
1985	5.68	28.36	14.19	63	29.16	226.5	2.04	274348	0.61	0
1986	2.2	28.12	11.17	62.9	29.17	236.2	0.61	290132	0.6	0
1987	3.59	28.65	10.21	62.7	29.17	249.9	0.12	310908	0.49	0
1988	6.69	30.84	9.83	62.6	29.17	257.6	0.64	308775	0.42	0
1989	4.94	32.01	10.3	62.8	29.17	264	2.28	317353	0.4	0
1990	5.21	32.72	10.35	63.3	29.07	267	3.06	332952	0.34	0

Source: World Bank Indicators

Table 32: The variables of the model 2

Year	GRGDP	GCF	INFL	EXR	DR	FC
1990	5.21	32.72	3.06	0.74	6	0
1991	3	32.44	3.26	0.8	6	1
1992	0.57	30.75	1.71	0.8	4	1
1993	-0.07	29.42	1.27	0.89	2.7	1
1994	0.52	28.25	0.69	1	1.75	0
1995	1.49	28.34	-0.12	0.97	0.5	0
1996	2.37	28.87	0.13	0.86	0.5	0
1997	1.297	28.34	1.76	0.77	0.5	1
1998	-2.29	26.25	0.66	0.86	0.5	1
1999	-0.33	24.84	-0.33	0.98	0.5	1
2000	2.68	25.43	-0.71	0.87	0.5	0
2001	-0.04	24.75	-0.75	0.76	0.35	1
2002	0.03	23.06	-0.89	0.83	0.1	0
2003	1.19	22.84	-0.24	0.93	0.1	0
2004	2.7	23.03	-0.01	0.96	0.1	0
2005	1.92	23.56	-0.27	0.84	0.1	0
2006	2.05	23.79	0.24	0.85	0.1	0
2007	2.35	23.7	0.06	0.88	0.1	0
2008	-1.15	23.6	1.37	1.09	0.1	0
2009	-5.12	20.36	-1.35	1.11	0.1	0

Source: World Bank Indicators