

# Growth, Poverty and Inequality Analysis on Japan 1998-2023

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## Abstract

After gaining high growth during 1960s to 1980s, Japan's asset price bubble burst in 1992 and the economy stagnated. Japan's stagnation is sometimes referred as "Lost Decade" [1]. This paper first performs growth accounting on Japan's macro economy from 1997 to 2023 using Solow-Swan model. Followed by analysis of various government policies' impact on growth, inequality and poverty. Suggestion on potential policies made at the end.

## Growth Accounting

Data Source:

- $Y$ : Real GDP, data from cabinet office of Japan, unit in billion, 1995 Japanese Yen. [2]
- $K$ : Net capital stocks of fixed assets, data from cabinet office of Japan, unit in billion, 1995 Japanese Yen. [3]
- $L$ : Labour,  $L = W * H$ , unit in ten thousand hours
  - $W$ : Seasonal adjusted number of workers at the end of the year, data from Statistics Bureau of Japan [4], unit in ten thousand persons
  - $H$ : Average working hours per worker in Japan provided by OECD [5], unit in hours per worker

I choose  $Y$  and  $K$  data from cabinet office of Japan as it should be the most authoritative source of data.

I choose  $L$  data provided by Statistics Bureau of Japan as it provides the most comprehensive data since Jan 1953, but it didn't provide average working hours per worker. Thus I use data from OECD, which provide data of OECD countries that may be used for comparison in future studies.

Although Japanese government's official statistics may contain error [6], the fact that such error being revised should add credibility to official statistics.

By using Solow-Swan model, Japan's Total Factor Productivity -  $A$  could be calculated by:

$$A = Y / K^\alpha / L^{1-\alpha}$$

- $\alpha$ : capital share of  $Y$ , this value is usually assumed to be 0.4, noting this value could be lower (like 32% for 1990s [7]), I also added calculation for  $\alpha = 0.2$  for comparison.

	A	B	C	D	E	F	G	H	J	K	L	M	N	O
1	Year	Real GDP(Y)	Capital Stock (K)	Number of Employment	Average annual hours per worker	Labour(L)	TFP(A) : $\alpha = 0.4$	TFP(A) : $\alpha = 0.2$			Calculate Growth Rates			
2	1997	477,269.50	1,711,955.8	6794	1,865.0	12,670,810.0	8.38849%	5.62110%		Y	K	L	A $\alpha=0.4$	A $\alpha=0.2$
3	1998	471,206.60	1,745,217.9	6779	1,842.0	12,486,918.0	8.29084%	5.59342%		-1.27%	1.94%	-1.45%	-1.16%	-0.49%
4	1999	469,633.10	1,774,679.1	6770	1,810.0	12,253,700.0	8.30138%	5.64054%		-0.33%	1.69%	-1.87%	0.13%	0.84%
5	2000	482,616.80	1,803,404.0	6787	1,821.0	12,359,127.0	8.43281%	5.73844%		2.76%	1.62%	0.86%	1.58%	1.74%
6	2001	484,480.20	1,828,077.9	6745	1,809.0	12,201,705.0	8.48449%	5.80418%		0.39%	1.37%	-1.27%	0.61%	1.15%
7	2002	484,683.50	1,843,243.7	6669	1,798.0	11,990,862.0	8.54899%	5.87843%		0.04%	0.83%	-1.73%	0.76%	1.28%
8	2003	492,124.00	1,856,725.8	6659	1,799.0	11,979,541.0	8.65987%	5.96448%		1.54%	0.73%	-0.09%	1.30%	1.46%
9	2004	502,882.40	1,869,642.2	6632	1,785.0	11,838,120.0	8.88778%	6.14453%		2.19%	0.70%	-1.18%	2.63%	3.02%
10	2005	511,953.90	1,885,117.4	6640	1,777.0	11,799,280.0	9.03612%	6.26151%		1.80%	0.83%	-0.33%	1.67%	1.90%
11	2006	518,979.70	1,899,502.2	6667	1,786.0	11,907,262.0	9.08254%	6.29177%		1.37%	0.76%	0.92%	0.51%	0.48%
12	2007	526,681.20	1,908,967.5	6702	1,785.0	11,963,070.0	9.17324%	6.35498%		1.48%	0.50%	0.47%	1.00%	1.00%
13	2008	520,233.10	1,911,305.9	6681	1,771.0	11,832,051.0	9.11654%	6.33117%		-1.22%	0.12%	-1.10%	-0.62%	-0.37%
14	2009	490,615.00	1,898,935.2	6626	1,714.0	11,356,964.0	8.83445%	6.17773%		-5.69%	-0.65%	-4.02%	-3.09%	-2.42%
15	2010	510,720.00	1,886,622.8	6626	1,733.0	11,482,858.0	9.15965%	6.38272%		4.10%	-0.65%	1.11%	3.68%	3.32%
16	2011	510,841.60	1,868,639.5	6597	1,728.0	11,399,616.0	9.23723%	6.43382%		0.02%	-0.95%	-0.72%	0.85%	0.80%
17	2012	517,864.40	1,865,378.8	6542	1,745.0	11,415,790.0	9.36280%	6.51715%		1.37%	-0.17%	0.14%	1.36%	1.30%
18	2013	528,248.10	1,866,980.7	6601	1,734.0	11,446,134.0	9.53206%	6.63259%		2.01%	0.09%	0.27%	1.81%	1.77%
19	2014	529,812.80	1,870,693.1	6625	1,729.0	11,454,625.0	9.54845%	6.64565%		0.30%	0.20%	0.07%	0.17%	0.20%
20	2015	538,081.20	1,876,448.4	6648	1,719.0	11,427,912.0	9.69914%	6.75783%		1.56%	0.31%	-0.23%	1.58%	1.69%
21	2016	542,137.40	1,881,904.2	6722	1,714.0	11,521,508.0	9.71325%	6.76056%		0.75%	0.29%	0.82%	0.15%	0.04%
22	2017	551,220.00	1,889,728.2	6761	1,709.0	11,554,549.0	9.84268%	6.85240%		1.68%	0.42%	0.29%	1.33%	1.36%
23	2018	554,766.50	1,897,426.0	6867	1,680.0	11,536,560.0	9.89916%	6.89948%		0.64%	0.41%	-0.16%	0.57%	0.69%
24	2019	552,535.40	1,905,045.4	6941	1,644.0	11,411,004.0	9.90840%	6.92660%		-0.40%	0.40%	-1.09%	0.09%	0.39%
25	2020	528,894.60	1,906,613.1	6930	1,597.0	11,067,210.0	9.65698%	6.79338%		-4.28%	0.08%	-3.01%	-2.54%	-1.92%
26	2021	540,309.70	1,908,173.0	6904	1,607.0	11,094,728.0	9.84749%	6.92510%		2.16%	0.08%	0.25%	1.97%	1.94%
27	2022	545,955.60	1,908,286.6	6899	1,607.0	11,086,693.0	9.95448%	7.00143%		1.04%	0.01%	-0.07%	1.09%	1.10%
28														
29	CAGR	0.54%	0.44%	0.06%			-0.59%	-0.53%	0.69%	0.88%				

As shown in above table, the compound annual growth rate - CAGR of Japan's real GDP  $Y$  is merely 0.54%, with a even lower CAGR of capital stock  $K$  of 0.44%.

The size of Japan work force almost didn't change, CAGR is close to zero (0.06%). The overall labour  $L$  is worsen by the declining of average annual hours per worker of  $-0.58\%$ , resulting in a  $-0.53\%$  CAGR of  $L$ .

The value of TFP(A) is between 6% - 8%. It may looks high comparing to  $Y$ ,  $K$ ,  $L$ , but this is due to the unit chosen for  $Y$ ,  $K$ ,  $L$ . If we change the unit of  $L$  from ten thousand hours to one hour, the TFP in 1997 will become 0.03340% ( $\alpha = 0.4$ ). And if we change the unit of  $Y$ ,  $K$  from billons to a dollar, TFP will become 2107094%.

It's more important to analyze the CAGR of  $A$  comparing to  $K$ ,  $L$ , instead of looking at its nominal value for individual years, which could be scaled by choosing a different unit of for  $Y$ ,  $K$ ,  $L$ .

The CAGR of  $A$  is 0.69% when  $\alpha = 0.4$ , or 0.88% when  $\alpha = 0.2$ , i.e the lower the capital share of  $Y$ , the higher the portion of growth will be attributed to  $A$ , as  $L$  already reaches negative.

By comparing the CAGR of  $Y$ ,  $K$ ,  $L$ ,  $A$ , we could identify that growth of Japan economy is mainly attributed to growth in TFP, and when TFP is limited, the overall growth of overall will be limited as well.

## Timeline

In 1998 and 1999, the real GDP growth were negative ( $-1.27\%$ ,  $-0.33\%$ ), this is due to the economy shock by Asian financial crisis.

It was bounced back by 2.76% in 2000, but the growth in subsequent two years are weak.

The growth in 2003 to 2007 are relatively strong, especially 2004 with a real growth of 2.19%, this is the highest in this 25 years period, besides the years bouncing back from negative growth.

This relatively good growth could be because of Junichirō Koizumi's structural reform policy: Basic Policies for Economic and Fiscal Management and Reform 経済財政運営と構造改革に関する基本方針 or "big-boned" policy 骨太の方針.

The overall CAGR in real GDP under Junichirō Koizumi's administration between 2001 and 2006 is 0.77%.

Global financial crisis hit Japan heavily in 2008 and 2009. Knowing full well of this impact, Prime Minister at the period - Tarō Asō states that: “The greatest concern right now is the economy..America is facing a financial crisis ... we must not allow that to bring us down as well.” shortly after winning the election. [8]

But Tarō Asō didn’t manage to restore Japan’s economic health, the real GDP shrunk by  $-1.22\%$  in 2008 and  $-5.69\%$  and it resulted in Liberal Democratic Party LDP losing the majority, and Yukio Hatoyama from Democratic Party of Japan became Prime Minister.

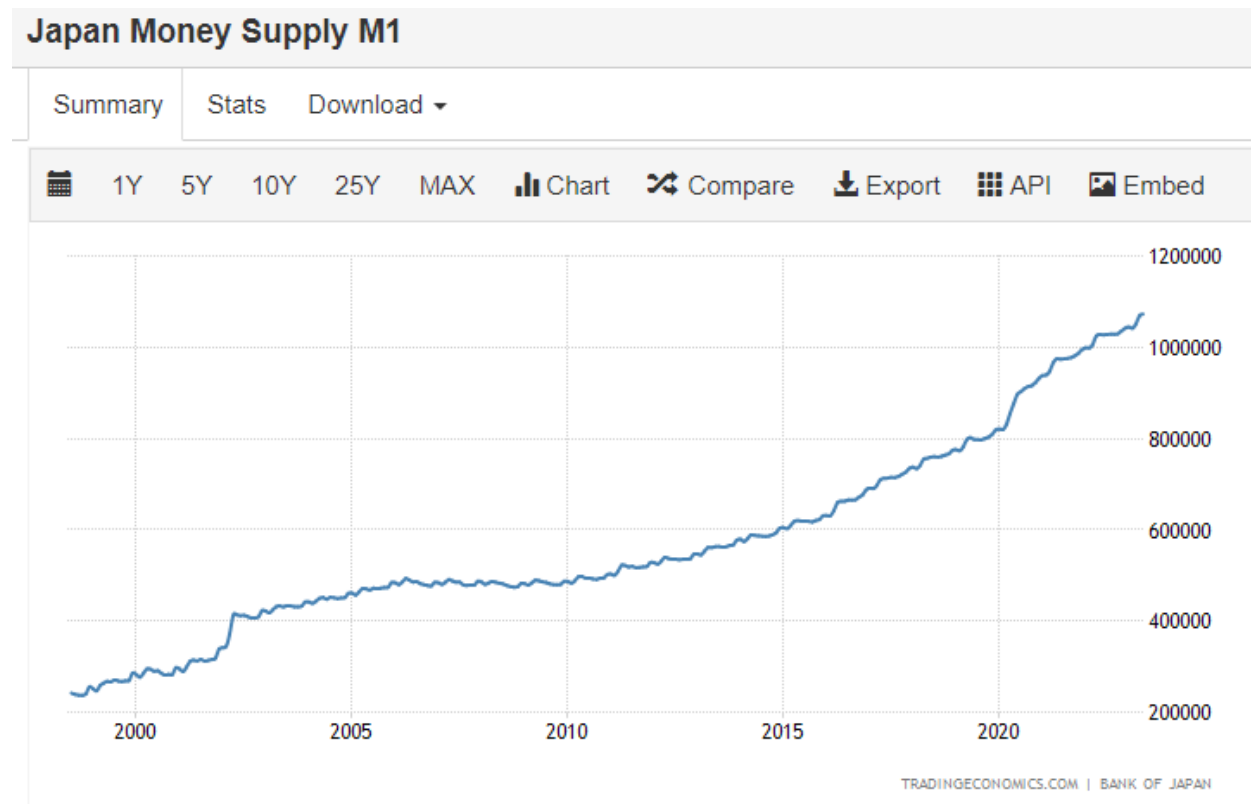
Yukio Hatoyama resigned less than 1 year because of breaking election promise [9] , and the growth in GDP is the lowest of  $0.02\%$  in 2011, after a recover of  $4.10\%$  in 2010.

The Tōhoku earthquake causing tsunami and Fukushima nuclear disaster [10] would explain its extreme low growth in 2011.

Shinzo Abe won election in December 2012, and started large and long standing economy reform known as “Abenomics” [11] which consists “three arrow”:

- 1st arrow: monetary easing from the Bank of Japan
- 2nd arrow: fiscal stimulus through government spending
- 3rd arrow: structural reforms

Abenomics appears to have huge impact on Japan’s economy in nominal terms, take the “1st arrow” as example, M1 money supply is doubled since 2012:





At the same time, the YEN/USD exchange rate is also depreciated by half.

So, roughly speaking, the Abe's 1st arrow - monetary policy reform didn't have impact in the real asset market if we consider change in exchange rate in the long run. This could be explained by the concept of neutrality of money.

The 2nd arrow - fiscal stimulus also appears to have big impact, if we look at private sector credit:

## Domestic credit to private sector (% of GDP) - Japan

International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.

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The private sector credit had been through “deleveraging” after reaching the peak in 2018, and re-leveraging since 2012. Abenomics seems to be taking effect.

But if we look at the overall growth of real GDP under Abenomics, the CAGR between 2012 to 2019 (before COVID hits) is only 0.30%, lower than Koizumi’s administration and even lower than the 25 years CAGR (0.44%).

And covid hits in 2019, real GDP shrinks by  $-0.40\%$  in 2019 and  $-4.28\%$  in 2020, and still yet to recover to the peak in 2018.

Overall, through out the 25 years period, the factors that has big impact(unfortunately all are negative impacts) on Japan’s real GDP growth are external factors:

- Asian financial crisis
- Global financial crisis
- Covid-19

(Tōhoku earthquake may also be considered as “external”)

The administrations has tried hard on various strategies in the past few decade, including drastic ones like negative interest rate, but all seems have limited if not no impact on real GDP growth.

The only aspect of policy appear to work is structural reforms, which Koizumi's "big-bone" policy shown, and the 3rd arrow of Abenomics could also be viewed continuance of the "big-bone".

## Structural Reform

Structural reforms are believed to have have big impact on countries' growth:

- Industrialization, build up industries like manufacturing help low-income countries to become middle-income
- Moving away from low end manufacturing to mid & high ends or to service sectors help middle income countries to escape from "middle income trap" and become advanced economy.

Japan had become moderately developed country (GDP per capita about 30K 40K PPP) in early 90s. The structural reforms Japan needs is something very different.

We could survey on countries that successfully grow to GDP per capita 60K PPP or above, and this level of GDP per capita will make them into the top rank globally.

Most of the countries with high GDP per capita measured in PPP have a small population, taking Norway are Singapore as example, their are able to obtain high economy growth via global investment by sovereign fund, but they both only have a population of 5+ millions. Their strategy will not work in Japan which has a population of 125 millions.

Or, Japan may have already adapted certain strategies to boost GDP per capita in its large cities, but it has a lot more population living rural area to cover.

Prime Minister of Singapore Lee Hsien Loon stated it frankly [12] :

"You said that our per capita GDP is higher than Japan but that is because you have many outlining rural areas of Japan which are not the same as Tokyo. If you compare Singapore with Tokyo or Osaka, I do not think our per capita GDP is higher than the per capita in Tokyo (population: 14 millions) or Osaka(2.691 millions)."

Each growth strategy will has its scaling limit. Even we assume making global investment could bring 5 millions population to 60K GDP per capita, it will require the global market to be least 10 times larger, and such global market simply doesn't exist.

The country with large population that successful overcome "moderately developed country" will be United State, it's a country with GDP per capita of 69,287 measured in PPP [13] and has a population 332 millions.

The US economy becomes the biggest economy in the world by deeply integrated with global economy, globalization that build up global supply chain and enable US products to compete in all over the world.































And one traits of global competition is sometimes "winner takes all" (or majority of the profit).

Taking smart phone market as example, Apple's iPhone dominates this market by taking 85% of the profit [14] .

Automobile industry is another example, being pioneered in electronic vhecles, Tesla is now the biggest automobile companies in the world. Japan's toyota ranks number two, but Tesla's market cap is bigger than the number 2-9 automobiles combined.

**Largest automakers by market capitalization**  
companies: 60 total market cap: \$2.240 T

Rank by **Market Cap** Earnings Revenue P/E ratio Dividend % Operating Margin Employees

Rank	Name	Market Cap	Price	Today	Price (30 days)	Country
1	 <b>Tesla</b> TSLA	\$838.68 B	\$264.61	▲ 1.98%		 USA
2	 <b>Toyota</b> TM	\$214.23 B	\$157.11	▲ 0.39%		 Japan
3	 <b>Porsche</b> P911.DE	\$108.77 B	\$119.40	▼ 0.23%		 Germany
4	 <b>BYD</b> 002594.SZ	\$104.48 B	\$37.31	▼ 0.18%		 China
5	 <b>Mercedes-Benz</b> MBG.DE	\$83.82 B	\$78.35	▼ 0.41%		 Germany
6	 <b>BMW</b> BMW.DE	\$77.70 B	\$117.99	▼ 0.55%		 Germany
7	 <b>Volkswagen</b> VOW3.DE	\$75.85 B	\$133.10	▼ 0.49%		 Germany
▲ 1 8	 <b>Ford</b> F	\$56.77 B	\$14.19	▲ 1.21%		 USA
▼ 1 9	 <b>Ferrari</b> RACE	\$56.00 B	\$307.29	▼ 0.33%		 Italy
10	 <b>Stellantis</b> STLA	\$51.93 B	\$16.63	▼ 1.13%		 Netherlands

Both Apple & Tesla are US companies. It's innovative companies like these gives tremendous growth, and their growth combined drives the overall growth of a country.

Companies need innovation to create distinctive products that grab the most profit - generate large growth.

If Japan aims to have growths similar or even higher than US, it will come down to the question: Can Japanese companies must beat US firms in the global competition. Or be more specific to above example:

Can Sony create innovative smart phones better than Apple, and beat Apple in competition? Can Toyota create EVs or hydrogen powered car that beats Tesla?

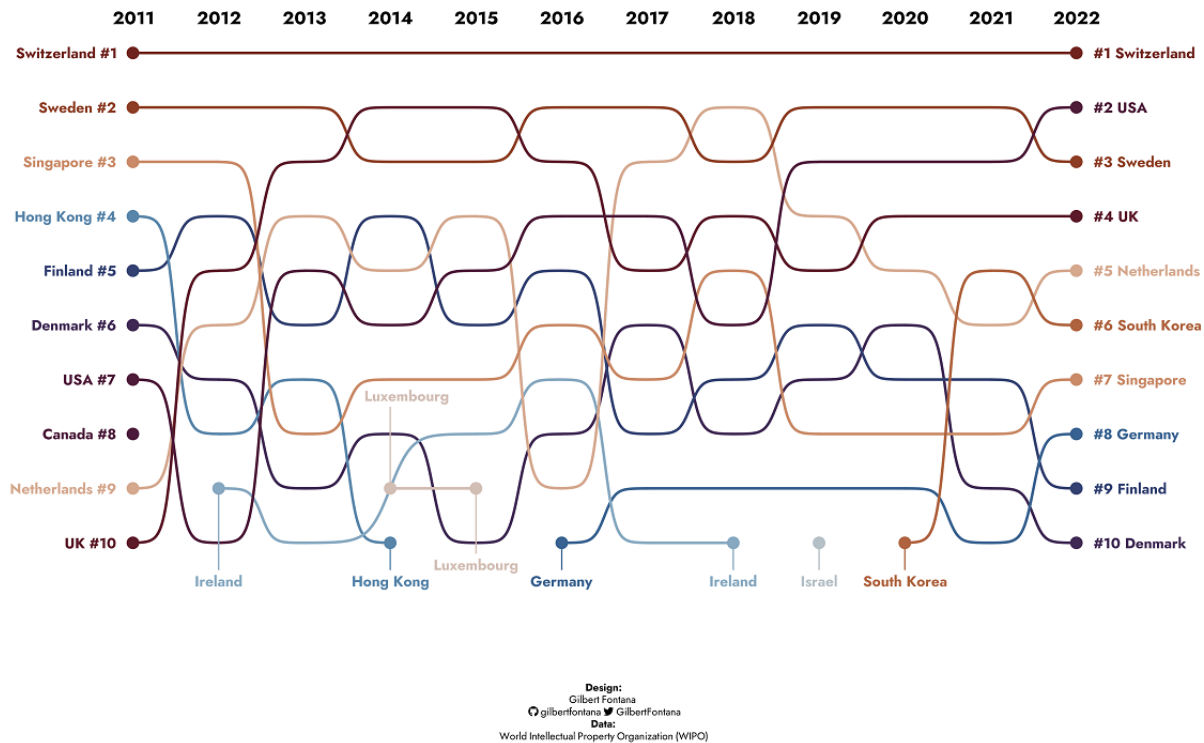
In order for countries like Japan & US with population larger than 100m, they will need to be leading in many industries with vast global market in the world. That includes entertainment, semiconductor, internet etc.

Although Japanese firms do well in all these industries, but they are seldom the top 1 that could gain the most profit, i.e. contribute to the country's growth by boosting TFP.

## Innovation

Japan didn't make it into top 10 in global innovation ranking:

## The Worlds Most Innovative Countries



This could due to various number of reasons.

The typical Japanese culture famous world wide is Craftmanship. And it's best be represented in the documentary Jiro Dreams of Sushi [15] : "After ten years they let you cook the eggs..."

Skilled worker - chef spending decades perfecting cooking skills could make the best sushi in the world, but it's not the product that could be sold to mass global market.

Another possible reason could be lack of economy incentive for innovation.

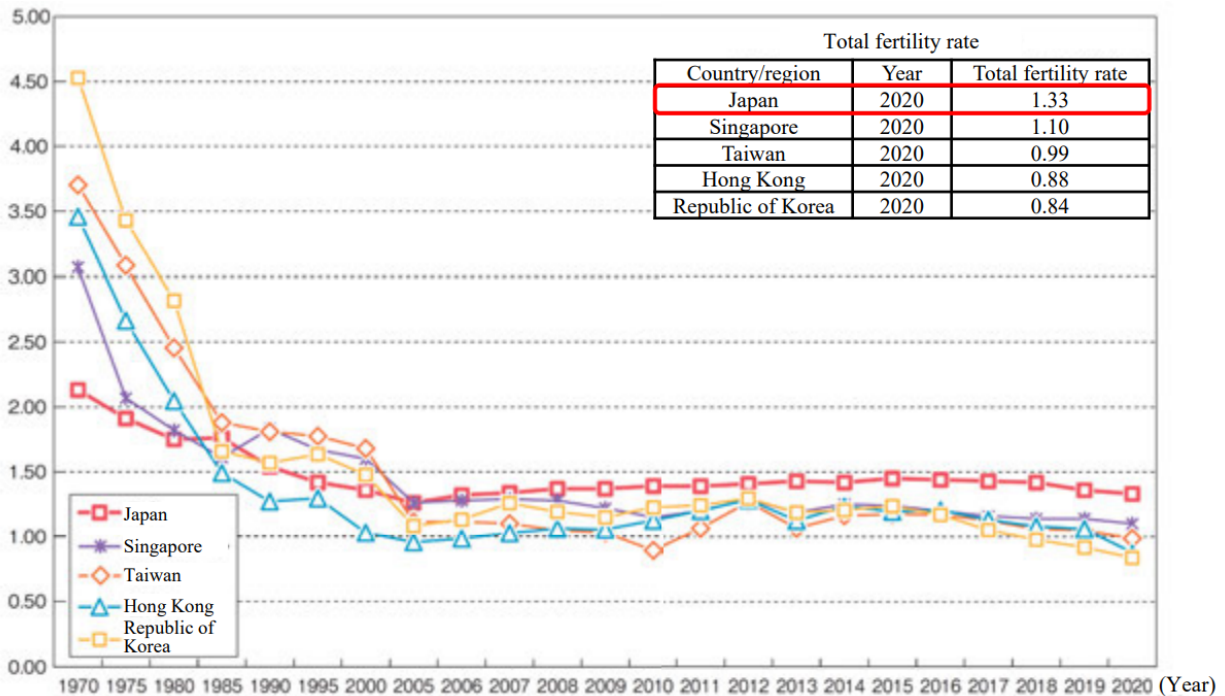
Traditionally, Japanese firms follows Nenko System [16] - seniority-wage system, while this system keep Japanese firms's labour turnover rate low, it only awards seniority of employee, not contribution not to mentions innovation.

There are signs for change in culture and wage system, but the traditional culture and system may explain the existing lack of innovation.

### Labour

Labour is another important aspect related to growth. Having a constant low birth rate (although higher than other Asian neighbours) and long life expectancy make Japan an aging society, and it's a problem that have almost no solution.





Source: The numbers are cited from statistics in each country and region. As for Japan the numbers are based on "Vital Statistics" by the MHLW.

Note: The figures for Hong Kong in 1970 are 1971's. The figures for Taiwan in 1970 are 1971's, for 1975 they are 1976's and for 1980 they are 1981's.

It implies that Japan will not be able to gain growth from growth labour. Labour may even decline due to short annual working hours, which may be due to change in working culture. This is a aspect that may not help drive growth, but the one pulling growth down.

Japan will need to have low-wage foreign workers to meets its econmonic needs, and also welcome high-wage foreign professional to boost TFA. This problem may be eased by having importing foeign worker and firms are adopting [17] .

The diversiting work force may help to drive innovation as well. Both Apple & Tesla have engineers & scientist from all over the world.

## Not only growth

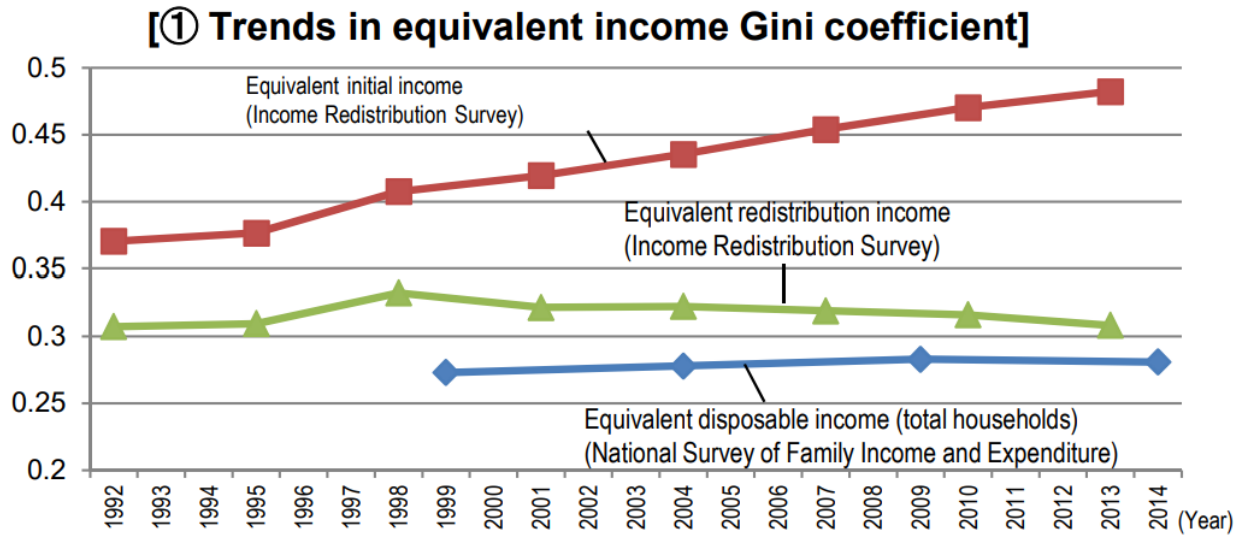
About are just my anyalise of potential ways of getting high growth for Japanese economy. But, it's not nessesary the only way, further more gaining high growth may not be the only goals of a country. It may be politician's election caimpaign goals, but not nessarry the needs of ordinary people.

Issue on poverty and inequality may be the concerns of ordinary people, and they may also related to growth in both positive and negative way.

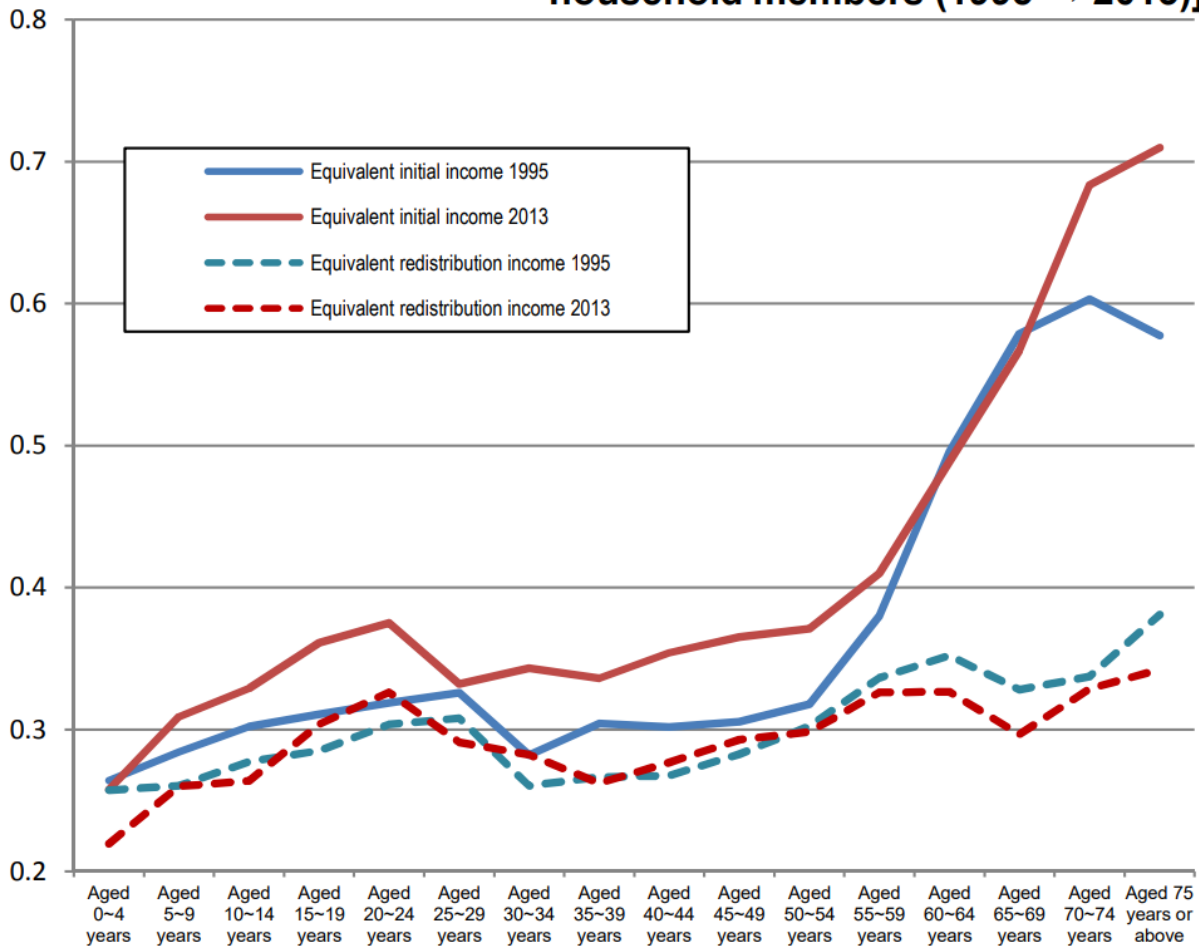
## Inequality

Unlike data related to growth, Japan has very limited official data about economy inequality. As for the most significant index about inequality, OCED only have one data sample on Japan in 2013 of 0.334 [18].

The Ministry of Health, Labour and Welfare of Japan has stats on gini co-efficient once in 2017 annual report [19]



## [② Change in equivalent income Gini coefficient by age groups of household members (1995 → 2013)]



Sources: Ministry of Health, Labour and Welfare "Income Redistribution Survey" and Ministry of Internal Affairs and Communications "National Survey of Family Income and Expenditure" for ①; MHLW "Income Redistribution Survey" for ②; Compiled by the Counsellor Office for Policy Evaluation under the Director-General for General Policy and Evaluation based on MHLW "Comprehensive Survey of Living Conditions" and MIC "National Survey of Family Income and Expenditure" for ③

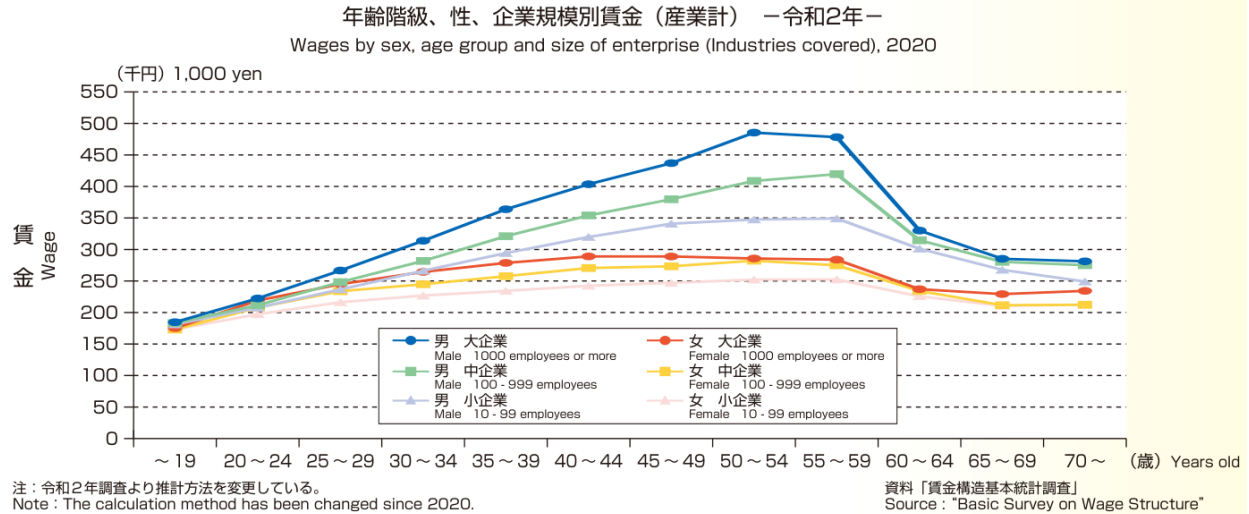
In the report, it stated:

- Equivalent income gap (Gini coefficient) of all people tends to expand consistently in terms of initial income due to the aging population and other factors. The redistributed income gap has narrowed after peaking in 1998. Income redistribution helps prevent the initial income gap from widening.

Not so bad comparing to other advance economy like UK or US. This is may due to the tradition of firms adapting Nenko System for wage. But, if we look at the wages data more closely, its shows large gender inequality:

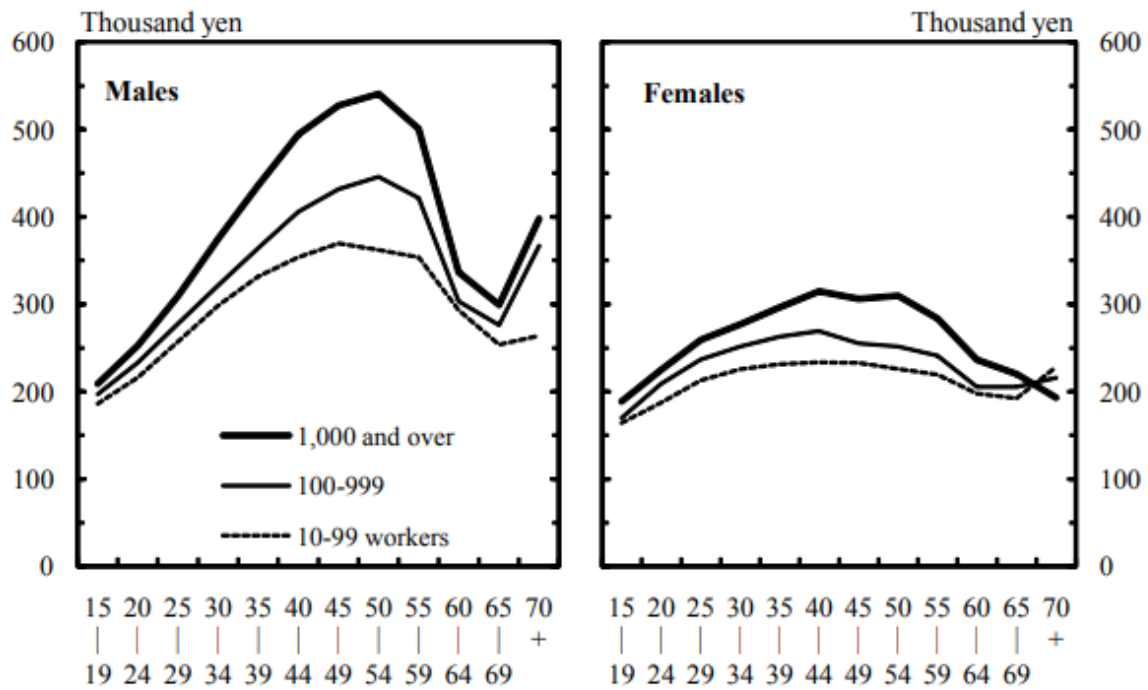
# ◇大企業の賃金ピークは男性は50～54歳で48万5,400円、女性40～44歳で28万9,000円

The peak of wages of large enterprises is 485,400 yen at 50-54 years old for male, 289,000 yen at 40-44 years old for female



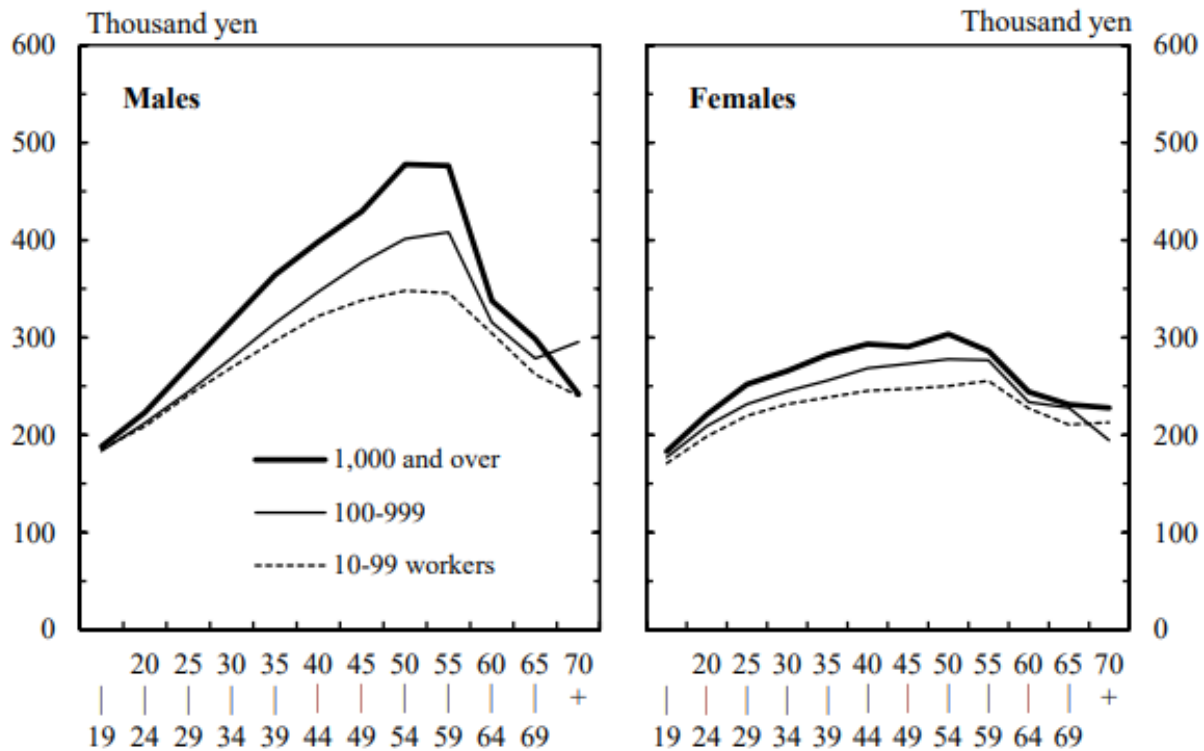
This gender income gap actually dropped if we look at data from 2008 (the earliest data available from Japanese government) and 2021

**Figure 12.10**  
**Monthly Contractual Cash Earnings by Size of Enterprise (2008)**



Source: Ministry of Health, Labour and Welfare.

**Figure 12.8**  
**Monthly Scheduled Cash Earnings by Size of Enterprise, Gender, and Age Group (2021)**



Source: Ministry of Health, Labour and Welfare.

The narrowing of the income gap between male & female is due to the decrease of top income male workers, other than the increase of females workers.

This could be due to various reasons, including but not limited to female Japanese not being ambitious at work and focus on family and possible gender discrimination at work place. But, this may show potential increase of Japanese's work force. It has half of the work force waiting to be economically incentivized and potentially bring innovation and growth.

Ensuring females work with equal pay to men, not only reduce gender inequality in Japan, but will also relieve it from relying on new foreign workers, which may bring cultural shocks to the society.

Restructuring of wage systems, may also have impact on income inequality both positively and negatively:

- Higher wage to young workers with bigger contribution will narrow the income gap between young and old generation
- Further increase of wage to high income will create bigger gap to the low income

Income inequality is only one aspect of inequality, wealth inequality sometimes may have more impact in society.

One effect of Abenomics is the booming of stock market:



The nikkei 225 index tripled since 2012, while the real GDP and productivity hardly increase. This will implies potential big changes in wealth inequality: people invested in stock market or listed company's share holders may have big increase in wealth, these are usually people that are ready wealthy. And when people didn't invest in stock market are most likely to be the group having less saving, i.e. wealth.

The stock market if functioned effectively, i.e. allow public listed firms to share profit to wider public via dividend, may have the impact to reduce wealth inequality.

Japanese firms are used to be stingy about profit sharing, Warren Buffett once describe Japanese firm as "low return on equity and the indifference of Japanese company managements to shareholders" in 1998 [20] .

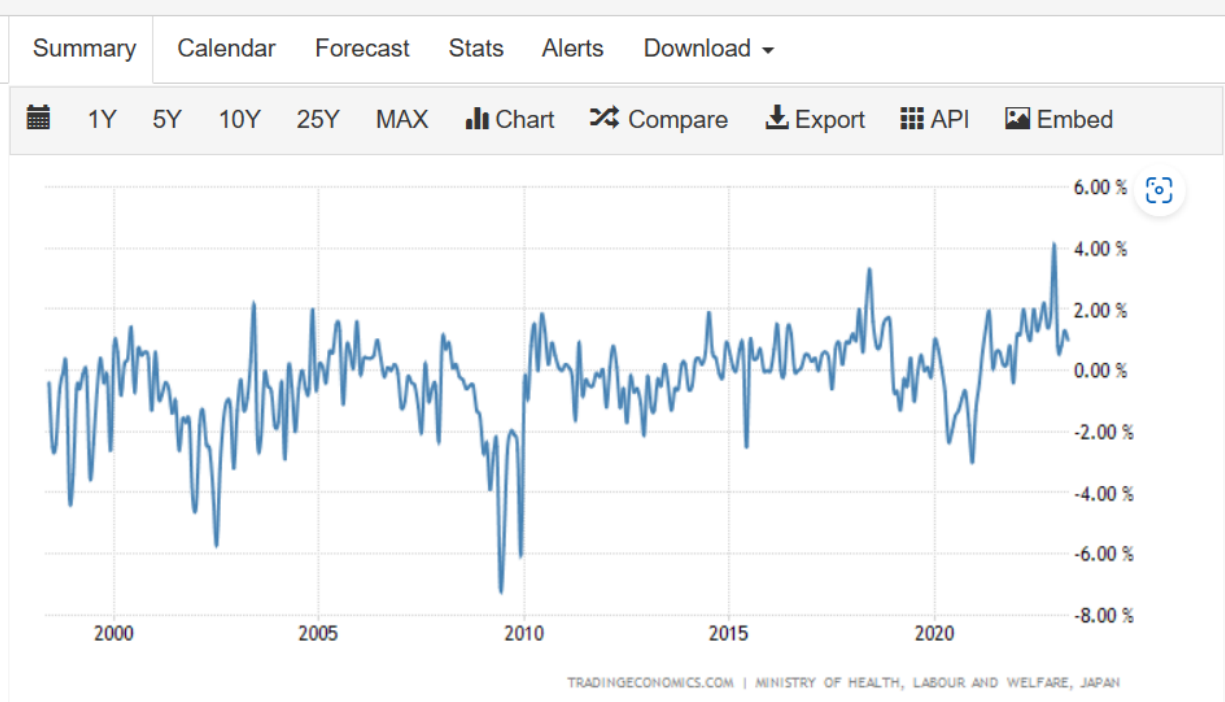
Again, this tradition has recently changed, Five Japanese Trading Houses agreed to increase dividends and attach buffect's investment [21] .

In terms of policy, Singapore governments allowing singaporean use CPF for investment (and buy property, another forms of investment), and it's tax free.

But promotioning investment could be a double sided sword, it may decrease wealth inequality, but it may also increase as it's a leverage tools, and it may create bubbles.

A more direct way for large japanese firms could do is to increase its worker's wages.

## Japan Average Cash Earnings YoY



Japanese worker's wage barely increase in the pass decades. And again, it has started to change significantly, for example uniqllo claims to give its employee 40% increasement [22] .

A more flexible wage system & profit sharing structure may decrease income & wealth inequality, and incentivise workers and even investors like Buffett. Increase in foreign investment will help to drive economy growth as well.

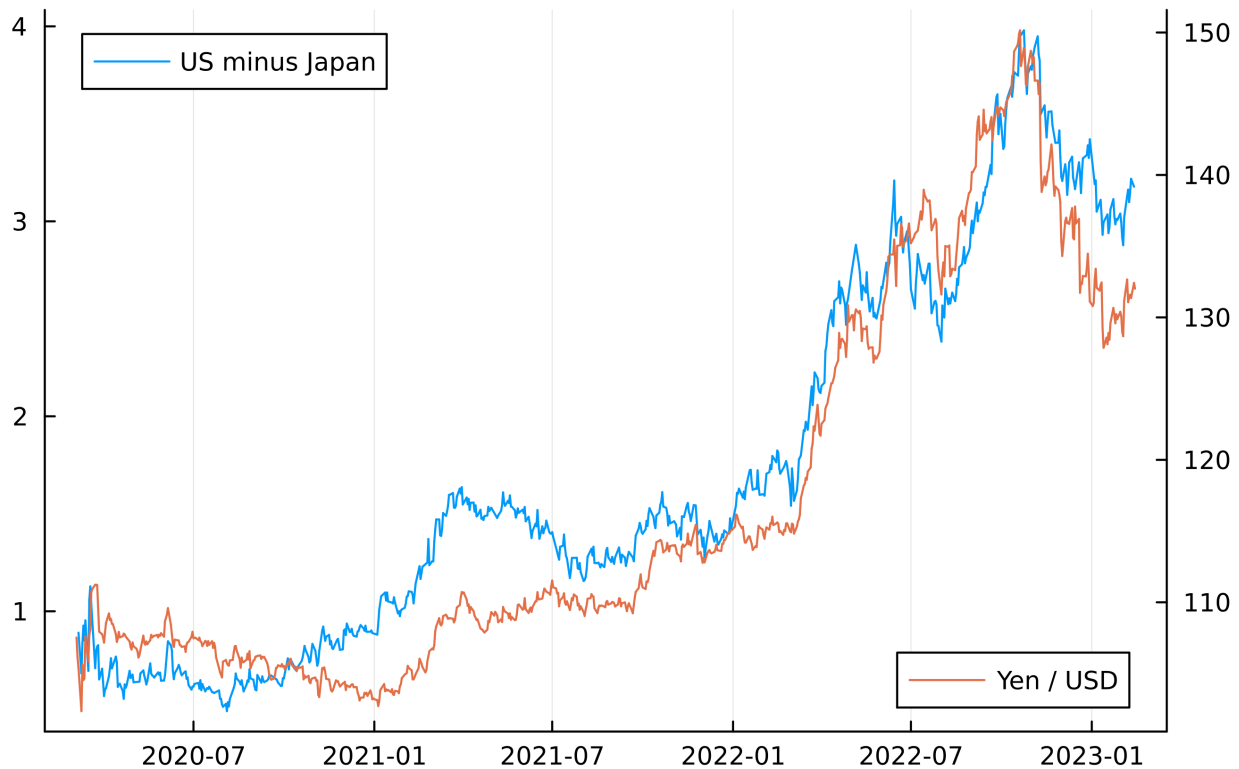
More importantly when people's income increases, their consumption will also increase, and if CPI is kept at the desired rate of 2%, Japanese's enomony will finally gets into virtuous circles.

Having a sustainable 2% CPI will allows Japan to move aways from monetary policies introduced by Abenomic like quantitive easing, negative interest rate and yeild curve control etc.

The low and even negative interest rate and yeild curve control has big impact on Japan's exchange rate in the short run. The recent increase of interest rate in US make YEN depreciated, The YEN/USD exchange rate follows closely to the 10y yield gap between US / Japan in the short run [23] :



## US & Japan 10 year yield difference vs Yen / USD

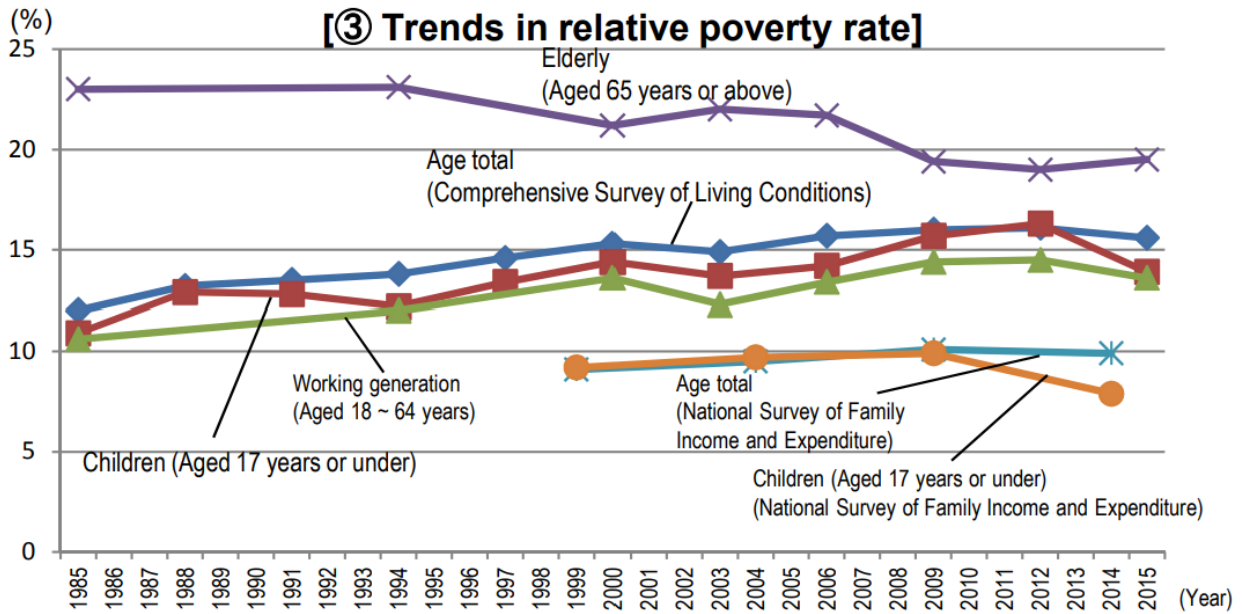


If Japan didn't have the monetary space to maintain its exchange rate, it will be its poor class will suffer the most if YEN keep depreciating.

### Poverty

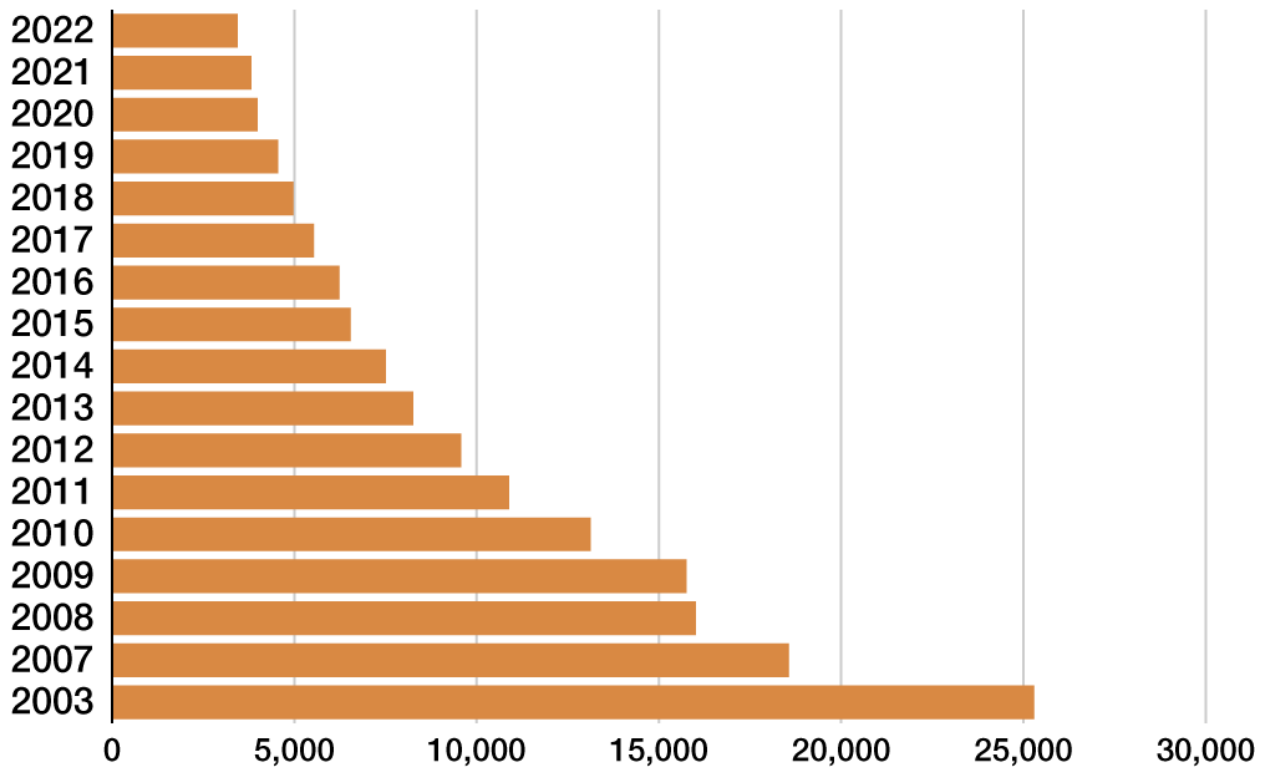
The data related to poverty in Japan is also limited. Officially, Japan government defined poverty line as half the median of equivalent disposable income. But the Ministry of Health, Labour and Welfare only reported related statistics once in 2017 [19], claiming:

- The relative poverty rate of total population, working generation and children, which had respectively been showing upward trends, declined recently. Although the relative poverty rate for the elderly generation is higher than for other generations, it tends to decline.



The other number worth noting will be the number of homeless person in Japan. I would assuming homeless people in Japan to be the most poor class, or in absolute poverty. And according to Ministry of Health, Labour and Welfare stats, this number has been dropping significantly through the years [24] :

## Number of Homeless People in Japan



Created by *Nippon.com* based on data from the Ministry of Health, Labor, and Welfare.

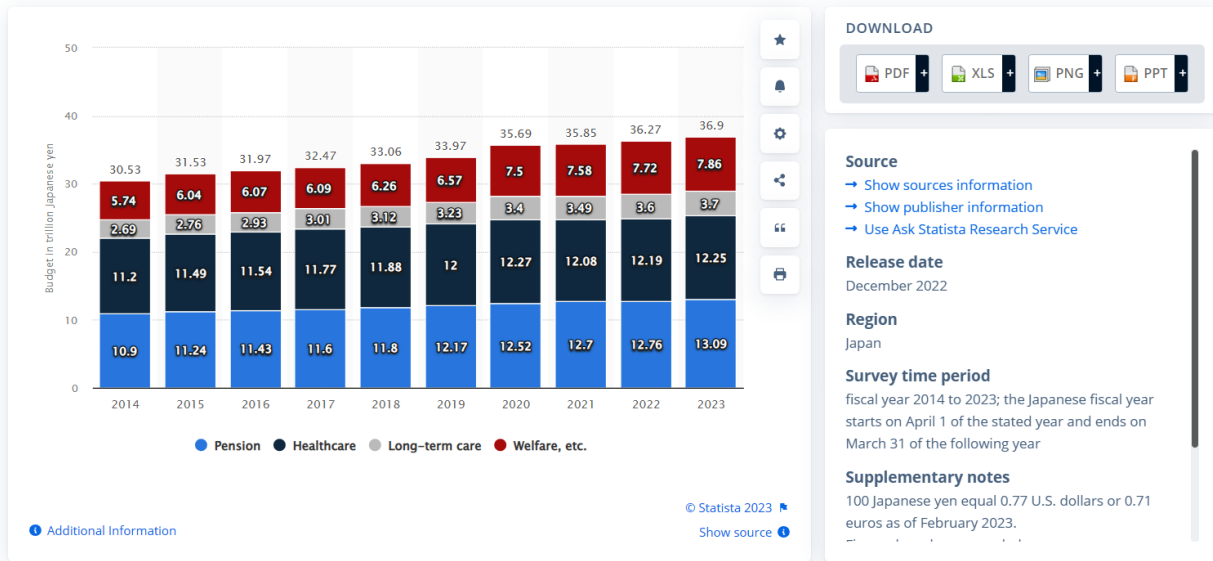


Although people moving away from homelessness - absolute poverty, their income may still be less than half of the median of equivalent disposable income, i.e. under official poverty line, I would still recognize it to be a big improvement in reducing poverty by decreasing number of homeless person from 25,000+ to below 4,000 in 2022 [25].

This result is consistent with continuous increase of Japanese government's welfare spending:

## Annual governmental budget for social security in Japan from fiscal year 2014 to 2023, by purpose

(in trillion Japanese yen)



## Conclusion

Growth must be inclusive

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