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May 2015

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Can Increased Public Expenditure Efficiency Contribute to the Consolidation of Public Finances in Japan?

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Abstract

The main narrative about the Japanese fiscal situation is about the unsustainable debt trajectory. On the public expenditure side however, Japan is relatively more efficient than its peers: using a Data Envelopment Analysis (DEA) methodology over a range of public policies, this paper finds that Japan has high efficiency score in health care, intermediate scores in education and non-pension social expenditures, but lower scores for administrative or infrastructure expenditures. Overall the input efficiency score of Japan is of 0.78 percent against 0.71 for the OECD on average and 0.64 percent for advanced G20 countries. We conservatively estimate that the scope for efficiency savings is of the order of 2.5 percentage points of GDP or 8 percent of non-pension public expenditures. Adding additional sectors where Japan overspends relative to its peer (such as agriculture or waste management), the overall saving could be of around 3.4 points of GDP, a significant contribution to the consolidation of public finance. There are however two caveats to the main results: Japan has comparatively less scope to consolidate its public finance through enhancing efficiency than its peers in the OECD, where efficiency savings are of the order of 4.1 points of GDP, or advanced G20 economies with savings of 4.7 points of GDP; aging pressures will contribute to further increase social expenditures, no matter how efficient they might be.

I. INTRODUCTION

Can expenditure cuts contribute to the consolidation of public finance in Japan? With a public debt above 240 percent of GDP and a public deficit hovering around 10 percent of GDP over the past five years, Japan faces a challenging fiscal situation. The history of the successive attempts to establish then increase the consumption tax, spanning over thirty years, illustrates the difficulty of increasing taxation. Previous tax increases have often been preceded by expenditure cuts (or by compensating decrease of other form of taxes), as a way to gain political acceptance for the tax increase. At the same time, additional expenditure cuts may jeopardize the very objectives of public policy and negatively affect the well-being of Japanese citizens.

¹ Associate researcher at CEAJFP. At the time of writing this paper, the author was visiting researcher in the Department of Economics of The University of Tokyo. I thank seminar participants at the Public economics seminar at the University of Tokyo, for useful comments and suggestions, especially Professors Hiroshi Yoshikawa, Masayoshi Hayashi, and Toshihiro Ihori. Comments on an earlier draft of this paper by Sébastien Lechevalier are also gratefully acknowledged.

This paper uses a Data Envelopment Analysis (DEA) methodology to investigate these questions. The methodology allows to analyze the efficiency of public expenditures by putting in regards the resources used and the outcome achieved. For example, public expenditures in the health sector need to be used cost-effectively to achieve policy objectives such as increasing a healthy life expectancy or reducing mortality rates. The DEA methodology allows to compare Japan's performance to a group of peer countries and to determine a best-practice frontier. We apply this methodology to five different policies, covering between 60-70% of total general public expenditures: health care, education, social protection (excluding pension), administration, and infrastructure. While the methodology cannot as easily be applied to pension expenditures, we discuss whether Japan operates in a low-cost or high-cost environment. The same methodology is then extended to analyze the expenditure efficiency at a regional level, by studying Japanese prefectures.

To our knowledge, the existing literature on public expenditure efficiency in Japan focuses mostly on specific policies, often in the health sector. For example, Kawaguchi and Tone (2013) study the efficiency of municipal hospitals while Yamauchi (2013) analyze the cost efficiency of long-term care system. Otsukaa, Mika Gotob and Sueyoshi, (2014) focus on the efficiency of prefectures in relation with the fiscal transfers from the central government.

A broader literature covers cross-country expenditure efficiency and find consistently that Japan is among the most efficient countries. For example, Afonso, Shuknecht, and Tanzi (2003) find that Japan is the most efficiency country for two out of seven indicators, and the top 4 (out of 23 OCDE countries) for all but one indicator. In the same way, Joumard, Isabelle, André, and Nicq (2010) find that the health efficiency in Japan is among the highest both in terms of overall efficiency and for specific diseases. Sutherland, Price, Joumard, and Nicq (2007) find similarly excellent efficiency for Japan in terms of education².

This paper brings the following contribution to the existing literature: (i) it revisits existing results, by taking into account factors that might biased some of the earlier results in favor of Japan, such as the contribution not just of public expenditures but also of private expenditures; (ii) it covers a wider range of economic policies, not just in cross-country comparison but also for Japanese prefectures; (iii) finally, it derives estimates of the overall efficiency gains in expenditures for Japan and G20 advanced economies.

The paper is organized as follows. Section II describes the main characteristics of public expenditures in Japan. Section III exposes the DEA methodology and its relation with other methods to analyze performance and efficiency. Section IV applies the methodology to five areas of public policies in a cross-country setting, while section IV analyses these policies at the level of prefectures. Finally, section V discusses the possible trade-off between efficiency

² In addition, numerous country-specific studies have applied the DEA methodology to: Italy (Tuladhar, 2014); Slovenia (Hribernik, Kierzenkowski, 2013); Croatia (Jafarov, Gunnarsson, 2008)...

and equity, how technical efficiency is related to the public perception of public expenditures, and presents some estimates of efficiency gains.

II. PUBLIC EXPENDITURES IN JAPAN

This section describes public expenditures in Japan in different dimensions. We first study whether institutional (social security), tax (gross vs. net transfers), or cyclical (debt service) factors may contribute to overstate or understate public expenditures in Japan compared to other countries. In particular, we detail the role played by private sector expenditures to contribute to some of the public policy objectives. Using the COFOG and SOX database from the OECD, we then describe the components of public expenditures to identify whether in some categories Japan tend to over spend or to under spend. Finally, we discuss the recent trends in public expenditures. Throughout the paper, Japan is compared to the full sample of OECD countries (34 countries) but detailed statistics are provided in annex only about the smaller sample of G20 advanced countries (nine countries³).

How large are public expenditures in Japan?

Japanese has long been characterized as a "small State". In 2013, total expenditures of the general government were around 40 percent of GDP, among the lowest third of OECD countries. Over the past 25 years on average, this ratio was of 35 percent of GDP, about 7 percentage points lower than the average for the OCDE. In this section, we classify OCDE countries in three categories as "small State", "medium State", or "large State" depending on size of public expenditures to GDP using different indicators.

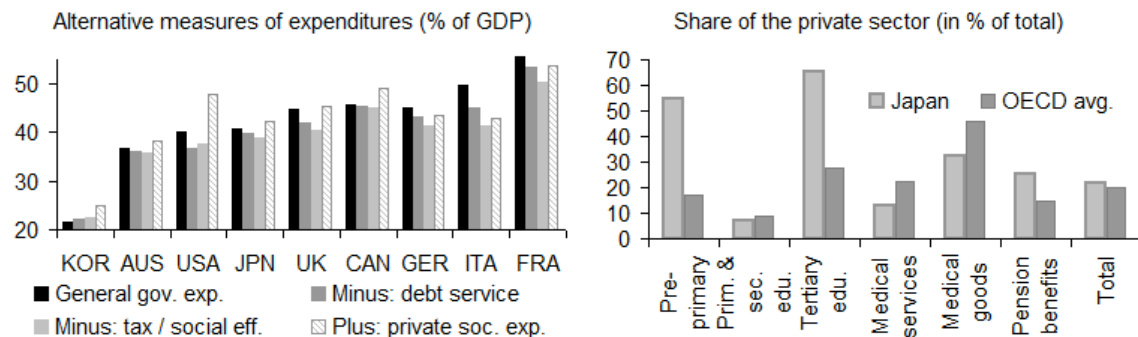
Three factors might bias downward the measure of government expenditures in Japan compared to its peers in the OECD:

- **Debt service.** The level of interest rate in Japan is artificially low for a country at that debt level: in 2013, the implicit interest rate was about 1/7th of the average interest rate for OECD countries and the debt service was about 2 percentage points of GDP lower. This reflects the deflationary environment in Japan and possibly an element of mispricing by investors in the bond market. For example, Italy with a debt to GDP above 132 percent of GDP has a debt service of 4.6 percent of GDP, sixth time higher than Japan.
- **Interaction of tax and social security.** The provision of social security benefits through tax breaks and the taxation of these benefits is much smaller in Japan than in other countries. Actual social transfers to households tend to overstate those benefits if they are later taxed; alternatively, they are understated if an important portion of those is provided by tax

³ Four European countries (France, Germany, Italy, the U.K.), three Asian-Pacific countries (Korea, Japan, Australia); two north America countries (United States and Canada). The OECD countries are all high income economies, save Mexico, Hungary, and Turkey.

expenditures rather than direct expenditures. Adema, Fron and Ladaique (2014) show that in 2011 the tax on social benefit was only 1.3 percent of GDP in Japan, much smaller than the average of 2.9 in OCDE countries, while tax breaks for social purposes were about at the same at ½ point of GDP. When corrected for this effect, net social transfers to households are actually 0.8 points of GDP lower in Japan than gross transfers, while this figure is of 3.9 points for Italy and 3.1 points for France.

• **Social expenditures by the private sector.** Beyond government expenditures, some social functions (pension and health) are sometimes provided either in a compulsory or a voluntary way by the private sector. The frontier between public social spending and mandatory private social spending is mostly institutional; the one between mandatory and voluntary social spending⁴ is stronger, households being free to decide on their own expenditures and on how expensive they can be. The specific arrangement on how spending is performed can have implication in terms of cost, access, or equity. Finally, the adjustment is applied only for social expenditures, not for other expenditures. Still, as an illustration however, it might be useful to aggregate all social expenditures. Adjusting for the provision of private social expenditures, Japanese expenditures are corrected upward by 3.4 percent, against only 2.1 percent for the OCDE on average. The difference comes mostly from voluntary private pension expenditures, at 2.9 percent in Japan against 1 percent in the OCDE.



Sources: IMF; OCDE; author's calculations.

Once these three adjustments are taken into account, Japan is no longer a "small State", but becomes a "medium State". Each successive adjustment contributes to increase the ranking of Japanese in terms of expenditures. Considering total general government expenditures, Japan is ranked 24 out of the 33 OECD countries. Adjusting for debt service increase Japan's ranking by one, adjusting for the tax-social security nexus by two ranks, and finally adjusting for private social spending by an additional rank. In total, Japan is ranked 20 out of 33, still comfortable in the lower half of the ranking scale, but less comfortably so. The same adjustments would have the opposite effects on Italy, ranked 9th in terms of total

⁴ In the Adema, Fon and Ladaique (2014) data we rely in this section, pension expenditures for civil servants are classified as voluntary private pension expenditures, as voluntary corporate pensions.

expenditures, but ranked 16th in terms of net primary public expenditures. When including private sector expenditures, the rank of Italy, at 18th, is now very closed to that of Japan. These adjustments leave the ranking of the countries with the largest expenditures (France, Denmark) virtually unchanged, as well as those with the lowest expenditures (Korea, Mexico).

Using data for 2013, only adjusting for debt service moves Japan from the third category as a "small State" to the intermediate category of "medium State". It is likely that the two additional adjustments will bring it even closer to the median position.

What is the role of the private sector to contribute to achieve public policy objectives?

Reaching public policy objectives does not depend solely on public expenditures but also on private expenditures⁵. Not accounting for private expenditures if they are comparatively large might give the false impression of a higher public efficiency. The focus is very much on expenditures (how much money is spent toward a goal), which is different from the issue of financing (how is the expenditure financed) or provision (who actually deliver the service): for example, household may finance education expenditures indirectly through general taxation or health expenditures directly through co-payment, but without direct decision on the level of public expenditures; also, the government may pay the bulk of health expenditures, although a large portion of those may be provided by the private sector.

Overall, the share of private sector for total expenditures for health, pension, and education, is only marginally larger than the average for the OECD countries. This share is of 20 percent for OECD countries but of 22 percent of Japan. Among G20 advanced countries, Japan's share is closed to the U.K. with 19.6 percent, larger than countries in continental Europe (France 9.7 percent, Italy 12.2 percent and Germany 14.4 percent), but much smaller than in the U.S. with 49.5 percent or in Korea with 39.4 percent (cf. Annex Table 1-1 for the detailed mix of private and public expenditures for G20 advanced economies).

The role of the private sector is not uniform among the type of expenditures. Compared to the OECD average, Japanese households tend to share a higher burden of expenditures in terms of pre-primary and tertiary education, pharmaceutical goods, and pension. By contrast, the public share is similar or larger than the OECD average in terms of primary and secondary education, and medical services. Specifically, the contrast between public and private expenditures at each stage of the education curriculum is instructive. Households contribute to 7% of the expenditures of primary and secondary education, a fraction marginally lower than the OECD average of 8%. For pre-primary and tertiary education by

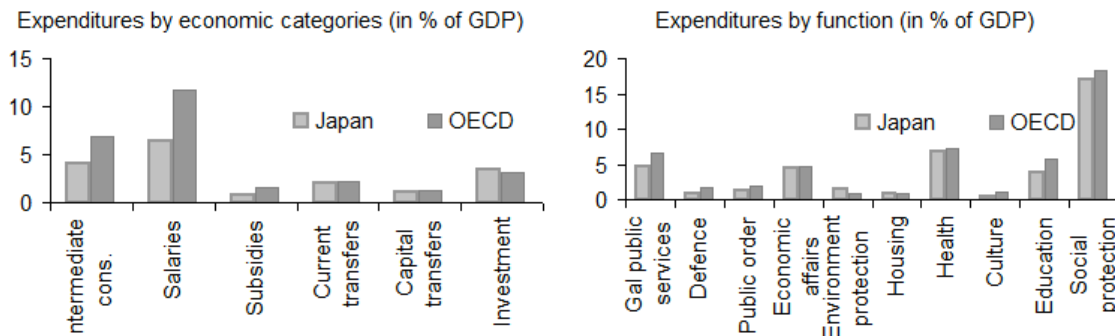
⁵ Other factors would also need to be considered: having law-abiding education-driven citizens living a healthy lifestyle is a positive externality that can reduce both public and private expenditures while contributing to achieve a higher outcome.

contrast, the shares of households are respectively of 55% and 66%, against OECD averages of 14% and 31%.

Beyond the three functions described above, it is more difficult to assess the role of the private sector. For example, anecdotal evidences suggest that the private security industry is large in Japan as in the U.S. and in contrast to the situation in the Europe; to some extent, though the private security industry and the public police are not strictly complementary, this might contribute to reduce public expenditures for law and order⁶. In terms of infrastructure, a analysis of JETRO (2010) suggest that the contribution of the private sector is limited by regulatory constraints and excluded notably from airports, highways, or ports; private infrastructure projects are generally of smaller size and concentrated in social infrastructures (school, hospitals...). Besides, statistics from the OECD indicate that PPP are less widely used in Japan compared to other G20 advanced economies, with the exception of Germany and the United States.

"How to spend it"?

This section uses the OECD COFOG database to analyze a breakdown of government expenditures either using an economic classification or a functional classification. For social expenditures, the OECD SOX database on social expenditures is used to provide additional information (cf. Annex Table 1-2).



Sources: COFOG classification, OCDE, Eurostat and Japan National Accounts.

For most expenditures, Japanese government expenditures are about 10 percent lower than the average of OECD countries. In terms of economic categories, compensation of employees for example, only represents 6.1 percent of GDP against 9.4 percent for its peers within the OECD. In the same way, most functional categories show that Japan under spends relative to its peers, with for example education spending of 3.5 percent of GDP against 5.2

⁶ To provide one piece of real life inconclusive evidence, the Ministry of Finance is guarded by private contractors in Japan, but by civil servants in France (customs officer) and in the U.S. (Uniformed Division of the Secret Service, the Treasury building being part of the White House complex). The U.S. Internal Revenue Service is guarded by private contractors.

percent on average in the OECD or general public services and public order expenditures of 5.8 percent of GDP against 7.9 percent on average in the OECD.

Further decomposition across classifications allows to have a clearer understanding of how Japan fares compared to other OCDE countries (see Annex table 3). In three categories only, Japan over spends comparatively:

- **Pension expenditures.** Social expenditures (pension and welfare) represent 18 percent of GDP against 16.3 percent in the OCDE. About 75 percent of the function is related to pension (old age and survivors) while 10 percent is related to family and children. Unemployment benefits only accounts for 2 percent of the category and social exclusion for 5 percent.
- **Environment.** Expenditures for environment protection represent 1.1 percent of GDP, 0.3 percentage point higher than the average in the OCDE. About 85 percent of this items represent waste management or waste water management. This may suggest inefficiencies for some public procurement contracts.
- **Capital transfers or investment.** Capital transfers are also somewhat larger, at 1.3 percent of GDP against 1.1. While gross capital formation is broadly comparable to its peer, investment for economic affairs is larger, with total expenditures of 1.8 percent of GDP against 1.1 on average. In 2012, 58 percent of the gross fixed capital formation for economic affairs was related to transport and another 21 percent to agriculture.

Finally, one could note that in contrast to pension expenditures, total health expenditures are broadly in line with the OCDE average, at 7.4 percent of GDP. This reflects a relative lower spending in terms of compensation of employees in the health sector and intermediate consumption (about 2.5 percentage points of GDP lower than the average) but higher social benefits and transfers, and may be related to the institutional organization of the health sector with a larger share of private providers.

For Japan and European countries only, a finer detailed breakdown of expenditures with 80 items instead of ten, allows identifying specific categories where Japan may overspend. The results need to be interpreted with caution, since some of the categories are either missing or aggregated in the Eurostat database. Besides, some of these differences may be explained by organizational choice: Japan has relatively expensive outpatient services and public health services but this is compensated by less expensive hospital services.

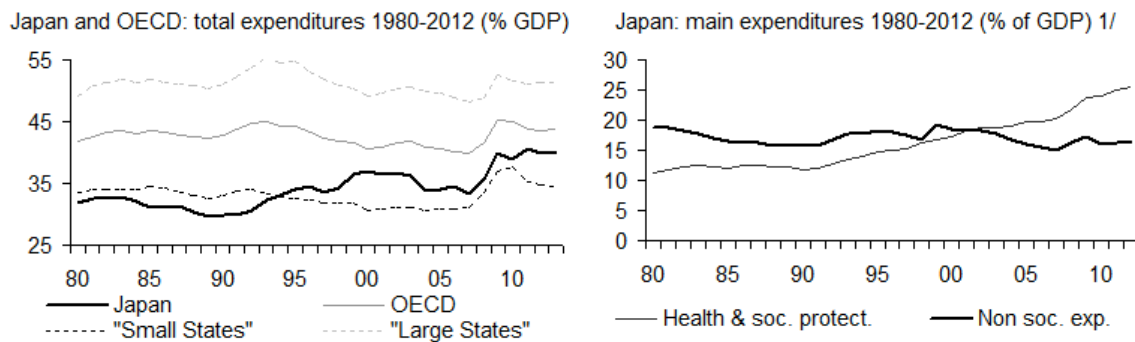
Looking specifically of three subcategories identified above (agriculture, waste management, and "other economic affairs"), public expenditures in Japan were respectively of 1.3, 0.9, and 0.9 percent of GDP in 2012 against only 0.5, 0.5, and 0.5 for a sample of 16 European countries. Waste management expenditures are high, twice as large as the sample average, but below those of the U.K. or the Netherlands. By contrast, expenditures for agriculture are twice as large as the next country and two and a half time larger than the average. Though

not available through COFOG statistics, alternative data suggest that support for agriculture large not just in Japan but also in Korea.

Using the finer breakdown based on Eurostat and Japanese National Accounts show that, for the most recent year, transport expenditures, at 2.3 percent of GDP, are in fact in line with expenditures in other countries. Japan realizes also comparatively significant savings in terms of education, police and justice, administration, and unemployment. Overall, in seven categories where Japan comparatively under spends, Japan expenditures represent 4 percent of GDP against 8.6 for the average of the OCDE. In seven categories where Japan over spends (including agriculture and waste management, but excluding aging related expenditures), the total expenditures of Japan is of 4.2 percent of GDP against 1.6 percent on average. The scope for savings for Japan is thus comparatively smaller.

What are the recent trends of expenditures? Expenditure rigidity and aging bias.

One of the main trends over the past 35 years is the rise of aged-related expenditures. Health expenditures have increased by 3.1 percent of GDP, from 4.3 to 7.4 percent, but social protection has more than double, from 7 to 18 percent of GDP. The difference between health and social protection reflect in part the development of long-term care (LTC) from 2005 and the shift of the accounting of this category from health to social protection. Meanwhile, education expenditures as a share of GDP have decreased by a third, from 5.1 to 3.5 percent of GDP. Other expenditures (administration, defense, environment...) have contracted by about 1 percent of GDP to 12.7 percent.



Sources: Japan National Accounts; WEO IMF.

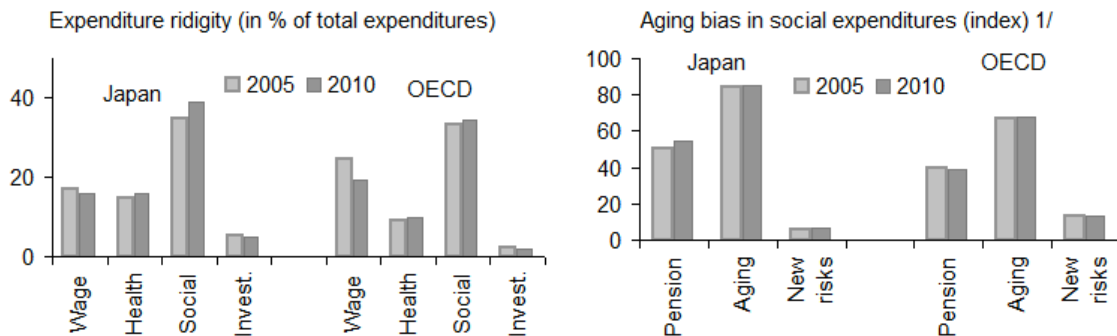
To appreciate these changes in comparative perspective, we construct two indicators, one of expenditure rigidity and another of aging bias.

- **Expenditure rigidity.** An expenditure category is considered as rigid when its inclusion in the budget is not at the discretion of the policy authorities, but reflects earlier commitments. We choose to include four categories as rigid: (1) debt service; (2) compensation of civil servants; (3) social security benefits and intermediate consumption; (4) investment for economic affairs only, with the idea of capturing infrastructure maintenance but not construction of schools or hospitals. The classification is very imperfect: wages of central

civil servants have been cut in Japan by 10 percent for two years following the March 2013 earthquake; delaying public investment, including maintenance, is also a popular way to reduce expenditures in time of crisis.

Using this index, Japan was the most rigid country after Portugal in 2011, whereas in 2005 it was only ranked eighth. By this metric, 77 percent of expenditures in Japan are considered rigid, about 7 percent higher than for the OECD on average. Interestingly, Japan displays low rigidity in terms of debt service and compensation of employees, but high rigidity in terms of social security and investment. Between 2005 and 2011, rigidity has decreased for OECD countries on average, but has increased for Japan. Although the share of compensation of employees has decreased for Japan, by about 1.3 percentage point, this decline is less drastic than the one of 5.3 percentage points for the OECD on average.

• **Aging bias.** We use indexes developed by Tepe and Vanhuyse (2009) to measure the extent toward which expenditures are biased in favor of the elderly or can address new social risk (NSR). Specifically, the "elderly / non-elderly spending share" (ENSS) is the ratio of survivors and old-age expenditures over total social expenditures excluding housing and other social policy actions. The "new social risk-spending share" (NSRS) is the ratio of family and active labor management (AML) programs over the same denominator. The first index is somewhat restrictive since a large part of aging expenditures are related to health, and, as noted above in the case of long-term care, there is some fluidity between the two categories. We complement the two indexes above by a simpler index with the ratio health and pension expenditures to total social spending.



1/ Pension / social expenditures (excl. housing); pension and health / social expenditures; family and ALM / social exp. Sources: WEO IMF; COFOG and SOX OCDE; Japanese National Accounts; author's calculations.

Using the broader index of total aging expenditures, Japan is ranked second, this time behind Turkey and before Greece, with health and pension accounting for 85% of social expenditures, against an OECD average of 67 percent. The narrower ENSS index focused only on pension is of 55 percent for Japan, behind Greece on Italy. By contrast, Japan ranked last but one in terms of protection of "new social risks". Over the period 2005-2011, both the ENSS and the broader aging index have increased, but the NSRS index has also increased, but still remains about half of the OECD average.

III. MEASURING PUBLIC SECTOR EFFICIENCY

Measuring performance and efficiency

Three main ways are often used to analyze the efficiency of an economic process. Though closely related, they differ mostly in terms of assumption and (how the statistical noise is considered, number of inputs and outputs allowed...);

- **Efficiency ratio.** This intuitive method is used for example by Afonso, Shuknecht, and Tanzi (2003) for a sample of OECD countries. The authors construct a composite performance indicator (public sector performance or PSP), based on a simple average of a given set of indicators. The public sector efficiency indicator (PSE) is then defined as the ratio of this indicator and its related expenditures. This method allows to consider only one input and one output. The way the components of the performance indicator are aggregated is somewhat arbitrary, either a single average of normalized indicators, or a weighted average depending on the variance.

- **Frontier approach.** The frontier approach was pioneered by Farrell (1957) and has been applied to analyze the efficiency of the production process, with various applications to specific industries. More recently, the methodology has been extended to the analysis of the public sector. This methodology allows to integrate potentially a greater set of inputs and outputs, without arbitrarily setting how they enter into the production process. The "best frontier approach" is a line of best performing countries with the most effective combination of output and input. The efficiency score is the distance of a given country to this frontier, and it can be measured either in terms of input (achieving a given output with the lowest input) or in terms of output (achieving the highest output for a given input). Among the frontier methodology, there are three main methods: both the DEA (data envelopment analysis) and FDH (free disposable hull) are non-parametric, which differ by their assumption on the production function, either convex, or stepwise; by contrast the SFA (stochastic frontier analysis) is a parametric approach. Sutherland et al. (2007) provide a concise explanation and comparison of the different methods.

- **Economic approaches.** Finally, estimating a production function seems a natural way to link an output (performance) to a set of production factors (inputs). In the case of Japan, the method is used for example to estimate a production function of education by Oshio and Seno (2007). Unlike the previous methods, stronger assumptions are required by a production function but the benefit is a clearer identification and estimation of the parameters. In this paper, we also report results of fiscal multipliers, which can be considered as proxies of the efficiency of expenditures.

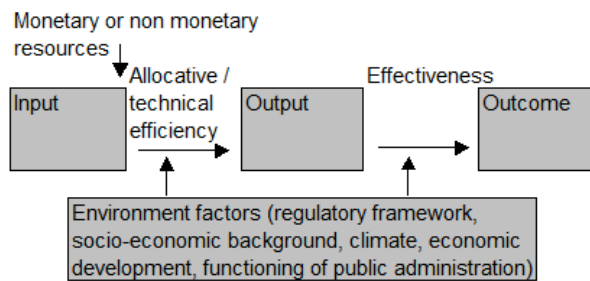
The DEA approach to measuring efficiency

In this paper we use the DEA approach. Given our focus on fiscal consolidation, the main output of interest from the DEA is the input efficiency: for a given output, how to use inputs

in the least expensive way. We also report the complementary measure of technical efficiency, output efficiency. Beyond these two concepts, a richer setup could also allow to measure "allocative efficiency", which takes into account a budget constraint. For public expenditures however, it is often difficult to obtain relevant prices for inputs. Moreover, this would also constraint the choice of variables and exclude survey variables from the analysis.

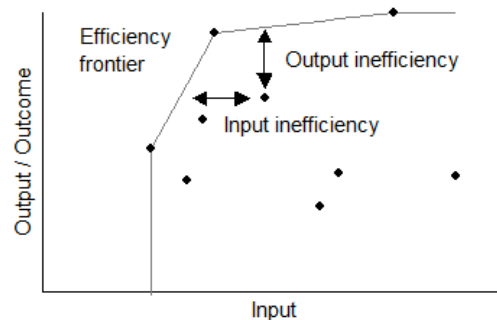
Mandl, Dierx, and Ilzkovitz (2008) provide a useful framework to analyze public policies with frontier analysis, including the DEA methodology. They make a distinction in three steps between inputs, outputs, and outcomes. For example in the education sector, inputs could represent education expenditures, output the results in tests of pupils, but employability of students leaving the education system would be the ultimate goal of the education system. They called the relation between input and output "technical efficiency", and the relation between output and outcome "effectiveness". Other researchers have a different interpretation of this three step process, as Jafarov and Gunnarsson (2008): for example, health input could be private and public monetary expenditures; health output the number of hospital beds, physicians, and nurses; and health outcomes the life expectancy and the mortality rate. Existing research alternatively treats for example the numbers of physicians or the teachers/pupils ratio as either inputs or outputs.

Conceptual framework of effectiveness of public performance



Source: based on Mandl, Dierx, and Ilzkovitz (2008)

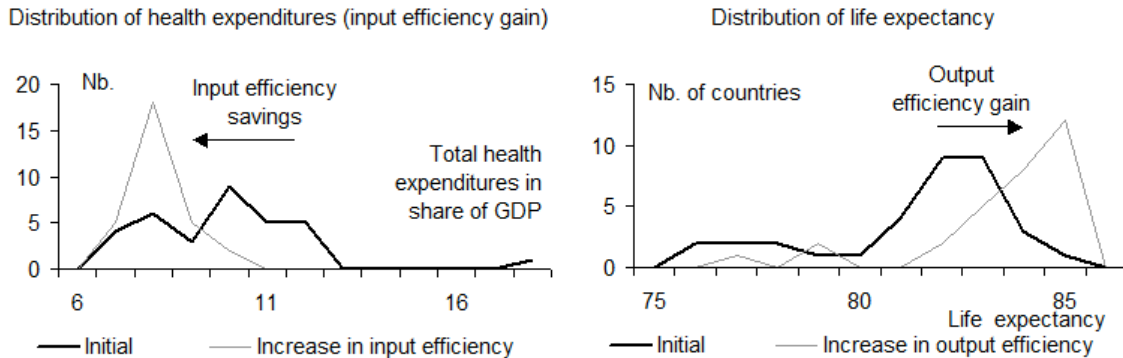
Data Envelopment Analysis (DEA)



In practice, this distinction in three steps is thus often blurred, as is the actual definition of each component. In our specification however, we try to identify what could be the ultimate goal of a policy, not its intermediate goal. As is often done in the literature, we loosely use "output" to describe the outcome of the process and "efficiency frontier" to characterize what should be more properly labeled a best-practice frontier.

The DEA methodology presents a number of advantages but also some limits. The main advantage is that it does not require assumptions on a specific functional form. The input efficiency is an intuitive measure of the potential savings that can be achieved. The method also allows benchmarking performance between countries. By contrast, the methodology assumes that any deviations from the frontier reflect inefficiencies, a strong assumption. Non-parametric scores are also sensitive to measurement error and outliers, and to the choice of the inputs and outputs considered. Finally, irrelevant or omitted inputs and outputs will impact the estimates of inefficiency. To address these shortcomings, we try to report the

results of different specification, and take as our main estimate the average of these estimates. It is important to bear in mind the strong assumptions that are implied by assuming that countries can converge to the efficiency frontier, either by reducing the resources for a given level of output, or for increasing the output for a given level of input. We illustrate this point with a simple model with total health expenditures as input and life expectancy as output. The initial average input efficiency is of 0.83 and the average output efficiency of 0.97, some values broadly in line with the literature. Assuming that all countries could decrease expenditures by holding life expectancy constant would bring the average health expenditures from 9.4 percent of GDP to 7.7 percent. Health expenditures would still vary between 6 to 10 percent of GDP. The total efficiency savings would be of 1.7 percent, or close to 20 percent of initial expenditures. A country with a low life expectancy and even lower health expenditures could see its position qualified as "efficient" from the point of how resources are related to the outcome. In the same way, assuming that all countries could move to the efficiency frontier while holding input constant would lead to an increase of average life expectancy by 2.4 years to 82.7 years. Countries would still have different life expectancy rates, from 76 to 84 years, but a third of the sample would now have a life expectancy at 85 years instead only one before.



Source: author's calculations.

Choice of input and output variables for the DEA

As the DEA methodology does not impose any specific functional form, the literature on public sector efficiency used a wide and somewhat puzzling variety of specifications. Some specifications are closer to a production function, with inputs representing production factors and output a policy objective, while other studies mix technical inputs and expenditures as inputs. In this paper, we adopt the principles below to guide our choice of the specification. For clarity, the discussion is focused on the case of education.

- Since the focus is on the fiscal cost of public policies, our preference specification for the **input** is to have the **expenditures** in terms of GDP or in terms of U.S. dollar in PPP per capita or per user. For example, education expenditures can be scaled by GDP or by students. This also allows computing easily a possible saving cost associated to moving to the best-practice frontier. This is also well suited to the diversity of education systems, some where the government pays and delivers education services, and other where it only makes a

monetary transfer or subsidy to private or public providers.

- Our preferred **output** is a range of measurable and objective variables. We allow for a possible range of policy outputs, for example the overall PISA score or the employability of students. Whether this economic efficiency is associated with a high equity (e.g. homogeneity of PISA score between high performers and low performers) or with a perception of good quality by the user is discussed separately. We have two exceptions to this rule: for social protection, desired policy outputs are themselves equity indicators, such as the Gini coefficient or the poverty rate; for infrastructure and administration, for lack of a better indicator, we also use survey data on the quality of government to complement other indicators of policy outcomes.
- We are agnostic about the how intermediate **technical factors** are used to achieve a given output and we do not include them in the specification, either as input or as output. We assume that the monetary expenditures are the best summary of the resources devoted to achieve a given objective. For example, a high salary for teachers or low teacher / student ratio can be seen as either negative or positive factors: both may be costly in terms of fiscal expenditures, but may reflect better qualified teachers able to achieve better education output (efficiency wage) or better quality teaching. In the same way, a high occupancy rate of beds in hospitals in Japan does not necessarily reflect a high efficiency of the health system, but on the contrary the tendency of some clinics to artificially increase the length of stay of patients to maximize fees reimbursed by the national health system. Such technical factors are however discussed and presented in annex as potentially high cost or low cost factors, but without implication on the estimation of the input efficiency.

Beyond public expenditures, a number of factors affect the outcome, for example, in the case of education, the family background or private education expenditures. Two different methods are traditionally used to control for these additional factors. One is to perform secondary regression on the score to identify its possible economic determinants. Another is to introduce control variables as inputs in the DEA. This allows direct comparison of the efficiency score with and without controls. When those variables are available and required, we choose the second method of integrating them as input variables.

IV. JAPAN AND THE INTERNATIONAL EFFICIENCY FRONTIER

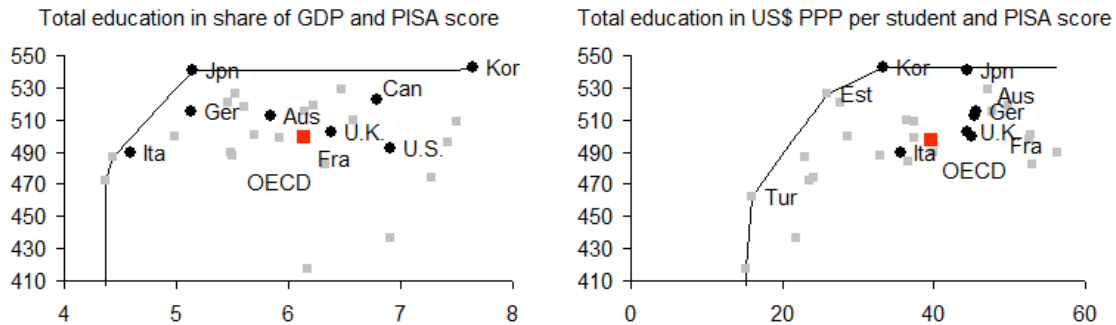
Education

Previous studies consistently report a high efficiency of education expenditures in Japan (for example, Sutherland, Price, Joumard, and Nicq, 2007 or Afonso, Shuknecht, Tanzi, 2003). This result is robust to the estimation method (DEA, SFA, or efficiency ratio), as well as to the segment of the education structure considered (primary, secondary, or tertiary). Two elements worth investing further are: (1) the difference between a measure in share of GDP or a measure in dollar PPP per student, with takes into account the lower share of the young in the population; (2) the role of the private expenditures along with public expenditures,

Japan having the lowest level of public expenditures in education in 2010 but among the highest for private expenditures.

In this paper, we consider two output variables of the education system: the average PISA score, which is a test given in the final year of lower secondary education and the first year of upper secondary education, and the ratio of youth aged 15-25 not in employment, education, or training (NEET). In both cases, Japan performs well, with the second highest PISA score within OECD countries behind Korea (but the highest performance in science and reading and the second highest in mathematics), and the fifth lowest NEET ratio. Japan's performance in the PISA score has fluctuated somewhat: while Japan had consistently had a good performance on science, its reading score has been as low as 12th. The publication of the 2003 PISA results the following year created a so-called "PISA shock", where Japan discovered itself behind other Asian countries included in the PISA survey (Korea, and Taiwan and Singapore, not in our OECD sample). Among OECD countries, Japan's rank has slid further from 4th to 7th between 2003 and 2006, before recovering to 3d and 2d in 2009 and 2012.

The costs in Japan appear to be moderate compare to other countries, the ratio of pupils to student in primary and secondary school are lower in Japan than elsewhere, a factor considered to be conducive to higher outcome but also higher cost. The salary cost per teacher is also somewhat lower than the OECD average



Nb. Illustrative only: the full specification includes the PISA score and the ratio of NEET among the 15-25 year-old as output variable.

We use three successive specifications: one with total education expenditures in share of GDP, another with total education expenditures per student in PPP US dollar, and finally a model with two inputs variables, private and public expenditures per student. While with the first specification, Japan is on the efficiency frontier, the input efficiency drops to 0.73 with the second specification (while the output efficiency is of 0.99). With the third specification, the input efficiency increases to 0.81 while the output efficiency is again of 0.99. With all three specifications, Japan is on or very close to the efficiency frontier. The lower results for input efficiency with the second and third specification however suggest that Japan could achieve the same result at lower expenditures per student or with a less expensive combination of public and private expenditures. These results come in part from the situation

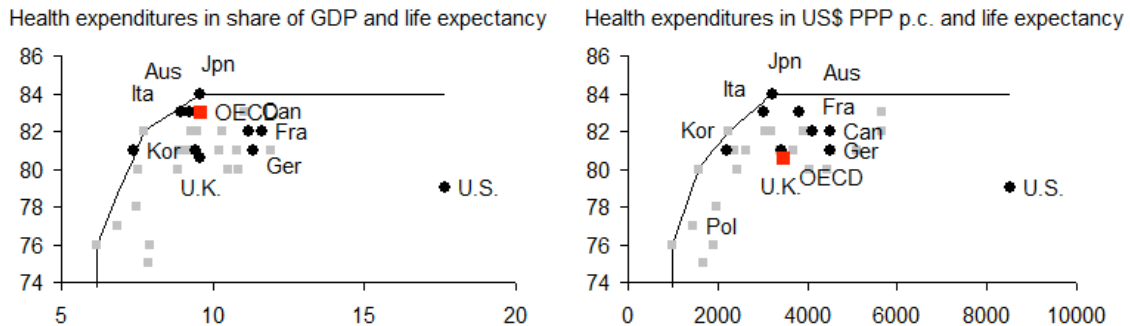
of Korea, with a PISA result marginally higher compared to Japan, but with expenditures about a quarter lower in US dollar at PPP.

Health

With the highest life expectancy (at birth, at 65, or in good health) and the second lowest infant mortality among OECD countries, the performance of Japan is very good. Japan is ranked fourth in terms of amenable mortality, that is, deaths that could have been prevented by timely access to appropriate health care. In terms of postsurgical mortality, Japan strangely has the best record for one reason of admission but the worst for another one. Despite this excellent performance, Japanese health care operates in a high cost environment, with the highest number of hospital beds, the longest length of stay, the highest numbers of MRI units (Magnetic Resonance Imaging), and a rather low share of generic use in pharmacy.

The number of doctors is one the low side, but with a high turnover of patients. The number of nurses is by contrast on the high side, reflecting government's efforts to maintain hospital quality with high nurse staffing levels even though, according to Hashimoto et al. (2011), this indicator has no impact on mortality. Overall, health expenditures in Japan are also on the high side, but still in the middle of the sample, and are also largely socialized since private health expenditures are relatively smaller. The impact of both elements - high cost but high performance - on the efficiency of high care is uncertain.

Previous studies consistently found Japan as one of the most efficient countries in terms of health expenditures. Using an efficiency ratio, Afonso and al. (2003) found that Japan is ranked second. Joumard, Andre, and Nicq (2010) also test a variety of specification, and found that Japan is most often in the top five performers. Unlike this study, Joumard and al. focus on the output efficiency, where our concern is more on the input efficiency to derive some estimates of potential savings.



Nb. Illustrative only: the full specification includes life expectancy, infant mortality, and an expenditure indicator.

Our preferred specification has two inputs, life expectancy and infant mortality (an undesirable outcome), and as input a measure of health expenditures. Since G20 advanced economies also tend to display high health expenditures, we also introduce as control variable GDP the national income per capita. In all but one specifications Japan is on the efficiency frontier, along with six to nine other countries. In the specification with amenable

deaths on a sample smaller by a third, Japan has an input efficiency of 0.95. The DEA based on the international best practice thus suggests little savings.

Social protection

Unlike education and health, social protection encompasses a diversity of programs each with specific objectives. The COFOG category of "social protection" represented in 2009 in Japan about 16 percent of GDP, with 12.6 percent of GDP for pension and survivor benefit, and another 3.4 percent of GDP for other programs (unemployment 0.4 percent, active labor market policy 0.4 percent, family 1 percent, incapacity 1.2 percent of GDP, and finally 0.5 percent for housing and other program). The SOX database takes a broader definition of "social expenditures", including also health expenditures. In line with another study on the efficiency of social expenditures, we focus on **non-pension** social protection, representing 3.4 percent of GDP, about half as much in Japan compared to other OECD countries, and the second lowest after Turkey.

The results depend from the specification of expenditures: given its low share of non-pension social expenditures in terms of GDP, Japan is on the efficiency frontier despite a poor performance. When the alternative measure of input as expenditures in dollar at PPP is used, the input efficiency declines to 0.55, above the average of the OECD and most advanced G20 economies (with an average of only 0.39).

We also investigate the efficiency of active labor market policy (ALM) expenditures, but using as output the share of long-term unemployment as a fraction of total unemployment and the unemployment rate, both undesirable outcomes. The results need to be interpreted with caution: Korea and Mexico report shares of long-term unemployment of only 0.3 percent and 2.4 percent, against a sample average of 31 percent; we exclude those two outliers from the sample. Japan spends half as much as other countries in ALM policy, at 0.3 percent of GDP, and with mixed outcomes: a lower unemployment rate but a higher share of long-term unemployment, at 37 percent of total unemployment. Japan, as other advanced G20 countries, obtains very low input efficiency score. These results seem to be driven by countries such as New Zealand (and possibly exogenous factors not captured by the specification), which combines low ALM expenditures, similar to Japan, and low long-term unemployment and low unemployment.

Infrastructure

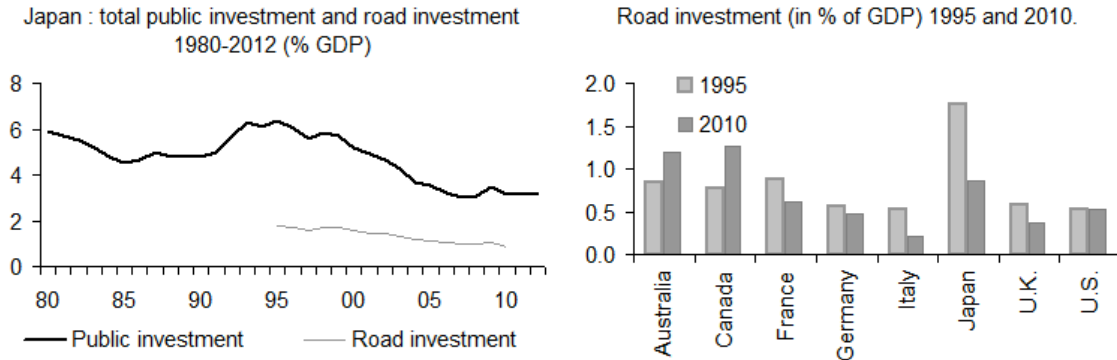
There is no agreement on what constitutes efficiency in public infrastructure investment and the results for Japan are quite contrasted from one study to another. Specifically, besides covering different time periods, existing studies differ in terms of the methodology, and of whether they use: (1) a stock or a flow of capital as input variable; (2) public or total infrastructure expenditures; and (3) a quality survey variable or a technical coefficient as output variable. Beyond the efficient frontier methodology, other studies also discuss public investment efficiency in terms of multipliers.

One strand of the literature considers quality indicators, using the quality of infrastructure variable from the World Economic Forum (WEF). The WEF indicator is mostly based on survey data for road, railroad, port, air transport, or electricity supply, but also includes some technical ratios, in terms of fixed phone lines or mobile phones by inhabitants. For example, Afonso et al. (2003) using an efficiency ratio and Albino-War et al. (2010) using a DEA methodology both rely on the WEF indicator. Those two studies however use different input variables, the first one the flow of public investment, the second one the stock of total (public and private) infrastructure investment. In the first study, infrastructure is the only of seven criteria where Japan is ranked in the lowest third of the sample largely, because of the high denominator, whereas it is ranked in the first third for all other criteria. In the second study, though the results are not reported, given the relatively high ranking of Japan for the infrastructure index in the WEF (ranked 10 among the OECD countries), it is likely that the performance of Japan is better.

A second strand of the literature defines the performance by technical quality indicators. Braconier, Pisu, and Bloch (2013) in a study of road efficiency in the OECD use as output a range of variables (congestion, injuries, passenger and freight transport per kilometer of road, and energy consumption) while input is measured by maintenance spending in share of GDP. With these criteria, Japan is among the worst performers, ranked overall in the lower third of the sample, penalized in part by the high injury rate and the low level of passenger traffic. They also discuss possible exogenous elements that may affect the road transport cost (and hence expenditures) such as an index of roughness of topography and of internal distance, both penalizing Japan compared to the average of OECD countries, but argue that it is not desirable for policymakers to compensate fully for these disadvantages.

Finally, a related strand of the literature defines efficiency as the multiplier of public investment. For example, Brückner and Tuladhar (2010) find that the multiplier is on the low side, at 0.24, lower than the average of the existing literature on Japan, at 0.77 against an average of 0.74 for a small sample of eight countries. The average estimate for Japan is similar to that of France, but much lower to that of the United States, Germany or France. The authors also find that the multiplier is low for the central government, even lower for prefectures, but larger for municipalities (respectively of 0.26, 0.14 and 0.78). They also find a declining marginal productivity of capital over the period 1975-2000, in line with Ihori and Doi (2004).

In this section, continuing using the DEA methodology, we focus on road infrastructure efficiency. Road infrastructure is the first largest component of total public capital expenditure. Other components of capital investment, such as construction of schools or hospitals, were indirectly considered in the previous section. We use a mixed of output variables suggested by the first and second strands of the literature (road quality index from the WEF, passenger and freight transport from the OECD, and road fatality index from the International Transport Forum). To eliminate the impact of the declining trend of road infrastructure, we use an average of maintenance expenditures over the period 2000-2010.



Source: Japanese National Accounts and OECD.

We are well aware of the limitations of this specification and of the data we used. Unlike other countries where both indicators are broadly comparable, Japan has a low road fatality when measured per km but a high road fatality when measured per billion vehicle-km (distance traveled), the latter being a better indicator of the risk of injury. As noted by Braconier, Pisu, and Bloch (2013), passenger and freight transport is more a technical "output" indicator than an "outcome" indicator, an inefficient transport system may lead to high transport volume and high congestion. Since it was not possible to replicate the construction of congestion indicators, a good candidate for an output indicator, we only use the WEF data on road quality and the data on road injury.

The DEA analysis show that Japan has the second lowest input-efficiency score, suggesting the same outcome could have been achieved with a fourth of the resources. The output-efficiency however is somewhat better. Although the lack of historical data for some of the series considered prevent us from doing an historical analysis, it is likely that the gradual reduction of road investment throughout the 2000s have contributed to improve the technical efficiency of infrastructure expenditures.

Administration

Previous studies find a high ranking of Japan in terms of administrative efficiency. For example, Afonso et al. (2003) find that Japan is ranked third in their sample behind Switzerland and the United States. They use a composite index representing corruption, red tape, the quality of the judiciary and the size of the shadow economy as an indicator of administrative performance, the first three indicators based on WEF survey data, while the efficiency index is calculated using expenditures on goods and services as a proxy. Forthun, and Hagemann (2000) use the same first three indicators for input efficiency, while adding the OECD Product Market Regulation (PMR) index as a proxy for the regulatory burden. Public expenditures for administration are defined as the sum of general public services excluding interest payment and public order and safety. The authors find that Japan and Norway are the two countries on the efficiency frontier. Japan is also ranked high on the World Bank government effectiveness index. The index is a composite about forty sub-indexes on the perception of the quality of number of public policy area, from education, health and bureaucracy.

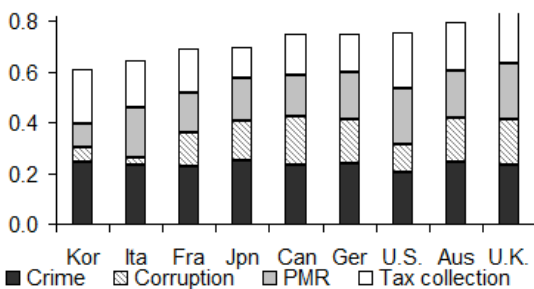
In this section, we consider four core functions of public administration: security, taxation, regulation, and add as in the above studies an indicator of corruption. We construct a composite index with equal weights as the input for the DEA specification: (1) security is measured as the homicide and robbery rate, using data from the UNODC; (2) efficiency of tax administration is measured as the ratio of administrative cost to net revenue collection, from the OECD Government at a Glance (2014); (3) the regulatory burden is proxied by the inverse of the OECD PMR index; (4) finally, transparency is derived from the perception of corruption from the WEF database.

Compared to earlier study, the index is more favorable to Japan by using actual crime rate instead of a perception of crime: Japan has the lowest homicide and robbery rate in the sample studied, while the perception of security is actually below the sample average. The index is also less favorable to Japan since it has one of the most expensive tax collection system. It does not seem that this underperformance is due to statistical issues (for example the inclusion or not, as in Japan, of social contributions from the tax base). Japan had in the early 2000s a cost of tax collection similar to other advanced G20 economies, but comparator countries have since reduced significantly their tax collection cost (or increase the tax base).

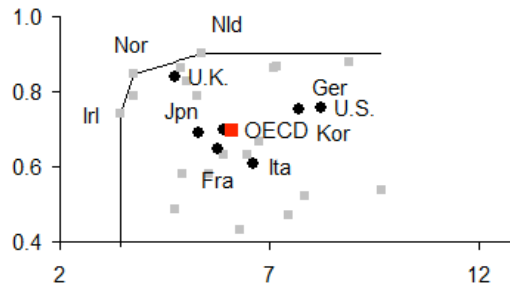
The sum of expenditures for general services and public order and safety are low in Japan, but when excluding debt service is excluded, Japan's expenditures are similar to the OECD average in share of GDP. Japan has also the second lowest number of civil servants in share of the labor force, which significantly reduces its overall wage bill. However, a larger fraction of civil servants are employed for the functions general services and public order (at 32 percent, against around 20-25 percent for other advanced G20 economies).

Overall, various DEA specifications indicate a low efficiency of the administration in Japan, with its input score always in the lower half of the sample countries. This result is robust to alternative specification excluding the tax collection variable (which penalizes Japan). The average input efficiency of 0.61 suggests that significant savings could be done by moving to the best practice frontier.

Components of composite index of adm. performance



Adm. expenditures (% GDP) and composite index



Composite index: crime & corruption (undesirable outcomes), low product market regulation, efficiency in tax collection.
Source: author's.

One important caveat about this result is that the link between expenditure and performance is arguably weaker for administration than for the previous ones. Larger expenditures for medical technologies, for school facilities, or for social protection should contribute to increase performance in health, education, or social security. Larger police force should also contribute to a decline in criminality, but a low criminality for exogenous reasons will also require a smaller police force. Improving transparency should reduce the cost of public procurement. Improving the regulatory environment (licenses, barriers to entry, antitrust exemptions) could be done at little fiscal cost, by shifting staff resources from central ministries to independent regulatory authority and could actually generate savings.

Pension

Pension expenditures cannot be as easily analyzed with an efficiency analysis. A related literature exists on the different issue of the efficiency of pension funds, comparing their management cost to their return. Pension expenditures have a redistributive component, in Japan with the Basic pension, given to all pensioners once they have contributed above a certain threshold of years, but a large share of pension revenues is proportionate or at least related to contributions done by the pensioners during their active lifetime. Thus, it is difficult to examine one single goal of the pension system. In line with the previous analyses, we provide here however some statistics derived from the OECD's publication *Pension at a Glance* on how pension expenditures achieved some level of redistribution and to what extent Japan operates in a high cost or low cost environment. Table 2-6 presents those statistics.

Many factors suggest a low-cost environment for the pension system:

- The net pension replacement rate is the lowest or the second lowest when considering either a pensioner who received during his lifetime about 50% of the median income or the median income. To contribute to the sustainability of the pension system, the 2004 reform in Japan automatically made the replacement rate the adjustment variable to ensure sustainability, so it is likely that that this rate could be adjusted downward further. Transfers account also for only 48 percent of income against 58 percent of average, with the share of income derived from work in Japan being the third largest in the OECD. Pension incomes as a percentage of average wage are the also second lowest in the OECD, at 36 percent against 56 percent on average.
- The normal pensionable age, at 65, is similar to a third on the sample and slightly higher than the OECD average. It is scheduled to gradually increase to 67. The average effective age of labor market exit is higher, at 68, is the fourth largest behind Korea, Mexico and Chile, countries, which also share with Japan the characteristics of low replacement rate.

In terms of equity, Japan has one of the highest income poverty rate of the elderly, at 19 percent against 13 percent for the OECD on average. The elderly poverty rate also declined in Japan, although the change was smaller than for the OECD as a whole. The elderly poverty rate is about 3.4 percentage points higher than the poverty of the population as a

whole⁷. Note however that the relative income of the elderly is actually slightly higher than for the OECD: elderly households are better off on average than in the OECD, but elderly poor are worst-off.

This preliminary analysis suggests that the pension system in Japan is not overly generous compare to other countries in the OECD: replacement rates are low, eligibility parameters are similar or tighter. The pension Gini coefficient suggests that pension revenues are actually more redistributive than other countries, but given the low level and transfers, this is insufficient to prevent larger than average elderly poverty rates. Direct revenues from social contributions, at 6.3 percent of GDP are equal to countries with a similar PAYG system, but the larger overall pension expenditures at 11.6 percent against 8.1 percent imply a larger contribution from the general government to close the financing gap. The issue with the sustainability of the pension system might be more related to low revenues and unfavorable demographics than with inefficient expenditures.

V. EXPENDITURE EFFICIENCY AT THE PREFECTURE LEVEL

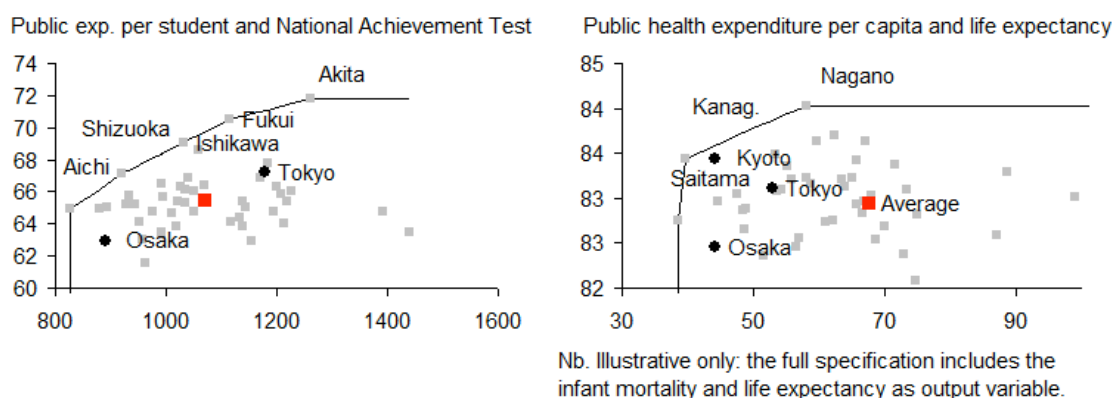
A number of public policies is implemented by local governments. Comparing the efficiency of different local governments also provide additional estimates of the potential savings. Total expenses of local governments represented in 2010 about 15 percent of GDP, against 17 percent in gross for the central government but only 9 percent in net for the central government after transfers to another level of the government. Social security expenditures represent the remaining 19 percent of GDP of expenditures.

A number of policies are directly implemented at the local level, with about 90 percent of total education expenditures (elementary to lower secondary), 78 percent of general administration expenses and the same share of judicial, fire and police services implemented at the local level. A number of papers have put emphasis on the imperfect relations between the central government and local government, with large transfers associated with a "soft budget constraints" and a weak incentive to raise taxes and possibly to control expenditures (Doi, 2002; Joumard and Yokoyama, 2005). Other studies suggest by contrast that the budget constraint is actually binding, as evidenced by the weak implementation of some joint investment project by the central and local governments, because they later do not have the resources to implement those projects. This section focuses only on the expenditure side. For reason of data availability, the DEA analysis performed in the previous section is only done for education and health, but we discuss variations for prefectures for administration and infrastructure.

⁷ This difference might be partly accounted by the way poverty in measure, since the OECD argues that elderly poverty is reduced by about 5 percentage points when imputed rent is included as income. While not reported for Japan in *Pension at a Glance*, this impact might be important, given the high home ownership rate of the elderly in Japan, around 80 percent. Even when this correction is taken into account, Japan likely remains one country with a high elderly poverty.

Education

At the prefecture level, we use a much simpler model than the model used for the international best frontier due to data availability. Public expenditure per student for the primary and secondary schools is available from the National Statistical Office, but no data is available for higher education or private expenditure expenditures. As an indicator of quality, we use the results of the Ministry of Education (MEXT)'s National achievement test. The test is administered since 2007 during the final year of primary school or the third year of junior high school. Results are presented in Annex table 3.



With this specification, on average the input efficiency is of 0.83 and the output efficiency of 0.94. This suggests that maintaining the same results but with lower resources could lead to savings of 17 percent. Tokyo has a lower input efficiency than on average, at 0.74. By contrast, Osaka has a higher input efficiency of 0.93, but this is associated with test results 7 percent lower than in Tokyo but expenditure per person 24 percent lower. The results might be influenced by the importance or not of private education and the related expenditures of households. However, given in general that the private contribution to education is somewhat lower for primary and secondary education, compare to pre-school and tertiary, this may limit the influence of private expenditures on the results.

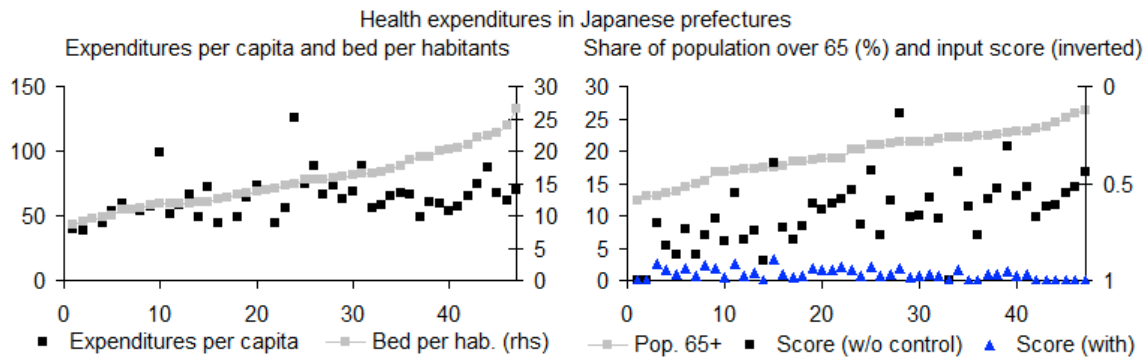
Health

Regarding health expenditure, we use the same specification as in the previous section with life expectancy and infant mortality as output, and expenditure per capita as input. This initial specification leads to a very high output efficiency for all prefectures but a wide difference in input efficiency, on average of 0.66. The life expectancy is very concentrated, in contrast to health expenditures: the standard deviation of the life expectancy is only of 0.5 years for an average expectancy of 83 years; by contrast, the standard deviation of health expenditures is much greater.

In the presentation of the 2014 budget, the Japanese Ministry of Finance (2014) has argued that health expenditures in Japanese prefectures is supply driven, as evidenced by the

correlation between hospital beds and health expenditures per capita. There is certainly an element of truth in it, as evidenced by Henke, Kadonaga, and Kanzler (2009): the average length of stay in hospitals is about four times the OECD average and there is a direct relation between the number of free beds and the average length of stay, a clear indication of a tendency to keep patients in beds to increase hospital revenues.

At the same time, the large difference in input score disappeared when controlling for aging. When adding as input the share of the population over 65, the average input efficiency increases from 0.67 to 0.97. The scope for savings implied by the DEA model, at only 3 percent, thus appears to be quite limited. While the tendency to keep elderly patients in beds may remain, this result suggests that at least part of the difference in health expenditures is justified by the age structure of the population.



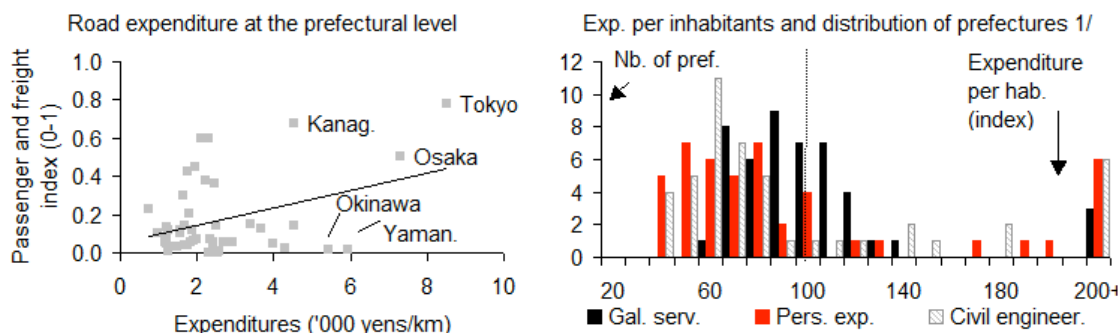
Our estimate on input efficiency is also on the low side compared to other DEA studies on the health sector using more complex modeling (including technical and allocative inefficiencies) or on specific individual expenditure units: for example, on long-term care, Yamauchi (2013) find potential efficiency gain of 20 percent, of which 10 percent deriving from technical inefficiency; Kawaguchi and Tone (2013), studying Japanese hospitals, find efficiency scores between 0.80 and 0.98, depending on the specification of the model. The specification closest to the one in this study (one period, variable return to scale) yields however very similar results in terms of efficiency, around 0.96.

Infrastructure and administration

Due to lack of comparable statistics on public expenditure outcome to ones used in the section on the international best-practice frontier, we only present here descriptive statistics on infrastructure and administrative costs by prefecture.

For road investment, we put in regards for each prefecture the construction orders in thousands of yens per kilometer and a simple average of a normalized index of freight tonnage and passenger traffic. Greater volume of traffic is associated with higher expenditures per km, with may relate to higher maintenance cost. At the same time, a large number of prefectures have relatively high expenditures despite low, sometimes extremely low, volume of traffic. Excluding the three urban prefectures of Tokyo, Osaka, and Kanagawa, Okinawa and Yamanashi for example both have the highest level of expenditures

per km despite a very low volume of traffic. This may suggest that there is still some scope to generate savings in terms of road expenditures. The Brückner and Tuladhar (2010) study cited above on public investment found that the investment multiplier was higher for city government than the central government (0.74 against 0.26) but also that investment done by the prefectures had the lowest multiplier, at 0.14.



Source: author's calculations. 1/ Average expenditure per inhabitant = 100.

Regarding the other expenditure items, the distribution of expenditures for civil engineering, general services or personal expenses scale by the number of inhabitants show some large differences. In the chart above, the average expenditures for a given expenditure items have been normalized to 100. For example, in terms of general service, while one may suppose that the expenditures for inhabitants for administrative should be broadly similar (after allowing for the cost of living or other variable costs), in fact an equal number of prefectures spend between expenditures from the index 60 to the index 120). As for road investment, the wide disparity suggests also they may be some scope for improving the efficiency of prefecture expenditures.

VI. DISCUSSION AND CONCLUSION

Is the efficiency achieved at the expense of equity?

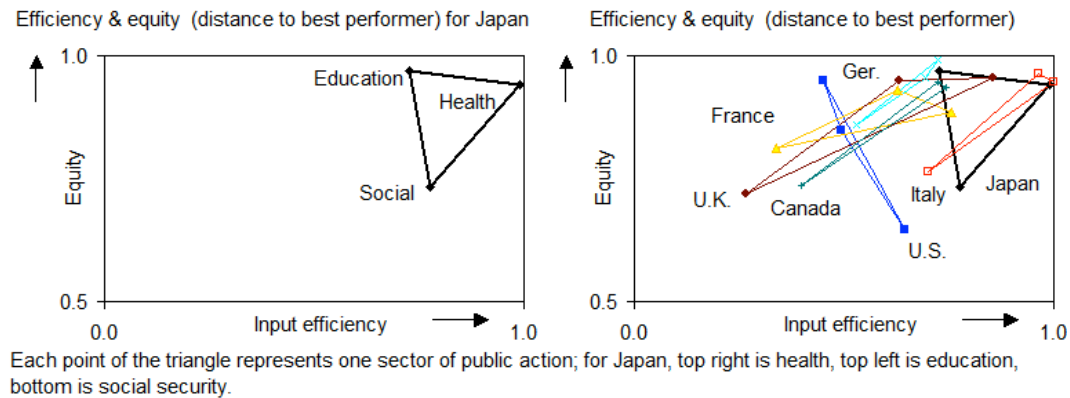
Tachibanaki (2009) examines the idea that Japan is an equal society and argues that he has strong reservation about its current relevance. This perception or "the myth of an equal Japan" is based on partly on historical favorable results on income inequality in the 1970s and one a number of policies designed to achieve greater equality, such as the high progressivity of the income tax until the 1980s. Equity considerations also remain important in terms of public policy choice. As already documented in the section on social expenditures however, all indicators of income inequality (Gini coefficient, ratio of top to bottom decile, or relative poverty) put Japan in the lowest third of the OECD sample, with a deterioration of these indicators over the recent period⁸. Lechevalier (2014) argues that skill-biased technical

⁸ A few indicators however present a somewhat different pictures. For example, the Piketty-Saez database on pre-tax income shows that Japan is ranked 9th out of 17 OECD countries in terms of top

(continued)

change is one factor, along with the social and family structure, explaining the increase in inequality.

Beyond income inequality, indicators of inequality for health and education offer a mixed picture for Japan. One indicator of inequality in health is the dispersion of health perception by income level. Despite good performance in terms of health outcome, Japan has one of the worst values for this indicator. Besides, for the lowest income group, this perception is about one third lower than the perception of the highest income group, against an OECD gap of one quarter on average. The dispersion of the age of death as of 2006, another indicator of health inequality is by contrast similar to the OECD average, with a standard deviation in death of 14 years. Over the previous fifteen years however, this dispersion seems to have gradually risen, from the lowest OECD level in 1990 of 13.4 years, while it has been on a declining trend for other countries.



In terms of education, Japan obtains better results. The homogeneity of PISA scores measures the ratio of the performance of the bottom quartile to the top quartile. In 2006, Japan was ranked 12th among the OECD countries but this ranking improved to 8th in 2012. Education equity remains however much lower than education performance, Japan being the second best performing country in 2012. Another indicator of inequality in education is the contribution of the social background to the student performance in PISA test. The social background explains a lower performance of PISA performance in Japan, about 9 percent, than in other OECD countries, at 14 percent on average. Both indicators thus suggest that Japanese education system, at least up the secondary level, remains relatively equalitarian.

income inequality, against 27th out of 34 for all three income indicators (Gini, inter-decile, relative poverty). In terms of material deprivation, Mira d'Ercole (2006) reports that Japan is actually in a better position than the OECD in average, with 11 percent of respondents reporting their inability to satisfy some needs (basic needs, consumer durable, financial, etc.) against 14 percent for the OECD. Finally, there is some possibility that income-based measure of inequality might overstate inequality compared to consumption-based measure, an important consideration in Japan given the larger share of elderly and the difficulty in appreciating their income.

To summarize, we provide a measure of Japanese average ranking of different measures of equity for each sector out of a sample of 32 or 34 OECD countries. Key statistics are presented in Annex Table 4-1. Overall, Japanese public services tend to contribute to a high equality in education (with a average ranking of 6) but a low equality in social protection (with average rankings of 26 respectively). In terms of the equity of health care, the relative position of Japan is rather low (with a ranking of 22) but the absolute position is actually similar to other countries, albeit a bit lower.

How does the efficiency of public expenditures relate to user perception?

One bias of the measures of performance and efficiency is that they tend to emphasis on quantitative instead of qualitative measures. To address this bias, we present information on the perception of each sector of public action based on various opinion survey, from Gallup, the OECD, or the World Value Survey. Overall, we have the following hierarchy of indicators: a high performance of public expenditures, lower efficiency and equity indicators, but overall a rather poor public perception.

As often with subjective judgments, there could be a pessimistic bias on the perception by the users. In terms of both education and health, Japan has among the best performance (but a somewhat lower efficiency). However, the perception of the quality of education is rather mixed (with only 56 percent having a positive view of the education system according to a Gallup survey against 66 percent in the OECD on average). In terms of health, we have contrasting results: Japan has among the worst perceived health care status by respondents according to the OECD despite one of the best performance measured by a variety of indicators; a Gallup survey however shows a larger confidence in the health care system, with 75 percent of persons confident in the healthcare system against 71 percent on average in the OECD.

In terms of social security and public administration, thought confidence is on average close to the OECD, there is a large dispersion for specific responses. For example, according to the World Value Survey, among a sample of about twenty countries, Japan is in the middle in terms of support for tax redistribution. Between the 2005-2010 and the 2010-14 surveys, respondents favoring redistribution have declined from 67 percent to 56 percent while those favoring unemployment benefits has decreased by 72 to 60 percent. By contrast, Japan has the largest share of respondents who agree or strongly agree with the opinion that "older people get more than their fair share from the government", at 41 percent, about twice the average in a sample of ten OECD countries. This suggests that there is limited support to expanding the welfare state in Japan, but stronger support to reduce its aging bias.

On public administration, the confidence in government is among the lowest and twice as low as the OECD average (17 vs. 40 percent), the confidence in the civil service in general on the low side (30 vs. 41 percent), but Japanese also show a high confidence in the police and the judicial system (74 and 60 percent, vs. 72 and 50 percent). Despite as shown above a rather expensive tax collection in Japan, Japanese display their confidence in the tax system by being the first country to oppose or strongly oppose the idea that "it is justifiable to cheat

on taxes if you have a chance" (82 vs. 57 percent on average). This contrasts with only about half of the respondents who opposed this idea in Germany or in France. For some indicators, the user perception might be inversely related to the size of the government: Japanese thus favors unemployment support and some dose of redistributive policies, which are rather low in Japan, while the greater declared tax compliance might be related to the lower tax rate.

Table 1. Public sector performance, efficiency, equity and user perception

	Indicator	Japan	Best	Worst	Distance to best 1/	Distance to best 2/
Education						
Performance 3/	PISA score, 2012	540	542	417	100%	98%
Efficiency	Avg. of DEA input efficiency	0.85	1.00	0.36	85%	76%
Equity	Homogeneity of scores	0.79	0.81	0.73	97%	71%
Perception	Quality of education (%)	56	82	44	68%	32%
Health						
Performance	Life expectancy, 2012	84	84	75	100%	100%
Efficiency	Avg. of DEA input efficiency	0.99	1.00	0.49	99%	98%
Equity	Death dispersion, 2006 (inv.)	13.7	12.9	15.2	94%	65%
Perception	Confidence in health care	75	94	29	80%	71%
Social protection						
Performance	Gini coefficient	0.34	0.25	0.51	73%	66%
Efficiency	Avg. of DEA input efficiency	0.78	0.96	0.25	80%	73%
Equity	Same as performance	0.34	0.25	0.51	73%	66%
Perception	Confidence in social security	62	83	37	75%	55%
Administration						
Performance	Composite index, normalized	0.70	0.90	0.34	77%	64%
Efficiency	Avg. of DEA input efficiency	0.61	1.00	0.41	61%	34%
Perception	Confidence in administration	53	74	33	71%	48%
Infrastructure						
Performance	Quality of roads, 2012 (survey)	5.8	6.6	2.3	88%	81%
Efficiency	Avg. of DEA input efficiency	0.23	1.00	0.17	23%	7%
Perception	Same as performance	5.8	6.6	2.3	88%	81%

Source: author's estimates.

1/ Distance to the best : Japan / Best for desirable outcome (or Best / Japan for undesirable outcome). For efficiency, the distance is equal to the input efficiency. 2/ Alternative index: (Japan - Worst) / (Best - Worst).

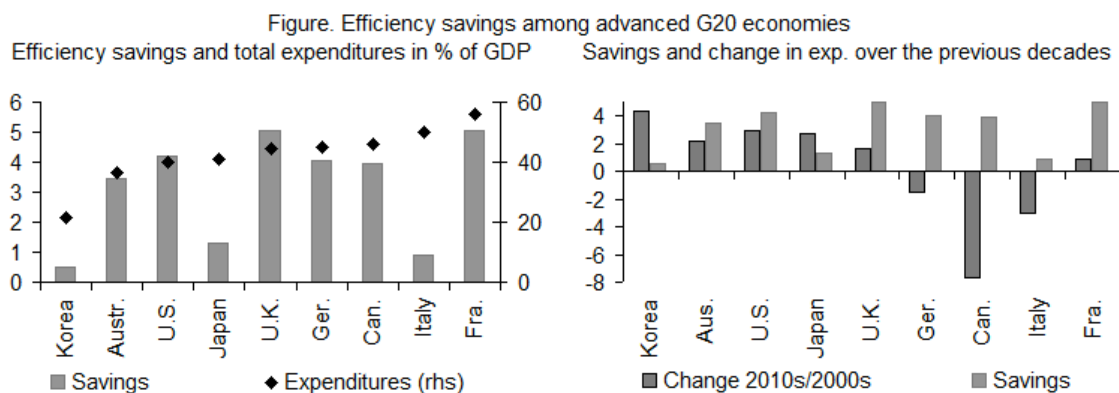
3/ For performance, presentation of one indicator, while the DEA analysis often includes a range of indicators

How large are aggregate efficiency savings?

Let us remind the reader about a few caveats about our results. One drawback of the DEA methodology is its interpretation of the best practice frontier as an efficient frontier, without considering the possibility of noises in these results. Part of the efficiency score can also be explained by exogenous factors that policy actions cannot reduce. Introducing a control variable in the measurement of efficiency at the prefecture level drastically changes the results. However, since our main focus was identifying cost savings for a range of policies, we did fully try to investigate in this paper these determinants.

Besides statistical uncertainty, political implementation is another constraint that may prevent to move to the efficiency frontier. Given these uncertainties, we take a conservative view of the efficiency gains that can be achieved, and arbitrarily consider that only **half** of these efficiency gains can be realized. We present a summary of the estimates of efficiency savings in table 2.

Finally, the efficiency analysis also covers about only 60 percent of total expenditures in Japan but 68 percent of expenditures for OECD countries. In particular, we did not apply any cost saving analysis to pension expenditures, which represents about 28 percent of total expenditures in Japan and 22 percent in other OECD countries. We discussed above some limits about our estimates, the potential underestimation of efficiency savings in health care given the high cost environment, and the potential overestimation of savings in general administration given the weaker link between performance and expenditures. In non-pension social expenditures, the priority might also be to increase the performance (output efficiency) rather to reduce expenditures (input efficiency) given the rise of inequality in Japan.



Source: author's estimates.

Overall, we find that the scope for reducing expenditures is comparatively lower in Japan, both when considering expenditures to GDP compared to international average, or by analyzing the efficiency of expenditures:

- The analysis of detailed expenditure data using the COFOG classification showed that in terms of expenditures to GDP Japan overspends relatively to its peer in only a few sectors. Japan clearly overspends in terms of support to the agricultural sector (0.8 percent of GDP higher than the average) and seems to overspend in terms of waste management (0.4 percent higher) or economic affairs (0.5 percent). Bringing this spending to OECD average could generate savings of about 1.7 percent of GDP. Taking half this number gives an estimate of about 0.9 points of GDP. By contrast, Japan underspends in a number of sectors, either because of favorable environment conditions (low crime rate...) or because of the complementary role of private expenditures.
- The analysis of efficiency using a DEA methodology covered about 60 percent of total public expenditures. On average, bringing Japan to the efficiency frontier and taking a conservative estimate could yield about 2.5 percent of GDP of savings (a decent 11 percent). This is lower than the efficiency gains of 4.1 percent for the OECD on average (15 percent) or the efficiency gains of 4.7 percent for other advanced G20 economies (17 percent). One reason for this result is the very high efficiency result in terms of health, and the rather high efficiency of education or non-pension social expenditures. There is reason to believe that the

efficiency score of health may underestimate the possible saving gains, given the high cost environment in Japan and clear identified technical inefficiencies. Efficient savings at the level of prefecture in Japan are also broadly in line with those identified at the international level. Investment in road and administration are two areas where the efficiency of public expenditures in Japan is lower than its peers, but some savings have already been realized in terms of road investment.

Overall, the total efficiency gains in Japan represent about 6 percent of total expenditures, against an average of 9 1/2 percent for OECD countries. Among G20 advanced economies, the largest gains can be realized by the United States, then Germany and France. The average efficiency gains for G20 advanced economies, close to 5 percent of GDP may seem large, but they are one third lower than the public expenditure reduction achieved by Canada in the 2000s compared to the 1990s. Efficiency gains could thus contribute to reduce Japan's fiscal challenge of reducing its public deficit and reducing its public debt.

Japan is after Korea and Italy the advanced G20 countries with the lowest efficiency savings. While the results may seem intuitive for Korea, a country with total public expenditures at 21 percent in 2013, about half the OECD average, it is less so for Italy given its very high expenditures at 49 percent of GDP. In line with our results, Tuladar (2014) find for Italy an input efficiency for health below the OECD average but an input efficiency close to unity for education and above the OECD average for social expenditures. For education, the efficiency is achieved despite a poor performance because of lower expenditures, while non-pension social expenditures in share of GDP are also relatively low. Besides, the efficiency analysis for Italy covers only 45 percent of total expenditures, with pension and interest payment representing 40 percent. It is possible that Italy has a somewhat similar experience to Japan, with aging pressure (and for Italy the additional pressure of servicing its debt) forcing the government earlier than in other countries to rationalize other expenditures.

Table 2. Public expenditures and upper bound on potential savings from efficiency gains or from benchmarking (in % of GDP) 1/

	Japan			Average OECD			
	Share of GDP (%)	Input score Internat.	Input score Pref.	Potential savings	Share of GDP (%)	Input score	Potential savings
Japan							
<u>(1) Efficiency</u>							
Education (2010)	3.3	0.81	0.83	0.3	4.7	0.76	0.6
Health	7.9	0.95	0.97	0.2	9.4	0.87	0.6
Non-pension soc. exp.	3.4	0.78	/	0.4	7.5	0.53	1.7
Road investment	1.2	0.23	/	0.4	0.7	0.54	0.2
Administration	5.9	0.58	/	1.2	6.1	0.66	1.0
Subtotal	21.6	0.78		2.5	28.3		4.1
<u>(2) Benchmarking</u>							
Agri., waste, eco. aff.	2.9			0.9	1.2		/
<u>(3) Other expenditures</u>							
Pension (2009)	11.6			/	9.7		/
Other	4.8			/	4.5		/
<u>Total expenditures</u>	41.0			3.4	43.7		4.1
Other advanced G20 countries 2/							
Canada	45.8	0.62		5.0			
United States	40.1	0.49		6.5			
France	55.9	0.59		6.0			
Germany	45.0	0.59		6.2			
Italy	49.8	0.80		2.2			
United Kingdom	44.7	0.61		5.4			
Australia	36.6	0.63		4.5			
Korea	21.4	0.76		2.3			

Source: author's calculations.

1/ To get a conservative estimate of potential savings, we take arbitrarily ½ of the savings derived from the DEA or from the international comparison of expenditures. The input score is the average of the input score derived from different models. Expenditures for 2011 or most recent year, while scores are calculated for 2010-12 depending on data availability.

2/ Input score is the average score weighted by the share of expenditures in GDP.

How do these estimates compare to the existing literature and to official estimates?

Compared to other papers based on the DEA methodology, we have somewhat smaller input efficiency estimates for education (0.8 vs. 0.9 in Sutherland, Price and Joumard, 2007), administration (0.6 vs. 0.8 in Hribernik and Kierzenkowski, 2009), and infrastructure (0.25 vs. 0.8 in Braconier and al, 2013), but better scores in health care (0.95 vs. 0.8-0.95 in a literature on Japan). While not reporting their input-efficiency, Joumard et al. (2007) suggest that the potential savings in terms in healthcare could be of 0.8 point of GDP, larger than our estimate. Differences between studies reflect in part the choice of specification for the DEA as well the time period considered. As an illustration however, taking these estimates rather than ours would yield slightly higher potential savings of 3 points of GDP, against 2.4 points in our baseline results.

Overall, the estimates in this study for OECD country on average seem plausible, with

average savings at 10-12 percent from health care and education, 15 percent for administration, and 25 percent for administration and infrastructure. The total efficiency savings is of 11 percent for Japan and 15 percent for the OECD.

Official Japanese government documents are short on actual estimates on expenditure savings, the main number being discussed being the aggregated general government deficit. The official "Basic Framework for fiscal consolidation" (CAO, 2014) insists in general terms on expenditure prioritization, elimination of wasteful expenditures, and improving efficiency. One specific measure mentioned is the promotion of generic drugs. The 2014 budget contained more detailed measures for the review and rationalization of expenditures, but some neutral in terms of expenditures (reduction of agricultural grant compensated by additional expenses, reduction of teachers compensated by additional staff for support...). The Ministry of Finance also reported the achievement of its target to reduce central government staff by 10 percent over a four-year period on a gross basis, or 2.5 percent on a net basis (0.2 percent of total government employees). Savings are also expected to be realized in infrastructure or defense procurement.

The latest IMF consultation with Japan suggests total expenditure reduction of 5 percent of GDP or half the consolidation effort, of which 1 point from withdrawing the fiscal stimulus, 2.5 point from curbing non-social security spending, 1 point from limiting nominal growth in social security spending and 1/4 point for reducing benefit for wealthy retiree. Detailed analysis on health and pension suggest possible larger savings from social spending, at about 1.9 percent of GDP instead of 1.3. On health expenditures, Nozaki, Kashiwase, and Sato (2014) discuss five expenditure measures yielding a total of 1.1 percent of GDP of savings and each yielding about 0.1 to 0.3 percent of GDP: introducing gate-keeping, incentivizing the use of generic drugs, promote a health lifestyle, introducing budget caps, or strengthening supply constraints. On pension expenditures, Kashiwase, Nozaki, and Tokuoka (2012) suggest total savings measures for 3/4 percent of GDP (1/4 point of GDP by reducing benefits for wealthy retirees and 1/2 point by reducing the replacement ratio). Some efficiency gains on the expenditure side can also be achieved by having one agency collecting taxes and social security benefits, instead of the division currently between the National Tax Agency and the Social Insurance Agency.

The 2.5 points from curbing non-social security spending could be compared to our own estimates of 2.8 points coming from efficiency gains in non-social expenditure (1.9 points) and from sector-specific expenditure cut (0.9 points). Total savings on social expenditures could be between 1.3-1.9 percent for the IMF, where the DEA model here produced a very low efficiency savings for health and we did not produce an estimate on pension.

The OECD offers a number of very detailed specific policy recommendations, presented as the previous ones in Annex table 4-2. Those recommendations are broadly shared by academics. For example, Ihori and Atsushi (2004) suggest that fiscal consolidation requires on the expenditure side overhauling the project-evaluation system for public works and streamlining the PAYG pension system. Regarding health care, Hashimoto et al. (2011)

suggest tightening the control of service with better planning at the regional level, but most of the adjustment suggested are qualitative, rather than on cost.

Concluding comments

We also explored in this paper the relations between performance, efficiency, equity, and public perception. The good performance of Japan in international rankings in term of education, health, competitiveness, or some indicators of transparency or security, does not mean that Japan cannot achieve the same results at a lower cost. The efficiency of public expenditures is indeed often lower than its performance: the high quality of infrastructure is achieved at a high cost; general public service expenditures also deliver excellent results in some areas but an average result otherwise for a cost comparable to its peer; existing local inefficiencies in health and education can also generate some savings...

Besides efficiency, equity needs also to be a consideration of policymakers, given the trend of growing inequality in Japan. Opinion surveys do not show any strong public pressure for larger redistribution or larger spending, but the Japanese population aspires to a more balanced distribution of public goods between the elderly and the rest of the population. More efficient and better targeted public expenditures could address equity concerns without increasing the fiscal cost of expenditures. They could also be a way to gain broader political support to implement consolidation policies not just on the expenditure side but also on the tax side.

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ANNEXES

- Annex Table 1.1. Measures of public expenditures, Japan and OECD
 Annex Table 1.2. Breakdown of general government expenditures, Japan and OECD
 Annex Table 1.3. Expenditure rigidity and aging bias, Japan and OECD
 Annex Table 2.1. Education Efficiency
 Annex Table 2.2. Health Efficiency
 Annex Table 2.3. Social Expenditure Efficiency
 Annex Table 2.4. Road Expenditure Efficiency
 Annex Table 2.5. Administration Efficiency
 Annex Table 3. Expenditure Efficiency at the level of the Prefecture and Municipalities
 Annex Table 4. Equity and perception of public expenditures, Japan and OECD

Annex table 1-1. Different measures of public expenditures (in % of GDP)

Indicator	Japan and OECD			G20 comparators							
	JPN	OECD Rank		CAN	USA	FRA	GER	ITA	GBR	AUS	KOR
In 2011											
Total public expenditures	40.6	44.0	24/33	45.8	40.1	55.9	45.0	49.8	44.7	36.6	21.4
Debt service	0.8	1.9		0.4	3.4	2.5	1.9	4.6	2.8	0.5	-0.8
Primary public expenditure (1)	39.8	42.2	23/33	45.4	36.7	53.4	43.1	45.1	41.9	36.1	22.2
Gross public social expenditures (2)	23.1	21.5		17.4	19.0	31.0	25.5	27.5	22.7	17.8	9.0
Tax on social benefits	-1.3	-2.9		-1.2	-0.9	-4.0	-3.5	-4.6	-1.7	-0.9	-0.4
Tax break for social purpose	0.4	0.5		0.8	2.0	1.0	1.6	0.7	0.4	0.5	0.5
Net public social expenditures (3)	22.2	19.1		17.1	20.1	27.9	23.7	23.6	21.4	17.4	9.1
Net primary public expenditure (4) = (1)+(2)-(3)	39.0	39.8	21/33	45.1	37.8	50.4	41.2	41.2	40.6	35.7	22.4
Private social spending (5)	3.4	2.1		3.9	10.1	3.4	2.4	1.8	4.8	2.7	2.5
Total 1/ (6) = (4) + (5)	42.3	41.9	20/33	49.0	47.9	53.7	43.6	43.0	45.4	38.4	24.9
Ratio (2)/(1): public social expenditures (%)	58%	51%		38%	52%	58%	59%	61%	54%	49%	40%
Ratio {(3)+(5)}/(6): total social expenditures (%)	60%	51%		43%	63%	58%	60%	59%	58%	52%	47%
Memorandum (in 2005):											
Pension (old age and pension)											
Public	11.6	8.1		4.4	6.6	13.7	10.9	15.2	6.4	5.2	2.4
Mandatory Private	0.6	0.3		0.0	0.0	0.2	0.0	1.2	0.6	0.4	0.7
Voluntary private	2.9	1.0		3.5	3.6	0.1	0.8	0.2	4.3	2.1	0.0
Health											
Public	7.1	6.4		7.9	8.2	8.7	8.5	7.3	7.7	6.3	4.1
Mandatory Private	0.0	0.0		0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Voluntary private	0.2	0.6		1.4	5.7	1.5	1.1	0.1	0.3	0.7	0.0
Share of the private sector in total expenditures (in % of total)											
Pre-primary education	54.6	17.3	1/32	...	29.9	6.3	19.6	9.4	19.3	29.3	45.7
Primary and secondary	7.0	8.8	17/32	10.3	8.4	6.5	12.1	3.8	7.9	15.5	18.8
Tertiary education	65.5	27.4	3/32	42.5	65.2	16.3	15.1	23.7	28.2	53.9	71.7
Medical services	13.1	22.2	23/34	20.7	49.8	15.0	21.1	13.1	...	26.6	45.2
Medical goods	32.6	45.9	26/34	65.2	67.9	39.2	30.7	53.4	...	55.3	44.3
Pension benefits	25.6	14.8	8/33	47.0	39.1	1.2	8.1	9.8	43.8	33.0	24.1
Total (education, health, pension)	22.0	19.8	10/34	38.9	49.5	9.7	14.4	12.2	19.6	32.8	39.4

Sources: SOX database, OCDE; WEO, IMF; Adema, Fron and Ladaque (2011); author's calculations.

1/ Total = private social and net public prim. expenditure.

Note. Classification in three groups among OECD Low Med. High

Annex table 1-2. Breakdown of general government total expenditures (in % of GDP, in 2009)

Indicator	Japan and OECD			G20 comparators							
	JPN	OECD Rank		CAN	USA	FRA	GER	ITA	GBR	AUS	KOR
Expenditure by function											
Total function	41.9	48.0	24/27	...	42.9	56.8	48.3	51.9	50.8	...	...
General public services	4.8	6.5	24/27	...	5.9	6.4	6.3	8.5	4.6	...	...
Defence	0.9	1.5	21/27	...	4.6	2.0	1.1	1.6	2.7	...	...
Public order and safety	1.4	1.8	24/27	...	2.4	1.8	1.7	2.0	2.8	...	...
Economic affairs	4.5	4.8	18/27	...	4.2	3.9	3.9	4.5	4.4	...	...
Environment protection	1.4	0.8	2/27	...	0.0	1.1	0.8	0.9	1.0	...	...
Housing and community amenities	0.9	0.9	8/27	...	1.3	2.1	0.7	0.8	1.4	...	...
Health	6.8	7.0	19/27	...	8.7	8.1	7.3	7.6	8.3	...	...
Recreation, culture and religion	0.4	1.3	26/27	...	0.3	1.4	0.8	0.9	1.1	...	...
Education	3.7	5.8	27/27	...	6.9	6.2	4.4	4.6	6.9	...	...
Social protection	17.0	17.6	16/27	...	8.6	23.9	21.3	20.4	17.6	...	...
Expenditure by economic categories											
Total government expenditure	41.9	49.2	18/20	...	42.9	56.8	48.3	51.9	50.8	...	...
Intermediate consumption	4.1	6.9	19/20	...	7.6	5.6	4.9	5.9	13.5	...	...
Total compensation of employees paid	6.4	11.7	20/20	...	11.0	13.5	8.0	11.3	11.5	...	...
Subsidies	0.7	1.5	16/20	...	0.4	1.7	1.2	1.1	0.7	...	...
Other current transfers (consolidated S13)	2.1	2.2	13/20	...	0.4	3.4	2.1	1.8	3.2	...	...
Capital transfers (consolidated S13)	1.0	1.2	11/20	...	1.0	0.8	1.4	1.9	2.5	...	...
Gross capital formation	3.5	3.1	8/20	...	4.2	3.4	1.8	2.5	2.7	...	...
Property income (consolidated S13)	2.1	2.4	11/20	...	3.7	2.4	2.7	4.6	1.9	...	...
Specific items (sub-functions)											
High comparative expenditures	4.2	1.6					2.0	1.3	1.7	1.6	
Agriculture, forestry, fishing and hunting	1.3	0.5	1/21	...	...	...	0.4	0.2	0.3	0.2	...
Waste management	0.9	0.5	4/18	...	...	...	0.8	0.3	0.5	0.9	...
Economic affairs, other industries	0.7	0.2	1/21	...	...	...	0.2	0.1	0.2	0.0	...
Fuel and energy	0.6	0.1	1/21	...	...	...	0.3	0.1	0.0	0.2	...
Fire-protection services	0.4	0.2	1/21	...	...	...	0.3	0.2	0.2	0.2	...
Mining, manufacturing and construction	0.3	0.1	2/21	...	...	...	0.0	0.2	0.4	0.0	...
Communication	0.0	0.0	4/21	...	...	...	-0.1	0.1	0.0	0.0	...
Low comparative expenditures	4.0	8.6					8.8	8.0	8.6	9.4	
Pre-primary and primary education	1.1	2.0	21/21	...	...	...	1.7	1.1	1.5	2.0	...
Secondary education	1.1	1.9	21/21	...	...	...	2.4	1.6	1.8	2.7	...
Police services	0.7	0.9	16/21	...	...	...	1.0	0.7	1.2	1.6	...
Government, Parliament, MOF, MOFA...	0.6	2.0	21/21	...	...	...	1.2	1.7	2.5	1.6	...
Unemployment	0.4	1.4	19/21	...	...	...	1.9	2.3	1.0	0.5	...
Law courts	0.1	0.3	21/21	...	...	...	0.2	0.4	0.3	0.7	...
Prisons	0.0	0.2	21/21	...	...	...	0.2	0.1	0.2	0.3	...
Additional major sub functions	20.3	17.4					22.1	16.6	22.4	15.7	
Old age	11.6	9.7	7/21	...	...	...	13.8	9.4	14.1	10.9	...
Outpatient services	2.9	2.0	5/21	...	...	...	2.8	2.0	2.4	0.6	...
Transport	2.3	2.4	10/21	...	...	...	1.3	1.5	2.0	1.8	...
Family and children	1.8	2.3	13/21	...	...	...	2.6	1.6	1.1	2.3	...
Survivors	1.7	1.0	5/21	...	...	...	1.6	1.9	2.8	0.1	...

Sources: COFOG, OCDE; Eurostat; Japanese National Accounts; author's calculations.

Note. Classification in three groups among OECD Low Med. High

Annex table 1-3. Expenditure rigidity and aging bias, Japan and OECD countries

Indicator	Japan and OECD			G20 comparators								
	JPN	OECD Rank		CAN	USA	FRA	GER	ITA	UK	AUS	KOR	
Rigidity (in % of total expenditures)												
<u>Overall rigidity in 2011</u>	76.6	67.2	2/20	...	62.7	71.0	72.7	74.7	65.7	...	...
Wages	15.9	19.2	16/20	...	20.5	20.3	15.0	19.9	19.2	...	...
Health benefits	16.0	9.8	2/20	...	17.5	9.4	14.1	8.9	8.2	...	...
Social benefits	39.1	34.5	4/20	...	19.4	38.0	40.4	39.8	34.5	...	...
Investment	4.8	1.8	1/20	...	2.0	0.8	1.2	1.4	0.9	...	...
Debt service	0.8	2.0	15/20	...	3.4	2.5	1.9	4.6	2.8	...	...
<u>Overall rigidity in 2005</u>	72.2	71.0	8/20	...	66.8	73.3	76.7	73.6	68.3	...	...
Wages	17.2	24.5	19/20	...	27.8	24.7	16.9	22.7	25.6	...	...
Health benefits	14.8	9.0	2/20	...	16.1	9.1	13.0	8.5	6.7	...	...
Social benefits	34.9	33.5	9/20	...	17.5	36.1	43.0	36.2	33.3	...	...
Investment	5.2	2.2	1/20	...	2.6	1.0	1.4	1.6	1.2	...	...
Debt service	0.1	1.8	18/20	...	2.8	2.5	2.5	4.5	1.5	...	...
Aging bias in social expenditures												
<u>In 2010 (or 2009 for Europe and Japan)</u>												
Elderly / non elderly spending (ENSS) 1/	54.6	39.0	4/34	28.5	35.6	45.9	40.0	57.1	31.9	30.9	32.4	
Aging and health	85.3	67.4	2/34	66.4	77.2	71.8	68.9	82.2	62.0	63.8	71.6	
New social risk spending (NSRS) 2/	6.9	13.0	32/34	8.9	4.3	13.5	11.1	7.1	17.8	16.9	13.5	
<u>In 2000</u>												
Elderly / non elderly spending (ENSS) 1/	50.7	39.7	6/33	31.9	40.8	44.0	40.6	59.3	35.0	32.6	37.0	
Aging and health	84.5	66.6	1/33	63.4	80.6	69.9	68.3	82.6	60.5	61.6	76.2	
New social risk spending (NSRS) 2/	5.5	13.0	32/33	9.9	6.2	15.2	12.4	7.1	16.6	18.1	9.8	

Sources: COFOG, OCDE; Eurostat; Japanese National Accounts; author's calculations.

Note. Classification in three groups amc Low Med. High

1/ Pensions and survival benefits over total spending (excluding housing and other).

2/ Family and active labor policy over total spending (excluding housing and other).

Table 2-1. Efficiency in Education

Source	Japan and OECD		G20 comparators								
	JPN	OECD Rank	CAN	U.S.	FRA	GER	ITA	U.K.	AUS	KOR	
Survey results on efficiency of education											
Sutherland, Price, Joumard, and Nicq (2007)											
Score with Stochastic Frontier Analysis (SFA) 1/	0.97	0.9	1/34	0.94	0.91	...	0.95	0.95	0.95	0.95	0.97
Score with Data Envelopment Analysis (DFA) 1/	0.78	0.7	2/34	0.74	0.70	...	0.77	0.72	0.75	0.75	0.82
Input efficiency score with homogeneity as add. Input.	0.96	1.0	7/34	0.97	0.92	0.95	0.91	0.93	0.94	0.95	0.96
St. Aubyn, Pina, Garcia and Pais (2009), higher education 2/	1.00	0.7	1/34	...	0.49	0.62	0.72	0.61	1.00	...	...
Afonso, Shuknecht, Tanzi (2003), efficiency ratio (% GDP)	1.12	1.1	4/34	0.84	0.92	0.99	1.09	1.11	1.10	1.06	...
This study											
<u>Output</u>											
Total PISA score in 2012	540	497.2	2/34	522	492	500	515	490	502	512	542
Fraction of 15-24 years NEET in 2012	9.4	15.0	5/34	13.2	15.2	16.6	9.9	24.6	16.3	11.7	17.6
<u>Technical ratios</u>											
Ratio pupils to teaching staff, primary and secondary	14.6	14.0	12/32	15.0	15.3	14.8	14.6	12.3	17.5	...	17.3
Salary cost per teacher, primary and secondary, US dollars	3028	3249	11/25	...	3036	2096	...	2936	...	3828	2741
<u>Input</u>											
Expenditure per student, total, US\$ PPP 2012	44.5	39.6	19/32	...	62.5	45.0	45.6	35.6	44.5	45.5	33.3
Total expenditure in % of GDP, 2010	5.1	6.1	6/31	6.8	6.9	6.1	5.1	4.6	6.4	5.8	7.6
Public expenditure in % of GDP, 2010 (primary to tertiary)	3.3	4.7	1/31	5.2	4.4	4.9	3.9	3.8	5.3	4.2	4.1
Private expenditure in % of GDP, 2010 (primary to tertiary)	1.2	0.9	19/24	1.6	2.1	0.5	0.6	0.4	0.7	1.5	2.7
<u>Score of DEA model</u>											
Specification: total expenditures in % of GDP. Units on the frontier: 7.											
Input efficiency	1.00	0.81	1/30	0.72	0.65	0.75	0.94	1.00	0.73	0.82	1.00
Output efficiency	1.00	0.95	1/30	0.96	0.92	0.95	0.96	1.00	0.95	0.95	1.00
Specification: expenditures in US\$ PPP per student. Units on the frontier: 6.											
Input efficiency	0.73	0.68	11/29	...	0.36	0.52	0.55	1.00	0.53	0.54	1.00
Output efficiency	0.99	0.95	7/29	...	0.91	0.93	0.95	1.00	0.93	0.95	1.00
Specification: public, private expenditures in US\$ PPP p. student. Units on the frontier: 10.											
Input efficiency	0.81	0.80	12/22	...	0.34	0.62	0.60	1.00	0.64	0.48	1.00
Output efficiency	0.99	0.98	11/22	...	0.91	0.95	0.97	1.00	0.95	0.95	1.00

Source: reference papers as indicated; Japanese National Statistical Office; OECD; author's estimates.

1/ Specification with 2003 PISA as output, and teachers student ratio, computer availability, socio-economic backgrounds as inputs.

2/ Input efficiency, DEA model with financially measured inputs.

Note. Classification in three groups among sample: Best Med. Worst

The classification reflect whether an output is desirable or not, for example a low fraction of 15-24 as NEET is a desirable output.

Table 2-2. Health Expenditure Efficiency

Source	Japan and OECD		G20 comparators								
	JPN	OECD Rank	CAN	U.S.	FRA	GER	ITA	U.K.	AUS	KOR	
Survey results on efficiency of health											
Efficiency ratio, Afonso, Shuknecht, Tanzi (2003)	1.3	1.0	2/22	0.9	1.1	0.9	0.9	0.9	1.0	1.1	...
Joumard, Andre, Nicq (2010), output-efficiency rank 1/	5	15.3	5/29	14	30	7	20	10	24	1	3
This study											
<u>Output</u>											
Main variables											
Life expectancy at birth, 2012	84.0	80.4	1/34	82.0	79.0	82.0	81.0	83.0	81.0	83.0	81.0
Infant mortality 2011	2.3	4.2	2/32	4.9	6.1	3.5	3.6	3.4	4.3	3.8	3.0
Additional output variables:											
Amenable death, 2006 (inverted)	61.2	73.0	4/19	77.0	95.5	55.0	76.4	59.9	82.5	56.9	...
Life expectancy at 65, 2012	26.0	23.6	1/34	25.0	23.0	25.0	24.0	25.0	24.0	25.0	24.0
Healthy life expectancy, 2012	75.0	70.6	1/34	72.0	70.0	72.0	71.0	73.0	71.0	73.0	73.0
Fatality after ischemic stroke admission, 2011	3.0	8.5	1/31	9.7	4.3	8.5	6.7	6.5	10.4	10.0	3.4
Fatality after AMI admission, 2011 (inverted)	12.2	7.9	30/32	5.7	5.5	6.2	8.9	5.8	7.8	4.8	8.9
<u>Technical 2/</u>											
Practising doctors	2.2	3.2	5/33	2.4	2.5	3.3	3.8	4.1	2.8	3.3	2.0
Practising nurses	10.0	8.8	21/34	9.3	11.1	8.7	11.4	6.3	8.6	10.1	4.7
MRI units	47	13.1	32/32	9	32	8	11	24	6	6	21
CT scanners	101	23.0	32/32	15	41	13	18	32	9	44	36
Hospital beds per 100,000 inhabitants	13.4	4.8	34/34	2.8	3.1	6.4	8.3	3.4	3.0	3.8	9.6
Share of generic in pharmacy, in percent	8.8	18.9	16/19	...	...	11.5	35.3	7.8	27.6	...	...
<u>Input</u>											
Expenditures in share of GDP, 2011, OECD	9.6	9	22/33	11.2	17.7	11.6	11.3	9.2	9.4	8.9	7.4
Expenditures per capita PPP, public, 2011, OECD	2638	2467	19/33	3183	4066	3161	3436	2345	2821	2578	1217
Expenditures per capita PPP, private, 2011, OECD	575	918	7/33	1339	4441	957	1058	668	584	1223	982
Expenditures per capita PPP, total, 2011, OECD	3213	3395	16/33	4522	8508	4118	4495	3012	3405	3800	2198
Environment variable: GDP per capita '000 US\$ PPP, 2011	35	34	17/34	41.5	49.8	34.9	38.4	30.8	35.9	40.5	30.9
<u>Score of DEA model 3/</u>											
Specification: total expenditures in % of GDP. Countries on frontier: 6.											
Input efficiency	1.00	0.83	1/30	0.69	0.39	0.67	0.65	0.94	0.78	0.97	1.00
Output efficiency	1.00	0.97	1/30	0.98	0.94	0.98	0.96	0.99	0.97	1.00	1.00
Specification: total expenditures in % of GDP and GDP per capita. Countries on frontier: 9.											
Input efficiency	1.00	0.87	1/30	0.72	0.40	0.74	0.69	0.98	0.79	0.97	1.00
Output efficiency	1.00	0.98	1/30	0.98	0.94	0.98	0.96	1.00	0.97	1.00	1.00
Specification: public, private expenditures in US\$ PPP. Countries on the frontier: 8.											
Input efficiency	1.00	0.78	1/30	0.53	0.19	0.63	0.53	0.94	0.76	0.78	1.00
Output efficiency	1.00	0.98	1/30	0.98	0.94	0.98	0.96	0.99	0.96	0.99	1.00
Specification: total expenditures in % of GDP and life expectancy at 65. Countries on the frontier: 8.											
Input efficiency	1.00	0.98	1/30	0.98	0.94	0.98	0.96	0.99	0.96	0.99	1.00
Output efficiency	1.00	0.98	1/30	0.98	0.94	0.98	0.96	0.99	0.96	0.99	1.00
Specification: expenditures in % of GDP and amenable death. Countries on the frontier: 4.											
Input efficiency	0.95	0.89	11/19	0.80	0.55	0.77	0.79	0.97	0.97	1.00	...
Output efficiency	0.94	0.86	6/19	0.74	0.92	0.69	0.79	0.75	0.94	0.76	...

1/ The authors present about eight different specifications with differences for the input (expenditure, environment variables) and for the output (life expectancy at birth, at 65, amenable death). Japan is ranked first in the specification with the amenable death indicator and otherwise mostly among the top five or at least among the top third. Expenditures are measured as expenditures per capita.

2/ The ranking indicates whether the technical components is a high-cost or low-cost factor, independently on its effect on performance.

3/ Baseline model with life expectancy at birth and infant mortality as output, and one indicator of expenditure as input.

Table 2-3. Non-pension social protection expenditures

	Japan and OECD			G20 comparators								
	JPN	OECD Rank		CAN	U.S.	FRA	GER	ITA	U.K.	AUS	KOR	
Survey results on efficiency of social expenditures												
Afonso, Shuknecht, Tanzi (2003), efficiency ratio.	1.60	1.11	4/22	1.39	1.15	0.64	0.85	0.95	0.98	1.80	...	
Tuladar (2014), input score non-pension social protection.	/	0.54	.../17	...	...	0.33	0.43	0.70	0.52	...	...
This study												
<u>Output (all rankings inverted)</u>												
Gini coefficient, 2010	0.3	0.3	26/34	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	
Ratio S90/S10, 2010	10.7	9.6	27/34	8.6	15.9	7.2	6.7	10.5	10.0	8.9	10.5	
Index of relative poverty, total population, 2010	16.0	11.3	29/34	11.9	17.4	7.9	8.8	13.0	10.0	14.4	14.9	
Relative poverty of the elderly, 2011	19.4	12.3	28/34	6.8	18.8	4.5	8.9	10.6	10.5	33.4	48.6	
<u>Input</u>												
Non-pension social expenditures, in % of GDP.	3.4	7.5	2/33	6.6	4.0	9.1	9.1	5.2	9.5	6.7	3.4	
Non-pension social expenditures, in US PPP per capita.	924	2198	6/31	1886	928	2482	2753	1331	2838	1920	560	
<u>Score of DEA model 3/</u>												
Specification: social expenditures in % of GDP. Countries on the frontier: 4.												
Input efficiency	1.00	0.60	1/33	0.51	0.83	0.43	0.80	1.00	0.36	0.50	0.40	
Output efficiency	1.00	0.91	1/33	0.90	0.76	0.95	0.91	1.00	0.67	0.88	0.97	
Specification: social expenditures in US\$ PPP. Countries on the frontier: 4.												
Input efficiency	0.55	0.47	11/31	0.29	0.45	0.24	0.26	0.40	0.18	0.27	1.00	
Output efficiency	0.89	0.93	24/31	0.90	0.83	0.92	0.95	0.90	0.87	0.88	1.00	
Memorandum: components of non-pension social protection, in % of GDP.												
Incapacity related	1.2	2.6	7/33	0.9	1.6	2.1	3.5	2.3	3.0	2.4	0.7	
Family	1.0	2.3	4/33	1.1	0.7	3.2	2.1	1.6	3.8	2.8	0.9	
Active labour market	0.4	0.6	16/33	0.3	0.1	1.0	1.0	0.4	0.3	0.3	0.6	
Unemployment	0.4	1.1	5/32	1.0	0.8	1.5	1.7	0.8	0.6	0.6	0.4	
Housing	0.2	0.4	11/30	0.4	...	0.8	0.6	0.0	1.4	0.3	...	
Other	0.3	0.5	10/30	2.9	...	0.4	0.2	0.0	0.2	0.2	...	
Subcategory: active labor market program												
<u>Output</u>												
Long-term unemployment, in % of total, 2010	37.6	31.3	21/33	12.0	29.0	40.2	47.4	48.5	32.6	18.5	0.3	
Unemployment rate, in %, 2010	5.0	8.6	6/34	8.0	9.6	9.7	7.1	8.4	7.9	5.2	3.7	
<u>Input</u>												
Active labor market program, in % of GDP, 2010	0.3	0.6	6/31	0.3	0.1	1.1	1.0	0.4	0.4	0.3	0.3	
Active labor market program, in US\$ PPP, 2010	77.0	182.8	8/30	94.0	32.2	309.7	288.1	109.3	122.8	89.3	56.1	
<u>Score of DEA model</u>												
Specification: ALM in % of GDP. Countries on the frontier: 4.												
Input efficiency	0.02	0.20	11/27	0.01	0.01	0.00	0.00	0.00	0.01	0.05	...	
Output efficiency	0.52	0.58	13/27	0.46	0.51	0.37	0.51	0.26	0.26	0.71	...	

Source: Japanese Statistical Office; OECD; and author's estimations.

Table 2.5. Administrative Efficiency

Source	Japan and OECD		G20 comparators								
	JPN	OECD Rank	CAN	U.S.	FRA	GER	ITA	U.K.	AUS	KOR	
Survey results on efficiency of administration											
Afonso, Shuknecht, Tanzi (2003), efficiency ratio.	1.25	1.00	3/22	1.00	1.30	0.61	1.01	0.54	0.94	1.21	...
Forthun, and Hagemann (2010), efficiency score.	1.00	0.75	1/34	0.83	0.88	0.66	0.88	0.66	0.77	...	0.89
Hribnik and Kierzenkowski (2013), input rank.	6	...	6/29	...	26	20	11	29	4	...	16
World Bank public efficiency perception index (2013)	0.95	0.87	11/34	1.00	0.92	0.92	0.93	0.63	0.92	0.96	0.82
This study											
<u>Output</u>											
<u>Main indexes</u>											
Crime and robbery rate (index), UNDOC, 2012	0.28	8.7	1/34	5.2	13.2	7.2	2.9	4.3	5.0	2.3	1.4
Corruption, WEF, 2012	4.9	4.5	15/34	5.3	4.2	4.5	5.0	2.9	5.1	5.1	3.3
Product market regulation (PMR), 2013, OECD, inverted.	1.4	1.4	17/33	1.4	1.1	1.5	1.3	1.3	1.1	1.3	1.9
Cost of tax collection (in % revenues, 2011), OECD, inv.	1.8	1.0	30/32	1.3	0.6	1.2	1.4	1.0	0.8	1.0	0.8
Composite index, average of normalized components	0.70	0.70	19/34	0.75	0.76	0.69	0.75	0.65	0.84	0.80	0.61
<u>Additional indexes</u>											
Perception of security, WEF, 2012	5.46	5.59	22/34	5.74	4.86	5.41	5.87	4.69	5.57	6.01	5.34
<u>Technical ratios</u>											
Civil servants as %age of the labor force (2011), OECD	6.67	15.07	2/33	17.72	14.39	21.90	10.61	13.70	18.29	15.72	6.50
<u>Input</u>											
Expenditures for general services (in % of GDP)	5.9	8.1	5/28	...	8.2	7.9	7.8	10.6	8.4	...	6.6
Primary expenditures for general services (in % of GDP)	5.9	6.1	15/28	...	8.2	5.3	7.7	5.8	4.7	...	6.6
Primary exp. for general services (in '000 US\$ PPP p.c.)	21.2	22.3	18/27	...	23.2	15.9	26.1	19.3	18.0	...	27.7
<u>Score of DEA model</u>											
Specification: expenditures in % of GDP. Countries on frontier: 3.											
Input efficiency	0.58	0.66	16/27	...	0.44	0.65	0.45	0.59	0.87	...	0.52
Output efficiency	0.67	0.73	17/27	...	0.84	0.71	0.77	0.62	0.96	...	0.55
Specification: expenditures in US dollar PPP per capita. Countries on frontier: 4.											
Input efficiency	0.67	0.77	20/27	...	0.84	0.88	0.77	0.62	0.96	...	0.55
Output efficiency	0.71	0.77	18/27	...	0.71	0.96	0.60	0.77	0.97	...	0.52
Specification: expenditures in % of GDP, without the cost of tax collection. Countries on the frontier: 3.											
Input efficiency	0.59	0.63	15/27	...	0.42	0.65	0.47	0.59	0.79	...	0.52
Output efficiency	0.82	0.75	12/27	...	0.75	0.74	0.85	0.64	0.93	...	0.56
Specification: expenditures in % of GDP, individual components of composite index. Countries on the frontier: 3.											
Input efficiency	0.59	0.72	17/27	...	1.00	0.65	0.45	0.65	1.00	...	0.52
Output efficiency	0.86	0.86	15/27	...	1.00	0.78	0.87	0.87	1.00	...	0.69

Source: debt service and expenditures from the IMF; expenditure data from OECD and Eurostat; author's calculations.

Table 2-6. Pension Expenditures

Source	Japan and OECD			G20 comparators							
	JPN	OECD Rank		CAN	U.S.	FRA	GER	ITA	U.K.	AUS	KOR
<u>Equity</u>											
Poverty rate among the over 65s, change 2007-10, OECD	-2.2	-2.7	...	2.2	-2.4	0.1	0.5	-3.5	-3.6	-3.7	2.1
Relative incomes of the over 65s, late 2000s	88	86	20/33	93	92	97	85	93	81	65	...
Median poverty gap, 2010, OECD 1/	29.9	18	28/33	...	23.6	10.8	16.1	12.1	15.4	12.4	44.1
<u>Measurement issues</u>											
Home ownership among the 65+, 2010, OECD 2/	80.0	76.1	...	72.0	80.9	75.9	53.3	81.3	74.0	84.0	...
Impact on imputed rent on poverty rate, 2010, OECD 3/	...	-5.4	...	...	...	-3.4	-1.8	-10.2	-12.7	...	...
Difference b/w 65+ and total poverty rate, OECD	3.4	1.0	...	-5.0	1.4	-3.4	0.1	-2.4	0.5	19.0	33.7
Pension Gini coefficient, in %, OECD	13.8	16	14/34	2.1	14.9	18.0	19.4	25.7	3.8	7.3	7.4
<u>Technical factors</u>											
Net pension replacement rates, 50% of AW, 2012, OECD 4/	54	82	1/34	91	59	76	55	84	67	101	65
Net pension replacement rates, 100% of AW, 2012, OECD	41	66	2/34	59	47	71	57	82	42	68	45
Share of elderly income deriving from transfers, 2012, OECD	48	59	9/34	39	38	73	69	73	50	40	16
Share of elderly income deriving from work, 2012, OECD	44	24	31/34	20	32	6	13	20	12	24	63
Share of elderly income deriving from capital, 2012, OECD	8	17	15/34	42	30	21	17	7	38	36	21
Normal pensionable age, in years	65	64	6/34	65	66	65	65	64	63	65	60
Average effective age of labour market exit	68	64	4/34	63	65	60	62	61	63	64	70
<u>Expenditures</u>											
Public pension expenditures in % of GDP, 2009, OECD	11.6	8.1	29/34	4.4	6.6	13.7	10.9	15.2	6.4	5.2	2.4
Pension expenditures, mandatory private, in % of GDP	0.6	0.3	29/34	0.0	0.0	0.2	0.0	1.2	0.6	0.4	0.7
Pension expenditures, voluntary private, in % of GDP	2.9	1.0	29/34	3.5	3.6	0.1	0.8	0.2	4.3	2.1	0.0
Pension income as % of average wage, OECD	36.4	55.9	2/34	44.3	37.8	53.9	42.2	74.9	31.3	55.0	38.4
<u>Revenues</u>											
<u>Full sample</u>											
Employer and employee contribution rate, in %, 2011, OEC	16.8	14.4	18/34	9.9	10.4	16.7	19.6	33.0	0.0	0.0	9.0
Pension contribution revenues, in % of GDP, 2012, OECD	6.3	3.5	25/34	2.6	4.2	0.0	6.9	9.0	0.0	0.0	2.1
<u>Excluding countries with private contributions only</u>											
Employer and employee contribution rate, in %, 2011, OEC	16.8	19.6	9/25	9.9	10.4	16.7	19.6	33.0	...	...	9.0
Pension contribution revenues, in % of GDP, 2012, OECD	6.3	6.3	10/19	2.6	4.2	...	6.9	9.0	...	...	2.1
<u>Memorandum</u>											
Old age dependency ratio (aged 65+, in %), 2009, OECD	37.4	24.4	34/34	22.1	21.4	28.2	33.9	33.0	27.4	21.8	16.4

Source: OECD, Pension at a Glance, 2013.

1/ Median poverty gap: fraction of income "at risk of poverty", i.e. below the 50% poverty line.

2/ For Japan, data from MILT.

3/ Data not available for Japan. Difference in the poverty rate when imputed rent is added to the income of homeowning elderly households.

4/ Net pension replacement rate are calculated for low earners (50% of AW average wage) and average earner (100% of AW) as a fraction of the pre-retirement earnings.

Annex Table 4-1. Equity and perception of public expenditures, Japan and OECD countries

Source	Japan and OECD			G20 comparators							
	JPN	OECD Rank		CAN	U.S.	FRA	GER	ITA	U.K.	AUS	KOR
Inequality indicators											
Education											
Homogeneity of PISA score 25th / 75th, 2012, OECD	0.79	0.77	8/34	0.79	0.77	0.75	0.77	0.77	0.77	0.77	0.80
Homogeneity of PISA score 25th / 75th, 2006, OECD	0.77	0.77	12/34	0.79	0.75	0.75	0.76	0.75	0.76	0.78	0.80
Role of social background in PISA performance, 2009, OECD	8.6	14.0	4/34	8.6	16.8	16.7	17.9	11.8	13.7	12.7	11.0
Health											
Perceived health status by income level, 2011, OECD 2/	0.68	0.76	26/33	0.84	0.78	0.82	0.67	0.81	0.78	0.81	0.70
Dispersion in the age of death (std deviation) 2005, OECD	13.7	13.70	10/15	13.8	15.2	14.6	13.0	13.4	13.5	13.8	...
Social protection											
Gini coefficient, 2010	0.34	0.31	26/34	0.32	0.38	0.30	0.29	0.32	0.34	0.33	0.31
Gini coefficient, 2007	0.33	0.31	23/33	0.32	0.38	0.29	0.29	0.31	0.34	0.34	0.31
Ratio S90/S10, 2010	10.7	9.6	27/34	8.6	15.9	7.2	6.7	10.5	10.0	8.9	10.5
Ratio S90/S10, 2007	10.3	9.3	26/33	8.5	15.1	6.8	6.7	9.0	9.8	9.3	10.0
Relative poverty of the elderly, 2011	19.4	12.3	28/34	6.8	18.8	4.5	8.9	10.6	10.5	33.4	48.6
Top income share 1% (pre-tax), Piketty-Saez, most recent	9.6	10.0	9/17	12.3	16.7	8.1	10.9	9.4	15.4	8.9	11.3
Perception indicators											
Education											
Quality of education, Gallup, 2012	56	66	29/34	74	64	67	66	62	78	66	52
Health											
Perceived health status among adults, 2011, OECD	30	67	26/26	...	...	68	65	65	78	...	37
Confidence in healthcare, 2011, Gallup	75	71	16/34	75	73	78	91	55	92	81	68
Social security (opinion)											
Favor redistribution, 2005-10 and 2010-14, WVS. 3/	62	60	10/19	56	39	62	71	...	...	55	...
Favor unemployment support, 2005-10 and 2010-14, WVS.	66	36	4/19	79	48	69	85	...	...	41	...
Oppose aging bias in transfers, World Value Survey. 4/	41	19	10/10	...	26	...	7	...	...	16	...
Simple average of confidence in social security 5/	62	54	4/19	68	53	66	83	...	...	60	...
Administration											
Confidence in government, 2011, Gallup	17	40	32/34	52	35	44	42	28	47	42	23
Confidence in civil service, 2010, World Value Survey	30	41	17/20	50	45	55	42	40	...	38	...
Confidence in police, 2011, Gallup	74	72	18/34	87	78	74	82	76	76	80	53
Confidence in judicial system, 2011, Gallup	60	50	12/34	57	48	50	61	38	62	58	22
Confidence in tax system, 2010, World Value Survey 6/	82	57	1/20	66	66	48	56	61	...	64	...
Simple average, all of the above	53	53	19/34	62	54	54	57	49	62	56	33

Sources: OECD, World Value Survey, Gallup, author's calculations. Classification in three groups among OECD: Best Med. Worst

1/ Percentage of score explained by social-background in PISA results.

2/ Ratio of perceived health status of lowest income group to perceived health status of higher income group.

3/ Average: the proportion of respondents favoring redistributive policies dropped from 67 percent in 2005-10 to 56 percent in 2010-14.

4/ Percentage of people who agree with the opinion: "Older people get more than their fair share from the government".

5/ Average of favorable opinions for three above indicators.

6/ Opposed or strongly opposed : "it is justifiable to cheat on taxes if you have a chance"

Table 4-2. Previous experiences and suggested measures to contain expenditures in Japan

Domain	Description
<u>Historical experiences</u>	
1970s	Total Staff Number Law of 1967,
1980-90	"Fiscal Reconstruction" with "Zero Ceiling" in 1982 and "Minus Ceiling" in 1983 for non-social expenditures.
1997-98	Fiscal Structural Reform Act under Prime Minister Hashimoto: cuts of 7-10% for specific programs, education and defense frozen with 0% growth, social expenditures growth contained at 2%. Abandoned 1998.
2001-04	Fiscal reconstruction under Prime Minister Koizumi. Target for fiscal deficit (abandoned 2002). Reform of local public finance ("Trinity Reform" 2003), pension system (2004), cut in welfare expenditures, FILP reform, reduction of public works. Initial reduction targets of 25% for public works and 20% reduction for education.
2009-10	Expenditure reviews under the DPJ governments and interruption of certain stimulus expenditures, of which public work projects, with decreasing yield of the reviews. Non-targeted increase of social transfers.
Social	Pension reforms of 1994 and 2004. Reforms of health care in 1984 and of social security in 1985.
Health	Long-term care reform in 2000, increased focus on preventive care, developing cost-effective home care.
Infrast.	Numerous reviews of public work expenditures throughout the 2000s.
<u>Current plan of the Japanese government 1/</u>	
General	Review of expenditures in GRA, special accounts, and agencies. Eliminate wasteful expenditures.
General	Expenditure prioritization for measures conducive to private demand and innovation.
General	Containment / reduction of Local Allocation Tax grants [to compensate for increase local tax revenues].
General	Enhance PDCA effectiveness (Plan, Do, Check and Act), esp. for measures in place for more than five yrs.
Social	Controlling the overall level of social security expenditure to the extent possible and improve efficiency.
Social	Improve pension efficiency, by resolving the issue of the exceptionally high levels of public pension benefit.
Health	Promotion the use of generic medicine.
Infrast.	Adoption of a "selection and focus" strategy by prioritizing projects with a high return on investment.
Infrast.	Prioritized public works budget for measures against aging infrastructure; reduction of road projects.
Health	Revision of drug prices and medical treatment fees [regular exercise every two years].
Educ.	Prioritization, expansion of support resources and reduction of teachers [neutral in terms of staff].
Agri.	Halving the grants for rice [expenditure neutral, resources to be utilized for financing "multiple functions"].
Social	Enhancing social security, increased expenditure for the "four expenses" (pensions, health, LTC, child-care).
Defense	Procurement reform of defense equipment.
Staffing	Reduction of staff by 10 percent over 2010-14 (gross); net reduction of 2.4 percent (0.4 percent in 2014).
<u>Recommandations of IMF and OECD 2/</u>	
Social	Reduce benefit for wealthy retirees (IMF, 0.25 pts of GDP)
Health	Limit non-pension security spending growth at 1-1.5 percent (IMF, 1 pt of GDP). Cf. details: Gate-keeping, generic drugs, healthy lifestyle, budget caps, strengthening supply constraints (IMF, ~1.1 pts).
General	Curb growth rate of non-social security spending (IMF, 2.5 pts of GDP).
General	Reducing government personnel costs, public investment, and pension benefits [or raise eligibility]. (OECD).
Health	Reduce length of stay in hospitals and tighter control of supply driven elements (OECD)
Educ.	Reduce spending per student at the primary and secondary levels, above the OECD average (OECD).
Educ.	Integrate childcare and kindergarten to reduce costs, consolidate universities [small internat. size] (OECD).
Salaries	Reduce teacher salary (higher than other civil servants) and civil servant salaries (higher than avg.) (OECD).
Social	Better targeting social expenditures towards population at risk (OECD).

Source: Miyazaki (2006); IMF; OCDE; Japanese authorities;

1/ Quotes from "Basic Framework for Fiscal Consolidation", CAO, 2013; "Highlights for the 2014 budget", MOF.