

Impacts of Income Disparity on Household Energy Consumption

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<Summary>

Concern is mounting over a widening income disparity. Compared to ten years ago, households with an annual income range of between 3 million yen and 4.5 million yen substantially increased, whereas those mainly falling in the income range of 7 to 9 million yen per year significantly decreased. In a general trend of income polarization, middle income groups are facing the harshest situation where households are being downgraded into below-average groups. While the number of low income households rapidly increases, the rate of decrease in income for the rich remains low in comparison with the middle class, and the number belonging to the upper rich class is even increasing.

What sort of impact is then made on household energy consumption as a result of the widening income disparity such as above?

Reduced purchasing power due to economic difficulty suffered by the middle to low income groups could exert a downward pressure on the household energy consumption. In particular, since energy purchasing patterns tend to change around households with yearly income of about 7 million yen as a threshold, it can be concluded that the changes in income levels as well as the number of households caused by the downfall of upper-middle income groups will have impacts on the overall energy consumption. By contrast, as the upper-rich group comprises a small number of households, the impact of its higher income on the overall energy consumption will remain minimal.

Furthermore, the impacts that the income disparity brings about will vary by respective energy sources, namely: (1) electricity and city gas consumption will be affected significantly from reduced income in the upper-middle income groups as well as the rich group, (2) the influence of reduced income on LPG and kerosene consumption will be less significant than others, and (3) for gasoline consumption, reduced income in the upper-middle income groups and the middle to low income groups will have a significant impact.

Degree of Impacts of Growing Income Disparity on Household Energy Consumption

	Electricity	City Gas	LPG/Kero	Gasoline
Reduced income: Mid-/low income groups	-	-	-	↓
Reduced income: Upper mid income groups	↓	↓	-	↓
Reduced income: Rich groups	↓	↓	-	-
Increased income: Upper rich group	↑	↑	-	-
Rate of energy purchase reduction due to growing income disparity (2001-2010)	1% or less	Approx. 2%	-	1.5% or less

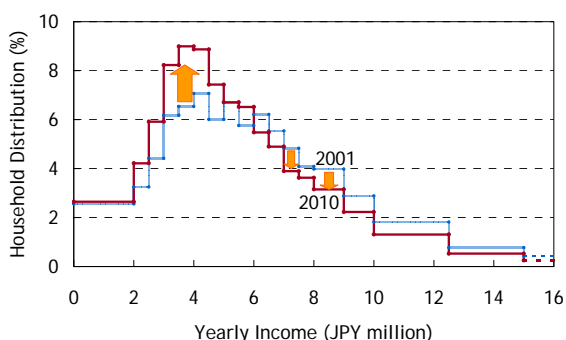
The reason that the impacts of widening income disparity, in particular of the reduced income in the middle to low income groups, are less conspicuous than perceived appears to be a reflection of the character of energy as an essential commodity. This aspect can be illustrated more prominently when compared to the demand for clothing which tends to be curtailed in advance of any other commodities as the very first means of defending household budgets.

Widening income disparity

Concern is mounting over a widening income disparity. In autumn 2011, a social movement called the “Occupy Wall Street (OWS)” began in the U.S. with a slogan “*We are the 99%*”, protesting against social and economic inequality. The movement spread over the world including Japan and led to a series of demonstrations and other events calling for corrections to growing income inequality and wealth distribution.

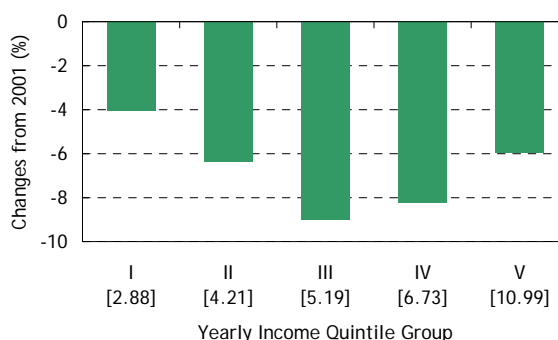
Although the Japanese income levels used to exhibit such a narrow distribution that it allowed the description “all Japanese belong to the middle class”, it is now a thing of the past. In terms of income distribution, households with an annual income in the low/middle range of between 3 million yen and 4.5 million yen substantially increased during the past ten years, whereas those mainly falling in the upper–middle income range of 7 to 9 million yen per year significantly decreased (see Fig. 1). On the other hand, high income earners of over 25 million yen have increased (National Tax Agency, “*Statistical Survey of Actual Status for Salary in the Private Sector*”). In terms of equivalent yearly household income¹ by quintile groups, the third (III) and the fourth (IV) quintiles representing middle to upper–middle income levels show the highest rates of decrease (see Fig. 2). In other words, in a general trend of income polarization, middle income groups are facing the harshest situation where households are being downgraded into below-average groups. While the number of low income households rapidly increases, the rate of decrease in income for the rich remains low in comparison with the middle class, and the number belonging to the upper rich class is even increasing.

Fig. 1: Distribution of Households by Yearly Income Groups (2010)



Note: Two-or-more-person households
 Source: “*Family Income and Expenditure Survey*” by Ministry of Internal Affairs and Communications

Fig. 2: Equivalent Income by Quintile Groups (2010)



Note: Two-or-more-person households (mean values in JPY million in brackets)
 Source: Derived from “*Family Income and Expenditure Survey*” and “*Consumer Price Index*” by Ministry of Internal

¹ To remove the effect of household size, the yearly income is corrected by dividing it by the square root of household size.

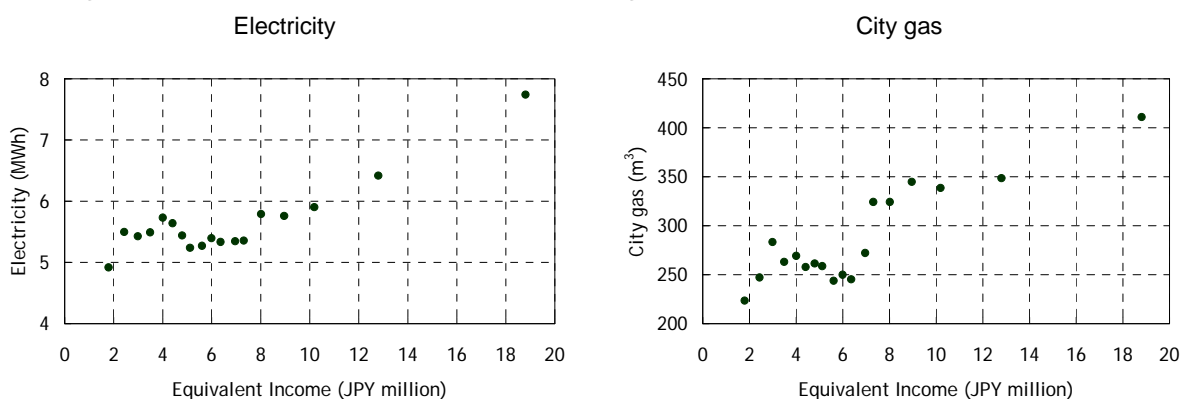
Impacts of widening income disparity on household energy consumption

The author has attempted to look into the impacts on household energy consumption as a result of widening income disparity caused by the downfall of middle to upper-middle income levels or lower and the increasing income for the upper rich levels. As is the case with other goods and services, it is inferred by analogy that decrease in income should lead to reduced energy consumption. However, the relationship between the above two is not necessarily proportional to each other, and particularly so when the character of energy as an essential commodity comes to the fore. The following section discusses the findings from the above exercise as to the actual relationship between the equivalent income by yearly income groups and the equivalent energy purchase² observed for various energy types:

Electricity, city gas:

For the household income range of up to 7 million yen or so, the purchased quantity of electricity and city gas stays roughly in the same level regardless of the income level (see Fig. 3). However, from around 7 million yen as a threshold value the purchased quantity jumps up and the correlation between the income level and the purchased quantity gradually becomes stronger. Since one of the characterizing factors of growing income disparity is the attrition of upper-middle income households with yearly income of 7 to 9 million yen, the income inequality will provide a factor to push down the overall demand of electricity and gas in the household sector.

Fig. 3: Equivalent Income vs. Equivalent Energy Purchase (Electricity, City Gas, 2010)



Note: Two-or-more-person households; the purchased quantity for city gas is estimated based on the purchased amounts and Tokyo Gas's gas rates table for Tokyo District customers.

Source: Derived from "Family Income and Expenditure Survey" by Ministry of Internal Affairs and Communications

LPG, kerosene:

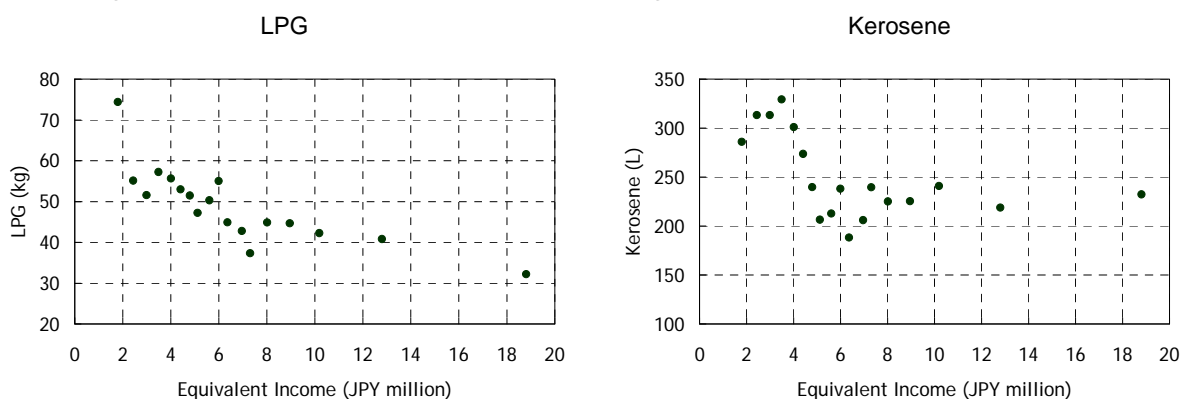
For LPG and kerosene consumption, a picture different from the above is observed. For the household income range of up to about 7 million yen, the purchased quantity of these items declines in line with increases in income³ (see Fig. 4). After the 7 million yen mark the correlation between

² To remove the effect of household size, the energy purchase is corrected by the logarithm of household size.

³ This is the character of so-called "Inferior goods" in economics.

the income level and the purchased quantity becomes weaker with the latter showing a trend to converge at a steady level regardless of income. Since another character of growing income disparity is an increase in the number of households within the yearly income range of 2 to 6 million yen, there is a possibility that the expanding income inequality is working as a factor supporting the demand for LPG and kerosene in the household sector⁴.

Fig. 4: Equivalent Income vs. Equivalent Energy Purchase (LPG, Kerosene, 2010)



Note: Two-or-more-person households;

Source: Derived from “Family Income and Expenditure Survey” by Ministry of Internal Affairs and Communications

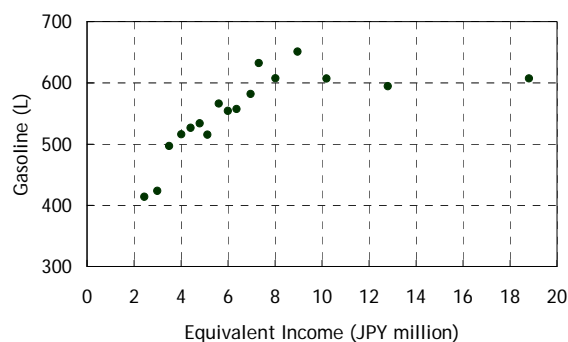
Gasoline:

The relationship between the household income and the purchased quantity of gasoline is in a situation that is almost point symmetrical with one for electricity and city gas (see Fig. 5). For the household income range of up to about 7 million yen per year, increases in income closely link with those in purchased quantity of gasoline. Beyond the 7 million yen mark, however, the purchased quantity reaches a plateau of 600 liters or so per year regardless of the income level. Here, the expanding income inequality will work as a factor to push down the gasoline demand by way of two processes; an increase in the number of households whose gasoline purchase is dependent on income amounts, and a decline in purchased quantity due to the reduced income amounts.

In the case of gasoline, further, it can be inferred that the gasoline purchase by middle or low income groups is also affected through the factor that the car ownership is determined by the size of income. As a result of this effect, the variances in purchased quantity for gasoline among differing income groups become greater compared to electricity.

⁴ However, this relationship obtained as a cross-sectional observation could also be affected by the fact that, compared with urban areas, provincial areas have a lower rate of city gas diffusion and, at the same time, tend to be in a lower income scale. If this is the case, a reduced income level in a household does not necessarily lead to an increase in the purchased quantity of LPG or kerosene.

Fig. 5: Equivalent Income vs. Equivalent Gasoline Purchase (2010)



Note: Two-or-more-person households;

Source: Derived from “Family Income and Expenditure Survey” by Ministry of Internal Affairs and Communications

Summary and Conclusion

Among the impacts of growing income inequality, the reduced purchasing power due to economic difficulty suffered by middle to low income groups could exert a downward pressure on the household energy consumption. In particular, since energy purchasing patterns tend to change around households with yearly income of about 7 million yen as a threshold, it can be concluded that the changes in income levels as well as the number of households caused by the downfall of upper–middle income groups will have impacts on the overall energy consumption. By contrast, as the upper rich group comprises a small number of households, the impact of its higher income on the overall energy consumption will remain minimal.

Furthermore, the impacts that the income disparity brings about will vary by respective energy sources. They can be roughly summarized as: (1) electricity and city gas consumption will be affected significantly from reduced income in the upper–middle income groups as well as the rich group, (2) the influence of reduced income on LPG and kerosene consumption will be less significant than others, and (3) for gasoline consumption, reduced income in the upper–middle income groups and the middle to low income groups will have a significant impact.

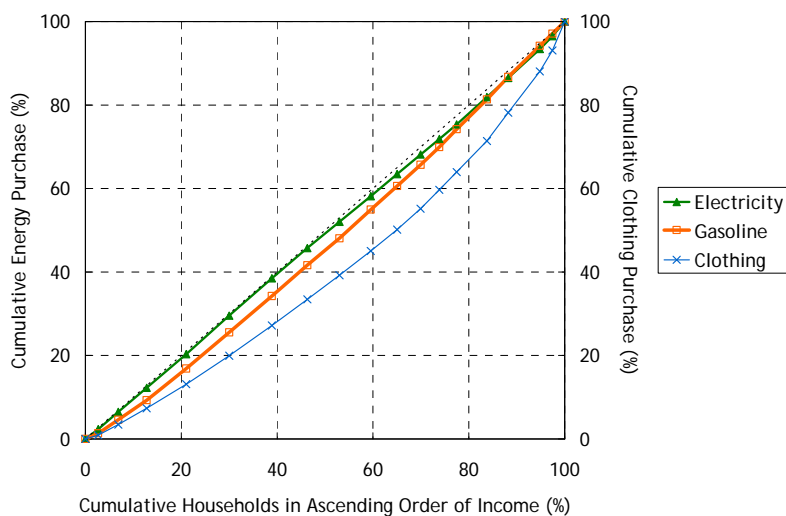
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commodities as the very first means of defending household budgets. Fig. 6 is an application of the Lorenz Curve in which a cumulative ratio of households arranged in ascending order of income is given on the horizontal axis while the corresponding goods purchase quantities or amounts are accumulated on the vertical axis. This graph shows that, the farther a data point is placed away from the line of equality (the “45 degree line”), the more disparity exists in the purchased quantities or amounts of the goods under discussion. Even though purchased quantity of gasoline is affected more by income level than other energy sources, the impact of widening income disparity appears smaller compared to the case with clothing and footwear purchases.

Fig. 6: Influence of differing income over goods purchases (2010)



Note: Two-or-more-person households;

Source: Derived from “Family Income and Expenditure Survey” by Ministry of Internal Affairs and Communications

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